

# Early Importations of *Pinus Radiata* to New Zealand and Distribution in Canterbury to 1885: Implications for the Genetic Makeup of *Pinus Radiata* Stocks.

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## Introduction

*Pinus radiata* D. Don shows great variability between individual trees. This genetic variation as scientists have shown, gives the species the potential for genetic improvement through selective breeding'. This has been achieved in New Zealand, where naturalized stocks have formed the base of an elaborate and scientifically based selection programme. While intensive breeding began around 1950, *the* story of genetic improvement in New Zealand begins with the introduction of the species. This introduction was almost certainly completed by 1885, since when no significant radiata plantings are known to have come from imported seed. In the meantime there have certainly been some genetic shifts, independent of the breeding programme.

Even though the breeding programme is well advanced, knowledge of the genetic history of the species in N.Z. would be valuable background information for tree breeders, apart from being of considerable scientific interest.

To understand the genetic history of our present New Zealand radiata stocks, it is necessary, to re-extend and re-evaluate our knowledge of plantings that may have contributed to this make-up, the origins of seed for these plantings, the relative size of the seed lots and their subsequent distribution on arrival. Only with such knowledge can the genetic changes since introduction be clearly identified and properly understood.

An historical evaluation is particularly appropriate with the Millwood Press release of the book "The Botanic Garden Wellington" which shows that there was a major Government importation and distribution of conifer seed from the Geological Survey (GS seed) for the years 1870-1885 during this 15-year period, some 56 lbs of radiata seed was distributed, a factor unknown (albeit suspected) in forestry circles, seems as if this GS seed, with its wide distribution, could have had a major bearing on ie genetic base of commercial *P. radiata* seed in this country today. This paper, therefore, pays further attention to this seed and distribution, particularly in Canterbury.

The paper takes a cursory look at provincial areas such as Nelson, Manawatu and Matamata which have made some contribution to commercial radiata stocks, but in other provinces GS seed distribution has not yet been investigated.

Nor have some pieces of relevant legislation been duly studied. M. Roche, for instance, states that a detailed examination of the effects of the 1871 Forest Trees Planting Encouragement Act has yet to be made.

Some of the GS seed distribution may well be linked to this Act. And in Auckland, the Provincial 1874 Highways Act, which operated instead of the Forest Trees Planting Encouragement Act, may be linked to the secondary distribution of GS Seed from the Auckland Domain Board, (Acclimatization Society) the provincial centre for GS seed. Old radiata trees on Devonport's Mt Victoria and on Mt Eden, for example, are the result of a provincial grant in 1875 to the Devonport and Mt Eden Highways Boards. One Board, the Grafton Highway Board, according to the N.Z. Herald 3 June 1875, bought trees from the Auckland Domain Board.

In 1876 seven Highways Boards received provincial grants — North Shore, Devonport, Parawai, Onehunga (Greenhill Reserve of Jellicoe Park) (Fig 1), Managapiko near Te Awamutu, and Ngaruawahia where today several old conifers can be seen in their domain. With the abolition of the provinces in 1876, central Government's 1871 Forest Trees Planting Encouragement Act and its amendments operating in Canterbury, Nelson and Otago now applied to the Auckland province and elsewhere in N.Z.

### **The GS Seed — Summary**

Government introduced 48 species of conifer seed during the years 1870/1885. There was as yet no State Forest Service, so the seed came to Dr James Hector, Director of the New Zealand Geological Survey. Hector was also Director of the Colonial Museum and Manager of the Wellington Botanic Garden and he used his pervasive influence to distribute the seed. It went throughout New Zealand, recipients being members of both Houses of Parliament, Acclimatization societies, Domains, Botanic Gardens, Schools, cemeteries, runholders (often members of Parliament), some nurserymen, and even settlers, in reply to advertisements. This distribution went even further and there were secondary distributions from agencies such as Acclimatization Societies, Domains etc. In Canterbury, for example, a large number of Domain Board plants which were distributed were raised from GS seed sent from Wellington.

The 1873 Annual Report of the Botanic Garden Board said "That from the success of raising imported conifer seed in the Wellington Botanic Garden 100,000 trees must have been dispersed in the Colony. In 1883/84 The Annual Report said "a vast amount of progress is quietly being made in stocking the Colony with forest trees. Of the 48 species introduced for this period two were particularly successful — radiata and macrocarpa (*Cupressus macrocarpa*).

From the 56 pounds of radiata seed introduced and distributed the yield for this 15-year period would be, if we use F.R.I. estimates of 20,000 radiata seedlings/kg, around 500,000 seedlings. Photographs and postcards dated around 1902-1910 demonstrate the success of conifer introductions, particularly radiata, for the period 1870/ 1885 and the landscape change they brought to New Zealand. (Fig 2).

An appreciation of the qualities and value of radiata and its effect on the landscape, as well as its value for providing timber and shelter, was slow in coming. In 1884 Thomas Kirk, appointed the first Conservator of Forests and a member of the Wellington Botanic Garden Board, must have been aware of the success of radiata in the Wellington Botanic Garden which by this time was harvesting and distributing some bushels of seed off 14 year old trees, yet he did not press for its use. In 1885 John Buchanan, also closely connected with the Garden, was disparaging in his remarks on possible use of radiata, an attitude which seems to have prevailed among foresters for the next twenty years.

By 1896, when Prime Minister Seddon called the Timber Conference, radiata and macrocarpa, much of which was attributable to GS distribution, had already made a huge impact on the New Zealand landscape although little had been done to encourage public afforestation. Some milling was now taking place.

### **Seed Production — the age of trees coning**

The local availability of seed and the phasing out of seed importations is extremely relevant to radiata distribution. When nursery stock was expensive this could rule out the ready local availability of seed.

The converse, however, need not be true as cheap nursery stock would not prove local availability of seed. English catalogue prices for radiata in 1875 range from 6/- per dozen, for 9" -12" plants to 2/6 to 3/6 each for 4' - 5' high plants". These prices are relatively high in relation to N.Z. catalogue prices for the same time. Does this indicate that English-produced seed was not readily available in quantity?

Ten years is accepted as an average for radiata coning. This accords with how Wellington Botanic Garden was by 1884 harvesting and distributing some bushels of seed from 10-14 year old trees. However, the age of onset of worthwhile cone production can vary a lot according to site and to provenance — in the latter connection the Monterey provenance seems to produce cones rather later on, and the very earliest collections seem to have been from Monterey rather than Ano Nuevo. Some young Monterey trees can be relatively shy seeders.

### **Radiata is introduced to cultivation — England, Australia and New Zealand**

It appears that radiata first came into successful cultivation when, in 1833, seeds and specimens, collected by the Scottish explorer David Douglas, a gardener employed by the Horticultural Society of London, were sent to England. They were grown in the society's garden at Chiswick and by 1838 were 3'-5' tall. Kensington nurseryman Richard Forest, that same year, had trees for sale 21s to 100s each. By 1847, to overcome the high price being charged for plants, gardeners were urged to graft slips of it on to the Scots pine. This was one of the beginnings of a 19th-century worldwide interest in conifers which became manifest in most of the public gardens in newly established British colonies which can still be seen today. Hooker remarked in the 1869 Kew Bulletin "It is a curious fact that the rage for introducing coniferous trees into English parks and gardens has almost extinguished the culture of all but a few deciduous trees".

During 1850-51 a further direct importation of radiata to England came from collector William Lobb who sent back cones and seeds from Monterey to his employer James Veitch at Exeter in Devon. Further conifer cones and seeds (unspecified) were sent from California in 1854-57, while large quantities of *Wellingtonia* seed were sent in 1853. Lobb continued to stay in California after his contract with his employer expired in 1857. Dispatch of plants, similar to the 1858 Kew consignment continued to reach England from time to time until Lobb's death in San Francisco in 1863.

