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The Cockayne Memorial Lecture, 1965

LEONARD COCKAYNE, BOTANIST

By LUCY B. MOORE

"LEONARD Cockayne played the most conspicuous and important part in the development of modern field botany in the British Empire during the first third of the twentieth century. . . . Cockayne's vigorous, indefatigable personality, combined as it was with complete sincerity of mind, wide outlook, and the particularly acute powers of observation and memory that make the born field naturalist, were devoted to a flora and vegetation of great richness and unique interest at a time when it was still largely unspoiled by human interference." So wrote Professor Tansley of Cambridge University in 1935, and ten years before he had said that New Zealand led the Empire in botanical ecology. Much earlier, when Dr Cockayne was awarded the Hector Medal in 1912, the comment from Germany was that he had introduced modern botany to New Zealand and had done more than anyone else for the biological understanding of the New Zealand plant world (Allan, 1934: 12). This is the man we commemorate.

As a young graduate I had the benefit of his encouragement and advice, and twice near the end of his long life, together with Lucy Cranwell, I visited him at his home at Ngaio, and there also met Mrs Cockayne. Of her it has been truly said: "No account of the influences that went to make Cockayne what he was would be complete without the mention of his devoted and self-effacing wife. All who met her loved her, and recognised her affectionate care, her tolerant understanding of his idiosyncracies, her steadying influence in times of stress, her guardianship of a great man" (Allan, 1935: 170). Incidentally, her work included the pressing of great quantities of specimens which arrived from the mountains and forests week by week.

CURRICULUM VITAE

Leonard Cockayne was the youngest son of William Cockayne, Esq., of Thorpe House, Norton Lees, Derbyshire, where he was born on 7 April 1855. His father was a merchant with business interests in Sheffield, a few miles away, and apparently it was steel, and particularly knives, that provided the private income that helped Cockayne, and so New Zealand botany, so much in later years. Brought up in the country, the small boy enjoyed the English woods and hedgerows, and remembered their wild flowers to the end of his days. He was well taught, though he did not attend any famous school. At one time he planned to take a medical degree and it is recorded (Hill, 1935: 445) that he attended Owen's College, Manchester, during the session 1872–74.

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Having an uncle in "the colonies" he travelled to Australia in 1876*, and there taught school in Queensland and visited Victoria and possibly other States. About 1880* he came to New Zealand, and for four or five years he was a schoolmaster in the Taieri district, south of Dunedin. Next he took over a piece of land near Styx in Canterbury where he farmed on a small scale and kept numerous fowls. He made a garden with an extensive collection of flowering, and especially bulbous plants. He was passionately fond of daffodils. It was G. M. Thomson's little book on ferns, which came into his hands in 1877, that turned his attention to native plants. He added alpine species to his garden as he gathered them in Canterbury, Westland and Otago, and at the beginning of the nineties his collection had become so large that he removed to a property of four and a half acres amongst the sandhills at Bexley Road, New Brighton, near Christchurch. Here he intended to "devote his life to horticulture and New Zealand botany" (Anon., 1919: 231), and for 12 years he developed his experimental garden called Tarata. Each year he made sowings of some 2,000 species of exotic plants, the seeds received from some 40 of the leading botanical gardens of the world. So began his enormous overseas correspondence with famous botanists, and so also began his intensified study of New Zealand plants, as he committed himself to sending local seeds in exchange for those he imported.

In 1895, Mr Cockayne, as he then was, was elected a member of the Philosophical Institute of Canterbury, being proposed by his friend, R. M. Laing, and much encouraged, according to Professor Wall, by Professor Dendy. In 1897, when he was 42 years of age, he read his first scientific paper, which was published in the following year.

In 1903 Cockayne, "in order to devote all his time to pure science" (Anon., 1919: 233), sold his New Brighton property, giving the contents of the garden to the Beautifying Association, of which he was a foundation member. Included in his gift were many cherry trees, and on the banks of the Avon and in private gardens older residents can still identify shrubs donated by him. Except for a few months about 1904, the Cockaynes lived in Christchurch until April, 1914, when they moved to Wellington. There, at his home in the suburb of Ngaio, Leonard Cockayne died on 6 July 1934, just three months after his 79th birthday. He was buried in the Otari Open Air Native Plant Museum which he had brought into being, and there too is the grave of his wife Maud.

BOTANICAL BACKGROUND

It is perhaps hard to remember that Cockayne was born four years before the publication of Darwin's *Origin of Species;* it was in fact one of Darwin's first supporters, Sir Joseph Hooker, who later proposed him for Fellowship of the Royal Society of London. Cockayne was already ten years old when Mendel's famous paper was published, and he had begun reporting the results of his own researches before Mendel was rediscovered about 1900.

It is generally believed that Cockayne had little formal training in botany. In any case the theoretical courses offered at the universities would hardly appeal to him; a botany student in England at that time could gain a pass without ever having seen a section of any part of a plant. At Cambridge it was as late as 1877 that the first practical classes were held, and those only in a borrowed room using microscopes and other apparatus supplied at the personal cost of the lecturer

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* These dates are taken from Anon., 1919: 231. Those given in *Who's Who in New Zealand* differ slightly.

(Bower, 1938: 50–52). In the seventies and eighties this branch of science was progressing at a more rapid pace on the Continent, and German botanists had a strong influence on Cockayne.

The Cockayne period in New Zealand may be said to have begun in 1896 when Diels of Berlin published his 100-page account of the Vegetations-Biologie von Neu-Seeland. Cockayne had at that time published no botanical work, but he supplied Diels (who had not then been to New Zealand) with lively descriptions of plants of the shingle slips and other parts of the montane, subalpine and alpine regions. In 1898 Professor Karl Ritter von Goebel of Munich visited New Zealand and Cockayne looked back on the weeks spent with him as the most influential of his life. The two friends saw something of New Zealand's vegetation together, and Goebel was therefore able to assess at first hand the value of the work Cockayne was doing, and to give him heartening encouragement. It was Goebel who, in 1903, proposed to the Munich University to confer the degree of Doctor of Philosophy *honoris causa* upon him, a rare distinction which Dr Cockayne was the first scholar in Australasia to receive, and one which he greatly prized. Goebel's whole approach must have endeared him to Cockayne, especially his insistence on " grappling with the facts, often obscure and insignificant, of the relationships of configuration of the plants around us. It appears to me " he wrote (1900: v) " that to recognise the factors which bring about the development of say a leaf with one side larger than the other is infinitely more important than to construct a phylogenetic hypothesis unsupported by facts." The correlation of form and function figures largely in Goebel's work, and this is reflected plainly in Cockayne's earlier papers.

