



A  
Natural  
Environment  
for  
Learning

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# A NATURAL ENVIRONMENT FOR LEARNING

Proceedings of an international  
congress on education in botanic  
gardens held in Utrecht,  
The Netherlands, 14 - 16 May 1991

**Edited by**

Julia Willison & Peter Wyse Jackson



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## **CONTRIBUTORS**

**Julian Agyeman**, Education Service, Barnsbury Complex, Islington, London N1 1QF, UK

**Alan Bennell**, Royal Botanic Garden, Edinburgh, EH3 5LR, Scotland

**Herman H Berteler**, Haydnstraat 44, 6561 EG Groesbeek, The Netherlands

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

**David Bramwell**, Jardín Botánico Canario "Viera y Clavijo", Apartado de Correos 14, Tafira Alta, Las Palmas, Gran Canaria, Islas Canarias, Spain

**James Carter**, Centre for Environmental Interpretation, Manchester Polytechnic, St Augustine's, Lower Chatham Street, Manchester M15 6BY, UK

**Ian Edwards**, Royal Botanic Garden, Edinburgh EH3 5LR, Scotland, UK

**Julie Foster**, Australian National Botanic Gardens, GPO Box 1777, Canberra, ACT 2601, Australia

**Renate Grothe**, Schulbiologiezentrum Hannover, Vinnhorster Weg 2, D-3000 Hannover 21, Germany

**A Heijnen**, Foundation Botanic Garden Kerkrade, St Hubertuslaan 74, 6467 CK Kerkrade, The Netherlands

**Vernon H Heywood**, Botanic Gardens Conservation International, Descanso House, 199 Kew Road, Richmond, Surrey TW9 3BW, UK

**Lucy E Jones**, Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, NY 11225-1099, USA

**Edelmira Linares**, Jardín Botánico, Instituto de Biología, de la Universidad Nacional Autónoma de México, Apdo. Post. 70-614, 04510 México DF, Mexico

**Richard Price**, Science and Plants for Schools, Homerton College,  
Cambridge CB2 2PH, UK & Royal Botanic Garden, Edinburgh EH3 5LR, UK

**Trevor Roach**, Norwood Hall Institute of Horticultural Education,  
Norwood Green, Southall, Middlesex, UB2 4LA, UK

**Didier J Roguet**, Conservatoire et Jardin botaniques de Genève, Ch. de  
l'Impératrice, CP 60, CH-1292, Chambésy/Genève, Switzerland

**Dawn Sanders**, Royal Botanic Gardens, Kew, Richmond, Surrey  
TW9 3AB, UK

**Suhirman**, Botanic Gardens of Indonesia, Kebun Raya, PO Box 110,  
Bogor, Java, Indonesia

**Ruth Taylor**, Chelsea Physic Garden, 66 Royal Hospital Road, London  
SW3 4HS, UK

**Leslie Tjon Sie Fat**, Leiden University Botanic Garden, Nonnensteeg 3,  
2311 VJ Leiden, The Netherlands

**H van Ginkel**, Utrecht University, Heidelberglaan, 8, 3584 CS Utrecht,  
The Netherlands

**Stans van der Veen**, Leiden University Botanic Garden, Nonnensteeg 3,  
2311 VJ Leiden, The Netherlands

**K Verhoeff**, Ministry of Agriculture, Nature Management and Fisheries,  
PO Box 20401, 2500 EK, The Hague, The Netherlands

**Jaap Vos**, Utrecht Botanic Gardens, Harvardlaan 2, Postbus 80.162, 3508  
TD Utrecht, The Netherlands

**J A B Wensing**, Burgers' Zoo, Bush and Safari, Schelmseweg, 85, 6816  
SH Arnhem, The Netherlands

**Julia Willison**, Botanic Gardens Conservation International, Descanso  
House, 199 Kew Road, Richmond, Surrey TW9 3BW, UK

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## FOREWORD

The first International Congress on Education in Botanic Gardens took place in Utrecht, The Netherlands in May 1991, thanks to the generous hospitality of the University of Utrecht. The papers presented and accounts of the workshops conducted at the congress are contained in this book. It was the achievement of this congress to strengthen the international botanic garden education network and highlight the crucial role that botanic gardens play in environmental education. The idea for the congress emerged from a successful Botanic Garden Education Meeting held in Stroud, UK in September 1989. There was a strong feeling at the meeting that educators needed to exchange ideas and information and to discuss global support for botanic gardens in conservation education.

Seventy-nine people from twenty countries participated in the congress. The majority were educators, but botanic garden directors and representatives from other teaching and environmental education institutions were also present. Over the three and a half days of the congress, a lively and stimulating exchange of views, ideas and information took place. The congress embraced a broad platform of subjects from public relations, tourism and education to plants and technology, from multicultural education to art and education. The unifying theme was conservation.

The congress succeeded in raising awareness of the education issues in botanic gardens around the world. Although both papers and practical workshops were presented at the congress, it was quite clear from the final evaluation that, participants favoured practical activities over papers as more relevant to the development of education programmes. Botanic gardens of all sizes were represented at the congress, some with substantial budgets for education, others with almost no budget at all. It was clear that lack of resources need not necessarily mean less effective education programmes and some very creative programmes were developed on tight budgets. Without a doubt botanic gardens could help each other and themselves enormously through increased sharing of information and materials. The need for strengthening regional botanic garden education networks was also emphasised as was the need to work more closely with other local institutions concerned with environmental education. It is essential that there be

good channels of communication through which botanic gardens can communicate locally, nationally and internationally.

Realisation of how important botanic garden education is for the conservation of our natural resources is growing rapidly. Plants touch every area of our lives and nowhere can the sheer diversity of plants be better represented than in a botanic garden. Not growing so rapidly, however, is the acknowledgement that, to carry out education effectively in botanic gardens, there needs to be more support from within the botanic gardens as well as from outside. Lack of funds, personnel, materials, training and support is all too common for educators in botanic gardens. These proceedings, which illustrate plainly what botanic gardens are achieving in education, will provide educators with persuasive arguments with which to obtain funds and increased support. Education is fundamental to conservation.

If we want to conserve our natural world then it is imperative that education is a priority.

## INTRODUCTION

The changing perception of the role of botanic gardens from passive exhibitors of plants to active educators has been reflected by an increasing willingness among botanic gardens to address the question of their relationship with the public.

Significantly the impetus for this change has come from an understanding, highlighted in Vernon Heywood's paper, that botanic garden involvement is critical to conservation of the endangered plant environment. Located in the community with a tradition of scientific enquiry and public display, botanic gardens are uniquely placed to offer effective programmes for environmental education.

Environmental education is about helping individuals and communities to understand the complex nature of both the natural and built environment, and to acquire the knowledge, values, attitudes and practical skills that will equip them to effectively manage the quality of the environment. Indeed papers by Julie Foster, Edelmira Linares, David Bramwell, Lucy Jones and A. Heijnen show that many botanic gardens are already committed to this.

Recognising the essential place that plants occupy in everyday life (food, clothes, medicine, shelter, oxygen in the air etc.) leads to the conclusion that what botanic gardens are capable of teaching is limited only by the imagination. To take just two examples, Jaap Vos describes a scent trail which encourages people to use their physical senses to observe plants and Ian Edwards and Ruth Taylor describe a chinese herbalist role-play which helps children to recognise and appreciate the use of herbs in another culture. It is also important to recognise the developmental experiences that students need to acquire knowledge and skills. Papers by Renate Groethe and A Heijnen both contain proposals for educational frameworks.

Clearly botanic gardens need to develop a written education and awareness plan. Such a plan must identify the audiences, the core messages, the facilities and activities needed to put those messages across. David Bramwell and Edelmira Linares demonstrate that only by developing a plan will botanic gardens be able to significantly evaluate their educational programmes and subsequently develop them to maximise their effectiveness.

Market research is essential to identify target audiences. The paper by Suhirman considers the implications of recent research carried out in his botanic garden. Effective communication with the public is a major preoccupation for botanic gardens, not least because funding is becoming increasingly dependent on contributions from the private sector. Didier Roguet draws on the experience of Geneva Botanic Garden and suggests a model which could be adapted to the circumstances of individual botanic gardens.

Most botanic gardens already develop education programmes for schools and colleges. A number of papers argue for closer co-operation with local teachers, school advisors, college lectures etc. One example is Lucy Jones' description of Project Green Reach, developed with the local education authority, specifically for children from disadvantaged schools. Leslie Bisset, in describing a successful programme involving universities, colleges and schools, demonstrates how much can be achieved on a limited budget.

Among the broad constituency of students are smaller groups who would benefit from educational programmes adapted to serve their particular needs. H Berteler emphasises the value of horticultural therapy and makes a strong case for enabling handicapped people to have better access to the environment. Trevor Roach, taking up an equally important issue, looks at how language barriers to learning can be broken down among children from multicultural backgrounds, while Julian Agyeman challenges us to re-evaluate the orthodox view of the natural ecology of cities. He suggests the creation of a strategy in which the environmental aspirations of ethnic minority groups can be realised through "cultural ecologies".

Many organizations are working in the field of environmental education. They possess a wealth of information and experience that is potentially of great use to botanic gardens. Such organizations include the Centre for Environmental Interpretation (CEI) and SAPS. James Carter of the CEI illustrates how, through the use of art, closer relationships can be achieved between visitors and botanic gardens. Richard Price of SAPS describes an exciting school-based science project where children create microclimates to study key influences on the life cycle of plants.

Lack of staff resources prevents many botanic gardens from running a full range of educational programmes for schools and colleges. This has

led many to become involved in an important area of education - teacher training. By training teachers botanic gardens can effectively spread their message to a wider audience. Dawn Sanders demonstrated how an innovative workshop involving teachers could be organised.

It is quite clear that botanic gardens are excellent centres for putting across the message of conservation. But as H. van Ginkel, emphasises in his paper, the success of this work will depend on the creation of effective partnerships. Botanic gardens must involve themselves in networks. They need to work with other organizations and agencies and, very importantly, with other botanic gardens.

There are already well developed national botanic garden education networks in many countries of the world. Australia, Cuba, France, Mexico, Portugal and Spain, The Netherlands, UK and the USA have all been very successful in arranging national meetings and exchanging educational materials. On an international level the education network is co-ordinated by Botanic Garden Conservation International. The BGCI Education Programme was set up in August 1989. Partly sponsored by the World Wide Fund for Nature, the Programme co-ordinates an education network of over 300 gardens in 67 different countries and publishes an education newsletter, *Roots*, twice a year, through which its members communicate.

This Congress "A Natural Environment for Learning" has emphasised the enormous wealth of expertise and educational material available in botanic gardens and has highlighted the fact it is essential to share resources if more botanic gardens around the world are to become involved in education. New contacts were made and it was proposed that a second international education meeting be held in Las Palmas, Gran Canaria, Spain in 1993, organised by BGCI in conjunction with the Ibero-Macronesian Botanic Garden Association.

There is no doubt that with enhanced communication and co-operation botanic gardens will become more effective in conservation education. Thank you to everyone who attended the congress and who contributed to these proceedings. A positive step forward has been made towards conserving our natural world.

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**PART ONE**

# **Policy and Planning**

## **AIMS AND EDUCATIONAL POLICY OF THE DUTCH BOTANIC GARDEN**

### **Introduction**

Botanic gardens have been established in The Netherlands for a variety of reasons. The older gardens such as Leiden, Amsterdam, Utrecht and Groningen were established in connection with the universities. Some others such as the Von Gimborn Arboretum at Doorn and the Bleydenstein Pinetum at Hilversum were established privately by interested individuals and others such as the Kerkrade Botanic Garden were established by local councils or other bodies.

Although the university botanic gardens were established for research and education, the last ten to twenty years has seen plant taxonomy playing a less important role in the biology curriculum. As a result, the number of scientists working in plant taxonomy in Dutch universities has decreased and consequently university botanic gardens have turned their interests towards serving the general public.

