

*DEPARTMENT OF
SCIENTIFIC AND INDUSTRIAL RESEARCH
NEW ZEALAND*



BOTANY DIVISION

1957 - 59

TRIENNIAL

REPORT

DEPARTMENT OF
SCIENTIFIC AND INDUSTRIAL
RESEARCH

BOTANY DIVISION
CHRISTCHURCH - NEW ZEALAND

Postal address: Botany Division,
Private Bag, Christchurch.

Telegrams: Botany, Lincoln. *Telephone:* 65-342

North Island Sub-Station
c/o Soil Bureau, Eastern Hutt Road,
Taita, Lower Hutt.

BY AUTHORITY

R. E. OWEN, Government Printer, Wellington, New Zealand.
1960

CONTENTS

INTRODUCTION	3
Functions and Location	3
The New Building	4
THE HERBARIUM	4
THE LIBRARY	7
THE EXPERIMENTAL GARDENS	8
THE INDEX SEMINUM	9
RESEARCH PROJECTS	
TAXONOMY	10
EXPERIMENTAL TAXONOMY AND PHYSIOLOGY	10
ADVENTIVE PLANTS	13
VEGETATION SURVEYS	14
VEGETATION AND ANIMALS	17
SUBANTARCTIC AND ANTARCTIC BOTANY	19
POLLEN MORPHOLOGY	20
QUATERNARY HISTORY	20
GENETICS	22
CYTOLOGY	22
PUBLICATIONS	24
STAFF	
PAST DIRECTORS	27
OVERSEAS VISITS	28
HONOURS AND AWARDS	28
APPOINTMENTS	29
STAFF APPOINTMENTS	29
STAFF LIST	30
RETIREMENTS AND RESIGNATIONS	31

INTRODUCTION

THIS IS the first report of a series which will appear regularly from now on. At three yearly intervals we will put on record the progress of our work in that time, and also note various other developments within the Division. The report will be widely circulated both in New Zealand and overseas. Each report in its time will be fairly topical, but will serve in the future as a valuable record of the past. Although only now entering a new and permanent home, this Division has had a relatively long history. It has borne its present name for twenty-one years, but before that, had a ten year history as a smaller section, and this in its turn had a direct connection with other units stretching back to the eighteen-nineties. It is time that some of this story was written. It has been particularly valuable for us to trace the history of the development of the herbarium, and to make available for the first time an account of the range of material contained therein, and from whence it came. The end of the period under review coincides roughly with the end of the Division's stay at Latimer Square, and our entry to the new building at Lincoln, in May, 1960.

Functions and Location

THE MAIN function of Botany Division is to study the wild plants of New Zealand, although the classification of horticultural and other cultivated plants is within our sphere. We seek to describe and classify both the native and adventive flora and to describe the vegetation whether old or new, past or present. To facilitate these aims, research is carried out in genetics, cytology, anatomy, morphology, physiology and ecology. The information thus obtained is made widely available both here and overseas.

The Division's headquarters is near the township of Lincoln, 14 miles south-west of Christchurch in the South Island.

Location	Latitude 43 deg. 38 min. South. Longitude 172 deg. 30 min. East. Height above sea level 36 feet.
Soil	Headquarters Block. Whakanui silt loam on sand, mottled phase. East Block. Templeton soils, ranging from very stony to moderately deep loams.
Rainfall	25 inches per annum on 125 days. Distribution erratic, late spring droughts common.
Mean Evap.	36.71 inches per annum (11 years).
Rainfall/Evap.	0.681
Temperature	Mean Maximum 61.0 deg. F. Mean Minimum 44.3 deg. F. Mean 51.1 deg. F.

Humidity 71.5 per cent (at 9 a.m.)
Days of ground frosts 93
Hours of sunshine 2005

SUB-STATIONS. The North Island sub-station is situated at the headquarters of Soil Bureau, D.S.I.R., at Taita, Lower Hutt, near Wellington.

The New Building

THE NEW building was designed by the Architectural Division, Ministry of Works, Christchurch. The District Architect was Mr P. C. Cornish, F.N.Z.I.A., the Assistant District Architect, Mr E. R. J. Hean, F.N.Z.I.A., and the project architect was Mr G. MisKimmon, A.N.Z.I.A. Mr A. F. Vines was Clerk of Works, and the contractors were P. Graham and Sons, of Christchurch. The building of approximately 15,000 square feet, was begun in early May, 1958, and completed in May 1960. It is sited close to the Crop Research Division, a sister division of the Department of Scientific and Industrial Research. The three main units are a herbarium, a library, and a two-storeyed office and laboratory wing, all of fair-faced reinforced concrete. These are linked by a single storeyed unit of brick veneer. The two-storeyed wing on the east side will provide office and laboratory accommodation for Botany Division on the ground floor, and on a portion of the first floor. The remainder of the first floor is taken up by the photographic unit, and by offices and laboratories of the sections of the Grasslands and Entomology Divisions which are stationed at Lincoln. The herbarium on the south side is 54 feet by 48 feet. The library on the east side, closest to the Crop Research Division buildings, is 46 feet by 30 feet and will house the amalgamated libraries of Botany and Crop Research Divisions.

THE HERBARIUM

(International Code, CHR)

(*Herbarium Keeper*, Mr T. W. RAWSON)

THE PHANEROGAM and fern section of the herbarium now contains some 120,000 specimens and is increasing at the rate of about 5,000 specimens a year. It consists mainly of native and adventive species and the latter collection at least is the largest in New Zealand. The herbarium represents the accumulated collectings of Government botanists during the last 70 years. The earliest collection was due to

T. W. Kirk, who, in 1892 was appointed Government Biologist to the newly established Department of Agriculture. In 1904 Kirk was joined by A. H. Cockayne as assistant biologist, and sometime after this the labels of the "Herbarium of the Biological Laboratory, Wellington, New Zealand", appear on the specimens. The herbarium gradually expanded due to collectors such as A. H. Cockayne, E. B. Levy (Agrostologist) and E. Atkinson (Botanist). Although the specimens represented the whole flora there was a predominance of plants of agricultural significance, particularly weeds.

The Biological Laboratory was moved to Palmerston North in June 1928, and was reconstituted as the Plant Research Station, a joint undertaking of the Departments of Agriculture and Scientific and Industrial Research with A. H. Cockayne as director. In this year H. H. Allan was appointed Systematic Botanist, and donated his private collection of some 3,000 specimens, mainly native, to the herbarium. This donation, together with the specimens brought from Wellington made a nucleus of some 5,000 specimens. Within the next few years the major part of the overseas collection of some 5,000 specimens was obtained by exchange, and this included large sets from the Berlin Botanical Museum, the Smithsonian Institute, and from Scandinavia.

Within a few months of Dr Allan's appointment, V. D. Zotov joined as his assistant with the immediate task of care of herbarium, and these officers were both closely associated with herbarium work from that time. Special sections were later developed, such as seeds (R. Mason) and algae (L. B. Moore).

In June, 1937 the Botany section moved to Wellington, and in October, 1938 became Botany Division with Dr H. H. Allan as first Director. The herbarium was first housed at 129 Sydney Street West, then 58 Bowen Street and later at 8 The Terrace. In November, 1947 T. W. Rawson was appointed Herbarium Keeper and took over his full duties about 1951. In March, 1954, the Division was transferred to Christchurch where the herbarium was at 2 Latimer Square. Finally, after its years of wandering, it was transferred to its final home in the new Lincoln building in May, 1960.

Due to assiduous collecting by Dr Allan and his associates the herbarium expanded rapidly, and by 1947 contained some 50,000 specimens. Since then it has doubled in size. The specimens have been stored in cardboard boxes, but a gradual transfer to steel cabinets is planned.

The following private collections have either been donated or deposited on loan. Adventive plants, (A. J. Healy); Westland collection, (Dr McKay); Little Barrier Island, (W. M. Hamilton, 1956); Niue Island, (A. C. S. Wright); Pacific Islands, general, (M. Laird); Raoul Island, (A. C. S. Wright and W. K. Dallas) (J. H. Sorensen, 1944) (M. A. Nolan, 1959); Netherlands East Indies, (D. Cairns); Chusan Archipelago, (D. Cairns); Borneo grass, (E. A. Madden); Chatham Islands (E. A. Madden).

