A BOTANIST IN BOTANIC GARDENING

A regrettable feature of most of the Botanic Gardens of Australia is the divorce which has taken place between botany and horticulture. These gardens have developed mainly as pleasure grounds and horticultural displays of introduced garden plants. Yet at the present time there is an urgent need to preserve and display the native Australian flora, which is rapidly vanishing and has largely not been studied biologically. This is true in other countries also, wherever the increase in world population and the development of marginal lands is causing rapid destruction of a natural flora.

To achieve a garden which is truly botanical, i.e., one in which plants, whether native to the region or not, are arranged in some scientific way and are available for study and research, it is necessary that the science of botany be held in some esteem. It is not sufficient for the garden to be under the charge of a horticulturalist, arboriculturalist, forester or other "practical man" with a botanist available to answer questions of plant identification for the public, and occasionally to check a specimen from the garden at the request of the curator. This is more or less the situation that has arisen in most Australian botanic gardens. National Herbaria are commonly located within botanic gardens, and carry out their own special work there, and their botanists are responsible to the Directors of gardens; but too often the connection ends there and only by special request has a botanist anything to do with the garden plants. It is possible for the absurd situation to arise where, if a botanist wishes to take any specimen from the garden for study, he must refer the matter to the Director, who in turn refers it to the garden superintendent, who in turn placates the gardeners, and so on. Surely the knowledge of plant physiology acquired in the course of obtaining a botanical degree is sufficient to ensure that the botanist is not likely to ruin a valued garden plant! It is likewise absurd that in herbaria of national standard, situated in the midst of botanic gardens, there are no facilities for experimental taxonomy; this situation contributes to the prevalent but erroneous idea that taxonomic botany is "out of date". In fact, the classification of plants and their correct identification is fundamental to all scientific work in botany, agriculture, horticulture, and forestry.

In a country as large as Australia the value of a scientific collection of living and dried native plants drawn from as wide an area as possible is obvious. But it is clear too that such collections will be worse than useless unless plants are accurately identified and labelled and a clear record is kept of those for which the identification has been completed. Since local races of a species are frequently the object of study, it is necessary also to keep accurate records of locality; and to achieve this a system of checking is necessary which follows the plant throughout its life. Even such matters as the success of cuttings and the length of life of a garden plant are of interest to the botanist who has the duty of planning the collection of material

In a native, scientific botanic garden it is therefore essential that the botanist should have full responsibility for botanical matters throughout the garden and throughout the life of the plant, and that this responsibility should be "built in" and not dependent on the request of an individual director or curator. This would include not only collection and identification of the original specimens, but a "back-check" of specimens growing in the garden to ensure that the plant which reaches the garden is in fact the same as that collected in the field, and the maintenance of a record system which ensures that the origin of the plant is not lost, and that further information concerning the species is related to the original specimens at all stages of life.

If the Canberra Botanic Garden is to develop as a scientific, genuinely botanical garden, the matters discussed below would seem to follow logically.

Eventually the Botanic Garden will have a Director, an Arboriculturalist, and a Botanist. (The appointment of a Superintendent, which title implies detailed supervision, implies that the professional officers require such supervision. If they do they are not professional and should be dismissed.)

Unlike many botanists, I do not believe that if the director's post falls vacant the senior botanist should automatically fill it. This could result in a loss to both botany and garden administration. Nor do I believe that the senior arboriculturalist should automatically fill it, for similar reasons. The director should not merely be a botanist or arboriculturalist who has sacrificed his specialty for status or salary. He should be primarily an administrator, but with sufficient training in botany to appreciate the needs of the garden in the matter. I stress botany here, because if he is skilled in either profession it is more likely that he will be chosen for a knowledge of horticulture than for a knowledge of botany; also because I think there is a considerable lack of appreciation of botany in the professions which might be grouped together as "applied botany"; there is a tendency to think of the botanist as an unpractical person whose job it is to name specimens and no more; there is also a very widespread failure (largely due, I think, to lack of any training in the rules of botanical nomenclature in universities) to appreciate the importance of correct nomenclature and to the reasons for name changes, etc.