### **Dutch Botanic Garden Foundation**

This change in direction brought about a closer relationship between the university botanic gardens and the other botanic gardens in the Netherlands. As a result of this relationship, a Decentralized National Plant Collection was developed and, in 1988, the Dutch Botanic Gardens Foundation was established.

The aims of the Dutch Botanic Gardens Foundation can be summarized as follows:

1. To coordinate, stimulate and control the Decentralized National Plant Collection.
2. To support and coordinate activities related to the various functions of the Decentralized National Plant Collection. In particular educational activities directed towards the general public.
3. To support all activities related to the funding of the collection and their functions.

All collections of the Decentralized National Plant Collection are subject to scientific management. For each plant represented in the collection, a full description must be written of it, its origin known and its name correct and presented on a label. All information about the plants is made available to other gardens in the Netherlands and elsewhere.

Educational material for use by all participating gardens is developed by the Foundation, in co-operation with educational staff members of the botanic gardens. The material is produced with the aim of educating the public about nature management and environmental problems.

An example of an exhibition was "Mother Earth's Coat". The exhibition consisted of eight separate boards. Each one with text, diagrammes, photographs and data on the biodiversity and physical characteristics of a different habitat, eg. rainforest, desert, wetland. Attention was given to the use and threats for specific plants in each habitat. The beauty of the exhibition was that each garden could select one or more boards to use with their own plant collections. For example, an alpine garden chose, among others, the "mountain" part of the exhibition, where as a garden specialising in succulents chose the "desert" part. A booklet describing all the habitats was produced to accompany the exhibition. The Foundation co-ordinated the project and produced the exhibition and accompanying booklet. Data and illustrations came from the gardens and the production costs for the exhibition were shared.

The Foundation also looks for funding to produce educational material (booklets, guides) for the gardens. For example, funds have been found to produce and distribute, on a large scale, a joint leaflet which gives general information about all gardens participating in the Dutch Botanic Gardens Foundation.

## Conclusion

Encouraging exchange of knowledge and inspiration is an important task of the Dutch Botanic Garden Foundations and the Dutch gardens, although diverse in their educational aims, have already experienced the benefit of this exchange. As chairman of the Dutch Botanic Garden Foundation, I believe that, with the involvement of the Foundation in helping to organise this congress, the gardens will benefit even more. On an international level such a positive effect can only be greater.

*Ministry of Agriculture, Nature Management and Fisheries,  
P O Box 20401, 2500 EK, The Hague, The Netherlands*

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## NETWORKING - KEY TO TOMORROW

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### Introduction

1991 being the year of the 355th anniversary of Utrecht University, this conference was particularly significant. The University has a great interest in networking and as the central theme of the conference was "networking", the link was very strong.

The theme of the 71st lustrum of Utrecht University focusses on the role of Utrecht in an international context and illustrates how important it is for the university to become more international in its view. With an increase in European integration it is even more important than ever to see education and research in an international context. Only when optimal co-operation and the best possible exchange of data and prospects are achieved can significant development be made in science and scholarship. Science and scholarship of course have always been internationally oriented, but in the last few years, the international exchange of staff, students, knowledge and ideas has developed at an enormous rate and will intensify further in the years to come. The importance of networking cannot be stressed enough.

This conference was a contribution towards the internationalization of Utrecht University. Here the foundations are being laid for an international network to service our society, and in particular to make the knowledge gathered within our institutions more accessible to society.

### Botanic gardens and education

Botanic gardens, with their accessibility and their attractiveness to the public are, for many, the public face of the university. Gardens have an important cultural-historical function; they are in a sense nature's pantry and, as such, eminently suitable for educational purposes.

The Utrecht botanic gardens have always been closely linked to the rest of the university, as far back as the planting of Utrecht's first botanic garden in 1639, three years only after the university was founded. At first, the Sonnenburg bastion offered ample space for the whole garden, but through the centuries the gardens outgrew their borders, as Utrecht did itself, and several locations had to be used to accommodate them.

Now, following the 70th lustrum of the botanic gardens, they are concentrated in the Van Gimborn arboretum in the town of Doorn and in the unique systematic garden at the Hoofddijk fortress which is part of the famous Water Defense Line of the Netherlands. As you may know, this stretch of land that could be flooded whenever necessary, served to keep all intruders from the east or the south out of "Holland". Nowadays, it has become one of the most beautiful botanic gardens in Europe, if not in the world.

Over the course of more than 350 years, the notions of education and research, and of the use of botanic gardens have changed and these ideas continue to change. The gardens' importance for education and research, in particular for the biology faculty, is beyond dispute. The same can be said of the gardens' cultural-historical function. Judging by the lustrum book and the many activities aimed at the public, the development of education has been well anticipated. One activity in particular is the theme-trail. The theme last year was "scent", this year it is "folklore".

This conference was the next step in the reinforcement of the gardens' educational function. The importance of the botanic gardens for both the university and the city of Utrecht and its surroundings cannot also be stressed enough. The pace of development in society, as well as in science and scholarship, raises many questions concerning responsibility and ethics; questions which do not only involve scientists and scholars.

## Conclusion

The necessity of well-balanced public education regarding nature and the environment is becoming clearer, particularly as concern for the environment is growing rapidly. Botanic gardens can play an important social role by encouraging people to treat nature and their surroundings with more respect.

*Utrecht University, Heidelberglaan, 8, 3584 CS Utrecht, The Netherlands*

## THE BACKGROUND FOR CONSERVATION EDUCATION IN BOTANIC GARDENS

### Abstract

As botanical institutions are increasingly at risk throughout the world, either through closure or merger into larger biological centres or departments, it is often the case in many regions that botanic gardens are the only centres that are devoted to botanical activity. This places on them an additional responsibility to act as information centres for plant science in general and to state the case for environmental concern and conservation. They are well suited, because of their facilities, to play such an advocacy role and this paper will outline ways of addressing these challenges. This should involve all the staff of the garden and will require in many cases a rethink of staffing policy. The ways in which different botanic gardens will react to these problems will depend on many factors such as their location, size, mission statement, accessibility, type of collections and facilities and numbers of visitors. Attention is drawn to the need for conservation educators to ensure that the information they impart is as accurate, balanced and up to date as possible.

### Introduction

Radical changes in the organization of plant science and its institutions during this century and more especially in the past few decades, have led to new opportunities and challenges for botanic gardens. No longer is botany seen as a mainstream subject in biological science and the number of University departments of botany has greatly diminished as emphasis has shifted away from separate plant and animal departments and courses towards unification of biology, especially at the biochemical, cellular or molecular level. Departments of Life Science or Schools of Biology abound while Botany or Zoology Departments are beleaguered. The Botanical Society of America polled its membership recently in response to pressure for a change of name that would reflect a more modern image.

An associated trend has been to reduce the amount of time and effort devoted to the study of organismic biology faced with the pressures of an ever-expanding set of subjects and techniques to be covered in the curriculum. In particular taxonomy and systematics have been squeezed out by subjects seen as more exciting or at the leading edge

of biology such as molecular biology and genetics, cell biology, immunology, ethology, biotechnology and other areas highly dependent on precise experimentation and often expensive instrumentation and techniques.

This has placed botanic gardens in an unaccustomed situation: often they are the only institutions in a country that have a concern for whole plant biology, including such areas as taxonomy, anatomy, morphology, anatomy, pollen studies, plant physiology and classical genetics. And by definitions, botanic gardens contain samples of a range of living plants, usually with some associated facilities for their study such as a library, laboratories, etc. In many developing countries botanic gardens are, moreover, likely to be the only institutions in a region with any concern for plant science at all.

For European botanic gardens this is in a sense a return to their past position. The early physic or medicinal gardens were established when botany, medicine, herbalism and pharmacy were all aspects of the same subject and the gardens provided material for the instruction of students of medicine and for research into the properties of medicinal plants. Taxonomy, in the sense of describing and naming plants and working out their natural relationships, formed at that time the basis of botanical studies. It was only logical, therefore, as botanic gardens developed and our knowledge of plant life extended from Europe and the Mediterranean that many botanic gardens became major centres for the study of plant taxonomy and systematics. Important herbaria and libraries were built up and as I have noted previously (Heywood 1987) the focus of research in botanic gardens gradually moved away from the living collections and focussed on taxonomic studies using the extensive herbarium collections to such an extent that for several major botanic gardens today their primary role is perceived as centres of taxonomic research.

While concern for the loss of habitats and species and the need for action to conserve them have been expressed for at least a century, it is only in the past three or four decades that conservation has become a prominent issue on both national and international agendas. Botanic gardens have generally been slow to recognize that they had a significant part to play in various aspects of conservation. In the early 1980s IUCN (today

IUCN - The World Conservation Union) had a sense that plants were being neglected in conservation work and together with WWF developed a joint Plant Conservation Programme aimed at asserting the fundamental role of plants in all conservation activities.

One of the six main themes of the original Plant Conservation Programme was to strengthen the role of botanic gardens which IUCN felt could and should become the specialist agencies for plant conservation. The subsequent creation in 1987 by IUCN of the Botanic Gardens Conservation Secretariat (now an independent body, Botanic Gardens Conservation International) and the publication of the Botanic Gardens Conservation Strategy in 1989 put in place the institutional structure and conceptual basis for botanic gardens worldwide to allow them in the words of the Declaration of Las Palmas (Bramwell et al 1987: 357), to work together to defend plant life for the benefit of all people now and in the future. Botanic gardens can be used to inform and educate; they are showcases for the plant world and places where science and people can meet and interact. They possess, therefore, many of the essential ingredients for offering environmental education, especially as regards plantlife, namely; an amenable location, a sense of dedication to plants and a wide array of plant material that can be used for teaching and instruction.

### **The diversity of botanic gardens**

In considering the participation of botanic gardens in conservation education it has to be remembered always that individual gardens vary enormously in size, facilities, policy and resources. While a considerable number of gardens in North America, Australia and Europe, for example, have developed major education programmes for varying age groups and consider environmental education as one of their primary goals, others (including some leading gardens) devote only modest resources to this area and rely more on passive education than on any more interactive and structured approach.

Many of the newer gardens created recently in the tropics regard the involvement of the local community in the life of the garden as essential and treat environmental education, especially of children, as a priority, even though resources are extremely limited. This diversity in the types

and facilities offered by different gardens makes it difficult to generalize and great care must be taken not to assume that educational materials will be viewed or treated in the same way.

Also it is salutary to remember that different countries and races perceive the natural world, wildlife and conservation in often quite different ways. A recent study, for example, examines Japanese attitudes to wildlife and conservation and compares them where possible to those of the North American public (Kellert 1991). It found considerable differences between them in certain areas.

We need also to be sensitive to the well publicized differences in attitude on key environmental issues between the developed and the developing worlds which to some extent reflects the extent to which rural peoples are still dependent on agriculture for a living and on the availability of suitable land for growing crops and grazing their livestock.

### **Conservation issues and education**

It is helpful to remind ourselves just how complex and controversial many environmental issues are. They occur at all levels, from attempts to preserve local populations of endangered species from extinction to the development of national conservation strategies and international efforts to preserve the global environment. Indeed the gradual internationalization of concern for the environment in the last decade is a new phenomenon (cf. Adams 1990; Mathews 1991) and one that gives cause for both hope and concern.

As in all other aspects of conservation activity, in planning environmental education programmes for botanic gardens, every effort should be made to present a balanced viewpoint (and perhaps even restrain ones campaigning zeal!) This is not always easy as much of the conservation literature is less than satisfactory in presenting certain issues and often there is a failure to use accurate and up to date information.

Some of the aims of environmental education are to instil a sense of care and concern at what is happening to the global environment, develop the concept of stewardship and to suggest what action the individual and the community can take. These need a reasonably good knowledge

and understanding of the major issues such as pollution, population growth (an exceptionally difficult issue), deforestation, protecting the ozone layer, energy and climate change, extinction of species and populations, genetic erosion, international regulatory mechanisms, sustainable use of resources, protected area systems, soil erosion and environmental economics.

