

A VISITORS' GARDEN

Introduction

Dundee is the fourth largest city in Scotland with a population of just under quarter of a million people. The city and the surrounding area, particularly the fertile valley of the River Tay to the west, have a long history of excellence in horticulture. Fruit and fruit trees once made a major contribution to the local economy and even today it is one of the major raspberry growing areas in Britain.

Although the university celebrated its centenary in 1982, until 1965 it had been a college of the University of St Andrews and it was the separation at that time and the subsequent development of the Department of Biological Sciences which stimulated the establishment of a botanic garden.

Since its inception in 1971 the University Botanic Garden has had education, at all visitor levels, as one of its founding principles. On a climatically favourable 9.5 ha. site overlooking the River Tay, a collection of over 4,500 introductions has been established by a small team of horticulturists which, until recently, consisted of the curator, a supervisor and two trained gardeners as well as a trainee gardener. Since then further posts have been added - a secretary to deal with the administration of the Garden and the voluntary helpers, and the posts of temporary gardener and business development officer - both of which are funded from outside sources. The first curator of the Garden, Dr E E Kemp, was responsible for the design and construction of the major features of the Garden in the first nine years.

Education

Since the Biological Sciences Department is a major user, the plant content and the physical layout of the Garden are greatly influenced by the teaching needs of its staff. Other users, schools, colleges, horticulturists and the general public are not ignored and their needs are catered for where possible. Currently, little emphasis is placed on making extensive, taxonomically-based collections. The layouts are loosely founded on habitats and natural plant associations where this style is appropriate but where this is not possible or desirable, plants are grouped according to some common factor to facilitate labelling and

their use in teaching. The presence of the Royal Botanic Garden, Edinburgh at a journey of one hour to the south and the most important teaching garden in northern Britain, with a huge range of species, also influences the choice of plants grown in the Dundee Garden. It would be a waste of precious resources to attempt to duplicate the excellent facilities which already exist in Edinburgh.

During his opening address on the occasion of the 150th anniversary of the founding of the Geneva Botanic Garden, Sir George Taylor quoted from Dr John Lindley's "Report on the state of Royal Gardens, Kew" when these were threatened with closure in the 1830s. Lindley's words are as relevant today when considering the founding principles of a botanic garden as they were when first published. Commenting on the lack of scientific research and public educational role, Lindley stated, "It is little better than a waste of money to maintain it in its present state, if it fulfils no intelligible purpose, except that of sheltering a large quantity of rare and valuable plants", and later, "A national botanic garden would undoubtedly become an efficient instrument in refining taste, increasing the knowledge and augmenting the amount of rational pleasures.....".

Using the glasshouses as an educational resource

The Dundee Garden has two large public glasshouses, one tropical and the other temperate. In these there is a progression east to west of examples of savannah plants, through tropical wet, open habitats to a sampling of tropical forest with its ground storey of shade-bearing species, opportunist climbers, bromeliads and a strangler fig. The tropical pool is home to a number of plants with physiologically interesting strategies for survival in such conditions, such as the water repellent hairs of *Pistia stratiotes*, the swollen petioles of *Eichornia crassipes* and, of course, the magnificently engineered leaf structures of *Victoria cruziana*. The progression then continues into the temperate glasshouse containing tree ferns, carnivorous plants and some examples of bird and animal pollinated plants and thence to a cool, dry zone in which there is a selection of xerophytes in appropriate settings. Here *Euphorbia candelabrum* and *Cereus jamacaru* flank opposite sides of a path to demonstrate convergent evolution. Very few of the plants are rare;

all are easily grown and can be relied on to grow well, as the staff inputs are necessarily very low with major maintenance confined to days when the weather is too severe for outdoor work.

The plant houses are particularly useful for pupils of all ages, from primary school children, where the aim of the visit is to demonstrate the interdependence of organisms including mankind, to those secondary school students studying Ordinary and Higher grade biology. With the younger children this is achieved initially by connecting "plant, plate and palate" by showing examples of the origins of common foodstuffs and other products such as cereals, sweeteners, fruits, fibres and timbers. The more fascinating - even bizarre - examples of plant/animal mutualisms such as bat and bird pollination, the explosive anthers of *Myriocarpa longipes* and the devices adopted for the distribution of seeds and its importance in species survival all serve to make a visit to the Botanic Garden more memorable. For older children with a need for a more structured and applied approach, lecture tours are led by teachers from the users' secondary and tertiary institutes.