How much and what kind of botanical work had been done in New Zealand before Cockayne? Primary interest had been, quite naturally, in the kinds of plants, and where new ones were to be found. Hooker's *Handbook,* published in 1864, was still the only consolidated species list, though Kirk for a long time, and Petrie and Cheeseman to increasing extents, had found that it recorded the character of the whole flora very incompletely. It was early in Cockayne's botanical career that Kirk's *Forest Flora* (1889) appeared with its wealth of detailed first-hand observations, but the alpine plants were still very poorly known.

The broad outlines of New Zealand plant geography had been sketched out in a remarkable series of papers in the early numbers of the *Transactions* of the New Zealand Institute, and these outlines were being confirmed or corrected. Botanical papers for the most part either dealt with individual genera or families (e.g., the long series by Kirk in preparation for his *Student's Flora*) or recorded the species to be found in limited areas, many of them remote and only then being explored. Some of these papers gave, more or less incidentally, some idea of the vegetation types (e.g., Adams, 1889), and Petrie's classical account of " Some effects of the Rabbit Pest " (1883) had been published.

EARLY PAPERS

Cockayne's work was inevitably affected by what was afoot locally and in the botanical world as a whole, but he was by no means dependent on outside influence. His progress followed naturally from his own experience. His innate love of growing plants and his insatiable curiosity about them led him to make a garden at each of the several houses he occupied, and his experiments were endless.

His first important work grew directly out of his garden "An Enquiry into the Seedling Forms of New Zealand Phanerogams and their Development ". Here we see, as in all later papers, his ability to " grapple with the facts ", his infinite patience in recording, and his good judgment in selecting what to present, though he had then not quite the lively style that he developed later. He was constantly probing for plausible explanations, but tried to maintain strict honesty in keeping speculation

in a separate compartment from direct observation. For instance, he was not satisfied with saying that his notes applied to a certain species; in each case he gave the precise origin of his seed and this means that, even after 70 years of taxonomic revision and name changes, there is rarely any doubt as to the plants he used. In his field notebooks he often made a heading "from memory" for notes written in the evening, to distinguish them from his constant jottings in the field. His closeness to the living plant, the whole basis for these first papers, permeates all his work.

Outside his garden, from seashore to mountain top, he seems always to have been wondering—how can these plants grow here? Where did the seeds come from, how did they travel? What special attributes allowed them to survive the dangers that all seedlings face, and how many other seedlings, of how many different kinds, failed in their early stages? Are these two plants really different, or do they merely show how the same plant can alter in appearance when growing in different kinds of situations? How are the plants growing here just now related to the history of this site? And how did their ancestors look?

With these questions in his mind he very quickly realised that the natural vegetation of this country was disappearing before his very eyes, though he hardly recognised how much comparatively recent change there had already been. He was then imbued with a compelling sense of urgency—urgency to record, urgency to form and test hypotheses, urgency to save, not for sentiment but for the crying need to learn and to apply the information won from nature to the problems of land use that he could plainly foresee. With the conviction born of sure and detailed knowledge he campaigned long and successfully for the preservation of characteristic examples of vegetation and some of his earliest writings were newspaper articles aimed at building up an informed public opinion. By 1901 he had ensured the reservation of the mountain area that he knew best—the great part of what is now the Arthur's Pass National Park.

It is not surprising that Cockayne is said to have been an ecologist readymade waiting for the term to be adopted by botanists and, with his keen insight, able to lead the way not in New Zealand only, but in the world (Hill, 1935: 444). The plains, foothills and mountains of Canterbury gave him ample scope. He was accompanied on his excursions, sometimes by his son Alfred, later to become Government Biologist and finally Director-General of Agriculture. Often he had as a companion one Robert Brown, a shoemaker-naturalist who had taken up the study of mosses. This friendship lasted twenty years and one can imagine the wide-ranging discussions as the two carried their plants home. When he joined the Canterbury Philosophical Society a world of new contacts opened up for him, and here too he could announce and publish the results of his work. He was a person who needed an audience, seen or unseen, and his pen was always busy.

In 1898 he read a paper describing what happened after subalpine scrub had been burnt at Arthur's Pass, and this was the first New Zealand account of successional changes in vegetation. In the following year he presented to the Institute a detailed classification of the vegetation types of the Waimakariri Valley, also the first of its kind in New Zealand.

Having a modest private income Cockayne was not tied to a regular occupation and he was always a great traveller. Before the end of the century he was acquainted with the vegetation of various parts of the South Island. Early in 1901 he spent six weeks on Chatham Island and his account of its vegetation (1902) brought him great fame abroad. The spring of 1902 found him travelling by lighthouse ship from Taiaroa Head in Otago through Foveaux Strait to Greymouth, with many botanical stops, and four months later he was again at Ruapuke Island, Centre Island and Milford Sound, and had the "rare opportunity" of landing on the windswept Open Bay Islands. It was in this same year, 1903, that he made his famous

" Botanical Excursion during Midwinter to the Southern Islands of New Zealand " —the Auckland, Campbell and other far south groups—in June and July. Perhaps all this travelling had something to do with an illness that developed soon after. In February, 1904, he wrote to F. G. Gibbs: " I have been for some time past by no means in my normal condition as regards health and in consequence am ordered to do no mental work of any kind and to live in the open air and sleep in a tent."