I am very strongly convinced that the Director should permit botany (including all matters relating to nomenclature throughout the garden) to remain entirely the responsibility of the botanist. (as long as the latter is not completely inefficient). and he should be willing to say "The botanist is doing....." rather than "I have instructed my staff to do...." It goes without saying that the director should not be merely a clerical administrator who is there to keep costs down and red tape up!

I would go so far as to say that it is a matter of professional ethics for a botanist not to accept detailed direction on botany from one who is not qualified in this science. If, through misunderstanding, a matter which is truly botanical is removed from the jurisdiction of the botanist, I believe it is up to him, in the interests of his profession, to oppose this decision. General policy is quite a different matter.

The botanist and arboriculturalist should be of equal status and should be reasonably congenial - i.e. they should not be so different in back ground that agreement ofer the purpose of the botanic garden is scarcely possible. They should be able to work together without continually stressing "the letter of the law". In my opinion it is unfortunate that neither can hope to reach Class 3 status; it places them at a disadvantage, professional and financial, compared with similar officers in other gardens, within the Public Service saddles them with "junior status" and makes them at least nominally responsible to a Class 3 officer who may have little sympathy with one or the other branch.

In no circumstances, in a truly botanical garden, should the botanist be responsible to the arboriculturalist (the fact that many people, inside and outside the organisation, have taken it for granted that this will be the case, probably reflects a misunderstanding of the content of botany). Neither should the arboriculturalist be responsible to the botanist. I believe that borderline matters can readily be settled by discussion if it is clear to both that they are <u>really</u> equal.

It follows that it is essential for the botanist to have his own staff (they must be regarded as permanently on botanical duties, although, of course, they may be readily made available by the botanist if any other work is really urgent. They would of course be automatically available in case of grave emergency such as a serious bushfire. All these remarks apply equally to the arboriculturalist and his staff.

Professional training is supposed to enable a person to carry out an experiment in his own field and evaluate the results. Both botanist and arboriculturalist should have complete responsibility for their own work, including evaluation of results; in many cases it may be necessary or the latter to be done jointly by arrangement between them. In no circumstances except incapacity through illness or gross neglect of duty by one of these officers should anybody else be asked to carry out such evaluations. The Director should have the ability to sum it up and the right of "imprimatur" (I have not discussed his position, but presumably he will be of such superior capacity that it would be an impertinence to do so; no doubt he will be fully conversant with both botany and arboriculture??)

I admit that the scheme outlines above seems ideal and we are coming closer and closer to saying "This can't be done within the structure of the Public Service".

Specific Duties of the Botanist

Z Botany is the fundamental science on which all forms of botanic gardening are based. All scientific work with plants depends in the first instance on exact identification. Let us remember these two things in assessing the detailed duties of a botanist.

Herbarium. All matters relating to the maintenance and development of the herbarium must be under the care of the botanist. There should be no argument with the botanist's ruling on matters of herbarium procedure from those not qualified in botany. Argument from botanical subordinates should be permitted and indeed welcomed since they know what they are talking about. (Here it is worth while to recall again the words of Dr. Gauba: "Herbarium and botanic garden belong together like fish and chips".)

Field Collecting should be under the general direction of the botanist, who may be expected to do a good part of it himself. I have always felt that there is no substitute for field experience in either taxonomy or ecology. The director will of course have to approve field trips; and any member of staff should feel free to make suggestions about good collecting places. The botanist, however, is the one who will know how thoroughly any particular area has already been collected. There can be no objection to the arboriculturalist and his staff sometimes carrying out field work, or indeed any member of Parks & Gardens or any interested friends; but the general methods prescribed by the botanist should be followed, to ensure that specimens have maximum value. It must be emphasized that there is no short cut in this matter - eg. buying from nurseries. The most valuable specimens from the scientific point of view are those which are collected with exact field records, later identified with certainty, and propagated in such a way that detailed records can be kept. Also, there are many beautiful and interesting species which are not as yet in cultivation To extend the herbarium, of course, continual collecting is essential.

Research in taxonomic botany and related topics must come if the herbarium is to be of national standard. It is essential that research on the botanical side be under the control of the botanist as regards detailed work - eg., choice of subject, consultation of experts, etc. It would greatly injure the reputation of the herbarium if research in taxonomic botany were dictated or supervised by one lacking training or experiance in that particular field. If there is no such research, the herbarium will have NO reputation.