The professional literature of conservation and the associated subjects of conservation biology and biodiversity has burgeoned during the past ten years and it might be useful to suggest key reference works of international stature that can be recommended. These include:

- The World Conservation Strategy (IUCN 1980)
- The Botanic Gardens Conservation Strategy (IUCN/WWF 1989)
- Conserving the World's Biological Diversity (McNeely et al. 1990.)
- Keeping Options Alive (Reid and Miller 1989)
- Biodiversity (Wilson and Peter 1988)
- Global Biodiversity Conservation Strategy (WRI/IUCN/UNEP 1992)
- Caring for the Earth (IUCN/WWF/UNEP 1991)

These will give a fairly balanced if "orthodox" overview of current perceptions of most of the major conservation issues. In addition reference should be made to any official national statements or strategy documents on conservation policy.

A number of myths have grown up around conservation and I believe we should all be careful to avoid propagating these. It is also desirable not to repeat hackneyed examples when most relevant and local examples can be used instead. An example is the repetition ad nauseam of the Rosy Periwinkle (*Catharanthus roseus*) as an example of a rare tropical medicinal plant species from Madagascar. While it is certainly an excellent example of a species which contains chemical compounds which led to the development of extremely valuable drugs for the treatment of childhood leukaemia, it also has to be remembered that it is a widespread tropical weed, not some rare forest endemic. Also continued reference to this species gives the impression that there are no other significant medicinal plant species worth mentioning. Most botanic garden educators will be able to refer to much better local examples of medicinal plants and demonstrate the problems of their

conservation. A good source of reference to the uses of medicinal plants and their conservation is the recently published volume *Conservation of Medicinal Plants* (Akerle et al. 1991).

Most summary lectures or reviews on conservation or the global environment tend to include reference to rates of deforestation, either global or of particular areas especially the Amazon basin, and predictions about the number of species that will become extinct within the next few decades. Both these are very difficult issues to present and to justify without a great deal of detailed knowledge and understanding. The risk is that by simply repeating a set of figures from such papers, questioners may successfully challenge by reference to other statistics. In the case of deforestation rates, care has to be taken to distinguish between loss of closed forest and any kind of forest cover and to define what is meant by deforestation: a widely used definition of forest loss is the conversion of forested lands to permanently cleared land for agriculture, pasture, industrial development or other uses, or to a cycle of shifting cultivation. It should also be recognized that even today with the use of satellite imagery, problems of interpretation still occur. There is still lack of agreement on the amount of forest loss in the Amazon and the amount of the Atlantic forest (*Mata Atlantica*) remaining is variously put at anything from 12% to 2%! These considerations are no reason for not referring to the serious global problems of deforestation nor of its consequences. Again while general reference to such problems may be important in some aspects of botanic garden education programmes, a focus on local examples will often be more relevant and meaningful to the target audience.

On the matter of extinction rates, a degree of prudence is also advisable. Despite the many assertions in the literature that if current rates of forest loss continue, then 60,000 species of higher plants "will become extinct" in 30 or 40 years time, it should be remembered that this and similar statements are simply predictions derived by extrapolation from species-area curves (the relationship between species richness and habitat area). Although it is incontestable that that many thousands of species will be committed to extinction sometime during the next century, there are so many uncertainties and variables that no precise figures can be given (cf Heywood and Stuart 1992). The fact that

recorded species losses are so far remarkably low only serves to reinforce the need for caution since actual examples to justify the high figures quoted are frequently requested. A subject that might be pursued through botanic garden education programmes is a study of how it is that so many rare and endangered species manage to survive over such long periods.

### **Institutional policy**

By drawing attention to these difficulties my concern is to highlight the highly complex nature of many conservation issues and the dangers of oversimplifying in certain situations. It is quite clear from the attitudes and actions of many governments that the conservation argument is far from won despite the growing weight of evidence about the deterioration of the environment. Those charged with educating the public on conservation issues at all levels and age groups carry an enormous responsibility. In many botanic gardens, by being able to work with other scientific and technical specialists, education officers have unrivalled opportunities not available to others.

### **Conclusions**

Conservation education ideally requires the cooperation and involvement of all staff in botanic gardens. In some cases there may be a need to review staffing policies and increase the staff and resources made available for education programmes. Since the recognition of conservation as a major policy concern of botanic gardens is a recent development, and not yet accepted by all gardens, it is clear that a great deal of rethinking of institutional policies will be needed if botanic gardens are to play a full part in education and advocacy for a healthy environment. Education should be seen as an intrinsic and essential part of the mission of most if not all botanic gardens and not just an appendix grafted on.

*Botanic Gardens Conservation International, Richmond, UK*

## References

- Adams, W M 1990. Green Development. Environment & Sustainability in the Third World. Routledge, London and New York pp 255
- Akerele, O, Heywood, V and Synge, H(eds) 1991. Conservation of Medicinal Plants. Cambridge University Press, Cambridge. pp 362
- Bramwell, D, Hamann, O, Heywood, V and Synge, H 1987. Botanic Gardens and the World Conservation Strategy. Academic Press, London. pp 367
- Heywood, V H 1987. The changing role of the botanic garden. Bramwell, D, Hamann, O, Heywood, V and Synge, H (eds), Botanic Gardens and the World Conservation Strategy, 3-18. Academic Press, London
- Heywood, V H and Stuart, S N 1992
- IUCN 1980 World Conservation Strategy IUCN/UNEP/WWF Gland
- IUCN/WWF 1989 BGCS IUCN, Gland
- IUCN/UNEP/WWF 1991 Caring for the Earth IUCN, Gland
- Kellert, S R 1991 Japanese perceptions of wildlife Conservation Biology 5: 297-308
- Mathews, J T 1991 Introduction and overview. In: Mathews, J T (ed), Preserving the Global Environment The Challenge of Shared Leadership, pp 15-38, W W Norton & Company, New York and London
- McNeely, J A, Miller, K R, Reid, W V, Mittermeier, R A and Werner, T B 1989. Conserving the World's Biological Diversity. WRI, IUCN, Conservation International, World Bank, Washington and Gland.
- Reid, W V and Miller, K R 1989. Keeping Options Alive. The Scientific Basis for Conserving Biological Diversity. World Resources Institute, Washington DC.
- Wilson, E O and Peter, F M (eds), 1988 Biodiversity National Academy Press, Washington DC
- WRI/IUCN/UNEP 1992 Global Biodiversity Conservation Strategy WRI, Washington DC

## **PUBLIC RELATIONS FOR A LIVING MUSEUM**

**("A young shoot on an old stem" (*Van Vleuten, 1986*))**

### **Summary**

The communication role of a modern botanic garden using Geneva as an example is outlined. The communication policy of the Conservatoire et Jardin botaniques de Genève (CJB) is recognised at three levels: -

- scientific
- political - economic
- media and public

A successful showcase (garden) indirectly encourages the development of the herbarium and library - the "hidden side" of the garden. A living museum benefits from a high attendance and the publicity directed towards this audience is developed in accordance with the communication policy of the garden based on information, education and public interaction.

Several channels can be used for this policy: media, information, education and public relations. This paper analyses the Geneva situation, looking at the different channels, possibilities and ways in which it complements and contrasts with the "Green space and environment services".

### **Introduction (Figure 1)**

During the past 10 years botanic gardens have gradually evolved from being cloistered old-fashioned institutions to living open-air museums. Botanic gardens still keep their scientific objectives, but now tend to be more public-oriented rather than collection-oriented. With new policies being run by the Public Relations Service, education and conservation are the keywords. The perception of what botanic gardens stand for began changing with the desire to increase the numbers of visitors to the garden and the quality of contacts. Objectives of the garden are reached by improving the following aspects of its activities:

- information inside and outside the Gardens
- perception, image and knowledge of the Gardens
- guidance and the interpretation in the Gardens

- motivation of the staff
- interest from the sponsors and from the political authorities

### **The complexity public relations in a botanic garden**

Using Geneva Botanic Garden as an example, the following themes can be discussed:

- the diversity of the public and their motivation
- the complex configuration of a garden
- the natural seasonal changes of a living collection
- the receptivity, the needs and the fluctuation of the public.

The presentation involved a series of slides which illustrated the characteristics of Geneva Botanic Garden (geographical, historical and technical), the well known conservatory which houses one of the best libraries and herbaria in the world, the medium size garden (18-25 ha. in extent), the lake, the entrance to the garden (there is no control and no entrance fee), a publication workshop, greenhouses, including the new temperate greenhouse known as a monument in Geneva and used as the public image of the institution and for its logo.

Once a botanic garden has decided on the message it wants to give to the public, it needs to consider how the message will be transmitted. Information can be given to the public entering the Garden through information boards, panels, signs, arrows and labels. In Geneva Botanic Garden, for example, information



*The temperate greenhouse, a "monument" in the garden and its logo*

and directions are given on interpretative signs designed to compliment the labelling of the plants. Information concerning exhibits in the

institution is displayed in special poster holders, also produced in the same design as the signs and information in the garden.

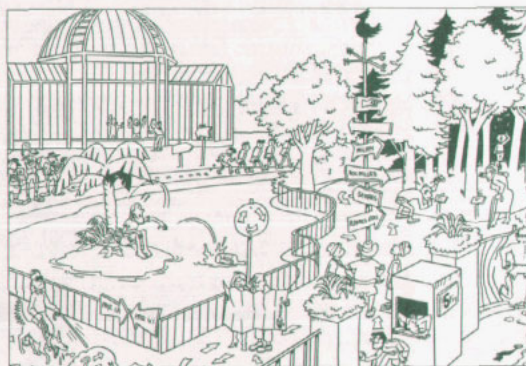


### **The effect of seasonal variation in visitor numbers on communication**

It needs to be borne in mind that seasonal fluctuation of visitors will have an influence on how a

garden communicates its message, whether it is in the winter or summer or even during the week or weekend. The motivation and the receptivity of the public is related to the fluctuation in numbers of visitors.

The Geneva Garden aims to be simple, clear and aesthetic in its message, to avoid elitism and segregation. Scheduled events such as Botanic Jazz session held every Sunday during May are effective ways in which to gain the attention of the visitor.



### **Conclusions**

Successful achievements and experiences are based on good public relations, moderate costs, selective educational activities and interpretation in the gardens. Although the following examples are based on events that have taken place in Geneva Botanic Garden, they

can be adapted to suit many other gardens according to their budgets, staff resources, etc. Funding sources are mentioned in brackets.

- open-air display (joint-venture with other museums and sponsorship)
- audio-guided tour (internal budget and private sector sponsorship)
- educational co-ordination (collaboration with the public school system, co-ordinators paid by the school system)
- jazz concert (institutional sponsorship by the City of Geneva)
- artistic exhibition, painting, photography, sculpture (private sector sponsorship, individual sponsorship)
- "Scent and Touch garden"  
(institutional and private sector sponsorship).

*"Botanic Jazz", a traditional day in the Garden*



Although a garden's distinctive features are complex, they represent the originality of the garden and need to be developed to the garden's advantage. This requires creativity, imagination and, last but not least, more collaboration between botanic gardens, indoors museums and private companies on an international multidisciplinary level.

*Conservatoire et Jardin botaniques de Genève, Ch. de l'Impératrice, C.P. 60, CH-1292, Chambésy/Genève, Switzerland*

## **CREATIVE GARDENING: SCULPTURE AS AN INTERPRETIVE TOOL**

### **Introduction**

This paper describes two projects which use sculpture as a tool for interpretation in forest parks. The original purpose of these projects is discussed, together with the artists' ways of working. A close relationship between the projects and productive forestry operations is important for the successful management of both. The effects of the sculptures on visitors' experience is described in detail: this differs considerably from conventional didactic interpretation but adds a dimension of emotional and personal feeling which may be more effective in promoting support for conservation. Projects like these have considerable potential for use in botanic gardens, though there will be special considerations in their use.