A LETTER OF MUCH MOMENT

It was precisely at this time that Cockayne received probably the most exciting letter of his life. This is how he wrote about it to his friend Mr Gibbs in May, 1904. "A few weeks ago, a letter of much moment botanically arrived from Prof. A. Engler of Berlin. Now Berlin, as you may know, is the centre of botanical activity at the present day, and among other things Engler is editing a most extensive work on Plant Geography, no less in fact than a series of monographs, each of 4 or 500 pages, dealing with the different botanical regions of the entire earth. Already Spain, and Portugal, The Caucasus, The German Heath, Servia and adjacent countries, The Carpathians, and part of the Mediterranean Region have appeared, all written by botanists of the greatest eminence. There are in the course of preparation [five more]. And now Engler asks me to write the volume on New Zealand. Of course it is a most high honour for a colonial botanist to be invited to contribute towards such a series, where every work is supposed to be of the highest excellence; and were my health only as it was six months ago, I would accept and go to work at once and do my best. As it is I am undecided and am giving myself a month to think it over. Prof. Chilton urges me to accept at once; my son tells me the same and so does Dr R. Koettlitz, botanist to the *Discovery*. On the contrary my medical adviser, Dr Mickle, says I shall not be fit for such work for 12 months, and even then not fit to climb any mountains." He wrote this as a man of 49; yet in the summer of his seventieth year he botanised at Arthur's Pass, Nelson, Mount Egmont, the Urewera Country, Central Otago and various parts of Southland, climbed about on Mount Earnslaw and twice walked over Wilmot Pass! But in 1904 he went on " However, if I do finally tackle the job, and I am working slowly at it now, I am relying on your assistance ". Then follows a detailed plan of chapter headings and subdivisions, clearly similar to the arrangement of Diels's early paper. Cockayne explains why he does not much care for certain features of the plan and concludes, " It is a most beautiful piece of work and I have long hoped to do something of the kind, for which my recent papers have been paving the way, but I never dreamt of being asked to contribute to ' Die Vegetation der Erde ' ".

Within ten days a reply, full of information, had been received from Gibbs, and an answer was on its way, with further instructions. The " Vegetation of New Zealand " was launched, in spite of Dr Mickle!

Later he complained of having to boil down hosts of facts into a botanical jelly but encouraged assistance by saying, " The only floristic knowledge you require for this work is to be able to identify the species at sight. Absolutely full lists are not essential, but no species which occur more or less frequently should be omitted. If you don't know a species then invent any kind of name for the time being. I remember using the term ' twisty-wisty grass ' on one occasion." (Letter to F. G. Gibbs, 6 October 1909).

LANDS AND SURVEY REPORTS

From 1904 onwards for ten years the book about the vegetation of New Zealand was taking shape in Dr Cockayne's hands. This was his central objective and all his activities contributed towards it, not least the series of botanical reports which he

was commissioned to produce for the Lands and Survey Department during these years. Enormous effort was involved in carrying out these projects, quite apart from all else in hand.

In early October, 1906, he spent two weeks at Kapiti Island. After a couple of months more or less at home he was away early in the new year to the Longwood Range in Southland and Stewart Island, returning home to Christchurch about mid-February. (Mrs Cockayne went with him, and F. G. Gibbs, R. M. Laing and J. Crosbie Smith were included in the Stewart Island party.) By early May the Kapiti Report was out of his hands. In mid-August he had arrived in North Auckland to spend seven or eight weeks in the Waipoua kauri forest, coming home via New Plymouth in mid-October. Less than a month later he was on the *Hinemoa* bound for two crowded weeks at the Auckland Islands. December he had mostly at home (apart from delivering some Auckland Island birds to Kapiti), but early in January he was "on the warpath again" to begin his ten weeks' survey of Tongariro National Park. April and May must have been busy months, spent mostly in writing in Wellington, but there are records of a couple of public lectures and a few short trips north. Before the end of June he had prepared two reports, fully illustrated—one on Waipoua Forest from the previous spring's field work, and the other the Tongariro Survey, handed in only five and a-half months from when he first tackled the job. Mid-September to early October he spent again in Stewart Island, and the following year three big reports were completed, on the ecological botany of New Zealand's Subantarctic Islands, sand dunes, and Stewart Island, the last two both dated 1 June 1909. Thus in three years or less he had begun and completed six major, well-illustrated reports dealing with widely separated areas and very diverse vegetation types, and each report is a classic.

These were not his only publications during this period. And in the following year, 1910, his first book, "New Zealand Plants and their Story", appeared. It perhaps grew out of a talk on "The Story of New Zealand Plants" given in a free lecture series in the Wellington Town Hall (*Evening Post,* Nov. 20, 1906). A second, very much altered edition of this book appeared in 1919, edition three in 1927 and there is a plan in hand for a fourth edition.

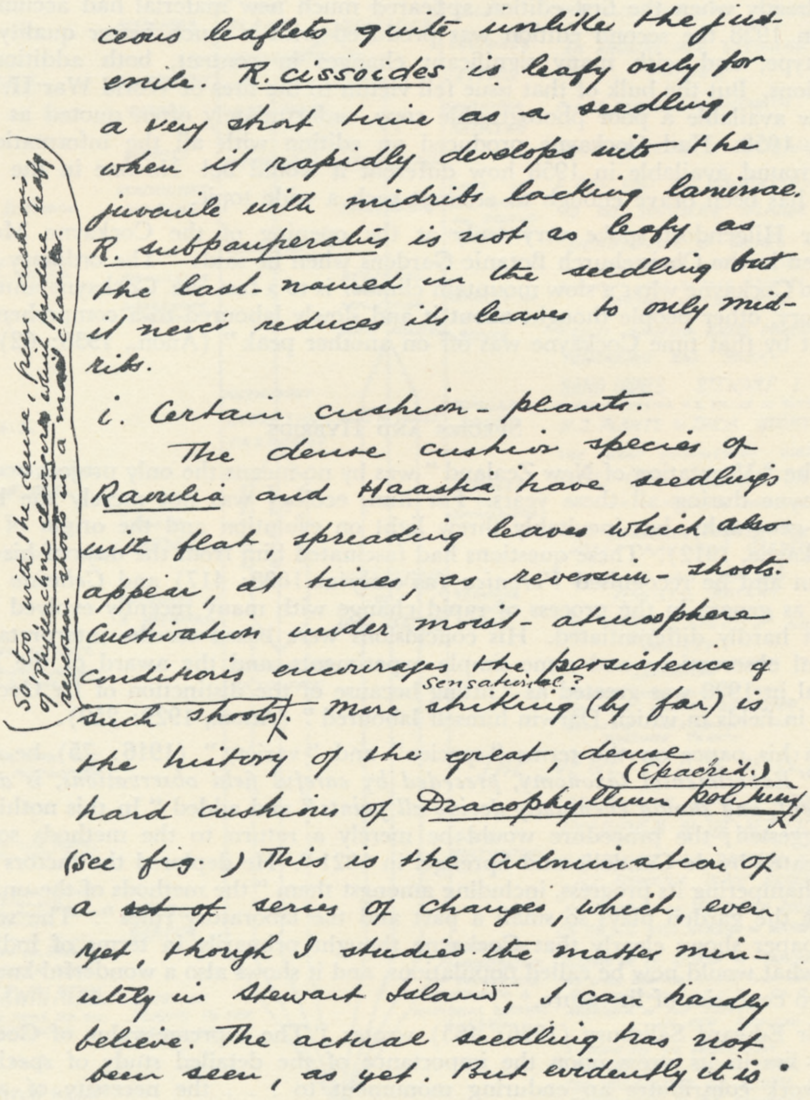
"THE VEGETATION OF NEW ZEALAND"

In February of 1906 Cockayne was considering "my terrible book to tackle", but by June of the next year, in the midst of all his excursions, he could write "My 'Vegetation of New Zealand' is well in hand; rough draft hoped for by August, then special trips over much of New Zealand to correct and give freshness . . . I think the book will supply a definite need and make botanical research in New Zealand easier than at present".