Choice of species. The botanist should have the principal voice in deciding which species are to be used in the botanic gardens. He will be able to point to the taxonomic gaps in the collection, and will know something of the distribution and ecology of the species required. Pointing to gaps in the collection is not merely a matter of lookingup a list - many cases of identity and synonymy are quite complicated and depend on knowledge of recent revisions, searches of literature etc. It is certainly insufficient to look up nursery lists - one of the botanist's duties should be to estimate the worth of names listed by nurseries (frequently nil!)

Siting of species. The botanist should have considerable say in the location of species within beds, and the final say in the case of taxonomic beds and edological groups. In the case of the latter, he should choose the right species to represent the locality, plant community, etc., which is to be re-created; he must also say whether there are sufficient species available to be truly representative, and whether it is necessary to carry out a special field trip to obtain more. He should comment from field experience on the siting of ecological groups and taxonomic beds eg., are higher and lower beds necessary, should the site be relatively frost free, and so on. He should also be able to comment on the design of ecological groups from the point of view of ecology - eg., a Grampians group planted among lumps of granite would be absurd, and the botanist would know this at once from field experience. The arboriculturalist should determine arrangement of plants within beds unless this depends on ecology.

Planting. It follows that the compilation of the spring and autumn planting lists and the spring sowing list, and of the winter planting list for Jervis Bay, should initially be undertaken by the botanist. These should subsequently be discussed with the arboriculturalist, who may want to add spectacular species, alter quantities etc. The implementation of the planting list is entirely the concern of the arboriculturalist.

Records All botanic garden record keeping should be under the general control of the botanist. It is recognised that certain of the records will be more directly the concern of the arboriculturalist, and that his staff will be the appropriate people to add information to the cards. Nevertheless the botanist must control all records relating to material brought in from the field, available for planting, etc., and to garden stocktake (since this is very closely bound up with nomenclature and identification) and should supervise nomenclature on more purely horticultural records. This is to ensure, for example, that a plant collected, propagated, and sited in the garden as Westringia fruticosa will not have horticultural information relating to it overlooked because it is indexed under W.rosmariniformis. The arboriculturalist will, of course, be able to make full use of the records and feed data into any of them.

At present the following sets of records are in use (those relating purely to the herbarium are not discussed here).

Field notebooks kept by individual collectors give details of herbarium specimens and propagating material collected in the field. They use a system of field numbers which are later translated into herbarium and nursery numbers which are cross-indexed.

Waiting list. This lists all propagating material collected in the field and obtained by purchase and exchange. By a system of "current" and "non-current" cards it shows material which is available at any given time for planting or sowing, and also shows how often a particular species has been collected.

Temporary stocktake lists. These list material present at any one time in any given place - eg., nursery cold frames, shade house etc., - and are used for preparing planting lists and then discarded.

Planting lists. These are prepared in spring and autumn for the Canberra Botanic Gardens and in winter for Jervis Bay. They direct the plants available to particular sites in the gardens.

Sowing list. This is prepared every spring and passed to the nursery. It lists seed required to be sown for use in the gardens.

Botanic Garden Planting Index. This is a card index showing numbers, sites and dates of planting of species. As regards recent plants, it is a card index of the spring and autumn planting lists.

Section maps. These are sketch maps showing "position numbers" of plants in beds. They also incorporate a

method of recording identity checks of the species. These maps will eventually supplement a grid system but will not them be obsolete - they still represent the best way of finding a particular plant and checking its identity. They are brought up to date every year at the annual stocktake carried out with the help of student labour. At the same time, checks of identity are made, and labels on plants are finalised. Should a nursery number be lost, the position number is a substitute to a certain extent. Should all labels be lost in a bed, the plants can be re-labelled with the aid of these maps.

Stocktake index. This is a "follow-up" of the planting index, and shows the numbers of plants actually found in the sections each year.

Mortality index. This is just being established. It is the "negative" of the stocktake index and shows the length of life of each specimen.

Australian Flora Index. This is a "general purpose" index which it is hoped will eventually be divided into several topics. It contains three kinds of cards - actual observations of behaviour of plants, collected mainly by Miss Boeton, locality observations, and horticultural notes from publications. It is hoped eventually to incorporate data on the behaviour of natives in the field and glasshouse collected during the present botanist's former career. This is at present on a separate private card index.