I refer to interpretation throughout this paper, rather than education. The two have broadly similar aims, though interpretation is concerned more with casual visitors who are at leisure, rather than visitors who come as part of a formal educational process. Visitors at leisure are particularly well served by using arts as an interpretive tool, and two projects run by the Forestry Commission, the state forestry organization in the UK, illustrate this well.

### **Two approaches to developing a sculpture trail**

The two projects both use sculpture as a medium, and are both based in forest parks. These parks are working forests: their primary aim is to produce timber as a sustainable crop; but they both have an important recreation and amenity function as well. This is largely due to their location - Grizedale Forest is in the Lake District National Park, although it is outside the most heavily visited areas. The Forest of Dean is on the Welsh/English border, close to Bristol and Cardiff and within easy reach of Birmingham.

The two projects had similar beginnings, but have developed with interesting differences. Both relied on the drive and enthusiasm of one Forestry Commission Officer, who made links with the local arts establishment. In Grizedale, Bill Grant had been using his work with the Commission as a basis for establishing artistic activity in the local area. He had set up a theatre at Grizedale, to some extent as part of visitor

facilities there, but also as a way of bringing arts activity to an otherwise isolated rural community. He started the Grizedale sculpture project in 1977, following discussions with the Visual Arts Officer at Northern Arts.

In the Forest of Dean, another Forestry Commission Officer, Martin Orrom wanted to set up an alternative form of "trail". Self-guided trails - a route along which visitors are directed while features of interest are explained to them - are a classic tool of interpretation but evidence suggests that they attract a narrow cross-section of visitors, and have significant disadvantages as an interpretive medium. (DART, 1978). The sculpture project, which started in 1986, was a way of establishing a trail which would be used, and encourage people to explore the forest, more than a conventional trail.

### **Management of the projects**

The way sculptors have worked on the two projects is also different. At Grizedale, sculptors are chosen from open submissions each year, and then come to work in the forest on residencies. They live in accommodation provided by the Commission for two and a half to six months, and may spend weeks exploring the forest, developing ideas and choosing sites. A residency may produce one piece of work, or several.

The project is still current, with two new residencies each year, and the works produced are scattered throughout the forest. Many of them are situated along the route of the Silurian Way, a 10 mile (16 km.) hiking trail. The sculptors are restricted to using local materials, usually wood or stone, and many of the pieces from early residencies have now rotted away. There are still over 50 pieces listed on the current guide. It would be impossible to see them all on a single visit. Using local materials and working on residencies means that the sculptors form close links with the foresters and with the local community.

At the Forest of Dean, by contrast, 18 pieces have been installed in two separate phases, with up to six sculptors working at any one time. Some pieces were made off-site and then brought into the forest to be installed. Only a few of the sculptors worked in residence, as in

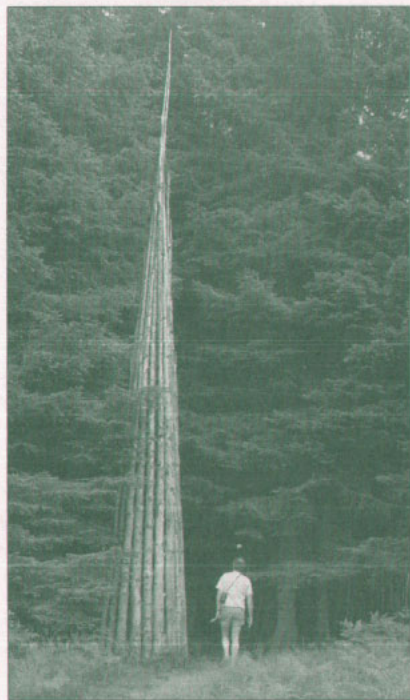
Grizedale. The pieces are all sited along a specific trail route, although the sculptors were given a free choice as to their exact location. They had to choose a site somewhere along this route to produce the desired trail of four and a half miles. Interestingly, one officer, Jeff Carter, who now looks after the trail, would prefer any future sculptors to work one

at a time on a residency basis. He feels that this has advantages in terms of the amount of community and visitor contact which occurs during the project. It is also easier from a management point of view. Providing resources for six sculptors at once is hard work! Unlike at Grizedale, The Forest of Dean project is a finite one. Although the trust which now administers the trail will seek funds to replace works as they deteriorate or decay, there are no plans for adding to the total number.

Both projects obviously need a close relationship with the working activities of the two sites. An essential part of their management is that there is one person on the Commission's staff who is responsible for linking the sculptures and the forest operations. In order to retain good sight lines, or to maintain the atmosphere of a piece, some sculptures at the Dean have "frozen" parts of the forest and no major alterations can be made in the area immediately around them.

This is catered for in a special

management plan which covers the corridor of forest along the trail. At Grizedale, the sculptors' chosen sites are cleared with forest managers to ensure that they do not conflict with imminent planting or felling, though this consultation does not include a "right of veto" over the ideas themselves.



*"Seven Spires" by Andy Goldsworthy (Grizedale) draws attention to the aesthetic qualities of the forest.*

## **Locating the sculptures**

The two projects have a very different "feel" to them. At Grizedale, the early guide map was more a general indication of where the sculptures were, rather than an accurate plan. There was no indication on the ground that you were near a sculpture - you had to judge that you were near, and then look hard. At first I found this annoying, but I later came to feel that a vague map is actually a great asset: the effect being that you become much more visually attentive and aware. You are looking for sculptures and so begin to appreciate the shapes, textures and colours of the forest far more keenly. In effect, you are seeing sculptures even where they do not exist.

At Grizedale red-topped marker posts have now been installed which show the site of a piece, but the sculptures still feel an intrinsic part of the forest which you must seek out. The Forest of Dean sculptures are far more obvious, grouped as they are along a specific trail. They are generally more substantial and more serious, often using materials which are not from the forest. The guide map is more accurate, and gives a brief descriptive statement about each piece. The effect is closer to being in a gallery than at Grizedale, though the works do not seem out of place in the forest.

## **Educational interpretation**

The subject matter and style of the sculpture are very varied. None of them take a glib representational approach - simple portraits of animals or forest workers would be meaningless decoration. All of them make very creative use of materials, surroundings or subject matter. Some are firmly rooted in the concerns of abstract art, others are responses to or evocations of the atmosphere of the forest (for example Andy Goldsworthy's "Seven Spires" at Grizedale). These draw your attention to qualities in the landscape, sometimes physical but also emotional or spiritual. Other pieces refer to the history of the area, to its wildlife or to human activity. Sometimes the sculptures are humorous, for example Andy Frost's "Red Indian" pieces in Grizedale, and which seem to be purely about encouraging people to play in the forest, to have fun there. It is impossible to categorize the sculptures. They do not have one specific meaning, instead they suggest thoughts which resonate in your

mind as you walk. They mean different things to different people, and new ideas come with each visit. David Nash's sculpture "Black Dome" in the Forest of Dean serves as a good example of this. It consists of a small mound of larch logs, mounted on end in the ground. The logs have been shaped and charred; this helps to preserve them, though



*"Black Dome" by David Nash (Dean) something to play with, as well as a reminder of past human activity.*

it is the sculptor's intention that the mound should eventually decay to a low green lump of humus. The work reminds you that charcoal burners once worked in the Forest, and in its shape, material and colour evokes their ways of working and their product. But it also offers beautiful contrasts of colour and texture with the surrounding woodland, and a fascinating study of how the wood changes and decays, how mosses colonize it. Beyond this, the process of change and decay may lead to thoughts of how the entire forest relies on this process, or of how human endeavour and industry is mutable, and how old industries disappear.

Visitors' reactions to the projects at both sites are generally very favourable. The sculptures are popular - the Forest of Dean sells 25,000 copies of its guide literature each year, with actual visitor numbers probably three times that figure. The objective of establishing a trail that would encourage people into the forest more than a conventional one has certainly been met. Several people I have met on the trail said they liked having a walk with an aim, especially for children. The sculptures also seem to encourage a high number of repeat visits.

There are interesting side-effects, too. Visitors often make small repairs to pieces which are disintegrating, or add their own work. On several visits to Grizedale, I have come across "spontaneous" sculptures, sometimes very slight but sometimes fairly elaborate; evidence that the "official" works spark visitors' own creativity. The sculptures provide an opportunity for people who would not normally visit art galleries to experience sculpture as something living, outside the hushed, church-like reverence of a gallery. You can touch these pieces, climb over them, picnic by the side of them. They subvert notions about the value of art by being left to decay.

This may well seem a long way from established notions of interpretation. The sculptures certainly succeed in encouraging people to explore, which is one possible aim for interpretation. But interpretation has usually sought to increase peoples' understanding of a place; of what happens there and especially of its "significance". In the environmental field, this has usually meant a didactic approach, giving visitors an understanding of basic ecology, concentrating on scientific principles and knowledge, hoping that this will lead to a greater concern for the environment and a wish to contribute to its conservation. This is all very well, but it is one of the great pitfalls of interpretation. Scientific data is important for scientists, but I doubt whether it means much to the casual visitor who has come for an enjoyable day out. There is very little evidence that increased knowledge really does lead to an increased desire for conservation, instead I suspect that people are far more ready to work to conserve something if they have an emotional or personal link with it; if they love it. The best interpretation manages to create or encourage this, and the sculpture projects are excellent tools to this end. Some of the sculptures do "explain" a factual aspect of the

forest, like the wildlife pieces, but they do so obliquely and in a very personal way. Others encourage people to think about the forest, or add something to the "forest experience" by creating or echoing an atmosphere. Even the humorous ones have a function: the Cowboys and Indians have nothing to say about the ecology of conifers, but they encourage people to play in the forest and feel at home there. For the majority of visitors, this is the significance of the place.

### **Sculpture and opportunities for botanic gardens**

Projects like these have considerable potential for botanic gardens. Though things are improving rapidly, interpretation in gardens has been rather like that in old-fashioned museums. They are places which hold collections of wonderful objects, and where fascinating and exciting work takes place, but which miss the opportunity really to bring the collection or work alive. When museums like this do make efforts to communicate with the public, they are often confounded by an over-academic approach, dictated by specialist curators. Sculpture or other art forms could offer an opportunity to introduce visitors to the aesthetic or emotional appeal of the garden, or to provoke thoughts about the human stories behind its work, in ways which may be more appealing and perhaps more deeply effective than traditional interpretive activity. Some gardens have experimented with this already: Kew has hosted a theatre project based on the life of a rain forest which exploited the extensive grounds in a "promenade" performance (in which the audience follows a pre-determined route along which various scenes are enacted). At Edinburgh, Andy Goldsworthy has created pieces which were on show for a limited period.

There are, however, considerations which should be born in mind before embarking on such projects. They require a commitment by the garden to public enjoyment and appreciation, coupled with an acceptance that detailed, academic exposition of the garden's work will not reach a wide audience and that other methods must therefore be tried. Sculpture projects are also likely to inspire strong feelings of both like and dislike; if gardens use them, they may well need to be on a smaller, more intimate scale than the ones described here, or limited in time. Forests

are huge places in which large pieces of work can be appreciated without undue impact on their immediate surroundings - except, perhaps, in the visitor's mind. Botanic gardens are generally more formal, and the style of any work would need to take this into account.

## Conclusions

My impression is that people are not confident of their ability to appreciate art, though their emotional responses to it are in fact powerful and meaningful, if only they can be encouraged to trust them. Both forest sculpture projects try to do this by explanatory statements in their guide leaflets; far fuller in the Forest of Dean than in Grizedale. There is a fine line to tread here between encouraging people to make their own meanings for a piece, and providing a text book explanation which defeats the fluidity and richness of this form of interpretation - in the Forest of Dean I noticed that several people approached sculptures reading the explanatory notes before actually looking at the piece. Finally, I would like to sound a note of caution. Though arts provide an exciting and thought provoking way of encouraging visitors to explore and respond to a place, they are not a panacea. To see a garden with sculptures at every turn would be as bad as having large display panels by every plant. They need to be used sensitively to leave their audience free to form their own relationship with the place they interpret.