Lichens. This section contains large collections by Messrs Scott-Thomson, W. A. Thomson, George Simpson, K. W. Allison and H. H. Allan. Suites of duplicate material, totalling 5,000 specimens, were forwarded to the late Dr A. Zahlbruckner and formed the basis of his "*Lichens Novae Zelandiae*". 169 isotypes and co-types of new taxa described in this work are deposited in the herbarium. Through exchanges with overseas workers, many of whom included New Zealand material in their monographs, a large and comprehensive overseas collection has been built up. We also hold co-type material of a number of New Zealand species described by overseas workers other than Zahlbruckner.

Bryophytes. This collection is mainly due to V. D. Zotov (Tararua Ranges, North Island) and to Miss L. B. Moore, who donated her private collection of almost 1,000 numbers in 1938. The latter accession has strong representation from the Auckland and Coromandel areas, again in the North Island. Both collections were almost wholly determined by G. O. K. Sainsbury, Mrs E. A. Hodgson, and K. W. Allison. Collections in Fiordland have been made by H. H. Allan and by G. Simpson (Doubtful Sound) and V. D. Zotov (Caswell Sound).

Algae. This collection occupies about 100 of our herbarium boxes. It especially illustrates groups with actual or possible economic importance, and there is also some emphasis on geographical relationships. The nucleus was a small collection donated by R. M. Laing. Divisional collecting, mainly by Miss L. B. Moore, has covered most parts of the New Zealand coast, Kangaroo Island in South Australia, and several stations in Tasmania. There have been many minor contributions, and the following important donations: the W. A. Scarfe collection donated in 1943, comprises at least a quarter of the herbarium and has strong representation from Dunedin and Wellington, with ample material of many species of special interest; V. W. Lindauer's *Algae Novae-Zelandicae Exsiccatae*, Nos. 1-350; J. H. Sorensen collections from the Kermadec and Campbell Islands; R. Gilpin collections from the Chatham Islands; overseas collections, especially from Australia (H. B. S. Womersley) and Pacific North America, (G. Papenfuss).

Seed Herbarium. This contains 1,500 specimens of seeds of native, adventive and cultivated plants, and overseas samples for comparison. They are used as an aid to taxonomy, and as a help in the identification of plant fragments obtained from such diverse sources as animal stomachs or quaternary bogs.

Pollen and Spore collections. The main pollen collection now numbers over 4,000 slides, and is used for taxonomy, and for identifying air borne and quaternary pollen. We also possess a closed part-duplicate set of Dr L. M. Cranwell's collection, on which were based early papers on New Zealand pollens. Another closed collection is that on

which Dr W. F. Harris based his account of New Zealand fern spores. There are also slides of bryophyte and fungus spores.

THE LIBRARY

THE LIBRARY, in its present form dates from 1949 with the purchase of Dr Allan's extensive collection of books, reprints and journals. This was a doubly important acquisition because certain of the books, reprints, and part-serials, such as *Das Pflanzenreich*, had originally belonged to the late Dr Leonard Cockayne. At this time, too, the position of librarian was established and the services of a trained librarian, Mrs E. H. Leatham were secured, on a temporary basis. An extensive programme of cataloguing and binding was begun, library purchasing increased, and a beginning made with ordering and purchasing out-of-print floras. Purchasing of rare out-of-print works at such a distance from Europe presented difficulties, but has been greatly facilitated by a more flexible purchasing system arranged by the Chief Librarian, Mr E. H. Leatham. By this means we have obtained a number of valuable and useful out-of-print works such as De Candolle's *Prodromus*. Our aim has been to build up a sound taxonomic section, with floras from as many major regions of the world as possible within the limitations imposed by available finance and requirements for contemporary books on other aspects of botany. There is now a reasonable coverage of Australia, North America (United States and Canada), British Isles, Central and Northern Europe, Mediterranean Europe, South Africa, with some material from parts of Tropical and North Africa, Pacific Islands and Asia. South and Central America are poorly represented as are a few other areas, and in most such instances the floras of these areas are out of print, rare, and when available, at a price beyond the finances of the Division.

The number of periodicals has been increased in recent years and a number held are the only copies in New Zealand.

Worthy of special mention are the reprints and other items dealing with lichens, which reflect the special interest in this group by Dr. Allan; through the good offices of Mr Leatham, the reprint edition of A. Zahlbruckner's *Catalogues lichenum universalis* was added to the library in 1955. The literature on this group, coupled with the large lichen collection in the Division's herbarium makes this institution a centre for lichen study in New Zealand.

The original librarian in 1949, Mrs Leatham, was only with the Division for a matter of months, but the binding programme and other duties were continued to some extent by Miss A. B. Cooke, a technician, who carried out some library duties in addition to her normal technical work, until the Division transferred to Christchurch in early 1954.

Since 1954, there have been several librarians, the intervals between succeeding ones with Miss Macmillan or Miss Harrison assuming part-time librarian duties. Librarians in chronological order since the transfer to Christchurch have been: Miss H. Drummond; Miss P. Davies; Mrs A. Lucas; Miss J. M. A. Jackson; Miss B. A. Somers; Miss B. E. Harris.

THE EXPERIMENTAL GARDENS

THESE GARDENS provide an important facility for experimental taxonomy. Collections of any genera and species currently under review, can be grown here under reasonably similar conditions, and the impressions gained from the study of herbarium specimens, and from the wild, can be checked in a more controlled environment. The gardens are also a reservoir of living material for current investigations in cytology, genetics and anatomy.

In 1941 when the Division was in Wellington, 5 acres were obtained at Waiwhetu, in the Hutt Valley, and were used for the study of medicinal plants during the war, and also as a general experimental area. In 1951, 10 acres were purchased at Greers Road, Bryndwr, Christchurch, and used as an experimental area until vacated in April 1958. Greers Road was destined at one time to be the permanent home of the Division.

1. Lincoln headquarters, South Island. (Officer in charge, Mr B. L. Nicholls). The gardens consist of an east block of 18 acres and a headquarters block of 11 acres. Development was begun in May 1956, and steady progress has been made since then.

The propagation house, with two Hartley plant houses (28 feet by 18 feet) attached, is sited adjacent to the laboratory wing, and was completed in April 1958. Installations completed during the period were: two hardwood lath houses; two cold frames; three misting frames for growing alpine ranunculi; and two Hartley glasshouses (7 feet 6 inches by 10 feet) adapted as isolation houses.

The East Block has been fenced, and Monterey cypress (*Cupressus macrocarpa*), stone pine (*Pinus pinea*), basket pine (*P. torreyana*) and Lombardy poplar (*Populus nigra* var. *italica*) have been planted as shelter trees and hedges to give protection from the dry north-west and cold east wind. The hedges of Monterey cypress and *Olearia paniculata* planted before April 1957, have established on the Headquarters Block and a hedge of tortuous willow (*Salix matsudana* var. *tortuosa*), has been planted to give a quick hedge for the screening of the yard and protection of the plants in the vicinity. Shelter trees and hedges are being propagated to be available for progressive plantings of the two blocks of land.

Major plantings of ranunculi, grasses, (*Festuca novae-zelandiae*, *F. matthewsii*, *Agropyron scabrum* and species of *Danthonia*) have been made, and many plants grown for identification. The collection of native plants has been built up, and many are to be planted out in the spring of 1960. As at Taita, detailed records are kept of the history of each plant.