Four years later (July, 1911) "I am making a great effort to have the MS of my book finished by November", and after a few months more, writing to a high country friend, "Would that I were with you in some camp far in the back. It is killing work to be all day long in a town in a stuffy house writing a book and every line of said book takes me into the mountains, the forest, or by the seashore. At present it is the mountains. I have just made a classification of the mountain scrubs for the whole of New Zealand."

Then at last in April, 1914, "'The Vegetation of New Zealand' was finished some time ago, and the greater part by now will be in the hands of the editor" (and all of it had been neatly handwritten). But in December, 1914, he could only write sadly of his "Vegetation" being interned at Leipzig, and there likely to find its burial place. "I have received proofs of the first hundred pages. This I expect will be the last I shall ever see of this ill-fated volume and, good or bad,

it represents my life work." (Hill, 1935: 449.) But things were not quite so desperate. In 1920, the war over, Cockayne was able to make a few alterations in the later part of the book, and in 1921, seven years after the text was submitted, "The Vegetation of New Zealand" appeared. It was an issue of only 400 copies (letter to Gibbs, 7 July 1922), but it was a triumph.


ceous leaflets quite unlike the juv-
enile. R. cissoides is leafy only for
a very short time as a seedling,
when it rapidly develops into the
juvenile with midribs lacking laminae.
R. subpauperatus is not as leafy as
the last-named in the seedling but
it never reduces its leaves to only mid-
ribs.

i. Certain cushion-plants.

The dense cushion species of
Raoulia and Haastia have seedlings
with flat, spreading leaves which also
appear, at times, as reversion-shoots.
Cultivation under moist-atmosphere
conditions encourages the persistence of
such shoots. More sensational? striking (by far) is
the history of the great, dense
hard cushions of Dracophyllum politum (Epacrid.)
(see fig.) This is the culmination of
a ~~set of~~ series of changes, which, even
yet, though I studied the matter min-
utely in Stewart Island, I can hardly
believe. The actual seedling has not
been seen, as yet. But evidently it is.

So too with the dense, firm cushions of Phyllachne clavigera which produce leafy reversion shoots in a moist chamber.

Example of Cockayne's manuscript.

The aim of the book was to present as vivid and accurate a picture as possible of the actual vegetation of the country. A historical account is followed by a sketch of the physical geography and climate, and then the primitive vegetation is described in detail—the sea-coast, the lowland and lower hills, the higher mountains and the outlying islands, each in its turn. The effect of settlement upon the plant covering occupies a section, and this includes some comments on agriculture and horticulture.

The distribution of species and genera is considered, and the country is divided into 22 districts each with its own floristic character. The relationships of our plants to those of other countries is discussed, and finally the history of the flora " a heterogeneous gathering of plants, children of north and south and east and of the New Zealand soil itself, moulded by great earth-movements and climates of extreme variety " (p. 329).

Already when the first edition appeared much new material had accumulated, and in 1928 the second edition was produced with a much better quality paper and type, and with many significant changes in content, both additions and omissions. But the bulk of that issue fell victim to the fires of World War II. There is now available a poor photographic copy, unfortunately often quoted as edition three, 1958. Had Cockayne produced an edition with all the information and background available in 1958 how different it would be! No one in the last 35 years has been brave enough to attempt such a wide topic.

Dr Hilgendorf spoke very truly at the opening of the Cockayne Memorial Garden in the Christchurch Botanic Gardens when he said: " The ordinary thinker was to Cockayne what a slow mountain climber is to a fast one. Cockayne announced a theory, other people thought about it and slowly laboured to a comprehension of it, but by that time Cockayne was off on another peak " (Anon., 1938: 62).

SPECIES AND HYBRIDS

The " Vegetation of New Zealand " was by no means the only project occupying Cockayne during all these years. For him, ecology was not merely the basis of plant-geography, but inevitably threw light on evolution and the origin of species (Cockayne, 1912). These questions had fascinated him from the days of his Tarata garden and he recognised *Veronica* (as early as 1898: 417) and *Celmisia* (1921: 324) as genera in the process of rapid change with many recently evolved species, as yet hardly differentiated. His conclusions were based on the interpretation of careful observations and some simple experiments, and the award of the Darwin Medal in 1928 was greeted as " fitting because of the distinction of Dr Cockayne's work in fields in which Darwin himself laboured " (Anon., 1929: 259).

In his paper on the terms " species " and " variety " (1916: 75) he stressed that *" Experimental taxonomy, preceded by careful field observations, is alone of moment, and should eventually decide all points "* and added " In this nothing new is suggested; the procedure would be merely a return to the methods so wisely advocated by de Candolle and Sprengel in 1821 ". He deplored the factors at that time hampering its progress, including amongst them " the methods of the university, where the garden plays so small a part and the laboratory rules ". The whole of this paper shows clearly that Cockayne thought primarily in terms of individuals and what would now be called populations, and it shows also a wonderful knowledge of two centuries of literature.

Sir Edward Salisbury (1936: 465) wrote: " The supreme value of Cockayne's work lies in its stress upon the importance of the detailed study of species . . . his work contributes an enduring monument to . . . the necessity of a sound taxonomic foundation for any ecological superstructure ". Cockayne's very first paper, read in 1897, recorded some admittedly crude experiments on the effects of freezing on alpine plants, and he suggested even then a biological laboratory where the exact conditions could be regulated. What would he have thought of a phytotron to explore fully the potential of any plant?