## References

- Centre for Environmental Interpretation, 1990. Environmental Interpretation, October 1990: Arts in Interpretation, UK  
DART (Dartington Amenity Research Trust), 1978 Self-guided trails. Countryside Commission, UK  
Davies, P & Knipe, T (eds), 1984. A sense of place: Sculpture in landscape. Ceolfrith Press, UK  
Martin, R, 1990. The Sculpted Forest: Sculptures in the Forest of Dean Redcliffe Press, UK

*Centre for Environmental Interpretation, Manchester Polytechnic, St Augustine's, Manchester M15 6BY, UK*

## ENVIRONMENT AND HANDICAP - INCREASING THE PARTICIPATION OF HANDICAPPED PEOPLE

### Introduction

In November 1987, the European Year of the Environment, I was one of the speakers at the first European meeting entitled "Environment and Handicap" held at Jouy-en-Josas in France.

I have given my speech today the same title to emphasise the close relationship between the environment and handicapped people. Furthermore, it is important to stress the general conclusion that was reached at the French meeting on the environment and handicap, which was that we must improve the accessibility and facilitate the enjoyment of the environment in all its forms.

My work place, Werkenrode, in Groesbeek, is a vocational training/rehabilitation centre in the Netherlands that gives support and guidance to young people with disabilities.

The centre houses a relatively large model-demonstration garden which is designed to assist other professionals in developing their own gardens for those with disabilities. The garden targets many people with a variety of disabilities, and visitors even have the opportunity to test the variously adapted tools.

At the centre horticulture/gardening-courses are conducted for professional ergotherapists and activity companions. These courses have been held twice a year since 1983. For the first time in September 1987, the course was conducted in German, for the benefit of Germans, Swiss and Austrians.

The centre is also involved in developing and disseminating educational publications and I authored an award-winning book "Handicapped and Elderly in Garden and Horticulture: adapted gardening", published by H Nelissen in Baarn. A former Minister of Agriculture in the Netherlands, wrote in his preface to the book in 1988, concerning government policy "we are giving attention to accessibility and the problem of the easy access of open-air-recreation areas, as well as to the State forestry for these groups.

Others working in this field, in urban settings, may also obtain support from the government if they develop model applications".

## **Educational activities**

I have designed several model-demonstration gardens of which I will make special mention of the first one which was set up in Germany, called the "garden for everybody". This garden which is about 5,000 square metres in size is situated on the flower island Mainau in the Bodensee near Konstanz. It belongs to Count Lennart Bernadotte and was opened by Queen Silvia of Sweden in 1989. This tourist garden also has some botanical value and is important as a resource for environmental study, to look at the environment and handicap or an environment for learning.

In April I wrote elsewhere of the need for botanic gardens to increase their activities in the field of promotion and teaching of horticultural therapy and while most gardens are adapted to suit an average or ideal human being, we must also consider human limitations. Botanic gardens are leaders in the world of nature, promoting the education of plants to visitors, not only by opening their gates to visitors but also by showing their botanical collections and by the development of thematic gardens along the lines I have discussed. At the botanic gardens of the University of Utrecht, for example, such work is being carried out and I have heard of similar examples from the UK, Canada and the USA of botanic gardens that are already actively involved in education with both disabled and non-disabled people as therapists.

In my experience I know that there are many and significant national differences applied to this subject which means that the social environment of handicapped people differs greatly by country and this is also the case with regard to support and care for the disabled as well as in the availability of technological aids. However, the natural environment and gardening should be enjoyed by everyone. People can choose to gain more knowledge about sowing seeds, cutting flowers, dividing plants, harvesting garden products or simply learn about the interactions of plants and animals with their natural environment. I also include private gardens as part of the natural environment, as well as those gardens surrounding institutions, town or local parks and allotment gardens. Indeed, I believe that one should also consider the scenic elements situated beyond the town limits such as camping areas,

recreation parks and nature reserves, and even agricultural fields and horticultural land.

### **Making the environment more accessible - who needs to be involved ?**

When we consider the target group of this paper, the handicapped, I also include elderly people because they often have certain physical limitations. The paper concerns:

- handicapped people themselves (there are about 1 million handicapped people in The Netherlands and about 30 million in Europe)
- social workers in the field of health care and welfare, and
- the environmental or "green" experts.

Handicapped or elderly people may be confronted with nature in different ways; as therapy, for education or employment or to improve his or her own food supply. Involvement in the environment can be useful for the rehabilitation of handicapped people.

Those who propose difficulties in horticulture and environmental education for handicapped and elderly people are short-sighted. These difficulties can be overcome through the sharing of knowledge and ideas.

We need to consider a number of factors about disabled people - who are they, where do they live, how are they integrated into the community, what sort of disabilities do they have?

If we consider institutions in the Netherlands for disabled people we must include hospitals, psychiatric clinics, nursery and children's homes, day-care centres, day-activity centres, homes for the aged etc. But we would be mistaken if we thought that most of the one and a half million Dutch people with a physical handicap, are living within some kind of institutions. Most of these people live, integrated with the non-disabled population, in the everyday community. This means that in designing access for disabled people we must integrate their needs into designs suitable and applicable to the whole population.

## Conclusions

As a teacher of handicapped people, a social worker and an environmentalist, as well as an author of works on educational tools for gardening by handicapped and elderly people, I would especially like to emphasise the necessity for educational activities. The reason for this is that education in this field stimulates an inclusive policy in the long term and will help to improve environmental design and access, providing a firm basis for development in the future.

If we want to allow handicapped people to share equally in our green areas as full fellow citizens, the future decision makers concerned will have to prepare for this. If they want to pursue an all-inclusive policy either in the training of gardeners and landscape architects, in the training of social workers in healthcare of handicapped people, they will have to be provided with information. It is to be hoped that a more balanced approach to these matters will be taken in the development of future educational tools and also in the way in which they will be used in training programmes.

This will increase the participation of handicapped people in environmental matters as well as in their enjoyment of the countryside and in agriculture and horticulture. In any country that has high agrarian employment this is of even greater importance.

To close, I would like to suggest that readers consider their own working environments and make a check list of the areas, encountered in their daily lives that may prove problematic to handicapped people. By becoming more aware, perhaps it will help us to consider fresh approaches and new ideas to overcoming such problems. We have a moral obligation to ensure that the natural environment for learning is not a human handicap.

*Haydnstraat 44, 6561 EG Groesbeek, The Netherlands*

## THE MULTICULTURAL CITY ECOSYSTEM

### Introduction

This paper argues that to make environmental education more relevant to under represented groups, especially ethnic minorities, we need to reassess our views of cities, their people, flora and fauna. The concept of the "multicultural city ecosystem" is suggested as a framework for this reassessment. Botanic gardens have a role to play in this process; they can advise on, and help in the creation of "cultural ecological gardens", areas dedicated to planting hardy species which represent peoples' countries of origin.

As a schools' adviser for environmental education in Islington, London, I am the person who advises schools where to visit, and what to do to fulfil their pupils' entitlement to an environmental education.

Botanic gardens show representatives of the world's flora in a small area and can create projects which show how human cultures and plants interact and have interacted in the past, present and future.

In my school area, about 30% of the students have parents who are from the Caribbean, Asia, Africa, Turkey, Greece, Italy and South America. To them, botanic gardens are places where they may see familiar plants and tell other students about the uses of such plants in their own cultures. Such students are thus given a rare opportunity to take the lead in a learning situation.

### Urban ecology

Nevertheless, botanic gardens cannot provide a complete environmental education. Students must also learn, amongst other things, about the ecology of the city and how it works, both built and natural. Teaching about urban ecology has not kept pace with the human changes in cities brought about by such factors as immigration. In Britain, we still try to create "the countryside in the city", when we ought to be showing that the city has a unique and cosmopolitan ecology of its own. It is different to that of the countryside, but it is still intrinsically valuable.

Imagine that you are an Asian or African-Caribbean pupil at an inner-city school. Today's lesson is urban ecology. The teacher has been talking about the planned school nature garden. Your "design-a-nature-

garden" pack talks about the different types of plants that "should" be encouraged. It says "native" British plants should be used in preference to "alien" or foreign ones, implying that they are "better". What are your feelings? It seems that even in urban ecology, the ecology of our local areas, parochial thinking is commonplace. Why is this so?

### **Native species versus alien species**

In general, the advice in school ecology project packs and from wildlife organizations is not to plant alien species. Because of the recency of their arrival, they are seen (with few exceptions) as being unsupportive of wildlife, when compared with native species which have been around at least since the last Ice Age - about 10,000 years ago. So the theory holds, this may result in, for example, their not having had time to establish ecological (feeding, shelter and breeding) links with other organisms such as insects and butterflies.

The assumption is also that such alien species can be invasive. Good examples of alien species invading natural habitats are known in most countries. Whilst the exertion of some form of ecological control may be justified in the case of special (and predominantly rural) natural habitats such as the U.K. Sites of Special Scientific Interest (SSSIs), ancient woodland, upland, downland, heath, bog or meadow, is it justifiable in the context of the diverse ecology of urban areas, where 85% of the population lives?

To answer this question, perhaps we need to look at towns and cities differently. Taking up about 10% of the land area of Britain, they are not static, isolated physical and living structures, cut off from local, national or, increasingly, global influences. They are dynamic open systems involving inputs of energy and materials, and outputs such as manufactured products and waste.

In this respect they are similar to ecological systems, except that ecosystems generally recycle waste materials. Just as an ecosystem depends on the sun's energy, towns and cities need power in the form of electricity. Moreover, improved global communications mean that urban areas are increasingly heterogeneous and cosmopolitan; they now

receive inputs from all over the planet. This means greater diversity, not only of humans, but ecologically. Viewed in this way, the town or city should be seen as a multicultural ecosystem.

### **The multicultural city ecosystem**

This approach to the study of urban areas combines the cross curricular theme of environmental education with the cross curricular dimension of multicultural education and provides a resource for endless practical ecological projects ("where is that plant from, what was it used for and how did it get here?") linking culture to science, the geography of technology and history. Information for such projects is readily available from many sources. For example in the UK, botanic gardens, such as those at Edinburgh or Kew, are invaluable sources, as are the Urban Wildlife Trusts (the urban branches of the Royal Society for Nature Conservation) as is a Worldwide Fund for Nature publication, "Green Inheritance".

Multicultural city ecology recognizes that, just as human populations are in a constant state of flux (with inputs and outputs of people from diverse backgrounds and ethnic, cultural or religious groups) plants and animals from different parts of the world form a significant element of the ecology of cities. These human, plant and animal inhabitants are very adaptable; exploiting habitats and niches, communities and opportunities which are created either through planning or by chance.

For incoming plants and animals, the multicultural city ecosystem offers a more sheltered, warmer and drier environment than the surrounding countryside. It contains rich food or nutrient sources (a city of 1 million people produces 500,000 tons of sewage and 2,000 tons of domestic waste per day - excellent food for seagulls and foxes whose urban lifestyle is relatively recent). The "urban heat island" effect adds 0.5 - 5.0 C to urban temperatures providing increased warmth.

A great variety of habitats, from parks, refuse tips and buildings to road and railway embankments act as wildlife corridors for animals, with trains and other vehicles helping in the distribution of seeds. For human immigrants to the urban environment, a city often provides the security

of joining a common religious or ethnic community as well as increased employment, medical, educational, cultural and social opportunities.

### Plant colonisation in the urban area

Urban renewal, road building and other ecological disturbances create temporary spaces which may account for 5-10% of an urban area. Such new habitats do not stay clear for long. The processes of plant colonisation and succession ensure that very quickly, the space is invaded by a diverse mixture of early colonisers and opportunistic animals. For example, in the UK amongst some of the first native species to arrive are groundsel (*Senecio vulgaris*) and coltsfoot (*Tussilago farfara*) and amongst some of the non-native species are *Buddleja davidii* from China and the Oxford ragwort (*Senecio squalidus*) from southern Europe. This mixing of plants and animals from diverse origins makes the study of urban ecology fascinating.