2. Taita Substation, Lower Hutt, North Island. (Officer in charge, Mr A. P. Druce).

The grounds at the Soil Bureau's Taita Experimental Station are being developed as a botanic garden under the control of Botany Division. Particular attention is being directed to North Island plants and it is hoped in time to have most of the North Island trees and shrubs growing in the gardens, where they will be available for study. In addition North Island tussock grasses, other grasses and a number of herbaceous species are being grown. Material from the garden has been used in the preparation of Volume 1 of the New Zealand Flora. At the present time some 3,000 plants are growing in the garden belonging to some 700 taxa. Each plant is accurately labelled and its introduction recorded in a book; labels show collection number, name, locality where collected, and date when planted. The record book shows the same information, plus the part of the garden where the plant is growing. At a later date it is proposed to issue a booklet cataloguing the plants in the garden so that maximum use may be made of them for botanical studies.

THE INDEX SEMINUM

(Miss M. J. A. Simpson)

Until 1959 an extensive seed collection was made each year, and a list of available seeds printed annually. This system has now been modified, and a basic list sent out of seeds which we can collect easily on request. This list will be printed every five years. We will still, however, collect seeds not on the basic list, if these are required by research workers and institutions overseas.

Research Projects

TAXONOMY

1. Flora of New Zealand, Part 1. The second edition of T. F. Cheeseman's "Manual of the New Zealand Flora" was published in 1925, and has long been out of date. On his retirement Dr Allan undertook the task of writing a new Flora, and at the time of his death had completed the ferns, gymnosperms and almost all the dicotyledons. This first part is being completed and seen through the press by Miss L. B. Moore.

2. Flora of New Zealand, Part 2. (Monocotyledons). Work has begun by Mr V. D. Zotov (Gramineae) and Dr E. Edgar (Juncaceae) on the second part of the Flora.

3. Flora of New Zealand, Part 3. (Adventive Plants). Dr Allan's "Handbook of the Naturalized Flora of New Zealand" (1940) is now out of print and will be replaced by Part 3 of this series, to be written by Mr A. J. Healy. Some 1,700 species will be described. A more popular handbook is also planned, to describe some 700 of the more common species and designed for use by extension workers in State Departments, by horticulturists, farmers and others.

4. Special Studies. Miss R. Mason has recently published a revision of the Australasian species of *Callitriche*; Mr. V. D. Zotov is engaged upon a study and reclassification of all grass genera in New Zealand, whether native or adventive; Dr F. J. F. Fisher is revising the alpine ranunculi of New Zealand.

EXPERIMENTAL TAXONOMY AND PHYSIOLOGY

1. *Ranunculus* (Dr F. J. F. Fisher).

Data from transplant experiments carried out at the University of Otago in 1952-53 are being incorporated in a taxonomic revision of the alpine species of *Ranunculus* in New Zealand. Close genetic relationships revealed in breeding experiments and extensive population samples have disclosed continuity among several groups of previously separated species. As a result the number of species in the alpine group has been reduced from 24 to 14. Four of the former species have been found to be hybrids and several new hybrids have been discovered.

The alpine group of *Ranunculus* species demonstrates very clearly the

activity of evolutionary processes occurring at the present day, every level of divergence up to full speciation including amphidiploidy having been found. Adaptive radiation into the same series of ecological niches appears to have taken place separately in two breeding groups of species. More important however is the significance of the material for taxonomic practice at the subspecific level. In several different groups the problem of the taxonomic treatment of continuous variation has been posed. The 'type concept' in taxonomy can make no allowance for the accurate taxonomic treatment of variation in the form of clines or other kinds of continuity between otherwise very different extremes. Methods are being worked out for the delineation of such continuous variation by means of separate distribution maps for each of the characters studied, symbols being used to show the conditions found at each sampling point. Such methods are likely to become increasingly important as species are studied in greater detail throughout their range.

2. Leaf Morphogenesis in *Ranunculus hirtus* (Dr F. J. F. Fisher).

Earlier studies have separated temperature as the major factor influencing natural variation in leaf dissection that takes place in individual plants of *R. hirtus* in New Zealand. Tracer methods are being used to follow the distribution of assimilated materials in the leaf-primordia under different temperature treatments. The possibility that the electrokinetic translocation-mechanism recently put forward by Spanner is connected with the dissection effects by way of differential distribution of materials in the primordia at different temperatures is being investigated.

3. Comparative Physiology of Ecological Races (Dr F. J. F. Fisher).

One of the most pressing needs in evolutionary studies is an accurate measure of the selective effects of physiological differences between plants or races of plants. The first step in such studies is the elucidation of the relevant physiological differences after which relative survival rates and reproductive efficiencies in different experimental and natural environments may lead to an evaluation of selective pressures. A survey of species with well marked ecological races is being carried out with a view to the initiation of selection experiments on New Zealand plants. As temperature is a factor fairly readily controllable for experimental purposes, the altitudinal races found in New Zealand mountain areas are expected to provide good material for these studies, altitudinal differences in habitat being to a considerable extent in the nature of prevailing temperature differences. Fruitful preliminary results have been obtained from the *Ranunculus hirtus* material already mentioned under the notes on leaf morphogenesis. Geographic races of *R. hirtus* differing in sensitivity to temperature differences expressed as differences in leaf dissection have been found in different parts of New Zealand and equipment is being planned for their study under controlled conditions.

When at the Carnegie Laboratory in California, Dr Fisher carried out measurements of physiological differences in growth rate and carbon-dioxide uptake in two ecological races of *Mimulus* using sterile culture techniques and an infra-red gas-analyser. It is intended that similar techniques will be used in studies of experimental selection in New Zealand material.

4. *Festuca*. (Mr H. E. Connor).

Studies on *Festuca* species, especially *F. novae-zelandiae* and *F. matthewsii*, have led to a detailed examination of the value of leaf-section anatomy in the classification of these species. Variation in leaf-anatomy has been studied within plants, and between plants, in some hundreds of individuals from many localities grown from seed in the relatively uniform environment of the division's experimental gardens. It has been found that for these two species, leaf-anatomy is not as good a diagnostic character as claimed for other groups by various authors.

Interspecific hybridization between *F. matthewsii* and *F. novae-zelandiae* is proceeding, and seed for an F_1 has been obtained without difficulty in controlled crosses. As there are two growing seasons before flowering it will be some time before the biosystematic status of these two species can be established.

5. *Agropyron*. (Mr H. E. Connor).

Work has now been completed on the relationship among the infraspecific units in *A. scabrum*, and the results indicate that there are no barriers to gene exchange within this species. Earlier work on indigenous *Agropyron* has shown the inter-relation of the four species, and the conclusion is drawn that the morphological boundaries for *A. scabrum* coincide with genetic boundaries.

Studies on the inheritance of apomixis in *A. scabrum* are continuing. F_1 sexual ♀ (=21) x asexual nonreduced ♂ (n=42) have set seed only very rarely, and a single F_2 plant seeded freely, and no segregation has been obtained in four subsequent generations. Further work is proceeding which involves the use of pollen from infraspecific units where apomixis is not as strongly developed.

6. *Sophora* (Dr E. J. Godley). The south Chilean species of *Sophora* has always been considered closely related to the New Zealand tree species, and at times has been classified as the same as one or another of our kowhais. Seed of this species was obtained on the Royal Society's Expedition to Southern Chile, and young plants are now growing at Lincoln alongside seedlings from trees in various parts of New Zealand, so that a direct and accurate comparison can be made.

ADVENTIVE PLANTS

(Mr A. J. Healy)

1. Taxonomy. The third volume of the Flora of New Zealand, and the more popular weed handbook have already been mentioned. The checking and identification of previously recorded species has continued and several hundred species, varieties and hybrids not previously known in New Zealand have been worked out. The facilities at the Lincoln experimental gardens for growing plants on have proved valuable for this work.

2. Distribution. Investigations have continued on the general pattern of distribution of adventive species in Marlborough, Nelson, Canterbury and Otago, and the detailed distribution of some economically significant species worked out. e.g. *Carduus nutans* (nodding thistle), and *Hordeum jubatum* (squirrel tail barley).