Publications index. This began as a private bibliography but now includes an index of books actually kept in the herbarium and a reference system for the location of revisions of genera etc.

The section maps, planting index, stocktake index, and mortality index have also been constructed for the garden annexe at Jervis Bay.

It is admitted that at times members of the Parks & Gardens staff have expressed doubt as to the value of garden records. It is for the Director to estimate the value of this work. It will be obvious, however, that a lot of work has already gone into this (it has infact necessitated the appointment of a clerical assistant) and that unintelligent or uninformed use of the system can cause a lot of trouble. It is also obvious that the records must be located at the botanic garden, since they are being used all the time in connection with garden work.

What are the reasons for all this record keeping? All botanical work is based on correct identification and sound nomenclature. All through the botanic garden system the human factor operates - in collecting and packing, in the nursery, in the shade house, in the botanic garden itself. It is not enough to collect a plant and later to name it; one must make sure that the name is correct, that the nomenclature is up to date, that the plant which reaches the garden is the same thing as was originally collected and labelled, and that the plant which is finally planted and labelled is still the same thing. Also, name changes and re-identifications must be passed through the whole system. And the recording of life history involves keeping a watchful eye on identity at every stage.

For checking names and labels, and collecting specimens for re-identification (eg. after revision of a genus) or to illustrate variation under cultivation, the botanist should have access to all plants in the garden at all times. This work should be taken for granted as part of the normal duties of the botanist and staff, and should not require permission from the arboriculturalist or overseer. It can surely be assumed that the botanical staff have sufficient horticultural knowledge to avoid damaging specimens. Similarly the arboriculturalist and members of his technical staff should be able to use the herbarium at any time once they have become familiar with it; it can be assumed that they have sufficient botanical knowledge to avoid damaging specimens. (This does not apply to garden

supervisory staff and their teams, who should be allowed to use the herbarium only under supervision; apprentices also require supervision).

Because accuracy of recording is particularly important at this stage, the labelling of plants in the nursery and their transfer to the botanic gardens is the concern of the botanists (This does not apply to plants for bulk ornamental planting). Maintenance, potting on, etc., and alphabetical arrangement in the shade house are the concern of the arboriculturalist, but he should ensure that the arrangement is the one agreed upon to facilitate stocktaking and the selection of specimens for planting. It seems clear that everyone should agree that ALL plants should have numbers and labels attached to them at ALL times, with the exception of those planted in bulk for edgings, erosion control, and special displays of one species. Labelling in general should be the concern of the botanist until the final stage; the wording of final labels for the public is also a botanical responsibility. The selection of the type of permanent labels and their maintenance is the concern of the arboriculturalist.

Duties of the Arboriculturalist

At first sight, the above programme of duties for the botanist does not appear to leave much for the arboriculturalist to do! - but in fact this is not so, he has a vast field open to him in the investigation of the culture and biology of native species, of which relatively little is known at present. It is recognised that this programme for the botanist bears little relation to the duty statement in the advertisement answered by the present botanist ("Collect seed for the botanic garden") or to the duties of the botanist as actually carried out in June 1960. If the arboriculturalist is worth his salt he will develop his own job in a similar manner, and the activities of the botanist will enable him to do so on a firm foundation.

He should of course deal with all matters which concern the care of plants once they have reached the garden, and he should also also supervise propagation if this is ever established in the garden. He should deal with such matters as proper methods of pruning, mulching, watering etc. although he should not disdain to listen to the opinions of his colleagues - eg. a botanist or other collector might be able to say that a certain type of mulch resembled the natural ground litter in the place of collection of a species.

The arboriculturalist is concerned with the design and management of the garden as a whole - eg., such matters as the provision and siting of tracks, roads, bridges, stepping stones, etc., and the implementation of design of water features, ecological groups, and so on, although the botanist should be able to comment on any of these from the point of view of habitat. Siting of ecological groups (eg. high or low, wet or dry) and their species composition should be decided by the botanist. (Presumably it is the director's job to decide whether such things are to exist at all).