Since the last Ice Age, the many waves of immigrants to Britain have brought in a host of plants and animals which have become widespread and are today often found in the multicultural city ecosystem. Neolithic agriculturists were responsible for bringing in many present day urban weeds from the Mediterranean and Near East. Some are valuable food sources to flying and herbivorous insects. Iron Age immigrants brought with them the house mouse (*Mus musculus* *check*) and the Romans brought, amongst other species, the black rat (*Rattus rattus*), ground elder (*Aegopodium podagraria*), sweet chestnut (*Castanea sativa*), walnut (*Juglans* spp.), and perhaps sycamore (*Acer pseudoplatanus*), a most maligned alien species by British conservationists. Nevertheless, sycamore flowers are copious early nectar producers and are used by bees. Aphids live on their leaves in abundance which are food sources for ladybirds, other insects and birds.

So-called urban wasteland and railway banks, are often habitats for non-native plants such as bristly-ox tongue (*Picris echioides*) from south west Europe and goldenrod (*Solidago canadensis*) from north America. The colourful Oxford ragwort, a prolific urban plant, is not a native species, despite its name. It was brought to the Oxford Botanic Gardens in the late 17th century from the volcanic ash fields of Mount Etna in

Sicily. Escaped seeds reached London by the mid-19th century. Its spread was firstly assisted by the expansion of railways, then it thrived on the rubble of Second World War bomb sites. Another such colonizer is a South American plant, the gallant soldier (*Galinsoga* spp.). This species escaped from the Royal Botanic Gardens, Kew and is now common in the London area. Due to Britain's position as a trade centre, many foreign species of plants and animals have arrived and become established here; the plants often arriving as seeds on people's clothes, shoes or in cargo and the animals often arriving in foodstuffs.

The multicultural city ecosystem is therefore a complex tapestry of interlinked human and ecological factors which have adapted to a favourable habitat (plants and animals) or economic, cultural and social structure (humans). As the human population changes so too do the plants and animals, colonizing the new habitats that arise in the city.

### Teaching urban ecology - a new perspective

Teachers should therefore be wary of the rather parochial ecological thinking surrounding the utility of native and alien plant species in urban areas. This is a view shared by George Barker, English Nature's Urban Programme Coordinator who, writing in "Environmental Interpretation" (Feb., 1991) notes that the use of such terms "in an urban context where the origin of human population is diverse, may give quite the wrong signals". He also notes that, in comparing rural to urban habitats "whose plant and animal communities may be different.....are they any worse".

All too frequently, practical school projects attempt to impose the native ecology of an arcadian, historic countryside on the unique and varied ecology of urban areas. For example, many schools have tried to establish wildflower meadows - why, when such meadows require low fertility, have a low success rates, generally because of the high level of nutrients and pollutants in urban soils, and there is a lack of time for management? Why not utilise urban wildflowers? This method of creating urban green spaces, by attempting to transplant rural habitats into the city is based upon scientific values developed over the last century by ecologists whose premier allegiance was towards, and whose

training was in the countryside. It does not take into account urban environmental heterogeneity, the increases in global communications, nor the resultant cultural and ecological diversity of urban communities and is in need of thorough review.

This is particularly urgent for two reasons: firstly, there is evidence that the environmental heterogeneity and habitat differentiation brought about by urbanization may actually select for recent arrivals over previously established plants, and secondly, the widely predicted changes in floral boundaries as we approach Global Warming-induced climatic change may result in an influx of species from warmer and drier areas such as southern Europe and the Mediterranean.

Within the framework offered by the multicultural city ecosystem, people are already growing Asian and African-Caribbean foodstuffs on allotments, wasteland and in greenhouses. Similarly, teachers can progress to creating imaginative habitats in school grounds. A "cultural ecological garden" is a place where flowers, ferns, trees and vegetables can be grown representing the pupils' countries of origin. This provides a valuable ecological, cultural and educational resource for parents, pupils and the local community. Many suitable plants from most parts of the world are widely available in the horticultural trade in Britain to provide material for such gardens.

## Conclusions

Perhaps botanic gardens, particularly those in urban settings, could encourage the establishment of cultural ecological gardens, regarding and supporting them as "satellite gardens" where people from different cultures could meet and learn about urban ecology. These gardens could provide a focus for outreach work from the botanic garden and may also have the benefit of encouraging the increased recruitment of staff from ethnic minorities for employment in botanic gardens. For a list of plants suitable for a temperate cultural ecological garden, write to: July Ling Wong, Black Environment Network, National Council for Voluntary Organisations, 26 Bedford Square, London, WC1B 3HU.

*Education Service, Barnsbury complex, Islington, London N1 1QF, UK*

## A CENTRE FOR BOTANICAL EDUCATION AT LEIDEN

### Background

Even before the Hortus Botanicus of Leiden was founded in 1590, students at the university could learn how to recognize the medicinal plants, they used to grow, in the private gardens of some of their professors. The establishment of the Hortus, however, revolutionized botanical education in two ways:

1. Though the classic medicinal plants were put into the garden, Carolus Clusius (the first director of the Hortus) was not particularly interested in these species. He filled the Hortus with plant species and varieties from all over Europe, North Africa, the Middle East and America. From its very beginning the Leiden Hortus was a real Hortus Botanicus and one of the cradles of modern descriptive botany. The professor of botany lectured in the Hortus on general principles of botany and illustrated his points with species grown for their own sake and not only for their medicinal properties.
2. The Hortus was opened to the general public virtually from the beginning. In the archives we can find a list of rules for the visitors, in Latin and Dutch. Also, the Hortulanus (Head Gardener) and his wife had to be able to show visitors around the garden and be able to give them some instruction.

During the past 400 years the Hortus has welcomed all kinds of visitors and has tried to link formal botanical instruction with the enjoyment of a beautiful garden environment. In the next few years these efforts will be greatly strengthened by the new exhibitions of the National Museum of Natural History (NNM).

### National Museum of Natural History

The NNM was founded at the beginning of the 19th century in the same wave of prestigious academic museum collections that produced the Rijksherbarium. In fact, these two institutes were meant as two complementary museums covering zoology and geology on the one hand and botany on the other. However, neither institute ever got round to building its exhibition halls, so that only students and other members of the university had access to the immense collections.

In the meantime the Department of Geology and Mineralogy evolved into an independent museum with exhibitions for the general public. Five or six years ago this museum fused once again with the Zoological Department and the whole institute was re-christened National Museum of Natural History. The museum is "national" because (after much emotional discussion) the natural history collections in Leiden were designated as the nuclei of natural history museum collections and education in The Netherlands.

As all public services of the NNM have to be built up from scratch, it was decided to base the new exhibitions on two principles:

- There is great (zoological, botanical and geological) diversity on earth.
- Everything on earth is inextricably linked together.

There will be seven major themes illustrating these principles: (these are just temporary titles)

1. Diversity of life and matter
2. Diversity through the ages
3. Earth dynamics (geological processes)
4. The dynamics of life (evolutionary processes and genetics)
5. The influence of climate on the earth and on life
6. Ecology (the diversity and mechanisms of ecosystems)
7. Nature and human nature (human influences on nature)

In all these themes, zoology, botany and geology will be presented as aspects of nature on earth. In fact, the museum will try to explain geological and biological processes, illustrated by objects from the justly famous natural history collections of the NNM and the Research Institute Rijksherbarium/Hortus Botanicus. At least one-third of the exhibitions will be devoted to botany.

Apart from the exhibitions (ca. 5,000 sq. m.) there will be a "Natuur Informatie Centrum" (Nature Information Centre) where visitors can obtain more information on the themes touched on in the exhibitions and on natural history in general. This part of the museum is meant for use by individuals (reference collections of plants, animals and minerals; books, periodicals, video, film, slides, sound archives, etc; data systems)

and by groups (teacher's corner, rooms for group activities, lectures, films, etc.). The centre will probably be staffed by competent biologists, geologists or naturalists.

Another educational service will be a natural history "discovery room" for children aged 6 to 10, also based on the exhibition themes.

### **Conclusions**

All of this suggests that botanical education in Leiden will not be quite the same after the NNM opens to the public in about 1997.

The traditional scientific and cultural-historic important collections will of course remain in the Hortus, together with the tropical greenhouse collections. There is no need for historical reconstructions and beautiful Asiatic gardens outside the old garden. The new gardens around the NNM (a sizable plot and a spectacular 17th century courtyard and several greenhouses in the exhibitions) will concentrate on botanical and/or ecological themes. Economic botany will probably also feature strongly. The NNM and the Hortus will set up a completely new educational programme for the joint collections and exhibitions, so that as many aspects of the plant world as possible can be presented to the public. If all succeeds, Leiden will not only be one of the oldest centres of botanical education in Europe, but one of the most comprehensive of modern centres.

*Leiden University Botanic Garden, Nonnensteeg 3, 2311 VJ  
Leiden, The Netherlands*

# THE ROLE OF INDONESIAN BOTANIC GARDENS IN EDUCATION AND TOURISM

## Introduction

Indonesian Botanic Gardens consist of four Botanic Gardens: Bogor, Cibodas, Purwodadi and Bedugul. The first three are located in Java, whilst the last one is in Bali. They have different climatic conditions. Bogor is a wet lowland city whilst Purwodadi is a dry lowland area. Cibodas is located at on the slopes of Mount Gede. Bedugul Botanic Garden is the largest (120 ha), whilst Bogor Botanic Garden is the oldest (1817) and the most famous.

People visit the Gardens for various purposes. The majority of them visit the Gardens for recreation. Film shooting is quite frequently conducted in the Gardens. The challenge now is how to capitalise on the public's visit to improve public consciousness of the importance of conservation. With the population growing at a rapid pace and industry expanding correspondingly, this challenge is urgent. Conservation is the responsibility of all members of society.

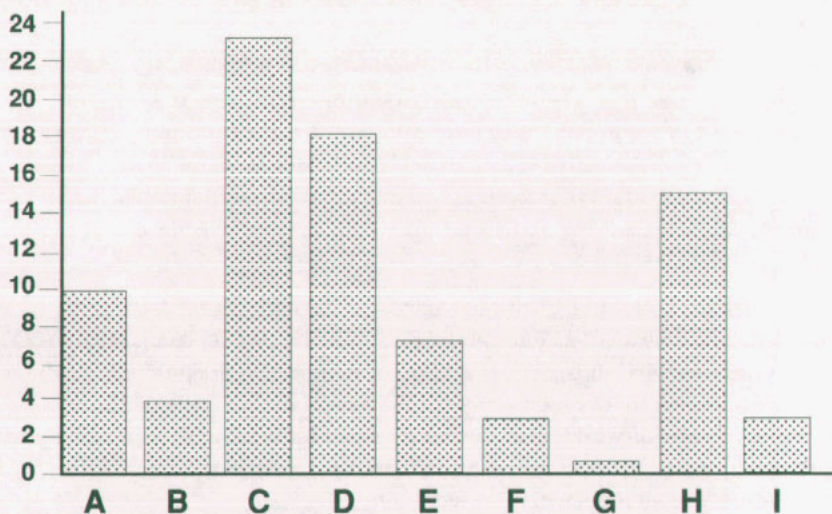
## Education

Indonesian Botanic Gardens (IBG) have been used as areas of education by a wide range of students, from university level to kindergarten. The number of students who used the Gardens in 1990 are presented in figure 1.

The figures show that the highest number of visits are made by elementary school students, followed by secondary school students. Figure 2 shows that student visits to Purwodadi Botanic Garden are concentrated during the months of May, June and July.

In 1990, 28,861 students used Bogor Botanic Garden for their field study. The field study includes plant systematics, horticulture, physiology, ecology, landscape architecture. Social aspects were also studied, for example the social aspects of vandalism in the Botanic Gardens.