3. Applied:

(a) Government Departments. Identification of critical plant material has been made for several Government Departments, in addition to routine identifications which provide useful data on distribution and abundance of species. Opinions have been given to the Department of Agriculture as to the desirability of addition of certain species to the Noxious Weeds Act 1950, and recommendations made to the same Department on the desirability or otherwise of permitting entry of particular plants into New Zealand under the provisions of the Introduction of Plants Act 1927. Assistance was given to Entomology Division on distribution and collection of material of *Agrostis tenuis* attacked by eelworm (*Anguina agrostis*). A large number of oak (*Quercus*) specimens were examined for Wallaceville Animal Research Station in connection with their mucosal disease investigation.

(b) Non-government work. Material has been critically examined for County Councils in connection with noxious weed work, and also for commercial organizations.

(c) Introduction of weeds. Investigations on means by which weeds are being introduced into New Zealand have continued, and one detailed one involving introduction in Australian wheat showed three species (two not previously reported from New Zealand) to be coming in and actually establishing about flour-mills and railway sidings where bulk wheat was handled.

(d) Prevention of spread of weeds. Several papers have been published and a number of lectures delivered, the theme being prevention of spread of weeds. In view of the increasing number of significant weeds arising as garden escapes, this problem and possible ways of alleviation, has been brought before the major horticultural bodies—The Royal New Zealand Institute of Horticulture (Inc.) and Conference of Superintendents of Parks and Reserves, as well as before local organizations.

(e) Publications. Publications have covered recording of new adventive species, keys for identification of certain groups of plants, and general papers on weeds.

VEGETATION SURVEYS

A NUMBER of surveys of National Parks were begun, and some of catchments concluded, in the period under review. It is planned to publish these as bulletins, under the general title "Contributions to a Botanical Survey of New Zealand". In addition the Division is asked from time to time to report on smaller areas of vegetation, such as the Opepe bush noted below.

1. The central catchment at Taita Experimental Station, North Island. (Mr A. P. Druce)

The results of this survey were published in 1957 (D.S.I.R. Bulletin, No. 124). The 40-acre catchment is situated in the hills on the eastern side of the Hutt Valley, Wellington, and was set aside by the Soil Bureau, D.S.I.R., in 1949, as a reserve for the regeneration of indigenous vegetation. The reserve is being used for three principal purposes. (a) To determine the rate of rock weathering and loss of plant nutrients to the drainage water by measuring rainfall and stream flow as accurately as possible, and analysing both rainwater and stream waters quantitatively (being carried out by Soil Bureau).

(b) To study regeneration of the vegetation over a long period (being carried out by Botany Division).

(c) To provide a study area for the use of students and others interested in plant ecology (under control of Botany Division).

The original forest was dominated almost entirely by hard-beech (*Nothofagus truncata*) but as a result of fires the present vegetation is all secondary, varying in age from 10 to 100 years. About 85 per cent is scrub and pines, and the remainder forest. Present development on the hills is towards kamahi (*Weinmannia racemosa*) forest, and hard-beech forest, with an ultimate return to the latter alone. Small areas of broad-leaved dicotylous forest are developing on colluvium and alluvium in the valley bottoms.

2. The Hutt Valley catchment, North Island. (Mr A. P. Druce and Mr I. A. E. Atkinson).

This survey was carried out at the request of the Hutt River Board, Wellington. Following the introduction of browsing animals, principally deer, marked changes have occurred in the silver beech (*Nothofagus menziesii*) forest above 2,800 feet in the headwaters of the Hutt River. The area affected, though only a small part of the total catchment, is

situated in a region of heavy rainfall, and loss of the forest may be expected to increase run-off, as well as affecting stream grading. Large sums of money are being spent at the present time on flood control measures in the Hutt Valley, but unless the browsing pressure on silver beech seedlings is reduced in the near future the position in the lower valley is likely to become worse. A report on the forest deterioration was submitted to the River Board. In the course of the survey a map of the vegetation was made, the various types of vegetation described, and a check list of the indigenous and adventive plants compiled. A preliminary account of forest variation in the catchment has been published.

3. Vegetation patterns in North Island mountains. (Mr A. P. Druce).

The purpose of this work is to present by means of a series of maps and photographs a broad picture of North Island high mountain vegetation, in its relation to biotic and other environmental factors. The maps are based on observations made during the last fifteen years, as well as any published information. At present thirteen maps have been prepared, showing the areas of high mountain vegetation, climate, topography, soil parent material, disturbance factors, vegetation, and the distribution of 55 of the more important trees, shrubs, tussock grasses and herbs.

4. Opepe Bush, North Island. (Mr I. A. E. Atkinson and Mr A. P. Druce).

Opepe Bush is 650 acres of remnant podocarp forest, 10 miles south-east of Taupo on the Kaingaroa Plains. As a result of representations against the milling of this forest, a report on the area was requested from Botany Division. During a two day visit a species list was compiled, and the canopy sampled for composition and for information on diameters and heights of major trees. After taking into consideration the scientific, educational, recreational, and economic values of the forest, it was recommended that a certain area be reserved, together with adjacent areas of *Dracophyllum subulatum* and *Leptospermum scoparium* scrub communities. The report is filed at Botany Division.

5. Reconnaissance Survey of Tussock Grass and Grasslands in the North Island. (Mr A. P. Druce).

The purpose of this survey was to sort out the various types of tussock grasses in the North Island, and to make a preliminary survey of the extent and nature of the grasslands. Ten tall danthonia types have been recognised, only one of which could be accurately named (*D. flavescens* var. *cheesemani*). Examples of these types are now being grown together in the Division's Experimental Gardens at both Taita and Lincoln, so that their taxonomic status may be better determined. Among the short tussocks, five types have been recognised in the *Festuca novae-zelandiae* complex, and four types in *Poa caespitosa*. One of the latter is considered an introduction from the South Island as it has not been found in indigenous vegetation in the North Island. Most of the areas of tussock

grassland have been visited, and the most important conclusion is, that whatever the climate, the high altitude snow tussock grasslands are unstable, in the sense that once opened up by fire or grazing both vegetation and soil are removed by erosion, leaving only weathered rock.

6. Tussock Grassland Studies, South Island. (Mr H. E. Connor).

In primitive New Zealand the greatest areas of natural grassland occurred in the South Island, and much of this low- and tall-tussock still exists, although it is usually in a much modified condition due to a century of grazing and burning. There have been few detailed studies of these great vegetation types to classify any differences in composition which occur within the wide range of sites and regions which are occupied. Observations have begun on a hitherto undescribed association of quite extensive distribution and considerable economic importance in which *Festuca matthewsii* is an important species. This association is one subdivision of the extensive community where *Danthonia rigida* is the physiognomic dominant and where *Poa colensoi* is important among the associated plants. There is a marked contrast between this association and the *D. rigida-Celmisia spectabilis* alliance described by Barker (D.S.I.R. Bull. No. 107). *Festuca matthewsii* is known to be abundantly present in mid- to high-altitude areas in the southern catchment of the Waitaki River, and in Central Otago.

7. Survey of fresh-water plants (Miss R. Mason).

New Zealand is not rich in native aquatic plants, and this may account for the fact that little attention has been paid to them for fifty years or so. Some of the taxonomic information in the second edition of Cheeseman (1925) was out of date when published, and nor was a good idea given of the distribution of many species. Likewise, the distribution of the adventive water weeds has not been well known and new ones are found from time to time.

As lakes and rivers may be spoilt for swimming, boating and fishing, as drains may be blocked by water weeds, and as, on the other hand such plants supply food and shelter for water fowl, it is of practical importance, and scientific interest that the aquatic plants of the country should be well understood.

A water plant survey has been in progress for some years. During the last three years field trips have been made to Nelson (1957), Westland (1958), and to the Waikato (1959), and in previous years to North Auckland, Wellington, Taranaki, Marlborough, Canterbury and Southland. During these studies one new native species has been recognised (*Callitriche petriei*); other plants, some adventive, one doubtfully native, are new records for New Zealand; a few species are much more restricted in distribution than recorded, and many others much more widely distributed.

About 5,000 specimens of water, swamp and bog plants have been added to the herbarium in the course of the survey. [This in conjunction with Mr N. T. Moar].