Designing the layout of the living collection for education

Outdoors the main feature of the Garden is the British Plant Communities Unit where, on a site sloping gently to the south, an attempt is being made to show students and interested lay public something of our native plant associations and the terrain they occupy in Britain. These range from the nutritionally impoverished Highlands in the north to the richer lowlands of the south. At its northern end, two "mountains" are being created to show the flora of the granitic Ben Macdhui and that of the richer mica schist of Ben Lawers. On their lower slopes a shrub layer has already been established containing, amongst others, *Calluna vulgaris*, *Betula nana*, *Salix lanata*, *S. lapponicum*, *Myrica gale* and the associated herbs. Further south a grove of *Juniperus communis* leads to a wood of *Betula pendula* and *B. pubescens* with mosses and *Trientalis europaea*, which in turn leads to a drier wood of *Pinus sylvestris*. This was planted in 1974 with plants of local provenances from Loch Maree, the Black wood of Rannoch and Glen Falloch. The last is the most southerly of the extant remains of the ancient Highland

pinewoods. Nearer the lowest point of the layout can be found separate woods of *Fraxinus excelsior*, *Fagus sylvatica* and *Quercus robur* and *Q. petraea*. The oakwood was one of the first planted and in the intervening 17 years a herb layer of *Primula elatior*, *P. veris*, *Ajuga reptans*, *Luzula sylvatica*, *Hyacinthoides nonscriptus* and *Mercurialis perennis* has become firmly established, whilst *Corylus avellana*, *Prunus padus*, *P. spinosa*, *Alnus glutinosa* and *Acer campestre* are the main fringe of woody species.

The whole is linked by a stream which has its source in the northwest corner of the Garden. It runs from a simulated nutrient poor, acid pool between the "mountains", through the various communities to a nutrient rich pool at the lowest point of the layout. This pool is appropriately fringed with the rampant and varied flora typical of such sites in the wild and contrasting vividly with the paucity of vegetation at the poorer Highland pool.

Now that most of the woody plants are established, further additions are being made to the ground storey plantings of herbs and smaller shrubs. These are grown from wild origin seeds and are planted whilst very small as an innoculum. It is hoped they will establish themselves and colonize areas as a naturalistic mixture with others to give that curious sense of competition and accommodation of wild populations. Fallen woody debris and leaves are not removed unless they are considered a hazard to visitors or when they are likely to smother herbaceous species. Indeed, where a restriction of access is required, dead branches are placed to make a natural barrier. By introducing decaying, fallen tree trunks and roots from the wild, a sense of long establishment is created. These are then colonized by mosses and liverworts to add further to this artificial ecosystem.

The whole layout is very much an experiment which is being modified in the light of continuing experience. Already it has the spirit, if not the ecological accuracy, of such niches in the wild. No measures have been undertaken to significantly alter the soils of the various sites and given the climatic uniformity over the whole unit, catering for the needs of environmentally dependent species is difficult. However, the presence of the variety of woodland birds and small mammals now inhabiting the woods of this relatively small, recently established unit is at least an

indication the communities are beginning to work. Red squirrels, voles, ducks, moorhens, owls, sparrow hawks, flycatchers and goldcrests can all be seen during the year. Plants too are arriving to occupy suitable niches.

In addition to its original role as a teaching facility for students of ecology, it is now seen as a valuable piece of "unofficial" countryside for children from urban areas, giving them a glimpse of "wild nature" and an indication of the ongoing, ordered mutual dependence in what is ostensibly an untidy, haphazard collection of plants. For children, and some adults, conditioned to the relatively tinsured urban landscape of the city, this is a surprise and a valuable first lesson in the appreciation of what is truly wild.

Conservation education

Oddly, perhaps, *ex situ* plant conservation has a minor role in the functions of the Garden but where threatened species have been introduced, these are used to demonstrate and publicize the need for *in situ* conservation. Deforestation, the fragility of island floras and the importance of genetic diversity can be better demonstrated to visitors by the presence of examples. A small, local botanic garden with very limited resources of cash and expertise may not be in a position to play a part in the *ex situ* conservation of rare and endangered plants, but by making the horticulturally desirable native plants of limited natural distribution available, it will perhaps reduce the need to further deplete the wild stocks. For example, a reasonably good collection of the native species of *Sorbus* sect. *Aria*, many of which have a very limited natural distribution, has been established in the Garden. A selection of these have been raised from seeds harvested and cleaned by volunteers from the Friends of the Botanic Garden and they will be offered for sale to publicize their qualities as garden plants and the need for their conservation in the wild.

In other areas of the Garden there are selections of hardy plants from every continent, including a collection of 19 *Eucalyptus* species, mainly from wild sources. These have been planted in groves so that visitors may experience what it is like to walk through a *Eucalyptus* "forest".