Although the university students come from various parts of the country, the majority of them are from Bogor where the biggest agriculture university is located. However, the students who conduct field studies are not only agriculture students and the various universities include schools of chemistry, education, nutrition and



**Figure 1**

*Number in thousands of pupils, students and others visiting Bogor Botanic Garden free of charge between April 1990 and March 1991 (total 83.248)*

<b>A</b> School for handicapped children	<b>D</b> Secondary School	<b>G</b> Youth Organization
<b>B</b> Kinder Garten	<b>E</b> High School	<b>H</b> Official Visitors
<b>C</b> Elementary School	<b>F</b> University	<b>I</b> Others

religion. For general information on basic botany and taxonomy, the Gardens provide some guides. Light microscopes are also available. Field studies are mostly one-day visits. Longer visits are needed if the students want to collect data for their scientific papers. Libraries are available in each Garden and 50% ticket reduction is given to the students (figure 1).

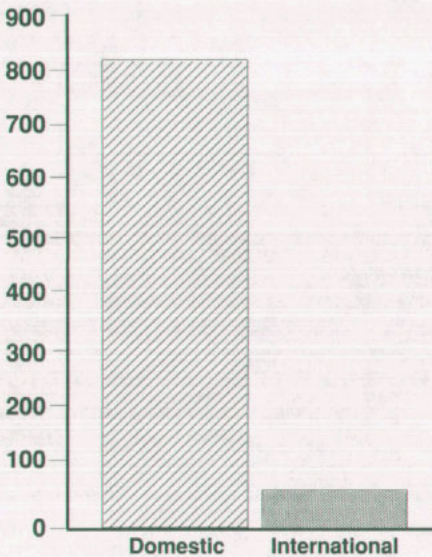
### Facilities

The educational facilities in Indonesian Botanic Gardens need improvement. Information about the Gardens' plant collection, for example, is still very limited. Explanations about the need for plant

conservation for human survival would be more effective if it were carried out using a well planned slide show. Our libraries conserve some antique literatures, but up-to-date books and journals are needed. Each Garden also has a guest house which can be used when visitors want to stay in the Garden.

## Tourism

Indonesian Botanic Gardens have been attractive to domestic as well as international tourism with the number of tourists reaching 923,027 a year. The proportion of tourists visiting Bogor Botanic Garden is presented in figure 2. Their countries of origin are given in table 1. The majority of international tourists are from The Netherlands (26,304).



**Figure 2**

*Number in thousands of domestic and international visitors to Bogor Botanic Gardens between April 1990 and March 1991 (total 871.682)*

The domestic tourists come into the Gardens mostly on Sundays or holy days. But the maximum number of visitors is reached during Iedul Fitri period (similar to Christmas) or Galungan in Bali.

Bogor Botanic Garden is attractive not only because of its beauty, but also because of its plant collections, its Dutch cemetery, which needs some improvement as a memorial of the pioneering spirit of Dutch people, and its historical background.

Tourists find interesting many of the historical plants grown. For

**Table 1**

*Number of International Visitors to Bogor Botanic Gardens between April 1990 and March 1991*

Countries	Numbers
Japan	4.526
Taiwan	4.074
Singapore	941
Malaysia	967
Hongkong	455
Korea	1.196
Thailand	392
Philippines	92
India	281
Brunei	113
Germany	6.964
Netherlands	26.304
France	2.229
Austria	406
Switzerland	1.574
Belgium	557
The United Kingdom	1.112
Italy	539
Spain	150
USA	1.098
Canada	315
Latin America	79
New Zealand	211
Australia	1.248
Africa	70
Sweden	97
Others	1.896
<b>Total</b>	<b>57.956</b>

example, the specimen of *Elaeis guineensis* which was brought from West Africa and planted in Bogor Botanic Garden in 1848 and which became the mother of oil palm in South East Asia. Also of interest is the collection of timber trees (one of Indonesian major exports). Although the presence of tourists in Bogor has been assumed to have a positive economic influence on the city, it has never been studied.

*Botanic Gardens of Indonesia, Kebun Raya, P.O. Box 110, Bogor, Java, Indonesia*

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## **PART TWO**

# **Case Studies**

## MORE THAN A TREE GROWS IN BROOKLYN

### Introduction

It was not too much of a surprise, though something of a disappointment, to get the results of an impromptu audience survey at the congress. Most public gardens represented had only one or two educators on their staff and these had other responsibilities besides education. Education is the *raison d'être* for non-profit public gardens in the United States. We have a responsibility to be advocates of the public's perspective, champions for universal accessibility and sticklers for superb quality of service and information. The congress, this book, *Roots* (the botanic gardens education newsletter), and other such commendable efforts of educators to know and support each other keep us energized and ready to carry out our important missions. Perhaps our role has never been so important as it is now, when agents of change are so desperately needed in our society.

Our approach at the Brooklyn Botanic Garden, since its educational programmes began in 1914, has been to focus on the general public as our audience and in particular on children. With a metropolitan population of some nine million, this is not hard to do. The challenge is to serve our audience well and with continuity, regardless of the economic climate and available resources.

Institutional commitment to education is essential for success and this means adequate facilities and personnel resources dedicated to educational programmes. When there is such commitment, it usually leads to a continuity of staff. Two of my predecessors, Ellen Eddy Shaw and Frances Miner, for example, between them directed the educational activities in Brooklyn for 60 years. In recent years another essential ingredient has been a volunteer corps and this of course requires commitment for recruiting, training and overseeing.

There are two tenets of the public garden education profession that I want to mention in passing, that one doesn't necessarily learn in school but are absolutely essential to success in our field. Firstly, as educators we often find ourselves in the role of advocate for the public viewpoint. We want people to feel welcome at our gardens and to feel that they can obtain a meaningful experience while visiting. Unfortunately, this is not necessarily the viewpoint or focus of other staff, administration or board

members. If we believe we can have any impact whatsoever on the future, everyone at the institution must help to make children feel wanted and invited. It is part of your job to convince others. We cannot just let this happen by chance!

Secondly, it is essential that we give people the opportunity to have their own direct experiences with plants. We need to facilitate this experience not obstruct it (unless, of course, it is damaging to valuable specimens). After all, our collections are what set us apart from other kinds of educational institutions. We have "the real thing" to offer. It has been said that the collections are the heart of a museum and that education is the soul or spirit. Visitors can carry the aesthetic experience with them for a lifetime. I recently met a woman who had once visited Brooklyn Botanic Garden, 65 years before. She remembered the experience clearly and believed that it had sparked a lifelong interest in gardening.

Becoming familiar with what each other is doing in education is important, however I do not believe in one perfect system. If one visits many public gardens, it is immediately apparent how very different each one is from the others: We each have different strengths, audiences, perspectives, resources and ideas. We can borrow from one another, but we still need to maintain the creativity that makes our own programmes unique. Given that caveat, I will go on to describe Brooklyn's educational assets and approaches.

## **General background**

Brooklyn Botanic Garden is a private, non-profit corporation with an annual budget of \$8 million. It is located on city-owned land and housed in a city-owned building. The City of New York provides approximately 1/3 of our budget. The rest is earned income from membership fees, plant and gift shop sales, programme fees, rental fees and contributions from corporations, foundations and New York State. We have 750,000 visitors annually.

It is the aim of the Brooklyn Botanic Garden to inspire and inform the public so that people will be aware of the significance and value of plants and may learn to protect and preserve them, together with their environment.

The Garden boundaries have changed very little since they were first laid out on wasteland in 1910. They now encompass 52 acres. It is the third oldest botanic garden in the United States. The original laboratory building, completed in 1917, is currently used as an administration building, and will soon undergo its first restoration. It is adorned by a magnificent and mature *Magnolia* collection.

The central Systematic Collection is surrounded by theme and specialty gardens such as; the Fragrance Garden, the Shakespeare Garden, the Herb Garden, the Rose Garden, Daffodil Hill, the Local Flora Section, the Cherry Esplanade, Cherry Walk and arguably the finest Japanese Garden in the West and one of the oldest, having been built in 1914.

### Steinhardt Conservatory

Our most recent addition is the \$25 million Steinhardt Conservatory, opened in May of 1988, which makes it possible to provide learning



School children still come to the Brooklyn Botanic Garden in large numbers as they did in 1915. The Conservatory pictured here has been renovated into a Special Events Center for catered functions that provide income to the Garden.

experiences for people of all ages, at all levels, in all seasons. Plant specimens are displayed in naturalistic environments that simulate a range of plant habitats from around the world. The remarkable "Trail of Evolution" traces the origin of plant life from four billion years ago to the present day. Living plants, real and replicated fossils of plants and animals exemplify many of the pieces of the evolution puzzle.

Other important plant environments can be experienced in the Aquatic House, the Desert Pavilion, Tropical Pavilion and the Warm Temperate Pavilion. Interpretative signs focus on aspects of plants that people relate to readily. Each of the pavilions' display maps indicates the geography of the appropriate climatic regions.

A portion of BBG's outstanding collection of over 750 bonsai plants, some ancient, are on display in the Japanese style Bonsai Museum.

The original Palm House has been turned into a Special Events Center where catered functions are held. Fine food and a beautiful atmosphere attract clients who add substantially to the treasury for the important work of the Garden. A building originally made for plants has been turned into a building for people and for our very basic necessity for food.

### **Children's Garden**

In the Children's Garden, about 250 youngsters a year learn about the ultimate source of food by growing their own vegetables, herbs and flowers. Children work in pairs in 4 foot by 15 foot plots in the one-acre garden. There are two sessions, spring and summer. Waist-high raised beds are used in programmes with disabled groups.

Children have three indoor classes before they are ready to plant on Planting Day in late April. The Planting Day parade is led by the smallest child being pushed in a wheelbarrow by the eldest child, and the other children marching with their groups from the Administration Building to the Children's Garden.

Teenagers dig and raise their beds in the same spaces where octogenarians learned to garden 75 years ago. The high schoolers compete to see how high they can raise their beds. The junior high age



*Perhaps the most excited child on Planting Day is the one selected to ride in the wheelbarrow, arriving as the first child in the Children's Garden each spring.*

group compete to find the most and the biggest worms and the young ones work every bit as hard as the older kids. When the garden beds are nice and smooth, children mark their rows with labels and check their plans, just as they have practiced. After planting seeds and transplants, the children love to water. From start to finish, Planting Day is a five-hour affair.

Weeding is inevitably a big part of gardening. It is not popular with all kids but the rewards are worth it. Seeing the look on a child's face as she

discovers a bright red radish is certainly reward enough for the staff! Children weigh their produce and record the tonnage produced by the garden. Lessons about composting and recycling are a natural part of weeding, harvesting and mulching.

In 1922, children shared their harvest with war orphans. These days children often contribute excess produce to shelters for the homeless. Children take part in nature study, cooking and crafts classes in the summer. They also go on a trip to the city-wide harvest fair in August and take a field trip to a nature preserve or historic site outside of the city. Junior Instructors are teenagers over 14 years of age who assist instructors during gardening sessions, make sure tools are properly cleaned, edit the Children's Garden newsletter, plan and care for specialty gardens, trim hedges, or do any number of other tasks. They are paid \$250 for 13 sessions. Most of them have been in the Children's Garden for many years as participants and consider it a great honour to become a "J.I." It is a real job experience for them, including the interview and selection process.

We have youngsters visit the gardens from all the various cultural backgrounds one might expect of a longtime port of entry for immigration. Being located in such a diverse community, this provides the Garden with an opportunity to encourage and perhaps improve the possibility that more Black and Hispanic youngsters will enter the science professions, something on which the US does not have a very good track record.

In the summertime, college interns from all over the US supplement our staff. Lately we've invited volunteers to help as well. It all culminates in a fall Harvest Fair of games, square dancing and activities for the whole family. The fair gives children a public forum for their summer's labours, their vegetables being displayed, with prizes for the best.

In 1989, the Children's Garden celebrated its 75th anniversary. Alumni returned and shared their memories and told how their experiences had affected the rest of their lives. The oldest alumna recalled the first year of the Garden. Frances Miner, who taught for 43 years, returned to be honoured. The young gardeners interviewed the alumni in an oral history project and a public exhibit celebrated the history of the children's gardening movement.