Earle Andrew, Wellington, 1938

I. Dr H. H. ALLAN, C.B.E., M.A., D.SC., PH.D. (Upsala), F.L.S., F.R.S.N.Z.



N.Z. Forest Service photo by J. H. Johns, A.R.P.S.

2. Mr A. L. POOLE, M.SC., B.FOR.SC., F.L.S.



D.S.I.R., photo by E. J. Thornley, 1960

3. Mr C. M. SMITH, M.A., B.SC.(For.)(Edin.), A.H.R.I.H. (N.Z.)



D.S.I.R., photo by A. P. Underhill, April, 1960

4. The new building, Lincoln. Herbarium (right), Administration (centre), Library (left, obscured), Laboratory and Office wing (rear).

Three lectures were given as part of a Field Officers Training Course, organised by the Wild Life Branch, Department of Internal Affairs, at Turangi, in January, 1958. The subjects were: the collection and preservation of plant specimens and the keeping of records; the main groups of water plants found in New Zealand; a general account of the ecology of water plants. A field demonstration was also given.

8. Bogs and Swamps (Mr N. T. Moar).

The main task is to identify the various bog and swamp types occurring in New Zealand in order to understand their origin and structure, and to describe the vegetation of these various types. At present observations are made when opportunity offers in the course of other work. In recent years areas in Westland, Nelson and Waikato have been visited.

9. National Park Surveys.

An arrangement has recently been made with the National Parks Authority for Botany Division to undertake vegetation surveys of the National Parks. With one exception such surveys have never been made. The exception is the Tongariro National Park where the vegetation was surveyed by Cockayne (1908) and Turner (1909). But both these classics are now out of print and in many respects out of date. Work has commenced on the following parks: Tongariro (North Island), Mr I. A. E. Atkinson; Mount Egmont (North Island), Mr A. P. Druce; Nelson Lakes (South Island), Miss M. J. A. Simpson; Arthur's Pass (South Island), Dr F. J. F. Fisher; Mount Cook, (South Island), Mr H. E. Connor.

VEGETATION AND ANIMALS

1. Kourarau, North Island (Mr I. A. E. Atkinson). This is a co-operative project with the Animal Ecology Section, and the Grasslands Division of D.S.I.R. A detailed study is being made of a rabbit population within an enclosed 21 acre area of hill-country sheep pasture at Kourarau, 15 miles east of Masterton. It is anticipated that rabbit numbers within the enclosure will build up to a high level, thus providing an opportunity for measurement of their effects on pasture composition. Identification and counting of grass tillers is made on 2½ inch diameter plugs collected at regular intervals, a method developed at Grasslands Division.

2. Molesworth, South Island (Miss L. B. Moore). In inland Marlborough, Molesworth and adjacent high country runs totalling more than 400,000 acres are administered as one block by the Department of

Lands and Survey. In 1943 Botany Division was asked to make preliminary vegetation surveys and to record changes in the vegetation following removal of sheep, vigorous attacks on noxious animals, especially rabbits, and gradual introduction of cattle. Photographs taken from about 100 fixed points at 3-year intervals beginning in 1944 show, with the accompanying botanical notes, that change was at first slow and uncertain, but that since 1953 improvement has been spectacular in many, though not all, places. In barer parts the first step was for weeds to hold the soil. By far the most important is sheep's sorrel (*Rumex acetosella*) though two species of mullein, (*Verbascum* spp.) viper's bugloss (*Echium vulgare*), thistles and several kinds of piripiri (*Acaena* spp. and scabweed (*Raoulia* spp.) have helped locally. With only light grazing Yorkshire fog (*Holcus lanatus*) spreads outwards quite strongly into the sheeps' sorrel from adjoining tussock areas, accompanied by smaller numbers of native grasses such as species of *Dichelachne*, *Deyeuxia*, *Koeleria* and *Agropyron*, but the dominant fescue tussock (*F. novae-zealandiae*), even after 15 years, is re-establishing actively in only a few places. At a certain stage of weed development grass seed sown from the air has been found to give good results and on some faces at altitudes of 3,000 to 3,500 feet broad green swathes of aerially sown cocksfoot run across the predominantly red slopes of sheep's sorrel. In general sown grasses do not establish easily amongst tussocks but the unpalatable tall oat grass (*Arrhenatherum elatius*) from small-scale broadcast sowings has grown freely, and actually choked out fescue tussocks. Trials of other grasses, mostly in nursery rows, will be reported elsewhere. In the period 1957-1959 work has been restricted to minimum routine recording and working up of some results.

3. Motunau Island, South Island (Miss R. Mason and Miss M. J. A. Simpson). This is a seven acre, 113 feet high flat-topped island, lying a mile off-shore, about 40 miles north of Christchurch. For many years it has been infested with rabbits, but has never been grazed, and only seldom burnt, long ago. As the island has recently been declared a bird sanctuary, the rabbits are being exterminated, and the vegetation changes which result are being studied. The top of the island is covered by *Poa caespitosa* tussock, with varying amounts of *Pteridium esculentum*, *Scirpus nodosus* and *Juncus pauciflorus* towards the northwestern half.

Two transects and 13 quadrats have been charted. In two places where there is much bird traffic are pairs of quadrats, one open and one covered by a frame, as protection from sea birds. Sixteen tussocks considerably damaged by rabbits, several of them above rabbit burrows, have been measured and photographed, and will be kept under observation.

The difficulties of access to the island are substantial enough to deter casual visitors, but not enough to make our own visits irregular. Observations have been made in March, April, May and September, 1958, and January, September and October, 1959. Changes are noticeable 18 months after the rabbits were almost exterminated. *Mesembryan-*

themum australe and *Urtica ferox*, both eaten by rabbits, are spreading or recovering. In some places barley grass (*Hordeum* sp.) is also spreading on to bare ground.

SUBANTARCTIC AND ANTARCTIC BOTANY

(Dr E. J. Godley)

THE POSITION of Christchurch as a major departure point for the south makes it a peculiarly suitable centre for the assembly of information on subantarctic and antarctic botany. This Division now houses the most representative collection in the southern hemisphere of plants from high southern latitudes, as the collections from our own subantarctic islands have recently been enhanced by a collection of South Chilean plants made during the Royal Society's Expedition to Southern Chile. The description of the latter collection is proceeding, as is an account of the South Chilean vegetation. The botanical relationships between New Zealand, South America, and the Subantarctic are being studied.

Mention has been made of the *Sophora* work under Experimental Taxonomy. A history of botanical exploration in the Subantarctic and Antarctic is being prepared, in order to determine the location and geographic distribution of collecting points, the names of collectors, and the present whereabouts of their collections. Mr N. T. Moar's valuable work on subantarctic peats and quaternary history should be mentioned here.

A paper on "The Vegetation of Southern Chile in relation to New Zealand and the Subantarctic" was recently given at a Royal Society symposium on the Biology of the Southern Cold Temperate Zone. A redefinition of the vegetation regions in southern Chile was proposed, and also a redefinition of the subantarctic vegetation zone. Only the western margin, of southern Chile, south of 48° was included in the Subantarctic, as compared with the whole of South America south of 48° in previous works. The probable significance of cushion bogs of certain types, as an indicator of subantarctic conditions, and their replacement by *Sphagnum* bogs as one moves out of that zone was discussed.

POLLEN MORPHOLOGY

(Mr N. T. Moar)

SUCH STUDIES are essential for our pollen analysis work, and are useful adjuncts to taxonomy. The pollen collection of over 4,000 slides has already been mentioned.

1. *Hydrocotyle*. This work now completed, shows that the New Zealand species may be divided into three groups, by exine characters and size range, and that they may form a distinct pollen group in the Umbelliferae. Other indigenous umbellifers are being assembled for study.