Sir Thomas Acland at Killerton in Devon benefited from these expeditions because Killerton, originally laid out by James Veitch's father, with its lime-free soil and sheltered position, made an ideal trial-ground for most of the new discoveries. The first '*Wellingtonia*' in England reputedly planted at Killerton in 1854 were from two living plants brought back by Lobb in 1853 but these failed to survive.

Significantly for New Zealand, in 1859, and again in 1863, it was from James Veitch that J.B.A. Acland of Mt Peel, in Canterbury acquired and sowed seed of radiata. From the same source, in 1862, by way of a Wardian Case Acland received a specimen of '*Wellingtonia*'. Acland did, however, order some plants from Australia and these too may have come in Wardian cases. A three-year-old "insignis plant", reputedly and bought from Shepherd and Co. Darling Nursery in 1859 had, by 1970, reached a height of 50.1m. It is still extant. In 1865 Acland imported 10 species of conifer seed from Veitch and 25 conifer plants from Shepherd and Co. Next year three-year-old radiata plants were imported from Camden Nursery in N.S.W. — these would have cost 5/- each. Conifers, particularly radiata, were succeeding at Mt Peel.

If 10 years is allowed for radiata to cone the earliest that seed distribution from these two introductions of radiata to England might be expected, is 1843 for London and about 1862 and 1866 for Veitch. It is unlikely; therefore, that Acland's seed received from Veitch in 1859 was harvested in Devon. More likely it was from a later consignment sent by Lobb to Veitch. The same would apply to the 1863 seed sent to Acland.

#### **Australia**

Until now, early introductions of American conifers to Australia would seem to have come from England rather than direct from California. Bannister found no evidence for early radiata imports direct from

California to Australia. In 1853 the newly appointed Victorian Government botanist Baron von Mueller was collecting Australian plant material for the herbarium at Kew.

Through his correspondence with William Hooker at Kew a close relationship developed between the two men. In 1857 Mueller was appointed Director of the Melbourne Botanic Garden. The Annual report for that year, states that "A Pinetum will be reared". Kew would have contributed to the extensive pinetum Mueller established in the garden. Unfortunately the Melbourne Garden archives were destroyed and Kew, while recording that packets of seeds were sent to many developing botanic gardens, did not identify the species. In 1859, two years after his appointment as Director of the Melbourne garden, Mueller, according to Bannister, distributed radiata "most extensively" in Victoria and other parts of the continent. If this seed came from England it ties in closely with J.B.A. Acland's receipt of seed from Veitch in Exeter. J.G. Veitch visited the Melbourne Garden in 1866 so Veitch's nursery in Exeter, and its branch in London together with Kew, appear to have played a significant role in the distribution of radiata to Australasia.

Hobart's Royal Botanic Garden does not list radiata in 1855 but it records it there for 1857 along with 26 other pines. Their achieves record a Wardian-case introduction of pine species from England about this time. Eight years later in 1865 their radiata coned and seeds were sent to the Melbourne Botanic Garden.

Although Bannister knew of no direct link with California for conifer introductions, it is now known that in 1851 a Mr de Murrant of California sent seeds of pines (unspecified) to Charles Moore, Director of the Sydney Botanic Garden.

Feilding (1957) investigated (in some detail) the introduction of radiata to Australia. He gives the earliest recording as 1857 when the Director of the National Herbarium, Sydney, received one radiata per the ship "Duncan Dunbar". This ship sailed from Plymouth and London and arrived at Sydney 13 December, 1857. Feilding goes on to suggest that the shipment may have included one or more radiata plants for the Melbourne Botanic Garden since it is listed there for 1858. Coincidentally, 1857 appears to be when the Hobart Botanical Garden received their plant(s). These are all records of plants from England. Two years later, in 1859, Mueller distributed the species most extensively in Victoria, which presupposes that he was distributing seed or plants raised from seed received about 1857. No evidence has been found concerning a seed source. Mueller, according to Feilding, is credited with introducing radiata to South Australia, but the earliest confirmed date for its introduction there is 1866. That year an avenue of radiata was planted in the Adelaide Botanic Garden soon after Mueller's 1865 Annual Report recommending radiata for avenue planting. By 1878 these had attained a height of 50 feet. The 1867 Annual Report for the Adelaide Botanic Garden, while not naming radiata, advocates the use of Californian pines for parks and approaches to the city instead of gums. For such a recommendation to be made it seems likely that South Australia received radiata before 1866 and that Mueller's 1859 distribution in Victoria extended to South Australia. J.B.A. Acland's three-year-old radiata imported from Shepherd & Co. N.S.W., would have been raised from 1856 radiata seed and thus appear at present to be the earliest record of insignis seed in Australia. The source of Shepherd's seed is unknown but exchanges of plants with the Melbourne Garden were frequent. Kew and Veitch are likely English sources but a direct importation of Californian conifer seed to Mueller and Australian nurserymen for 1856 may yet be found, for by this time some trade was established between Australia and America. "American Bacon" was sold by nurseryman Lang when he first arrived in Ballarat in 1856 and traded in general stores. In 1862 Mueller did receive Californian pine seed from San Francisco nurseryman C. Walker, while Shepherd and Co. were also in receipt of direct imports of seed. The Kew Bulletin in 1868 mentions that a Dr Walker supplied them with unspecified plant material.

It is possible that Mueller received packages of seed earlier than 1862. During the 1860s "some 36,000 conifer seedlings (mostly cypresses, pines, araucarias and *Seqnoiadendron giganteum* (*Wellingtonia*) were propagated in the Gardens and distributed around the State

If the Hobart Botanic Garden first coned radiata in 1865 then we could expect radiata trees in Victoria and New South Wales to be doing the same. An 1866 Camden Nursery catalogue gives a cost of 5/- per plant. Lower prices in an 1868 catalogue would tend to confirm that locally produced seed like the Hobart

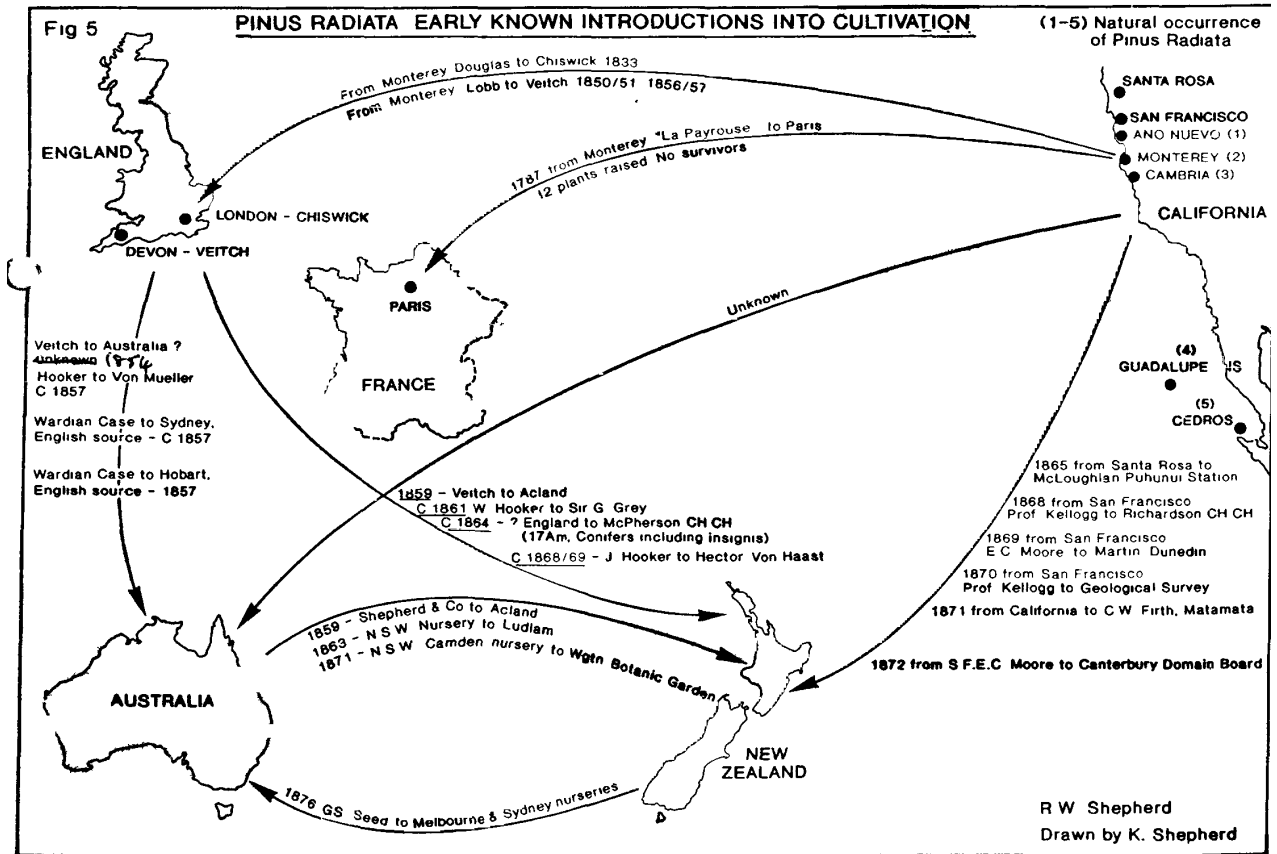
seed was by now becoming available although equally it could suggest receipt of a quantity of seed from California.