Cockayne was inclined to be scornful of the professional species-maker and he once wrote (Smith, 1938: 7), " I am giving Petrie all my new species, since I dislike describing plants and he loves it above all things ". Nevertheless, he could

not avoid recognising units for which no names were available, and he himself described at least 50 species, without, it may be said, always leaving reference specimens to show how the names should be applied. He realised that " there are undoubtedly many distinct races of plants one meets with in the field, all called by the same name, an absurd proceeding! If we make all these races which differ in trivial characters into species, all idea of relationship is lost . . . but by using a trinomial nomenclature great progress can be made, and names of plants will be more or less intelligible, which is far from the case at present " (letter to F. G. Gibbs, 1 March 1915).

He proposed to grow many forms of *Acaena* as he saw in a series of spined, half-spined and spineless bidibidis something that " looks precious like a case of Mendelian crossing, as seen in bearded and beardless wheats ". The experimental programme was beyond his resources and even now, just fifty years later, we are still only guessing at the relationship between these forms, though some work has been done on other species of *Acaena* (Dawson, 1960).

Hybridism as an explanation for so-called " intermediate forms " had been suggested by Cockayne as early as 1899, in relation to the well-marked differences in the juvenile forms of *Sophora* (1899: 373), and from then on the idea was never very far from his mind. Characteristically he recorded the occasion of his re-awakened interest in hybrids (1925: v): " It was in April, 1921, that I had the good fortune while sauntering one evening in the beautiful forest near Elfin Bay, Lake Wakatipu, to accidentally find . . . a most diverse assemblage of sapling and seedling southern beeches (*Nothofagus*) . . . the great majority matching no known species. This at once suggested hybridisation. . . . This case of hybridity led me into examining in the light of many years' experience the whole matter of wild hybrids in the New Zealand flora and I published a preliminary account of the subject in 1923." In 1926 he wrote to Gibbs: "At any rate New Zealand is showing far better than any other region that wild hybrids occur in vast swarms . . . a matter even yet doubted by many herbarium botanists ". Had he lived longer he would have seen wild hybrids taken for granted, and the principle of introgression widely accepted.

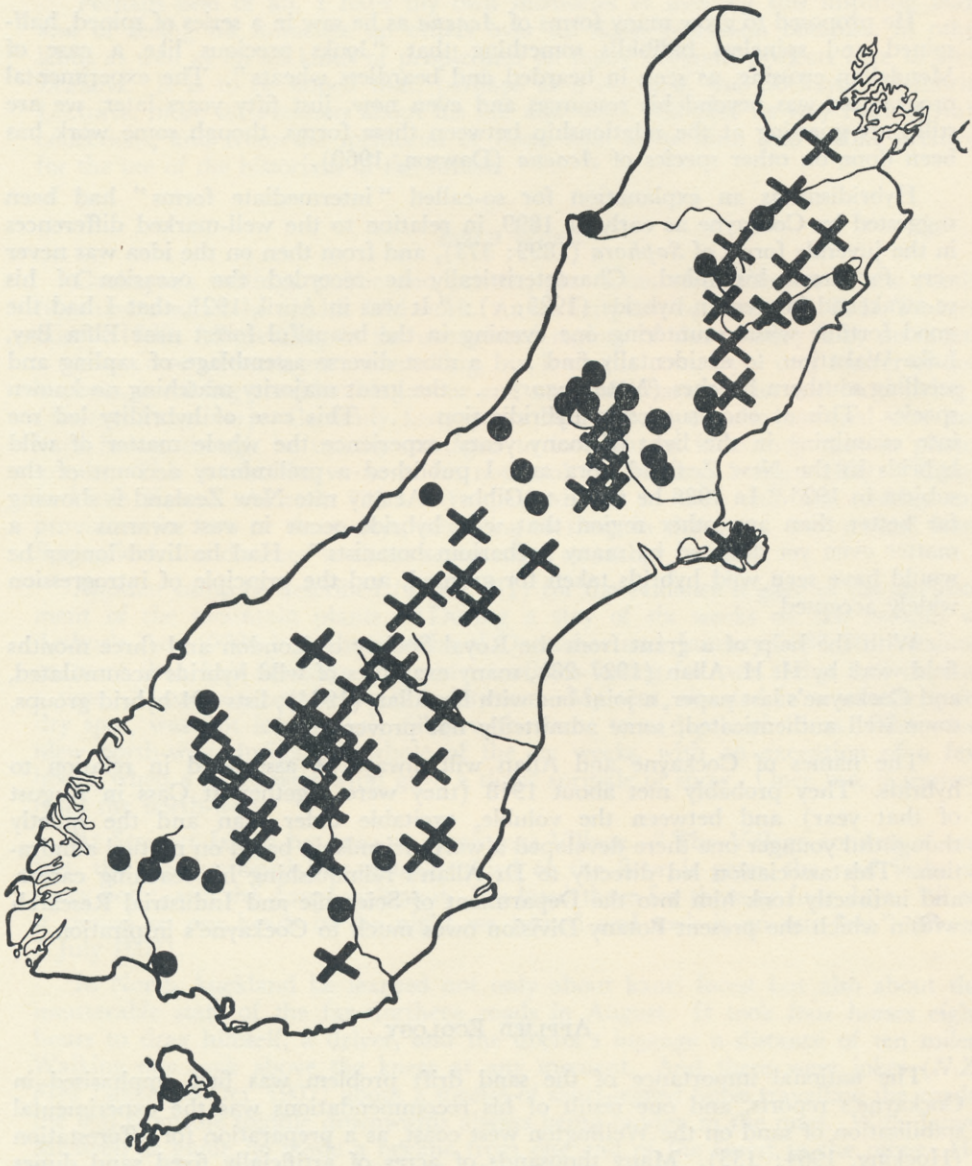
With the help of a grant from the Royal Society of London and three months field work by H. H. Allan (1927–28), many examples of wild hybrids accumulated, and Cockayne's last paper, a joint one with Dr Allan (1934), lists 491 hybrid groups, some well authenticated, some admittedly not proven.

The names of Cockayne and Allan will always be associated in relation to hybrids. They probably met about 1918 (they were together at Cass in August of that year) and between the voluble, excitable older man and the quietly thoughtful younger one there developed a warm friendship based on mutual admiration. This association led directly to Dr Allan's relinquishing his teaching career, and indirectly took him into the Department of Scientific and Industrial Research within which the present Botany Division owes much to Cockayne's inspiration.