2. *Podocarpus*. Pollens of *Podocarpus* species are difficult to differentiate in Quaternary deposits, and suitable diagnostic characters are being sought. A useful character has been found in the ectomesexine of the proximal cap, but as pollen does not always lie conveniently on slides prepared for analysis this criterion is not always useful. *P. dacrydioides* is easily recognised as it is the only three-winged pollen, but *P. spicatus* can now be separated from *P. ferrugineus* and pollen of *P. nivalis* can be separated from that of *P. totara* and *P. hallii* if the proximal cap is visible. This study will be continued and extended to include *Dacrydium* pollen.

3. *Callitriche*. Notes on the pollen grains of the New Zealand species and of two Australian species are included in Miss R. Mason's revision of the Australasian species. A more detailed account will be published later.

QUARTERNARY HISTORY OF THE FLORA

(Mr N. T. Moar)

1. Waikato (North Island). In these bogs well preserved logs of a *Dacrydium* species are common. These have hitherto been regarded as belonging to an extinct species, but otherwise little attention has been paid to them. A search was made for other plant fragments among the logs, and innumerable twigs with attached leaves were found, which have been identified as *Dacrydium colensoi*. Pollen of *D. colensoi* has also been found in the peat from which the plant fragments were extracted. Deep profiles now require examination in order to trace the history of this species in the Waikato. *D. colensoi* is now common only on the

western flanks of the Volcanic Plateau, (North Island) and in Westland, (South Island), and the reasons for the extinction of this once common Waikato tree are still obscure.

2. Mokai Patea and Whauahuia Ranges. (Ruahine Ranges, North Island). In these peats there are two pumice layers of which the younger or Taupo pumice, has been dated at 1700 B.P., and the older, tentatively assigned to the Waimihia pumice, is about 3,000 years old. These deposits are useful in obtaining an absolute time scale in these peats. The main trends disclosed by pollen analysis are:

(a) a gradual decrease in *Podocarpus* sp. pollen, and an increase in *Nothofagus* pollen, with decreasing age.

(b) the continued presence of *Nothofagus menziesii* pollen at low frequency throughout the profiles. (There are still many pockets of this species about the Mokai Patea site, and it has possibly been so distributed for a long time.)

(c) a persistent but low frequency of pollen of *Ascarina lucida*, a species not now recorded from the area.

(d) superimposed upon the general trends is a possible fluctuation of the *Dacrydium bidwillii*—*D. biforme* pollen type suggesting that the sub-alpine scrub has been fluctuating in altitude. This agrees with the discovery of buried *D. biforme* logs above the present bush-line.

3. Palmers Road, near Rahu Saddle. (South Island). A preliminary examination of a peat profile suggested that detailed work would be worthwhile. Samples have been submitted for ^{14}C dating, and until results are obtained no further collections will be made.

4. Christchurch. (South Island). Buried peats have been examined, both by pollen analysis and by a study of plant fragments, such as seeds and leaves. ^{14}C dating gave ranges in age from 1,000 to 3,000 years. The results suggest that the area was then more heavily forested than in European times, and that the main forest trees at the localities studied included *Podocarpus dacrydioides* and *P. spicatus*. The youngest samples from the base of the Port Hills also yielded many leaves of a *Podocarpus* species which is either *P. totara* or the allied *P. hallii*.

5. Chatham Islands. A preliminary examination of a peat profile suggested that further work would be profitable, and late in 1959 three profiles were collected during a brief visit. These will shortly be examined.

6. Subantarctic Islands. Since publication of the Auckland Island pollen diagrams a section from Antipodes Island has been examined. The results showed that there was no significant change in the flora during the time of accumulation of the peat section. A profile 225 cm. deep from Campbell Island has been examined and a deeper one collected by the Cape Expedition is now being investigated. Results

so far indicate a marked change from an herbaceous to a shrubby flora from the base upwards.

GENETICS

(Dr E. J. Godley)

ATTENTION HAS been confined to a study of the genetics and evolution of breeding systems using native plants as experimental material. This involves descriptions of flower types, determination of the breeding system and its genetic basis where possible, and application of this knowledge to a study of natural populations.

The distribution of the various flower types of *Fuchsia procumbens* in the known natural populations has been worked out, and will be published soon.

Dioecism has been recorded in *Cyathodes colensoi* (Epacridaceae) and an interesting situation described in *Cyathodes acerosa*, (Nature, 1957). Here, in populations in the South Island, there are two kinds of plants, one female and fruiting, and the other apparently hemaphrodite but not fruiting. This is a breeding system which is gynodioecious in structure but dioecious in function, and the cause of the sterility will be investigated.

Gynodioecism has been studied in *Melicope* (Rutaceae) and *Pimelea* (Thymeleaceae).

An early observation by G. M. Thomson that an isolated plant of *Pentachondra pumila* (Epacridaceae) did not set fruit, has been confirmed on several plants, by hand self-pollination. A crossing programme will be carried out to determine the genetic basis of the incompatibility.

The theoretical consequences of a combination of dioecism and incompatibility—two breeding systems previously considered mutually exclusive—have been worked out, and the results considered as a possible explanation of the divergence from equality in the sex ratios of many plants.

H. E. Connor is also investigating the breeding systems of the native grasses (see Experimental Taxonomy).

CYTOLOGY

1. Chromosome Atlas (Dr J. B. Hair and Mr E. J. Beuzenberg).

Work on the Atlas commenced in December 1953. To date the chromosome numbers of some 500 species of flowering plants have been determined, with each determination covered by a voucher

herbarium specimen. This represents an estimated one-quarter of the New Zealand flora, excluding the ferns and lower groups. One-half, or 250 of these numbers have been established during the period under review. The 500 species whose chromosomes are now known, have been derived from 150 genera (350) and 70 families (100), the figures in parenthesis being the estimated totals for New Zealand in the respective categories. Twenty-one families have been dealt with completely.

The ultimate aim of this investigation is the publication in book form of a complete Chromosome Atlas of the New Zealand flora, excluding ferns, and lower groups. The extent of this task, which will require another 15-20 years of work, has made it desirable to publish a series of contributions to the Atlas, each such contribution being complete at the generic level so as to provide useful information as soon as available for both local and overseas botanists and cyto-taxonomists. The first of these interim publications appeared in December 1958, the second in March 1959, and the third in September 1959. A fourth paper in the series is almost ready for press and thereafter not less than two papers per year should add to the series.

2. Podocarpaceae (Dr J. B. Hair and Mr E. J. Beuzenberg).

When a preliminary cytological examination of the New Zealand species of *Podocarpus* and *Dacrydium* revealed an unexpected variation in chromosome numbers as between species, a detailed analysis of the karyotypes was undertaken in representatives of these genera from many other parts of the world, as well as in the other genera of the family: *Acropyle*, *Microcachrys*, *Pherosphaera*, *Saxegothaea* and *Phyllocladus*. In all, 52 species were analysed.

The evidence at present available suggests that with certain exceptions the wide range of chromosome numbers found in this family fit an evolutionary series in which repetitive "centric fusions" have reduced a presumptive basic set of 20 acrocentric pairs to 10 pairs of metacentric chromosomes. From the extant material, it is clear that chromosomal evolution and morphological evolution have not necessarily proceeded hand in hand or at the same rate, either within the same or in different taxonomic sections of the family.

The results of this study have been in part published in *Nature* (1958), and were the subject of a paper delivered at the X International Congress of Genetics in Montreal, August 1958.

3. Violaceae (Mr E. J. Beuzenberg).

Mr Beuzenberg has completed a cytotaxonomic survey of the *Viola*-ceae and a parallel study of the development of sex expression in *Melicytus* and *Hymenanthera*. The evidence suggests that the distinction between these genera is artificial and therefore unjustified. In the first place, their constituent species are all connected by a progressive reduction and fusion of floral parts; in the second place, chromosomal behaviour at meiosis in an intergeneric hybrid is perfectly normal.

Both hermaphrodite and unisexual flowers pass through an initially

male phase which in hermaphrodites and females is succeeded by a female phase of development. In females, the anthers collapse at a definable stage which may be indirectly related to the rate, or stage, of ovular development. In males, ovular development is inhibited soon after its inception.