Old radiata resembling those planted in N.Z. for the period 1870-1885 can be seen in the Hobart Botanic Garden and the Launceston region of Tasmania. However, at Entally House, a National Trust Property near Launceston, a Californian redwood said to date from the 1820s and radiata from the 1840s do not reconcile with present understandings of the distribution for these two species and should be re-examined.

### **New Zealand**

During the late 1850s and early 1860s Sir George Grey was a regular recipient of plants and seed (which included pines) from William Hooker. With a large collection of conifers established by 1862, Grey presumably received his radiata from this source. Burdon, on a recent but purely visual examination of radiata at Mansion House, Kawau Island has said Grey's radiata appear to be straight Monterey. In origin this would accord with a London source for early trees. In 1863, Auckland nurseryman David Hay advertised radiata 2'-4' at 3/6d. An earlier undated Hay catalogue lists radiata 3'-4' at 7/6d each. Challenger reservedly dated this catalogue as 1860, but 1862 is possibly more accurate since an 1860 Hay's advertisement in Chapman's Almanac lists only pines of European origin. Hay's "Priced Catalogues" advertised in Chapman's monthly. Volume 1 (August 1862), may be referring to this catalogue and since it shows a significant increase of conifers over Hay's earliest list in the 1860 Chapman Almanac, 1862(?) is the date accepted in this article. It remains a mystery as to where David Hay acquired seed to enable him to advertise 3'-4' plants at 7/6d each in 1862(?) and 2'-4' plants at 3/6d in 1863. Hay, although born in Scotland, was married at St Giles-in-the-Field, Middlesex in 1840. He was then 25 years of age. A few years later he moved to Gloucestershire before emigrating to New Zealand in 1855. His profession at the time of his marriage is not known but if he was a gardener or attached to a nursery near London then he may well have known John Veitch, also of Scottish descent, who, in 1832, established the London branch of his father's Exeter firm. He may have heard of the success of the Douglas introduced radiata seed at Chiswick. No evidence has been found to link David Hay with America before his emigration, so it seems likely that it was from England that he first obtained his conifer seed. The firm's connection with America came later, especially in the mid 1880s with the importation of the Burbank plum from the Burbank nursery in Santa Rosa. Descendants of David Hay have failed to shed further light on the subject. When in 1874 Hay collected radiata cones. Hector was releasing large quantities of Californian seed and plants from Wellington. Sir George Grey's presumed acquisition of radiata in 1860/61 followed closely upon Acland's in 1859 Andrew Sinclair, appointed New Zealand colonial Secretary in 1845, may, according to researcher John Adam, hold the clue to the source of Hay's seed. Adam suggests that Sinclair while studying medicine in Paris may have first seen radiata trees raised from a cone collected in the neighbourhood of "Monte-Rey" and sent in 1787 by a gardener named Colladen of the "La Payrouse" to the Museum of Natural History in Paris. According to Burstall, however, only 12 plants were raised and all failed to survive. In 1837, Sinclair collected *Pinus Sinclairii* now considered a synonym of *P. radiata* at "Tepic" (sic) in California. Adam's theory re Sinclair's possible involvement with radiata introduction to N.Z. and with Hay is, at present, conjectural, particularly as Hay's arrival in Auckland in 1855 coincided with Andrew Sinclair's retirement and travel abroad for a period. Sinclair did return to New Zealand in 1858, ostensibly to gather more material for Joseph Hooker's forthcoming Handbook of New Zealand Flora. If, before his return to N.Z., William Hooker discussed with Sinclair the recent defection of William Lobb with his employer Veitch, then it is possible that a direct Californian link for nurseryman Hay came about at this time. Another possibility is that Hay's ship on route to New Zealand in 1855 called at Sydney where nurserymen from N.S.W. may have provided an American contact address. Hay may even have used Australian nurseries for the initial stocking of his own nursery in Auckland. Nairn's 1932 Banks lecture confirms that the firm imported largely from California, and from leading firms in Britain and Australia. One N.S.W. firm, Shepherd and Baptist, (Shepherd & Co) advertised in the N.Z. paper. The Southern Cross in the 1860's.

In Christchurch in 1862, **H. J. Tancred** and Mr Edward Reece, both of Windmill Road, had radiata while in Wellington both Ludlam and Mason had established it by 1865. Potts in Canterbury, although known for his conifer plantings, did not establish it until 1866. Sources of these specimen trees may well have been from the Australian nurseries, Shepherd & Co, Camden of N.S.W. or Lang & Co. in Victoria, although English sources cannot be discounted. The Gardener's Chronicle, 1 July