The arboriculturalist should co-operate with the botanist by feeding his own data into the established record system. Probably both should assist in producing joint reports at intervals. He would naturally make suggestions to the botanist about suitable plants to be collected, etc., or ask for information, eg. on suitable species for filling up beds, introducing certain colours, and so on. Depending on his personal training and talents he could by arrangement take over some work from the botanist - eg. herbarium work on a certain group of plants However, as this will differ with each individual, the work concerned should be left as part of the botanist's duty statement.

Visitors

Visitors other than the general public - eg. botanists, horticulturalists and other professional people, people with native gardens, school groups, etc., - should be conducted round t garden by the most appropriate person. ANYONE on the staff with a degree of responsibility should be able to introduce visitors and conduct them round. I do not think it should be necessary for professional officers to obtain permission for this (other ranks might mention it to their immediate professional superiors) nor do I think that introductions all round should be compulsory. It would be normal for visitors to be introduced to those they particularly would wish to meet - eg. professors of botany would meet the botanist, heads of institutions would meet the director, garden superintendents would meet the arboriculturalist, keen home gardeners would meet the overseer and maybe the botanist as well. Even personal visitors should be encouraged in the interests of conservation publicity. Everyone on the staff with any degree of responsibility at all should know the garden well enough to show visitors round, and a team of people should turn out for big groups such as ANZAAS. A visitors' book should be provided, and it should be signed by everyone who is shown round by a member of staff.

Slide Collection

The numerical list and card index of the slide collection is in process of construction. So far, the slide collection is thoroughly botanical. Whatever system is finally adopted for the rest of Parks & Gardens, this collection should definitely remain in the Botanic Garden. It is envisaged that it will be used at a moment's notice - eg. to show Telopea truncata in flower to a botanical visitor who arrives at the end of January. This collection is used a good deal, mainly by the botanist in giving informal talks on botany and conservation. The arboriculturalist should use it this way too. One thing which has been found useful is for botanists to take boxes of slides away on field trips - there is often an opportunity to explain the work of the garden and the principles of conservation to people who have never thought about them.

Responsibilities of Herbarium Staff (Industrial) 16.5.66

Mr. Burgess	General botanical work. Take charge should both Dr. Phillips & Miss Carroll be absent.
Miss Beeton	Horticultural observations and records in garden and nursery; general horticultural work as available; horticultural information to visitors; general organization of library; charge (for the present) of book catalogue, literature abstracts, native flora abstracts; some supervision of apprentice.
Mrs. Craig	All matters relating to stores and supplies; numbering of plants in nursery (Botanic Gardens material); direction of movement of plants from nursery to Botanic Gardens; co-ordination of all records relating to plant origin and location (as distinct from purely horticultural observations); specimen reception and drying; cataloguing and indexing of slide collection; occasional field work; some supervision of apprentice; organisation of tea; first aid.
Mrs. Carriage	Mounting and final preparation of specimens for herbarium; first aid in absence of Mrs. Craig; assist Mrs. Craig.
Mr. Auber (O.C. herbarium team)	Co-ordination of all work on specimens after identification; co-ordination of all student work in herbarium; charge of Downer Herbarium as long as it exists; direction of specimens to final herbarium location; occasional field work; first aid as required; some supervision of apprentice.
Mr. Pearson	Assist Mr. Auber
Mr. Richards (O.C. stocktake team)	Complete responsibility for garden stocktake and production of maps and stocktake and mortality indexes relating to it; similar work in Jervis Bay in collaboration with the Gardener in Charge; shade house stocktakes; organization of teams to assist Mrs. Craig in transfer of plants from nursery and for any other physical work; maintenance of labels and boundaries in the Botanic Gardens; transfer of identification records from herbarium throughout system; field work; greater part of supervision of apprentice.
Mr. Thambaiya	Assist Mr. Richards and take charge of stocktake team when necessary; occasional field work.
Apprentice	Work with stocktake team, herbarium team, Mrs. Craig or Miss Beeton as required.
Students	To be directed to stocktake team, herbarium team, or other duties as required.

Clerical assistant

May have work given to him by the following: Botanists: Mr. Burgess: Miss Beeton: Mrs. Craig: Mr. Richards. Botanist in charge to determine priority.

M. E. Phillips

M.E.Phillips
Botanist