APPLIED ECOLOGY

The national importance of the sand drift problem was first emphasised in Cockayne's reports, and one result of his recommendations was the experimental stabilisation of sand on the Wellington west coast, as a preparation for afforestation (Hocking, 1964: 133). Many thousands of acres of artificially fixed sand dunes now carry forest and the development of their soils is being carefully studied. The assured return that must accrue from more knowledge of the soil was something Cockayne insisted upon time after time.

As early as 1908 he was pleading for the establishment of plant breeding stations, instancing their importance for cereals, potatoes and other crops, and many newspapers gave space for his views (e.g., *Dominion,* 10 Jan., 8 May; *Press,* 8, 11 May; *N.Z. Times,* 8 May, 25 June; *Lyttelton Times,* 11 May; *Otago Daily Times,* 9 May). He was given one project along these lines to improve *Phormium,* but even he could do little without more substantial support. Deliberate plant breeding for crop improvement in New Zealand was still at its very early stages twenty years later (Hadfield and Thomson, 1932), though Hilgendorf had begun to cross wheat in 1921.



Map prepared from two lists in one of Cockayne's notebooks. Crosses show "Grassland areas visited by L.C. during his Grassland Investigation and of which notes were taken." Dots show "Localities visited by L.C. previous to his Grassland work but bearing on such work."

1.—Dr and Mrs Cockayne at Ngaio in 1933 when the Doctor's sight was almost gone.
2.—Professor Karl Goebel with small vegetable sheep (*Raoulia eximia*) in Canterbury, 1898.
3—Dr Cockayne with notebook at Punakaiki, probably 1925.

Tussock grassland investigations, with special reference to depleted lands, were undertaken for the Department of Agriculture, and in 1918–23 he devoted intensive efforts to these problems, especially in Central Otago. His demonstration plots, squares of a quarter acre, could still be seen from miles away after 25 years—he had managed to make grass grow.

He was on the Forestry Commission in 1913, and later was Honorary Botanist to the Forest Service. His monograph on beeches (1926; 1928) is still the basis for the classification of these important trees. His notebooks show that he had embarked too on a survey of tawa forests—a brave task for a solitary honorary botanist to attempt. The modern Forest Survey (Masters *et al.,* 1957) was mounted on a very different scale and took 10 years to complete.

Another aspect of applied ecology was horticulture through which he had himself entered into Botany. He praised and encouraged those gardens, public and private, where native plants were grown well. Gradually the concept grew in his mind of a national botanic garden devoted solely to New Zealand plants. In Wellington he saw in the Wilton's Bush Reserve of about 150 acres a place where this dream might come true; and there, with the help of the City Council and prominent citizens, and with contributions of plants from helpers all over New Zealand, he watched his Otari Open Air Native Plant Museum become established. As an old man he made a good beginning on his ambitious project to produce artificial examples of various types of the primitive vegetation of New Zealand, which was an integral part of his scheme (Cockayne, 1932). Now, after more than 30 years, the Otari Museum, in the suburb of Wilton, is still maintained and attracts many visitors, including parties of school children and students, and botanists from abroad. With proper public support there is no reason why its founder's brightest hopes should not be achieved, though it will require exceptional skill, knowledge and imagination to carry out all Cockayne's ideas.

SOURCES OF INFORMATION

My sources of information about Dr Cockayne and his work have been numerous and varied. The scientific papers number many scores, published in learned journals in many parts of the world and, regrettably, not yet covered by a complete bibliography. To find the full story one must go also to newspapers—metropolitan dailies and small country weeklies and such unlikely places as the *Young Men's Magazine,* the *New Zealand Farmer, Stock and Station Journal, The New Zealand Dairyman,* and the *Railways Magazine.* Dr Cockayne was a much-interviewed man, and contemporary newspapers tell of diverse activities; for example in 1912 he was engaged by the South Canterbury Education Board to give a series of lectures to primary school teachers, and throughout one talk 150 senior pupils of the Timaru schools listened to him " with breathless attention " (*Timaru Herald,* 27 July 1912). Fortunately he kept good records and I have two of his books of news clippings, covering a number of years early in this century.

Manuscript sources likewise are ample. There must be a hundred or more field notebooks. Cockayne's practice was to move always with notebook in hand, and so he appears in several photographs. Then notes had to be written up and amplified at nights, and at this time they often went down in a form almost ready for publication. He sometimes quotes " my field notes say . . ." and there they may be seen, wonderfully legibly written out in black pencil, by whatever light there was in camp. The Dominion Museum has a great stack of notebooks, the Auckland Museum another pile. Those in Wellington have been scanned by Mr B. G. Hamlin, and from them he has abstracted an approximate timetable of field trips which he generously put at my disposal. Amongst the Auckland Cockayniana are 25 years of correspondence with Cheeseman. Mr F. G. Gibbs of Nelson received

many letters from Cockayne, and from these it has been possible to quote freely, with the permission of Miss H. M. Jenkins to whom they belong. Other letters have been available too, and some dozens of his lantern slides. His enormous volume of overseas correspondence has survived at least in part, for example at the Royal Botanic Gardens at Edinburgh and at Kew; these letters I have not explored. From his library we can learn something—many volumes and reprints from it came to Botany Division through Dr Allan. Miss H. Edgar of Oamaru, and Mrs M. M. Martin of Whangarei have helped with personal reminiscences, and Mr A. H. Cockayne and his family have provided unpublished information.

Perhaps best of all, I have my own memories of meeting this inspiring man, and of seeing his influence on others over all these years—on botanists in other lands as well as on all kinds of people and on many different projects here in New Zealand. It is to be hoped that, perhaps as a result of the Cockayne Memorial Lectures, more information about his life and work will find its way from private collections, and from the memories of those who knew him, into public archives for the use of the historians of the future.

FIELD WORK

Cockayne's writings, public and private, give some vivid pictures of the conditions under which he did his field work. An earlier plant collector, W. T. L. Travers, said in 1860: "Travelling in the unexplored regions of this country is by no means a romantic or adventurous undertaking, but is on the contrary a very matter-of-fact business, involving considerable labour and no small share of dirt and hard living" (*Nelson Examiner*). Certainly forty years later Cockayne also endured dirt and hard living, though he usually managed to look almost indecently tidy in photographs. This is what he wrote in his notebook on Sunday, 2 April 1899: "Camp at Little Kowai. Altitude 730m. We (Alfred and I) took only our oilskins and provisions for two or three days, intending to sleep in the open. We walked from Springfield, the distance is about seven miles or rather more."