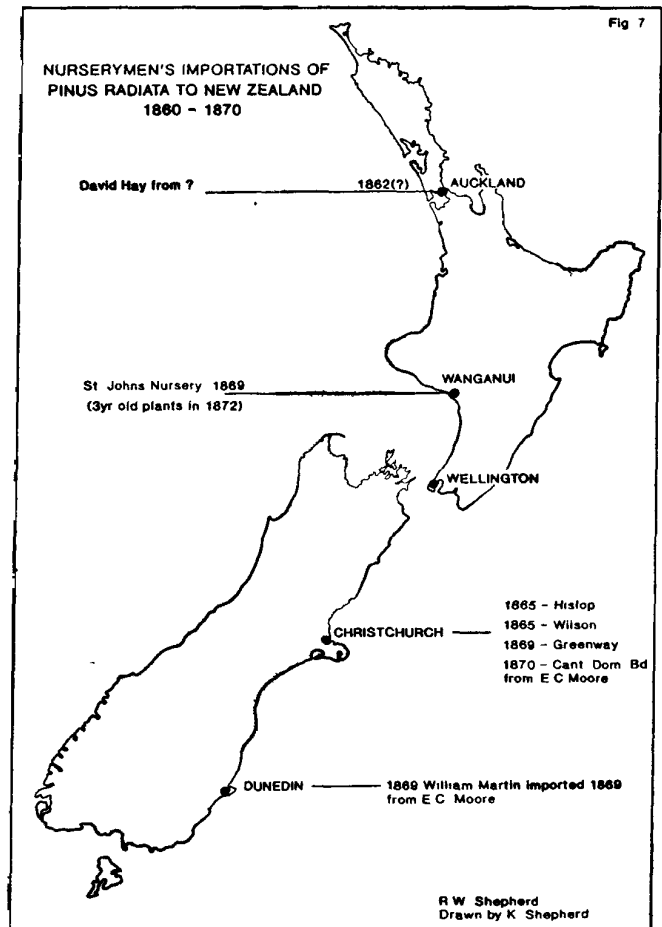
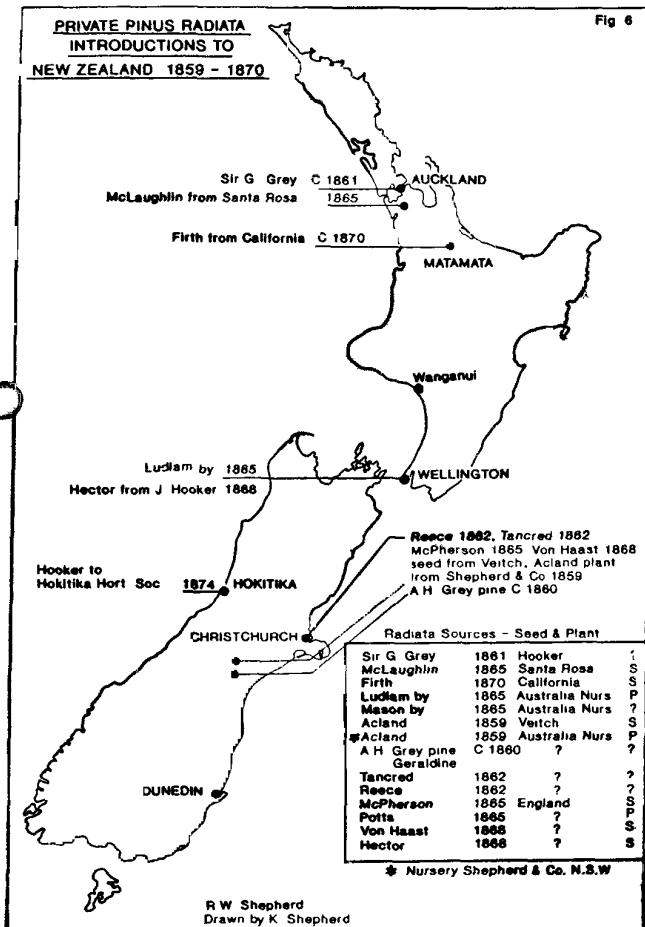
1865, carried an interesting account "Gardening in Canterbury, New Zealand". Written by Walter Tipler it lists seventeen American conifers including "insignis" which his employer MacPherson, of 'Hawthomden' Christchurch imported at great expense from England. A recording for an 1877 Canterbury milling of radiata from twenty-seven year old trees is decidedly suspect particularly when Swale in 1858 wrote that the only pines he saw there were *Pinus pinaster*. Campbell-Walker (1877) refers to inspecting 10-15 year exotic plantings in Canterbury, i.e. 1862 and 1867 plantings. Only the latter could have contained appreciable radiata. After 1865, however, it became common knowledge that conifer seed could be readily obtainable from Californian nurserymen.. Between 1865-67 Robert Rhodes of Christchurch introduced, according to Barnett, "12 varieties of conifers" from San Francisco.

An important early Auckland planting occurred at Puhunui Station near Papatoetoe, the radiata seed (thought to be 14 lb approx from the Santa Rosa area in 1865. Significantly, Luther Burbank, the nurseryman who later supplied Hay with the "Burbank" plum operated from Santa Rosa. In 1959 Bannister believed Burbank had earlier acquired the seed of radiata from Monterey. With 1865 Puhunui radiata seed coming from Burbank and by allowing a minimum of 10 years for coning, Burbank's trees must have been planted by or before 1855. C. W. Firth 1874 gave a detailed description of a Matamata planting of conifer seed (quantity unknown) presumably obtained from America in 1869/ 70. A similar date applies to Wanganui's St John's nursery which advertised 3-year-old plants in 1872". In 1868 Edward Richardson, resident of Christchurch and owner of Albury Park, received some seed, probably a small quantity, from California's

leading botanist Professor Kellogg. In January 1869 the Dunedin nurseryman William Martin introduced the first Californian conifer seed to Otago. It came from the firm E. C. Moore and contained radiata, if the Canterbury nurserymen, the firm Duncan and Son were known to Professor Kellogg. Presumably Kellogg, or some contact of his, was their source of radiata seed. Until 1867 Duncan and Son operated as seedsmen only, but with the purchase of land off Ferry Rd they then commenced nursery production. Their first catalogue, of 1870, advertises "80 varieties and species of conifers". It would appear that this was about the time when they made contact with Professor Kellogg, possibly learning his address from Richardson. Andrew Duncan was active in the C.H.S., a member of the Canterbury Philosophical Society, Mayor of Christchurch in 1869, a member of the Provincial Council from 1868-1873 and a member of the committee with Wilson & Hislop which advised on the Planting of the Tree Belts (Press, 14 May 1867). Duncan and Son supplied conifer plants to the Wellington Botanic Garden in the 1870's but the firm's interest increasingly became more "glasshouse" orientated. Nurseryman William Wilson had radiata for sale in 1865, while J. Greenaway advertised "a fair stock" for 1869.

The source of the radiata seed for these two nurseries is not known. In 1872 Wilson said of radiata "It is rapidly raised from seed either from England or California but is a comparatively recent introduction and little is known about its timber". The same year the Canterbury Domains Board said, in reply to receiving GS seed, "*Pinns insignis* was becoming common in the Province". In 1872 the Domain's Board received additional conifer seed, including radiata, from Californian nurseryman E. C. Moore, supplier to Dunedin nurseryman W. Martin with Otago's first Californian conifer seed.

Coning, even from Acland's 1859 seed or plants from Shepherd & Co. would not have occurred much before 1870, so imported seed would seem, up until this time, to be the most likely source for all the foregoing. American sources therefore identified to date are "Santa Rosa", and from San Francisco (Professor Kellogg, E. C. Moore, and Miller and Sievers). Knowledge of these Californian seed sources may be linked to some of the importers, e.g. Martin, Pharazyn, Duncan, W. Wilson and Firth, being members of the New Zealand Institute. There is also the question (raised by the story of the GS seed) of some interconnections among Californian suppliers. Various seed shops and nurseries in and around San Francisco were visited by W. Gray when purchasing seed for Hector in 1871. Significant also is the fact that both Miller and Sievers and Professor Kellogg sent plant material to Kew in the 1870's and 1880's. It is more than likely they supplied Kew with plant material earlier than this.



Some radiata seed as well as plants may have come from Kew. In the late 1860's and early 1870's Hooker sent parcels of both American and Indian conifer seed to New Zealand, some of the seed being purchased at auction in London. The 1869 Kew Bulletin records that 9386 packets of tree and shrub seeds were sent back to the U.S., N.Z., Australia and South Africa. It goes on to say that in the previous year extensive correspondence with H. Capron Esq., the Commissioner of the U.S.A. Dept. of Agriculture, had resulted in a vast number of American seeds, especially those of California and the Rocky Mountains, being procured and distributed to the colonies. Known recipients of Hooker seed were Hector, Julius von Haast, and in 1874, the Hokitika Horticultural Society. The latter evidence would suggest a Kew origin for radiata on west coast mine tailings and not that of miners bringing in seed from California or even from Australia where radiata would just be beginning to cone. Von Haast gave this seed to the North Canterbury Acclimatisation Society although 1868 seed received by him was given to the Christchurch Domains Board.

Diagrams have been drawn to summarise the above-mentioned radiata distributions. Figs 5-8.