The numerical cytological results of this investigation have been published in the third contribution to the Chromosome Atlas (September 1959). A detailed paper by Mr Beuzenberg will follow.

4. *Pomaderris*. (Dr J. B. Hair in collaboration with Miss L. B. Moore).

Cytological examination showed that there are two diploid species, 5 triploids (!), and 2 tetraploids. Reproduction seems to be exclusively by seed. Uniformity, lack of evidence for hybridisation, and meiotic behaviour strongly favour the possibility of apomixis in the triploid species and perhaps in one of the tetraploids. To check this possibility the range of material necessary for sectioning is available but will be supplemented by bagging experiments in the field when occasion offers.

5. *Ranunculus* (Dr J. B. Hair in collaboration with Dr F. J. F. Fisher).

A preliminary cytological study of *Ranunculus* was begun in December 1958, and has been resumed this season. This investigation will embrace the whole genus in New Zealand but is being concentrated first on the alpine species concurrently with Dr. Fisher's investigation of this group. The detailed karyotype analysis now in progress promises to supply critical evidence for a proper understanding of evolutionary trends in the genus.

PUBLICATIONS

(April, 1957—March, 1960)

- Atkinson, I. A. E., 1959. Soils and Growth of *Pinus radiata* at Cornwallis, Auckland. *N.Z.J. Sci.* 2: 443-472.
- Boyce, W. R., 1958. Resistance to Yellow-leaf Disease in *Phormium tenax* Forst. and the Occurrence of Delayed Expression of Symptoms. *N.Z.J. agric. Res.* 1: 31-36.
- Connor, H. E., 1957. Breeding systems in some New Zealand Grasses. *N.Z.J. Sci. Tech.* A38: 743-751.
- Connor, H. E., 1957. *Agropyron x wallii*, A Natural Hybrid in New Zealand. *Trans. roy. Soc. N.Z.* 84: 757-60.
- Connor, H. E., 1959. Something about the Plants, In Packard, W. P., *Mount Cook National Park Handbook*, 16-24.
- Connor, H. E., 1960. *Nassella* Tussock in Argentina. *N.Z.J. Agric.* 100: 18-21.

- Druce, A. P., 1957. Botanical Survey of an Experimental Catchment, Taita, New Zealand. *N.Z. Dept. Sci. Ind. Res. Bull.*, 124.
- Druce, A. P., 1957. The vegetation of Mt. Kaiparoro. *Wellington Bot. Soc. Bull.* 29: 7-13.
- Druce, A. P. and Atkinson, I. A. E., 1959. Forest Variation in the Hutt Catchment. *Proc. N.Z. Ecol. Soc.* 6: 41-45.
- Druce, A. P., 1959. An Empirical Method of Describing Stands of Vegetation. *Tuatara* 8: 1-12.
- Druce, A. P., 1959. Southern Rata in the Tararuas. *Wellington Bot. Soc. Bull.* 31: 12-15.
- Edgar, E., 1958. Studies in New Zealand *Cotulas*.
Part 1—Floret Types and Natural Groupings of the Species.
Part 2—Floral Biology. *Trans. roy. Soc. N.Z.* 85: 357-377.
- Godley, E. J., 1957. Notes on Mendel's Experiments in Heredity. *N.Z. School Sci.* 11: 24-35.
- Godley, E. J., 1957. Unisexual flowers in the Ericales. *Nature* 180: 284-285.
- Godley, E. J., 1959. Some Impressions of a Botanist in South America. *J. roy. N.Z. Inst. Hort.* 3: 210-214.
- Godley, E. J., 1959. Problems of the Origins of Species. *N.Z. Sci. Rev.* 17: 78-83.
- Hair, J. B., 1959. The Chromosomes of the Podocarpaceae. *Proc. Internat. Congress of Genetics II*: 1.
- Hair, J. B. and Beuzenberg, E. J., 1958. Chromosomal Evolution in the Podocarpaceae. *Nature* 181: 1584-1586.
- Hair, J. B. and Beuzenberg, E. J., 1958. Contributions to a Chromosome Atlas of the New Zealand Flora—1, *N.Z. J. Sci.* 1: 617-628.
- Hair, J. B. and Beuzenberg, E. J., 1959. Contributions to a Chromosome Atlas of the New Zealand Flora—2, Miscellaneous Families. *Ibid.* 2: 148-156.
- Hair, J. B. and Beuzenberg, E. J., 1959. Contributions to a Chromosome Atlas of the New Zealand Flora—3, Miscellaneous Families. *Ibid.* 2: 531-538.
- Healy, A. J., 1957. Contributions to a Knowledge of the Adventive Flora of New Zealand, No. 5. *Trans. roy. Soc. N.Z.* 84: 649-659.
- Healy, A. J., 1958. Mediterranean Mustard, a New and Potentially Troublesome Weed in New Zealand. *N.Z. J. Agric.* 96: 111-113.
- Healy, A. J., 1958. Eelworm (*Anguina agrostis* (Steinb.) Filijer) in *Agrostis tenuis* Sibth. in New Zealand. *N.Z. J. agric. Res.* 1: 265-266.
- Healy, A. J., 1958. Weeds of Turf (with Key for Identification). *Proc. N.Z. Inst. Turf. Culture Conf.* 1956 and 1957.
- Healy, A. J., 1958. Horticultural Discards May Become National Weeds. *J. roy. N.Z. Inst. Hort. II*: 333-338.
- Healy, A. J., 1958. Contributions to a Knowledge of the Adventive Flora of New Zealand, No. 6. *Trans. roy. Soc. N.Z.* 85: 531-549.
- Healy, A. J., 1959. Contributions to a Knowledge of the Adventive Flora of New Zealand, No. 7. *Ibid* 86: 113-118.

- Healy, A. J., 1959. Contributions to a Knowledge of the Adventive Flora of New Zealand, No. 8. *Ibid* 87: 229-234.
- Healy, A. J., 1959. Unintentional Introduction of Plants into New Zealand. *N. Z. J. agric. Res.* 2: 312-313.
- Healy, A. J., ("Inquiline"). 1959. Weed Toll Tops all others on Farm. *The New Zealand Young Farmer II*, 164.
- Healy, A. J., 1959. Weeds of Parks and Reserves. *Proc. Ann. Conf. N. Z. Inst. Park. Admin.* 1959.
- Healy, A. J., 1959. Weeds—Biology and Distribution. IN "Lecture Notes for Chemical Rating". Wellington, Civil Aviation Administration.
- Madden, E. A. and Healy, A. J., 1959. The adventive Flora of the Chatham Islands. *Trans. roy. Soc. N. Z.* 87: 221-228.
- Mason, R., 1958. Foods of the Australian Opossum (*Trichosurus vulpecula*, Kerr) in New Zealand Indigenous Forest in the Orongorongo Valley, Wellington. *N. Z. J. Sci.* 1: 590-613.
- Mason, R., 1959. Callitriche in New Zealand and Australia. *Aust. J. Bot.* 7: 295-327.
- Moar, N. T., 1958. Notes on the Botany of the Auckland Islands. *N. Z. J. Sci.* 1: 466-479.
- Moar, N. T., 1958. Contributions to the Quaternary History of the New Zealand Flora. 1. Auckland Island Peat Studies. *Ibid.* 1: 449-465.
- Moar, N. T., 1958. Contributions to the Quaternary History of the New Zealand Flora 2. Plant Remains from a Buried Peat Layer at Bowenvale, Christchurch. *Ibid.* 1: 480-486.
- Moar, N. T., 1959. Contributions to the Quaternary History of the New Zealand Flora. 3. Pollen Analysis of a Peat Profile from Antipodes Island. *N. Z. J. Sci.* 2: 35-40.
- Moore, L. B., 1957. The Species of *Xeronema* (Liliaceae). *Pacific Science* 11: 355-362.
- Rawson, T. W. and Marcussen, K. H., 1960. Propagation of Lilac. *N. Z. J. Agric.* 100: 243-244.
- Young (Mrs) P. E. and Moar, N. T., 1958. Pollen-analysis of a Post-glacial Peat Bog. IN "*The Flora of Cass*", Part II, 1. Christchurch, Botany Dept. Univ. of Canterbury.
- Zotov, V. D., 1957. A Numerical Study of the Distribution of Grasses in New Zealand. *Proc. N. Z. Ecol. Soc.* 4: 9-10.