Another camp he described (1900: 131) for the evidence it gave of the environment of the mountain plants. "During a stay of six weeks on the summit of Arthur's Pass (900m) in the months of December and January 1897–98, it rained on more than half the days, the rain sometimes lasting for two and a half days at a time. There was one heavy thunderstorm. My tent, situated in a usually quite dry spot, was not infrequently filled with water to a depth of 15cm. The wind blew north-west during the whole of the six weeks, with an exception of a few hours, when a south-west wind gave a slight sprinkle of snow. Once too, it snowed from the north-west."

At Stewart Island he came to Christmas Village. "The Village consists of one hut, the weatherboards are gone, a third of the floor is gone, the roof leaks at every point, and the door won't shut. We lived there for three or four days. When it rained on our heads in the night we turned and took it on our feet." (*Press,* 4 July 1907).

In North Auckland he learned not only about kauri forest but also about the unutterable state of the far northern roads in August. It took four horses eight hours to drag himself, a driver, and the doctor's luggage a distance of ten miles. Walking one sank above the knees at any moment. And there were jokes (*N.Z. Free Lance,* 19 Oct. 1907) about a species of short-legged horse travelling the roads, the legs from the middle downwards always being hidden in the mud. With James Maxwell as guide he made a beeline from one end of the forest to the other. He found a nikau whare to be "absolutely impervious to even the fiercest thunderstorms" and reported that mangemange "equals the finest wire-woven mattress and invites to dreamless, refreshing slumber" (*Press,* 28 October 1907).

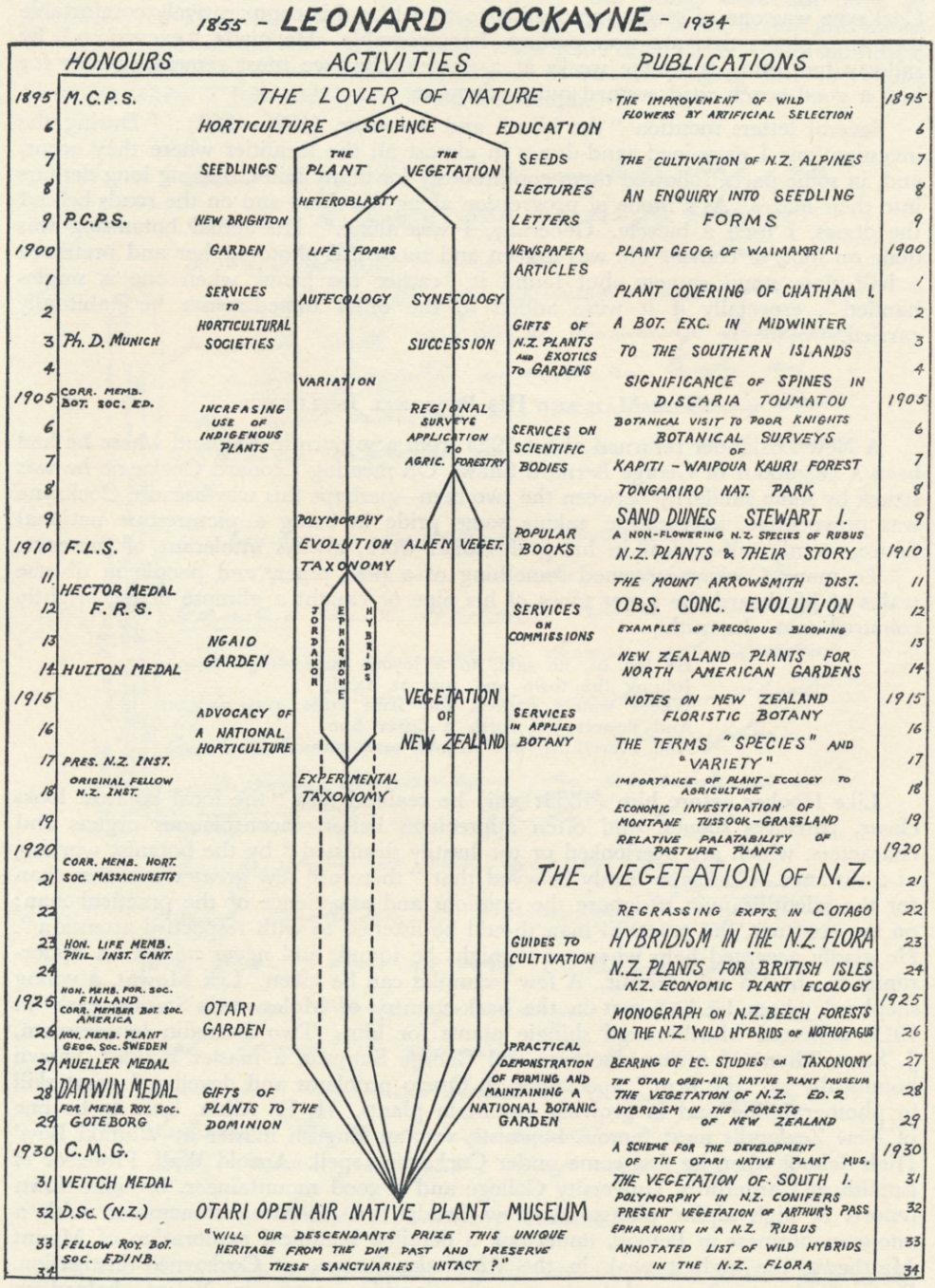


Chart prepared by Dr H. H. Allan for a lecture on Leonard Cockayne delivered in Christchurch about 1934. Copied from the original by R. A. Burns.

The lighthouse ship *Hinemoa* had a botanist-master, Captain Bollons, and Cockayne was one of several naturalists to travel by this comparatively comfortable means to places that are now perhaps less accessible. He made " excursions " by railway too, often for some weeks at a stretch. But we must remember that for him a good coach road seemed quite adequate.

Several letters mention " the bike " and he wrote (1926: 362): " During the investigations I examined sand-dunes in almost all the localities where they occur, and, in some parts, followed them continuously for many miles, making long detours into their mazes. As a mode of progression along the shore and on the roads behind the dunes, I used a bicycle. Generally, I was alone." His actual botanising was done on foot, of course. He was a keen and successful photographer and preferred a half-plate stand camera, but found it " rather too heavy when one is single-handed ", especially if it were added to the other impedimenta he habitually carried.