Fig. 8 shows the distribution of conifer seed through the Geological Survey. This does not cover the secondary distribution of seed through provincial or other agencies. Shepherd and Cook have covered the part-item for Wellington's provincial seed distribution for this 15-year period. What was the provincial distribution in other centres? Because of comparatively early settlement and the need for shelter and firewood extensive planting was carried out in Canterbury. As this in turn would make the area a major source (*sensu lato*) for locally collected seed,

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## Canterbury Plantations, The Domain Board, Canterbury Nurserymen Plantations — Private and Public

The history of both public and private plantations is the key to much of South Island radiata seed sources. Known Canterbury recipients for GS seed were Sir John Hall, Edward Richardson, T. H. Potts, William Rolleston, John Enys, the Hon. Col. Brett, the Canterbury Domain Board and D. Nairn. There could well be others. The composition and age of trees in Richardson's Albury Park stand which was felled in 1986 can be explained when original source information is re-examined and with the knowledge that Richardson was a regular recipient of GS seed. Sir John Hall, a recognised pioneer of tree planting in Canterbury, was also a recipient of GS seed, certainly for the first 1870 shipment and in 1879, and probably like Richardson on a regular basis. It seemed desirable therefore to examine Hall's property "Terrace Station" at Hororata and search papers still held there.

In April 1988, both on "Terrace Station" itself, and on the properties around, extant 1870/1880s radiata confirmed Hall's statement that he gave seed to his neighbours. These occur outside the 1885 Terrace Station boundaries. It illustrates the plantations established by 1885 and although today the size of the station is considerably reduced, the majority of plantations illustrated are still in existence. The relationship of Terrace Station Plantations to Provincial Plantation reserves is not clear as the Station diary shows —

19 April 1883 "I believe the Planting Board will plant the strip at McDonald's"...

15 June 1883

"The Planting Board are going to plant the 80 acres at McDonalds."

7 Sept. 1883

"I have got the 2,000 pines up for the Planting Board for planting in McDonalds."

2 Nov. 1883

"Powell and Barson have finished the fence at the County Plantation. The Plantation at McDonalds cost the Board £109.1 *charged* them 12/- per chain for the end fences and bought material for their share of the division fences charging for putting up and also for the men's time planting and digging holes "

6 Dec 1883

"There is no other tender for your plantation reserves they can take the ground for planting anytime Mr Stevens says he will try and get Mr Baker to have them (plantations) surveyed and lay off your roads and water race reserves "

11 Sept 1885

"Turner, contractor for planting the 88 acres at McDonalds is working at it and I have got the strips filled up over at Hororata with 2 yr insignis It took 600 "

Clearly "the Board" refers to the Canterbury Plantation Board established in 1879 to administer 32,000 acres of crown land set aside for plantation reserves, primarily in Selwyn, Ashburton and McKenzie Counties These reserves were typically in elongated strips from 200 to 300 yards across Initially many ran north to south, but these were superseded by east-west strips which proved to be more effective shelterbelts

Today a few radiata pine, topped many year ago, are close to the homestead itself, while there is an interesting triangular planting, probably experimental, which features several mature conifers including *Pinus coulten*, *P radiata* and *Cupressus macrocarpa* Unfortunately no reference in Station papers was found to the 1870 or any other conifer seed sent by Sir James Hector. An envelope, no date, marked *Pinus lancio*, *P coulten*, *P ponderosa* and Wellingtonia and giving the address James Veitch and Sons, Kings Road, London, may indicate that Hall imported some seed from Veitch The first reference to pines is for 1872 when a further fifteen acres of the homestead's "Hill Paddock" was planted, a "few" pines being used Their source is obscure. They could have come from the 1870 GS seed sent to Hall, but equally they could have come from the Christchurch nursery of Kerr & Barnett and Greenaway which are mentioned in the records. Increasing use of pines particularly radiata came after 1872 In 1876, 200 two year old radiata as well as first year

seedlings were planted at Hall's "Bluff Station" These came from the nurseryman Greenaway and cost 40/- per hundred. It was evident too that by 1876 Hall saw radiata and macrocarpa as "nurses" to more desirable plantings, but by 1883 entire belts were in radiata. "White and Ontario" poplars were the only trees ordered from the Government Gardener. Extensive plantations on his property were at first supplied and carried out under contract by the above two nurseries. Later Hall found it preferable and cheaper to raise radiata plants from his own seed e.g 2,000 were "got up" for planting in "McDonalds" in 1883. Some of these could have been raised from GS seed.

In August and September 1885, Kerr & Barnett were contracted to do the plantation plantings — nine feet apart for 40/-per acre.

Gums and wattles did not fare as well as pines, and at Terrace Station Hall had the plantation strips on his property filled up with 2 year radiata. Although other pines were used - *Pinus sylvestris*, *P maritima*, *P austriaca*, *P ponderosa*, *P tuberculata*, *P sabineana*, *P torreyana*, *P Jeffreyi* and *P benthamiana*, clearly *P radiata* was the most successful. In 1898, Sir John Hall's reputation in the field of tree planting was widely known and he was invited to give a paper entitled "Planting for Shelter" to the Agricultural Conference

The following extracts from this paper give a valuable insight to late nineteenth century plantings for Terrace Station and the exposed Canterbury Plains

... In Provincial days the Provincial Government of Canterbury, instead of selling all the land, made Plantation Reserves of many thousands of acres for ensuring planting on our treeless plains Management of these lands was at first vested in a Plantation Board, but more recently in the County Councils The Reserves not intended to be planted at once, have from time to time, been leased by public tender and the rental has provided a fund out of which considerable portions of the remainder have been gradually covered with trees... Some belts on the Plains, 10 and 11 chains in width, have been made by the County Council " Hall found belts of 1-2 chains in width were ample and when shaped like the letter L the angle formed by the two sides of the letter gave shelter to stock from prevailing winds

Describing the failures or advantages of the many tree species he had experimented with Hall concluded that "the one tree which is conspicuous for rapidity of growth and abundance of foliage, and which by its strength and constitution is enabled to resist frost and drought and to thrive in the poorest soil is the *Pinus insignis*. It is an abundant seeder, and is easily grown from seed. After letting contracts for planting I have found it more satisfactory to grow my own trees and do my own planting . The plantations in Hororata cover an area of 280 acres extending in belts 1-2 chains wide for a distance of 19 miles There are also 5 miles of plantations made on reserves by the Selwyn County Council " With the section of a seventeen year old tree on the table he found it "difficult to believe that for such timber many useful purposes will not be found" Nineteen years later the position was unchanged. The Selwyn Plantation board distributed a report by Mr K Wilson which said "the number of species of pines used in plantings was very limited, *Pinus insignis* being the principal one used, and thrives better on the Plains than any other, but its timber can only be used for a few purposes." Gums, Oregon pine, macrocarpa, oaks and poplars were among the trees recommended. The sources of supply to the two nurseries used by Hall will be looked at more closely when examining other Canterbury nurseries.

### **The Christchurch Domains Board**

In Christchurch the Government Gardener reported to the Christchurch Domains Board who controlled inter alia the Botanic Gardens. Adjoining this was the Acclimatisation Society's garden. In the early days a close liaison existed between the Society and the Domains Board. A proportion of all plants and seeds presented to the Acclimatisation Society were given to the Domains Board. Both the Acclimatisation Society and the Domains Board appear to have received 1871 GS seed, the latter coming through Superintendent Rolleston. Planted in the Nursery gardens they had by Jan. 1872 "come up and were doing well."

By that time radiata was established in the Garden, one plant having been donated by W. Hislop in

1865. W. Wilson recorded two earlier plants in the Domain near Deer Park. See Fig. 11. In 1868 von Haast gave the Acclimatisation Society seed sent to him by Joseph Hooker. It may well have included radiata. In 1870 pines (unspecified) "were planted on the angle of the river opposite the sandhill in the Domain and on the waste ground north (sic) of the road near Carlton bridge." Pines generally were not listed in 1871 Domains Board circulars to roads boards and school committees although sycamore, ash and native plants were. However, by May 1872, 2000 plants of various pines were available for distribution. Some of these may have come from the Acclimatisation Society and included therefore some plants raised from GS and von Haast seed. In 1872 the Domain Board received a packet of seed which contained radiata from Californian nurseryman E. C. Moore, the same nursery which supplied William Martin in Dunedin in 1869.