Visitors are not discouraged from touching the trunks of these and by creating layouts with many narrow paths of shredded bark and other materials, good access allows the visitors' tactile senses to be used as part of the experience of a visit to the Botanic Garden.

On a dry, rocky, sunny site a "Mediterranean" plant collection has been created. By exposing the underlying rock and introducing additional loose, small rocks and rock debris a series of dry, well-drained niches for the cultivation of Mediterranean plants has been established during the last four years. The plantings of a range of species have been kept deliberately sparse to simulate the slightly stressed, natural homes of *Cistus* species, *Halimium*, *Santolina*, *Lavandula*, *Rosmarinus*, various *Leguminosae*, *Erica* and *Cercis*. Herbaceous species of *Biarum*, *Cyclamen*, *Asphodelus*, *Paeonia* and others are now established amongst the scree of rock debris. The whole is fairly weed-free because of the groundcover of rock and debris and any annual weeds are killed with the discriminate use of a paraquat-based herbicide. Since the individual plants and groups are sparsely planted, this task is not difficult to carry out safely.

Increasing public interest

As a first major step to increasing public interest and knowledge an Interpretative Centre was built and opened in 1984. Of local design and construction, it was financed from the public appeal for funds during the University Centenary year in 1982. The building consists of four small carpeted zones designed round a gentle upward spiral of ramps to give a series of compartments, each of which is capable of housing an interpretative display, being used as a small meeting room, or as a place for holding public events. These areas, whilst discrete, are not so remote that the building cannot be used for a single event during which all of the space is used. It also acts as a focal point in the Garden, a place of shelter during cold or wet weather. It also houses a small collection of horticultural and botanical reading materials and is the point of entry to the Garden where visitors can pay the admission charge and be advised about the areas of the Garden of greatest current interest.

The displays within the Centre are aimed at making a visit to the Garden more meaningful with regard to the functions of the Garden and its

plant content. The displays both enlighten and open the eyes of lay visitors to the properties of plants that are not immediately obvious.

The displays were designed and mounted between 1983 and 1985 by three teams of unemployed biologists and natural history artists. Each team of five to seven people was funded for 48 weeks by the Manpower Services Commission and co-sponsored by the University of Dundee and the local Department of Education. The artists, guided by a biologist as team leader, were given individual briefs of the subjects for display, prepared by the curator. Then they had to prepare a proposal, including the medium to be used, the cost and the time to completion. The media varied from water colours to oil paints and from simple black and white drawings of xerophytic plants - to emphasise the importance of structure in their survival - to three-dimensional creations to accompany a series of drawings depicting the mechanisms of carnivory. A great many paintings and drawings were made of plants with a short season of interest and these are mounted and demounted as a series of "Focus On"-type of display.

This scheme for the adult unemployed was withdrawn four years ago and no additions have been made to the display materials but these originals are still being used.

The Interpretative Centre has been the subject of several architectural awards, receiving commendations from both the Scottish and Dundee Civic Trusts and in 1988 was given, firstly, a Regional Award by the Royal Institute of British Architects and, later, a National Award for Architecture, one of 18 buildings so honoured in that year.

The Garden, whilst it has no formal educational programme, offers guided tours for adults and school children for which there is a steady demand. To date, the curator has guided all of these tours and this, in effect, limits the number of visits that can be accommodated. Discussions are going on with regard to the funding of a teaching post to exploit the educational potential of this locally important facility.

Recently, the Garden has appointed a business development officer to expose the Garden to a wider, paying visiting public and to plan and implement a series of fund-raising ventures which, in turn, would make

the Garden less financially dependent on the university and produce capital for further investment in educational features.

One of the most important sources of funding and labour is the society of the Friends of the Botanic Garden which was established some years ago. Its express brief is to help to fund, by cash or kind, the non-academic activities of the Garden. The membership is in excess of 350 people, of which some 50 are engaged in some activity of value to the Garden. Some members assist in the Interpretative Centre to oversee the admission charges, others raise plants and collect, clean and package seeds for sale. Soon, it is hoped, volunteers will organize guided tours of the Garden for the general public on a regular basis. Label-engraving, a most important of botanic garden functions if it is to be educationally useful, will soon be undertaken by a member of the "Friends"

Conclusion

Whilst there is a lack of resources for educational purposes available to the larger and longer established botanic gardens, the Dundee Botanic Garden has steadily increased this role through funding from various individuals and trusts to the point where it is being recognized as having an important role in the teaching of environmental education, as a source of practical demonstration plant materials for teachers of biology in the area and as an important public amenity.

References

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*University of Dundee Botanic Garden, Riverside Drive, Dundee
DD2 1QH, Scotland, UK.*