THE MAN AND HIS PERSONAL INFLUENCE

A New Zealander returned about 1923 from a sojourn in England where he had been a neighbour of George Bernard Shaw. On meeting Leonard Cockayne he was struck by some similarity between the two men—perhaps this was because Cockayne was provocative, iconoclastic, taking some pride in being a picturesque national figure, sternly self-critical in his professional work, always intolerant of pretence.

To many Cockayne seemed something of a pied piper, and people in diverse walks of life heard the sweet tones of his pipe or caught a glimpse of his brightly coloured coat. In truth

> He led us, he said, to a joyous land
> Joining the town and just at hand,
> Where waters gushed and fruit trees grew
> And flowers put forth a fairer hue
> And everything was strange and new.

Like Hooker before him (1853: xiii) he realised that " the local botanist looks closer, perceives sooner, and often appreciates better, inconspicuous organs and characters, which are overlooked or too hastily dismissed " by the botanist working at a distance. Cockayne firmly believed that " there are few greater mistakes than for the scientific man to ignore the opinions and experience of the practical man; on the contrary, the practical man should be listened to with respectful attention ". He gladly accepted help wherever it might be found, and never missed an opportunity to enlist a new recruit. A few examples can be given. Lex Mowat, a young shepherd whom he had met in the back-country of Molesworth Station early in 1912, collected Marlborough shingle plants for him. Two Dunedin businessmen, J. Scott Thomson a manufacturer and George Simpson a master builder, known botanically as " the firm ", specialised in Otago problems and developed great skill in photographing and in growing mountain plants. H. H. Allan, later to be one of New Zealand's most famous botanists, was an English master at Waitaki Boys' High School when he first came under Cockayne's spell. Arnold Wall, Professor of English at Canterbury University College and a good mountaineer, brought down reports of high alpine plants. Andrew Beddie, an Aberdeen stonemason with a one-man business in Petone, undertook a detailed botanical exploration of Mount Matthews, the highest peak in the Rimutaka Range, at Cockayne's instigation. F. G. Gibbs, teacher and leader in all scientific matters in Nelson, helped so generously that Cockayne wrote " Virtually all I know regarding the plants of Nelson and their distribution can be traced to your work ". Michael Gudex, who was in the field with Cockayne in 1909, was another teacher who fostered the study of native plants all his life; in his later days in Hamilton he helped to bring about

the present remarkable upsurge of enthusiastic interest amongst young people in the Waikato. N. L. Elder, author of a recent series of papers on the vegetation of North Island mountains, treasures the first letter of encouragement he had from Cockayne. And so one could go on.

Cockayne was known and his work was admired far beyond his own adopted country. Carl Skottsberg, famous among a race of Swedish botanists, wrote (1938: 3): "I never met Dr Cockayne. . . . He did not need to travel about the world and speak for himself. He stayed where he was, true to his mission, his work spoke for him, and the world honoured him. He deserved it all. . . . He used to write long letters, and gradually I began to know him, not only as a great botanist, but as a remarkable personality. We became friends, and I could feel, across the seas, the firm pressure of his hand."

Dr Turrill, who also had not met Cockayne, wrote more stiffly, but still sincerely (1936: 466): "In his facts and in his presentation he gives the reader not only a desire for more, but a real incentive to observe and to experiment for himself. In this sense Cockayne became a true teacher of many who lived and studied far from him." This was from a place of which Cockayne himself once wrote, "Kew in general is not wont to lavish indiscriminate praise."

But Sir Arthur Hill, Director of the Royal Botanic Gardens, Kew, could speak from his personal experience in 1928 (1934: 314): "Throughout our long and sometimes tiring journeys, Dr Cockayne was astonishingly active, though he was then an old man [73] and the hurried tours might have upset him. . . . He was at times, a trifle disturbed by a sudden change of plan, and had a facility for losing his cap or his bag, but his sense of humour always saved the situation, and we had a great time together. No matter whether we were in a crowded train or wedged in the back seat of a motor car, he would discuss abstruse botanical matters or bring forward knotty points as to hybrids, or what was meant by such and such a species. Then his son Alfred would join in with a totally opposite point of view and a fierce altercation, proving quite harmless, would ensue—an outsider might have thought blows would follow!—and all would end happily."

H. H. Allan, with more intimate knowledge and keener insight, gives the best picture of all (1935): "His overflowing enthusiasm sometimes led him into errors, and his love of argument for argument's sake often deceived his listeners as to his real views, but he was always ready to withdraw an opinion on sound cause shown. Easily roused to ire, he rapidly recovered from these "mutations", as he called them, and when working in the field was always ready to consider with care views expressed by his co-workers even if they conflicted with his dearest hypotheses. Not a good conversationalist, dogmatic in certain moods, he was a good talker on a wide range of subjects, full of anecdotes and reminiscences. He dominated any company he was in, whether in a railway carriage, the inn corner, or round the camp-fire. Always in his work a strenuous condemner of the faintest suspicion of the 'scientific lie', he allowed in general conversation his imagination to run rampant, would enhance the slightest incident to a great tragedy or a greater comedy. Rabelaisian in some moods, he was elfin as a Shelley in others—a side revealed only to his intimates. Often appearing arrogant, he was at heart the humblest of men in face of the mysterious ways of nature."

Cockayne's general outlook is reflected in a letter in which he pointed out that a naturalist who could become financially independent not only could enjoy himself in his chosen field, but might also, as he said "become a great instrument for good in the scientific world, and what more can the heart of a sane man desire?"

Throughout his botanical career he worked unremittingly for the conservation of nature, and the whole concept of National Parks in New Zealand owes perhaps more to him than to any other single person. He wrote at the end of his great

book " We, who now live in this wonderful country, and love its marvellous vegetation, have set aside sanctuary after sanctuary where the palaeotropic, subantarctic, Australian and palaeozelandic plants, the survivors of that bitter strife with Nature, that commenced millions of years ago, can still pursue their destinies. Will our descendants prize this unique heritage from the dim past and preserve these sanctuaries intact?" One may read the final words again on his gravestone at Otari. Surely these sanctuaries, properly cared for, should be the best possible memorial to Leonard Cockayne, Botanist.

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