By 1873 local demand for trees from the Domain Board was so great that a request for forest trees for Invercargill was turned down. Table I, extracted from Domain Board minutes lists trees sent out for the years 1870-1881. The distribution peak for 1877 was matched in Auckland.

**Table 1**

No. of plants		No. of Plants	
1870	4,437	1876	128,146
1871	9,050	1877	184,265
1872	11,250	1878	105,673
1873	13,353	1879	75,520
1874	27,470	1880	36,319
1875	33,585	1881	63,944

**Total: 693,012**

The Otago Daily Times 10 Jan 1874 reported:

"The Canterbury Government are planting out trees on Government reserves on a much more extensive scale than has been attempted in Otago. We read of avenues around Christchurch being planted with the lime, Spanish Chestnut, *Pinus insignis*, and *Pinus radiata*, and of terraces being "clumped" with a variety of Californian pines and cypresses; also of an avenue of Californian pines and" cypresses; also of an avenue containing an area of five acres being planted entirely with *Cupressus macrocarpa*. On the Northern line of the railway, near Kaiapoi, about 8000 young trees have been planted this year with a view to protecting the line from sand. ... About 5000 trees were planted at the same place last year".

Extracted also from Domain **Board** records Table 2 shows their distribution list of 37,075 plants for 1874.

The proportion of radiata trees in Table 2 is uncertain but a distribution list dated May 1876 indicates that 8.6% were pines of various sorts. Approximately 11,000 pines were sent out that year. Oak and sycamore still predominated while birch, ash and gum made up the remaining. Between the years

1870-82 a total of 763,034 trees were distributed to public bodies in Canterbury. It can be presumed that most, although not all, of the radiata and other conifers distributed for the years 1872 to 1881 were raised from GS seed particularly so after 1874. Distribution of 1871 seed sent to the Canterbury Acclimatisation Society is unknown. Provincial Government in May 1876 reserved one-third of Domains Board seed for

forwarding to Timaru. In 1876, 2000 young trees were sent from the Domain Board to the New Plymouth Recreation Grounds. The foregoing information confirms a distribution pattern of GS seed similar to that for Wellington although Canterbury nurserymen are not mentioned. Early photographs and postcards confirm this distribution. Timaru was exceptionally rich with radiata shelterbelts around Caroline Bay. Winchester Domain today is interesting in that it contains two completely different races of Douglas fir. In 1875 a pinetum was established in the Christchurch Botanic Garden. One hundred and fifty species were planted out, grouped according to their country or source of origin — Europe and Africa, Asia, Canada and the U.S.A., California, Australia, New Zealand and South America. It is easy to see now why Rolleston, Superintendent for Canterbury, recommended this source of origin — Europe and Africa, Asia, Canada and the U.S.A., California, Australia, New Zealand and South America. It is easy to see now why Rolleston, Superintendent for Canterbury, recommended this approach to the testing of all conifers in New Zealand botanic gardens and domains. By 1875 in the Wellington Botanic Garden, 127 species representing twelve genera were recorded by Buchanan.

**Table 2. Domain Board Plant Distribution for 1874**

	No. of plants		No. of plants
Railway Plantation	17,860	Templeton School	363
Domains and Parks	2,052	Rangiora Park	2,462
Kaiapoi-Stationmaster	136	Mrs Miles	118
Mr Howlings	50	Rangiora School	950
Lyttelton-Public Cemetery	200	Mrs Davies	74
Lyttelton Bor. Council	619	Addington Gaol	1,043
Convent-Christchurch	165	Kaiapoi Domain	1,000
Waimakariri Conservation	100	Police Dept	182
Courtenay School	165	Mr Hopkins	672
Dunedin Asylum (mulberries)	600	Springston Cemetery	560
Dunedin Asylum (trees&shrubs)	1,746	Timaru Park	180
Kaiapoi Cemetery	450	Mr Lewis, Timaru	146
Temuka Park	2,500	Royal Soc. Hobartown	124
Ashburton Cemetery	200	Ven. Arch.' Davies	48
Indust. school (mulberries 100)	1,941	Captain Southern Cross	29
Killinchy school	340		

Total: 37,075

## Canterbury Public Plantations

— Summary Government Railway Plantations were managed by the Canterbury Domains Board and in 1874 these were supplied with 17,860 trees. Of these possibly one-twelfth were pines. Domains Board resources were obviously strained by supplying such large numbers of trees and in 1878 they sought a government grant for this work. The Canterbury Plantation Board on the other hand, formed in 1879 to administer some 32,000 acres of Crown Land Reserves, came under the Department of Crown Lands, itself administered by a Board. Domains Board representative on the Canterbury Plantation Board was T. H. Potts. In 1885 when the Canterbury Plantation Board went out of existence 2000 acres had been planted under its auspices. The Reserves were now vested in the Selwyn and Ashburton County Councils respectively. Plantings were mainly eucalypts and *Acacia dealbata* with some conifers. Negotiations with the Selwyn County Council involving the sum of £3,000, are referred to in Domain Board minutes for Dec. 1878<sup>81</sup>. Discussions were still proceeding in 1881 but it is unclear what these were about. Clearly more needs to be known about the source of trees used to afforest those 2000 acres of the Canterbury Plantation Board for the years 1878 to 1885 but it may be, as was shown for Sir John Hall's Hororata property, that it was general to use contract nurserymen such as Greenaway and Kerr & Barnett. In 1881 the Domains Board, on the recommendation of T. H. Potts, appointed a forester named Gray but unfortunately no initials are given (refer Shepherd & Cook, The Botanic Garden, Wellington). In conclusion it would appear that in the 1870s and 1880s the Christchurch Domains Board administered and planted the Canterbury Railways Plantations and some other public plantations. They included trees raised from GS seed. The Canterbury Plantation Board plantings were supplied, under contract, from nurseries, or from locally grown seedlings as Hall provided at Hororata. Plantations like those of Terrace Station initially may have been planted with trees raised from GS seed but by the 1880s, radiata seed harvested locally from trees planted in the early 1870s was being used for private plantings and those of the Plantation Board.

## Canterbury Nurserymen

Early Christchurch nurseries have been researched by S. Challenger who concludes that the years 1863-67 were critical years in the increasing awareness of the value of conifers. Particular acceptance of American and Indian conifers is reflected in nursery catalogues after this date. Greenaway, the nurseryman used by Hall, exhibited conifers at Canterbury Horticultural (C.H.S.) shows for the 1863-64 season. On 3 March 1865 Hislop exhibited 84 "varieties" of conifers. Greenaway also staged an exhibit of unspecified conifers, while in 1866 he was awarded an extra prize for his collection of conifers at the C.H.S. show. A C.H.S. lecture in 1865 makes no reference to the possible use of conifers for planting on the open plains. Two years later however, in 1867, it was said that limited use could be made of some species of Coniferae for planting of Town Belts. The giant Californian redwood or *Wellingtonia gigantea* as it was called appears to have been introduced to Canterbury shortly after Lobbs 1853 collection of it in California. Challenger also remarks on this early introduction. Nurseryman Hislop in 1863 had a 9-year-old tree and by 1864 was advertising seedlings for sale. There is some mystery here since 1853-54 is the date given for its first planting (unsuccessful) in England at Killerton. Gerd Krussman says in his Manual of Cultivated Conifers - 'In 1853 W. Lobb sent huge quantities of Wellingtonia seed to Veitch & Son in Exeter. Some months before, a Scottish plant collector, John D. Matthew was collecting seed in the same region which reached Scotland before that collected by Lobb. It has been presumed that the old specimens in Scotland were grown from seed sent by Matthew and those in England from Lobb.