Index Seminum Anno MCMLVII Collectorum
 Index Seminum Anno MCMLVIII Collectorum
 Index Seminum Anno MCMLIX Collectorum

Staff

PAST DIRECTORS

DR H. H. ALLAN

IT IS with sadness that we record the death, on October 29, 1957 of Dr H. H. ALLAN, C.B.E., M.A., D.SC. (N.Z.), PH.D. (Upsala), F.R.S.N.Z. F.L.S. An account of Dr Allan's contributions to botanical science, together with a list of his published work has already appeared in the *Proceedings of the Royal Society of New Zealand*, for November, 1959. Here we must emphasize our indebtedness to him for the unique part he played in the development of the Botany Division of the Department of Scientific and Industrial Research. The evolution of this division properly began with the appointment of Dr Allan as Systematic Botanist to the Plant Research Station in 1928, and when the unit which he had developed became Botany Division in October, 1938, Dr. Allan was appointed as its first Director. He continued in this position until his retirement in 1948. During these twenty years the herbarium was built up, in great measure by Dr Allan's own gatherings, from a small nucleus of some 2,000 specimens to a collection of about 50,000 specimens, second to none in the country. His personal collection of books and reprints forms the backbone of our Library. Under his guidance and in large part due to his personal reputation, and membership on international committees, Botany Division became known overseas. His influence is still very much with us for the manifold works which he began or inspired are still continuing.

MR C. M. SMITH

Mr C. M. SMITH, M.A., B.SC. (For.) (Edin.) A.H.R.I.H. (N.Z.) the third Director of Botany Division, retired on the 31st December, 1957. When Mr Smith joined as Director in January, 1951, the division was still in Wellington at 8 The Terrace, and it was during his time that the shift was made to Latimer Square in Christchurch, and development at the Lincoln site began. We are particularly indebted to him for the improvements which he made in the library, clerical services, and gardens organization, and for the standards of scholarship which he continually upheld.

MR A. L. POOLE

Mr A. L. POOLE, M.Sc., B.For.Sc., F.L.S., the present Assistant-Director of Forestry, joined the Division in January, 1937, and was appointed Assistant-Director in April, 1945, and Director in January, 1949. Although he guided the Division for only two years, Mr Poole's influence was shown in the beginning of library development, and an expansion of ecological work.

OVERSEAS VISITS

- Mr H. E. Connor spent four months in 1958 in the United States and Canada, studying natural grasslands, and research in experimental taxonomy. He also spent four weeks in Argentina studying *Stipa trichotoma* (nassella tussock) in its natural habitat, on behalf of the North Canterbury Nassella Tussock Board.
- Dr E. J. Godley took part in the Royal Society's Expedition to Southern Chile, as botanist, between August, 1958, and March, 1959.
- Dr E. J. Godley visited London during December 1959, and January 1960, to take part in the Royal Society symposium on the "Biology of the Southern Cold Temperate Zone", and to visit the Royal Botanic Gardens, Kew, and the British Museum (Natural History).
- Dr J. B. Hair was official New Zealand delegate to the First International Wheat Genetics Symposium at Winnipeg, and to the X International Congress of Genetics at Montreal in August, 1958. Between September and November he visited research organisations in the United States in the fields of botany, cytology and genetics.

HONOURS AND AWARDS

- Miss L. B. Moore, M.B.E., in recognition of services to the Dominion. Birthday Honours, 1959.
- Dr H. H. Allan. Philosophiae Doctor et Artium Liberalium Magister. Honoris Causa. University of Upsala, May 1957. One of twelve honorary degrees conferred on eminent biologists at the two hundred and fiftieth anniversary of the birth of Linnaeus.
- Miss M. B. Ashwin, M.Sc. (First Cl. Hons.) Victoria University College, 1957. Post Graduate Travelling Scholarship in Science, 1958.
- Miss E. Edgar, M.Sc. (Equ. First Cl. Hons.) Canterbury University College, 1957. University Research Scholarship, 1957. New Zealand University Research Fund Fellowship, 1958-59, Ph.D., University of Canterbury, 1960.

APPOINTMENTS

- Mr H. E. Connor. North Canterbury Nassella Tussock Board; North Canterbury Catchment Board; Mount Cook National Park Board.
- Dr E. J. Godley. Hon. Lecturer, Canterbury University; Hon. Lecturer, Canterbury Agricultural College; Central Standing Committee, Soil Conservation Council.
- Dr J. B. Hair. Hon. Lecturer, Canterbury Agricultural College.
- Mr N. T. Moar. Hon. Lecturer, Canterbury University; Marlborough Nassella Tussock Board.
- Miss L. B. Moore. Systematic Botany Committee, Section M, of A.N.Z.A.A.S.

STAFF APPOINTMENTS

Dr E. J. Godley	6.1.58	Director*
Mr I. A. E. Atkinson	17.3.58	Ecology
Mr A. P. Druce	1.4.58	Ecology (transferred from Soil Bureau).
Dr F. J. F. Fisher	1.12.58	Ecology and Experimental Taxonomy
Mr J. E. Herkert	2.2.59	Technician, Quaternary Research
Miss B. E. Harris	7.9.59	Librarian*
Mr K. R. West	23.11.59	Botanical Artist*
Miss M. R. Jackman	23.11.59	Typiste*
Dr E. Edgar	1.12.59	Taxonomy (transferred from Crop Research Division).
Dr P. Wardle	1.4.60	Ecology
Mrs M. E. Blackmore	1.6.60	Assistant Librarian (transferred from Crop Research Division).

* Indicates a replacement.

STAFF LIST

(1.4.60)

DIRECTOR: E. J. GODLEY

ASSISTANT DIRECTOR: A. J. HEALY

RESEARCH STAFF

	<i>Professional</i>	<i>Technical</i>
Flora Revision		
Adventive Plants	A. J. HEALY	
Monocotyledons	L. B. MOORE E. EDGAR	B. H. MACMILLAN
Grasses	V. D. ZOTOV	B. M. GILPIN
Herbarium	T. W. RAWSON	A. A. SUTHERLAND J. A. HARRISON
Genetics	E. J. GODLEY	
Cytology	J. B. HAIR	E. J. BEUZENBERG
Experimental		
Taxonomy,	H. E. CONNOR	
Ecology, and	F. J. F. FISHER	
Vegetation	P. WARDLE	
Surveys	R. MASON	M. J. A. SIMPSON
Quaternary History	N. T. MOAR	J. E. HERKERT
Botanical Artist		K. R. WEST
Librarians		B. E. HARRIS M. E. BLACKMORE

NORTH ISLAND SUBSTATION (TAITA)

Vegetation Surveys	A. P. DRUCE
and Ecology	I. A. E. ATKINSON

EXPERIMENTAL GARDENS

Officer in Charge: B. L. NICHOLLS
Staff: I. C. BROWN, W. J. FULLER, P. E. PAGE, H. J. F. PRATT.

ADMINISTRATION

Clerical Officer: R. J. SHEEHY
Typiste: M. R. JACKMAN

RETIREMENTS AND RESIGNATIONS

Mr C. M. Smith, Director since 1.1.51 retired on 31.12.57.

Miss J. N. M. Adams, Botanical Artist since 4.1.43, resigned on 6.5.59, to become artist to the Dominion Museum, Wellington.

Miss M. B. Ashwin, Assistant to Dr H. H. Allan since 1.12.54, resigned on 25.5.59, and is now studying at the University of California (Davis).

Miss J. M. A. Jackson, Librarian from 25.6.56 resigned on 12.4.57.

Miss B. A. Somers, Librarian since 20.5.57, resigned on 7.8.59.

Mrs G. M. Syddall, Typiste since 15.3.54 resigned on 30.9.59.