Dec 1853 was when it was first described by W. J. Hooker. One would expect a Wellingtonia to exceed 4'6" in height in 9 years so there may be some inaccuracy in the Torlesse report. Did Hislop achieve a very early contact with California or did Veitch? In 1873 Hislop went as Park ranger to Timaru Parks & Reserves. His experience with conifers benefited Timaru and in 1875 he requested and was sent a donation of seeds from the Christchurch mains Board while in 1876 one-third of Domains Board GS seed was reserved

for Timaru.

Nurseryman Wilson, in 1865, according to Swale said "newly introduced trees, shrubs, evergreens and conifers would always meet with a fair trial", This would have included specimens of "handsome *Pinus insignis*". In 1869 Greenaway, now also secretary for the C.H.S., advertised "A fine stock of *Pinus insignis* and other choice conifers". In 1870 Andrew Duncan (referred to Hector by Professor Kellog in 1874) listed 80 varieties of conifers. An executive member of the C.H.S., he was also a Provincial Council member for 1868 to 1873, when Rolleston received the first GS seed sent to Canterbury Province. Acceptance, but not yet the dominance, of radiata and macrocarpa was now evident. In 1872, Wilson, now vice President of the C.H.S., lectured on conifers to the Society. Of radiata he said "it is rapidly raised from seed either from England or California but it is a comparatively recent introduction and little is known about its timber". Of macrocarpa he said

"The province abounds in beautiful specimens of this tree. Two planted in 1863 are near the deer park in the Government Domain. One is coning. A" tree grows in Mr Steven's lawn (President C.H.S.) — height 28'; two are in the garden of Mr Jenkins, Ferry Rd — slender and upright compared with the two previous examples. There are a large number of specimens on the peninsular hills behind the residence of Murray Aynsley. The tree is readily raised from seed which is now being produced in great abundance in the Province."

At Kew in 1867, the oldest macrocarpa in Europe, a 50' high tree, was killed by frost and snow. *Pinus lambertiana* was the only other American conifer referred to by Wilson. Wilson, Duncan & Son, and Greenaway all exhibited at the C.H.S. show that year — species shown did not centre specifically on American conifers.

In the early 1870s remarkably high stock numbers were advertised by some Canterbury nurseries. For 1873 Wilson lists 500,000 "insignis" (represents 25kg seed approx.) but this is reduced to 100,000 for 1876. Challenger was unable to reconcile Wilson's nursery acreage with these figures. He raises the question "was there an overstatement of stock in the newspaper advertisements? Did Wilson taken an entrepreneurial 'punt' on the impact of the Forest Tree Planting Encouragement Act in his 1873 advertisement? As conifer stocks in Wilson's 1876 catalogue were twice that for hardwoods, they must have become accepted as being easy to establish in Canterbury. GS radiata seed imports for the successive years 1871 to 1874 were 5 lbs and 9 lbs respectively.

Quantities and the origin of radiata seed obtained by Canterbury nurserymen are still far from clear but Australian and New Zealand sources can be discounted since it seems unlikely that radiata coned much bore 1867 in Australia and even later than this in New Zealand. Strong evidence exists

for early 1860s importations of seed from England possibly from both the Exeter and London branches of Veitch's Nursery. London nursery firms cannot be discounted. Gold mining activities and establishment of the Mail Service between California and New Zealand could have furnished the first addresses for seed distributors in California. Once that first initial information became known it would not take long for this to come to the notice of all those in public affairs and certainly Canterbury nurserymen were linked to the C.H.S., the Provincial Council and Town Council, while men like Hall, Rolleston, Duncan, Potts, and others were members of the New Zealand Institute. Unfortunately the Christchurch Domains Board records are not detailed enough to say whether GS seed, as in other centres, was sometimes distributed to nurserymen e.g. Wilson or Greenaway.

By 1871 the 1,300 acres of private land which had been planted would have had little or no conifer contact but of the 20,000 acres planted by 1898, radiata and macrocarpa would have formed a large part. Add to this the planting of the 32,000 acres of Crown land in McKenzie, Selwyn and Ashburton counties which followed the 1879 amendment to the 1871 Forest Trees Planting Encouragement Act, v/e can get some idea of the areas planted in radiata. Hall used the nurseryman Greenaway who in 1876 supplied 250 "insignis" for his Bluff Station. Greenaway died in 1880 which accounts for Kerr & Barnett, nurserymen, Stanmore St, being contracted to plant 25 acres for Hall in 1885. Unfortunately, Challenger does not discuss this firm in

detail although he notes that Wm Kerr in 1864 advertised as a "Landscape Gardener". The two other nurserymen mentioned by Hall, Duncan & Hislop were used to supply other plant material for Station use.

We may conclude therefore that up until 1886 Canterbury nurserymen planted extensive areas in conifer plants raised from at present unknown American or English seed sources. Besides this, there was also a wide distribution of plants raised from GS seed. Cooney gives no figures for the acreage of conifer or radiata forest planted on Selwyn County Reserves land between 1880-1890. He takes no account of reserves on properties like that of Hall, yet it is obvious that areas like Hororata and Darfield, with early radiata still extant, benefited from this afforestation. Perhaps it is significant that the Selwyn Plantation Board's nursery was established at Darfield.

The 'Old Boy' network and early GS radiata distribution appear to go hand in hand, e.g. Hall's first manager at Hororata was John W. Buller, son of the Rev. W. Buller and brother of the ornithologist. In 1869 John Buller left Hororata, moving to Wanganui where his brother Walter was Resident Magistrate. In 1871 GS seed was sent to Buller at Wanganui — the initials and address are not stated.

A similar "network" may uncover the origin of Geraldine's "Grey Pine", and even link together some early Christchurch radiata. The "Grey Pine" C.1860 in Geraldine grows on a bend in State Highway on the outskirts of the town. The property is presently owned by D. N. Godsiff. It has a magnificent tree circ. 314 inches at chest height, diam. 100 inches". Originally the tree had a big companion but this was felled 40 years ago when it became broken in the crown. n • in the crown. The property 'Blackfoot Station', as it was then called, was bought by Hall's brother Thomas W. Hall in 1858. A year later it was sold to Albert Henry Grey. The "Grey Pine" in age, coincides with expected germination of Acland's 1859 radiata sent from Veitch and raises the question as to whether Acland gave his nearby neighbour these two plants. Did he distribute any in Christchurch to, for example, the Christchurch Botanic Garden where the radiata tree like the Grey Pine is a substantial tree? (Fig. 11) Newly returned from his home in Devon, Acland could be expected to enthuse about the Californian conifers Lobb was sending back to Veitch. In treeless Canterbury he could have passed this knowledge, Veitch's address and a few plants raised from his 1859 seed to neighbours, friends and nurserymen in Christchurch. It is an intriguing thought, Lobb's continued residence in California until his death in 1863 and Acland's link with Veitch may have provided direct seed supply sources for those in Canterbury.

### **Radiata Seed Sources Important Regions additional to that for Canterbury**

Nelson is an important source of radiata within N.Z., and possibly for Australia. About 1950, according to Burden, the firm of H. G. Kingsland is reputed to have sent large quantities of bulk seed around N.Z. and to (at least) Australia. In 1925 3581lbs of seed was collected from trees circa 1875-1885 for export to South Africa. Challenger infers that the nurseryman Hale had radiata by 1865 but the species is not shown in Hale's 1865 catalogue. However from the Californian species mentioned, (*Pinus sabineana*, *P muricata*, *Wellingtonia gigantea* and a number of *Cupressus* species), it seems likely that he received *Pinus radiata* around this time.

Burstall gives C 1850 as the estimated age for a radiata and *Pinus wallichiana* at Nelson's Isel Park originally formed by Thomas Marsden. Evidence used by Burstall to support this early date is obscure. It may be linked to misinterpretation of an entry in the Saxton Diary 11 Sept. 1849.

"They gave me 3 pine cones picked by her mother (Mrs Marsden's mother) on New Year's Day. They got me but a seed. One bed was filled with forest tree seeds and I was promised seedlings."

The cones clearly were not locally grown, and probably were harvested in Cumbria (Marsden's home) as possibly was, the seed for the "Forest Tree" seedlings. With the first Californian seed collected by William Lobb being sent to Veitch in 1850/51; to date the first record for radiata from Veitch to Australia being 1 plant in 1854; the commercial unavailability of the species in Australia before 1860; and that Hale does not list it for 1865, it appears that a review of the dating of radiata and other American and Indian conifers at Isel

Park is necessary.

No evidence is yet available as to where nurseryman Hale, sometime after 1865 received American and Indian conifer seed prior to the release of GS seed in 1871. Canterbury nurserymen, Wilson and Hislop, may hold the key here as both had radiata by 1865 and were well known to Hale.

GS seed was sent to the Nelson Superintendent in 1871 and probably from then on a regular basis until 1876, when with the abolition of the Provinces, GS seed was given to Dr Boor, Nelson hospital superintendent, for distribution to certain nurserymen and others in Nelson. Plants too were sent from the Wellington Botanic Garden to public bodies and others in both Blenheim and Nelson. Postcards and early photographs of Nelson and Blenheim churches, schools, cemeteries, the orphanage and old homesteads support a conifer distribution pattern similar to that found for Canterbury and Wellington. No examination of Provincial records has yet been made. It would be helpful to find the source of seed to nurserymen such as Hale. It should be noted here that Marsden of Isel was at one time a member of the Nelson Provincial Council.

### **Manawatu**

Large quantities of radiata seed sent to Kaingaroa were collected at Aokautere, Palmerston North by a Mr Oxam. Old radiata resembling those in the Wellington Botanic Garden are in this area and may well derive from GS seed. Only a further search of Botanic Garden records and a knowledge of the 1870/85 owners of the land can decide this.

### **Waikato**

No analysis of Auckland Domain Boards (Acclimatisation Society) distribution of seed and/or plants raised from GS seed has been undertaken. Some seed was certainly distributed to Waikato and Tauranga. In just one year, in 1876, N.Z. received a quantity equal to over one half of the total amount of GS radiata seed imported for the period 1870-1885 — 41bs of GS radiata seed came from Miller and Sievers, while in response to Major Jackson's order 241bs came from Professor Kellogg. Upon its arrival Major Jackson who was a Member of Parliament for Waikato did not want all the order. The Wellington Botanic Garden took 121bs radiata seed, the balance being divided among the 9 superintendents. What proportion of radiata seed was taken and distributed by Jackson is unknown but a considerable amount of radiata seed could have been distributed in the Waikato for that year.

Matamata is an area which seems to have furnished forestry with radiata seed. In this vicinity C. W. Firth first planted radiata C. 1869/70. These would have coned about 1880 and could therefore have provided early seed for the area. Unfortunately the source of Firth's seed is unknown. The high yield of radiata timber as compared with that of other pines was evident when Firth's stand was felled in 1919.

Summary Given the very localised natural populations of radiata, and information covered in this literature review, the theory that radiata spread is linked to Californian miners moving around the Pacific basin is discounted. Likewise is the view that Australia was the main source of seed for N.Z. Pivotal to the species first introduction to both Australia and N.Z. is the English firm of James Veitch in Devon. The provenance of James Veitch in Devon. The provenance was Monterey. A similar provenance would have been applied to any English grown seed derived from Douglas's 1833 introduction, which may have been on stream about the same time as Lobb's first seed (1850-51) was sent to Veitch. Around 1869 any American and Indian conifer seed supplied by Joseph Hooker and purchased at auction in London or sent to him from the U.S.A. Department of Agriculture is of unknown provenance. Only in the late 1860s did importation start to come direct from California. Importations of GS seed followed for the years 1870-1885, a small proportion being forwarded across the Tasman to Australia. Early GS seed supplied by Professor Kellogg may have had a Monterey provenance although as yet this is by no means sure. Later seed supplied by commercial firms in San Francisco could be either Monterey, Ano Nuevo or both.

Source of radiata seed sent to von Mueller in Australia is still central to an understanding of its distribution in that country even though a previously unnoticed import of pines (unspecified) to Sydney as early as 1851 is now documented. In 1858 shortly after his appointment as Director of the Melbourne

Botanic Garden, Mueller acknowledged a first parcel of unidentified seed from American Harvard University botanist Asa Gray. A further letter in 1859 infers Gray was to send more seed but with the destruction of the Melbourne Botanic Gardens archives nothing further is known. A brief examination of archival papers of N.S.W. nurseryman Thos. Shepherd, indicated a possible American link by 1861-62. Supplying radiata to Acland as Shepherd did in 1859, before most other Australian nurserymen stocked it recommends further study be undertaken on this nurseryman.

The GS seed distribution noted by Shepherd and Cook is confirmed for Canterbury and possibly for Nelson/Blenheim regions. However, additional to this general distribution pattern GS seed provided trees for some public plantings such as Highway Board plantings in Auckland and Railway Plantations in Canterbury. Also in Canterbury some private plantation belts planted in the 1870's contained GS seed. Use of radiata for all plantings increases from 1871, the earliest date one could expect to see GS plants. In Hororata, trees in the private plantations coned and supplied some seed for the Canterbury Plantations Board plantings of the 1880's. It would be helpful to ascertain the exact localities and ownership of properties used for collection of seed in the 1880's.

Radiata C.I 850 at Isel Park, Nelson is discounted and it is recommended that early dates in Burstall's mensuration reports be re-examined. Acland's 1859 importation of one three year old radiata from N.S.W. nurseryman Thos Shepherd, a tree still extant, stands as the first record for radiata in N.Z. Equally important is Acland's 1859 introduction of seed from Veitch probably collected by Lobb in Monterey. Returned from his home in Devon that year Acland would well have been enthusiastic about the success of Lobb's seed there. If he returned via Sydney it could account for his purchase from Thos. Shepherd. It raises an interesting question as to whether this enthusiasm may be central to early Canterbury radiata introduction.

A major query rises from Challenger's analysis of figures for nursery production in Canterbury. While the importance of GS seed relative to undocumented imports is still open to question, enough is known of the GS distribution to give a general picture of the spread of the ubiquitous pine from California. A series of relatively large seed lots, with complex and strongly overlapping distributions around N.Z. would ensure that the local stock was quite broadly based genetically, and of fairly similar origins among N.Z. localities. Further information may yet pinpoint collection areas for both California and N.Z. radiata seed from which our commercial forests derive. Monterey was the main seaport before the rise of San Francisco. Douglas and Lobb collections were from Monterey. The general appearance of some of the earliest N.Z. plantings seems to converge on Monterey dominating the early, small-scale seed introductions. On the other hand Ano Nuevo appears to predominate in the overall ancestry of New Zealand stocks, which suggests that this provenance must have figured very prominently in the GS seed. Thus from its introduction to New Zealand gardens last century stem today's commercial radiata forests. A synthesis of historical investigations into its introduction together with genetic studies is, according to Forest Research Institute scientist Dr Rowland Burdon, likely to be highly productive.

Rowland Burden's invaluable contribution to this article is gratefully acknowledged as are the splendid photographs contributed by John Johns.

\**Etior* in Fig 5, Part I of the article published in Horticulture in New Zealand Volume I Part I. 'Veitch to Australia? unknown' should read 'Veitch to Australia 1854'.

***PLEASE NOTE: REFERENCES HAVE BEEN DELETED.  
REFER TO ORIGINAL DOCUMENT FOR EXTENSIVE REFERENCES.***