Also in 1989, we turned our successful experiences gardening with children into a video kit titled, "Get Ready, Get Set, Grow!" It has been widely acclaimed as an inspiration and a practical guide.

### **School programmes**

Some 90,000 school children visit the Garden each year. Of that number, the Education Department has direct contact with about 20,000 through workshops and tours. Our latest programmes which began in 1989 include a Discovery Center and a Junior Flower Show. The Discovery Center features a life-sized oak tree and the many animals that depend on it, discovery boxes with games and plant artifacts, and other interactive exhibits including microscopes. The Junior Flower Show is an opportunity for school children to show off their horticultural

accomplishments to the whole world; it is judged by a team of experts and every child receives acknowledgement for their accomplishments. One student remarked that a ribbon he won was the only good thing that had happened to him in all of his years in school.

The size of our school programmes is utterly dependent on our weekday Garden Guide force who supplement the



*The Children's Garden is an area of the botanic garden where children can have their own experiments and displays. Parents are invited only at Open House and Harvest Fair times.*

five instructional staff in Children's Education. The guides consist of volunteers who receive ten training sessions and continual refresher courses throughout the year. New instructional facilities include four large classrooms and three teaching greenhouses equipped with adjustable potting tables to accommodate children, adults and people in wheelchairs.

With over a million school children in New York City, our goal of having contact with every child at one point in their school career is a challenge indeed. One new method that we are exploring is an audience-participation auditorium programme. It will travel to the schools and serve up to 500 students at a time, being educational and entertaining but also profitable.

### **Project Green Reach**

Project Green Reach is a privately funded programme that brings hands-on classes to schools that are in the lowest income areas in Brooklyn. Teachers compete to be accepted into the programme and can be in it only one semester. The programme is so popular that we often have to turn away twice as many teachers as we can accept.

Teachers attend a workshop and select a curriculum tract for their class, based on several options; they receive one visit by a BBG instructor in their classroom, one visit to the Garden (in motor-coach paid by the programme) and assistance with a community project of their own making. Community projects carry the lessons beyond the school, such as the class that shared the plants they had propagated with residents of a nursing home.

Students that show special interest are nominated by their teachers and 15 are selected to be part of the Junior Botanists Summer Adventure programme. They take part in the children's garden and intensive botany classes and also take a trip to a different environment, such as a marsh or a seashore.

Parents become involved too. They are impressed by the quality of the programme and learn how to propagate plants themselves. They attend the graduation of the Junior Botanists at the end of the summer. This

year, the students sang "Dirt Made My Lunch" and did a rap number about "Roots, Stems and Leaves."

Junior Botanists return for a winter reunion to make holiday decorations and learn about conifers. One alumna brought the neighbourhood grandmother figure. Others bring parents, guardians, friends. Families that live blocks away that have never been to the Garden come to see it as a friendly place with people that they know and like.

### **Adult education and public programmes**

Adult courses center on horticulture more so than botany, although interest in botanical classes is increasing. Whenever we can and when it makes sense, classes and portions of classes are taught out in the collections, or using samples from the collections. Botanical art classes and bonsai workshops are very popular. We also offer nature hikes and tours of other gardens to our members and the public. Approximately 2,000 students attend these offerings.

Special events often have an ethnic focus, such as Sakura Matsuri, the Japanese Cherry Blossom Festival, which this year attracted 38,000 visitors in two days. A diverse roster of symposia, seminars, lectures, concerts, plays and exhibits are provided year-round attracting over 30,000 people annually.

A programme to support community gardeners in Brooklyn has been revived. Although many support agencies for community gardeners have developed in the 20 years since BBG created the first such programme in the area, the Garden is still the logical place for people to begin looking for information and assistance. So we have once again begun to serve in that capacity.

Despite huge budget cuts this year and the loss of many good staff members throughout the institution, education continues to figure large in the mission of the Brooklyn Botanic Garden and indeed, much can be done even with reduced resources. It is a challenge to justify our programmes in terms of dollars and ultimately it can only strengthen our position. After all much of what private funders seek to contribute to, happens in the educational arena.

## **Conclusions**

With respect to conservation education in public gardens on which the theme of this Congress is based, conservation is an ethic; it is instilled only by an understanding of the value of the threatened entities or communities. Zoos have worked hard to create wonderfully interactive programmes to teach conservation values and it is no surprise that there is a more natural sympathy for the plight of wild animals than for plants. As plants are the basis for all life and no life endures where plant habitats are demolished our scope is more basic and broader. Yet I believe the challenge for us at this point is to relate global issues to an urban child's experience. We get nowhere by preaching and insisting that it is the child's lot in life to repair the damage done by older generations.

Only when a person understands what she can do in her own life, in her family, her community, her government, does it really make any sense and go beyond "Tsk, tsk, isn't that a shame that we're losing the rain forests." What does it accomplish for a high school student to worry about endangered lemurs in Madagascar when he is eating fish out of the polluted East River? Our strongest position for acting as agents for change is in providing experiences that make people want to know more, care more, pay attention and get involved with conservation issues. We do this best by making it possible for people to fall in love with plants.

*Education and Information Services, Brooklyn Botanic Garden,  
Brooklyn, New York, USA*

## THE ENVIRONMENTAL EDUCATION PROGRAMME OF THE JARDIN BOTANICO CANARIO "VIERA Y CLAVIJO"

### Introduction

The Jardín Botánico Canario "Viera y Clavijo" was founded about 40 years ago as a conservation garden dedicated to the cultivation, study and protection of the local Canarian endemic flora. In the original project for the garden the subject of environmental education was one of the principal themes and although it took a number of years for the garden to become actively involved with this subject, it has now become one of our most important activities.

The garden really became involved in education in the late 1970s when the liberalization of the Spanish education system followed the transition from the old Franco regime to democratic government and decentralization allowed the development of local and regional education programmes.

### Schools education

Our first steps into this field came in answer to the demand from local teachers for information and materials on our local flora and fauna. We started by organizing courses for in-service teachers on these subjects using the garden as a base and as a centre for the practical activities carried out on the courses. These courses were very successful and, in response to the demand, were repeated several times in the first few years.

One of the main results was a large increase in the number of schools and children wanting to visit the garden, so the next stage in the development of our programme was to move one member of staff to the co-ordination of school visits and to act, initially, as a guide.

About the same time, we also set up a small nursery for two purposes, first as an extension exercise to enable us to provide local Canarian plants for school gardens and thus enable teachers who participated in our courses to carry on locally with some of the projects in their own school gardens and, secondly, as a means of teaching children to look after plants directly by planting seeds, potting on, watering, weeding etc. This helped to teach about the requirements of the different types of local plants and habitats, dry-zone succulents, laurel forest species, coastal plants etc. Children are also given access to laboratories where

advanced research goes on but where it is emphasized that very basic knowledge is needed before advanced research can be carried out. The large number of school visits eventually led us to request help from the local education authorities who eventually placed two permanent teachers at our disposal in the garden. This left us with the possibility of using our own staff to promote the extension service side of our education programme and to broaden the spectrum of our activities.

### **Outreach education**

Now we consider taking environmental education into the classroom as much a part of our role as bringing children to visit the garden. We have, therefore, developed a series of travelling exhibitions which are taken regularly to schools all over the island. We have also prepared a number of slide packs with appropriate texts for various levels on several aspects of flora, fauna and general conservation issues etc so that teachers can use them as the basis for their own courses on such subjects. These slide packs are given to schools in exchange for blank film which can then be used to reproduce a new set of slides for another school.

The original project was funded as part of a WWF grant given to the garden for a programme known as "Plantas y Futuro" which covered a wide spectrum of conservation activities from research and rescue of critically endangered species to environmental education and specialist training. Within this project we were able to produce a series of posters on the Canarian flora and fauna which are distributed free to schools, local ecology groups etc. Within the WWF project we also produced a series of leaflets, worksheets, colouring books and other practical materials to be used during visits to the garden and later in the classroom. These materials form the basis of our philosophy of taking environmental issues into the school and into the classroom as part of the normal education system and of not allowing a visit to the garden to be simply a one-off event but to be part of a continuing education process. Two of the posters are associated with our children's Tree Planters Club which encourages children to look after and plant trees in their local school and home environments. The posters have proven to be particularly useful as, if they are attractive enough, they appeal to adults as well as to children and we see them in local shops, hotels and

even bars and this helps to spread the conservation message wider than just the school population.

### **Adult education**

Getting a conservation message through to the adult population is also an important part of conservation education but requires a different approach. Most of our effort in this field goes into either exhibitions at local fiestas, flower shows, trade fairs etc which have a large public audience or by using the garden itself as a shop window for conservation by means of exhibitions and activities in the garden which vary from lectures and seminars on subjects such as culture and environment to concerts in the garden etc. Adult environmental education is an area we are seriously exploring for the future with the development of a new education resource centre in the garden which will serve both adult visitors and children. This will have a large exhibition room and several smaller ones, a classroom/laboratory, audio-visual facilities, an outside patio which can serve as a classroom or a stage for other activities. We are considering building a small open-air amphitheatre in a new area of the garden which is currently under development.

### **Teacher training**

New developments in the education field over the past year or so have included the setting up with the Teacher Training Department of the University of Las Palmas de Gran Canaria of a programme which enables a limited number (5 in 1990, 8 in 1991) of trainee teachers to do part of the classroom contact period of their course in the garden working with visiting school children. The garden offers them an initial course of 15 days on environment, flora and fauna, one month of practical work with visiting children, 2 weeks working on design of education materials, routes for visits etc, using their previous experience of school visits to the garden, and 2 weeks when, with the aid of staff from the garden and the University, they evaluate the results of their experiences.

Another recent development has been to extend our in-service teacher courses to include other environmentally orientated centres on the island of Gran Canaria, such as the Fisheries Technology Centre, the Cabildo Insular estate and traditional farm at Osorio, the Bird Rescue Centre belonging to the Canarian Government's Environment Department etc. In co-operation with these centres we are able to offer a much wider spectrum of education on environmental issues, including such important ones as coastal pollution etc.

## Networking

One of the most useful developments in recent years has been provided by the co-operation network now existing on an international scale between botanic gardens and learning what other people are doing and how they are going about it. The education network set up by Botanic Gardens Conservation International (BGCI) has been particularly helpful in this sense and the garden's education staff have been very pleased with the education packs, ideas, posters etc received from BGCI. We have been able to use many of these to show local people that conservation and environmental education is not just a local issue but one which demands attention on a world scale and that our own programme is part of the world network.

## Conclusion

H G Wells said that "Human history becomes more and more a race between education and catastrophe" - nowhere is this more true than in the environmental crisis we are currently facing and here botanic gardens, the unique interface between people and plants, can be one of the most important vehicles we have for getting the plant conservation message through to the general public and their representatives.

*Jardín Botánico Canario "Viera y Clavijo", Apartado de Correos  
14, Tafira Alta, Las Palmas, Gran Canaria, Islas Canarias, Spain*

## 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 repellant 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 non-scriptus* 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

- Kemp, E E, 1978. United Kingdom: a phytosociological layout for locally endangered species. In: Syngé, H & Townsend, H (Eds), *Survival or Extinction*, 135-139. Bentham - Moxham Trust, Royal Botanic Gardens, Kew.
- Taylor, G, 1968-1969. *Boissieria*, 14-15: 24.

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

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## **AUSTRALIAN BOTANIC GARDENS: A RESOURCE FOR ENVIRONMENTAL EDUCATION**

### **Summary**

As education about the environment increases in significance, Australian botanic gardens are increasingly being viewed as valuable resources. The initiation of a network of botanic gardens educators has already resulted in the sharing of ideas and resources and, with the diverse nature of projects going on in botanic gardens in all parts of Australia, this network will be invaluable.

The network will also provide a means by which education officers can support each other to work towards increased resource allocation for environmental education at all Australian botanic gardens.

### **History**

Botanic gardens were established in most large Australian cities during the second half of the 19th century. They were set out along similar lines to large European gardens with extensive lawns, deciduous trees and beds of annuals, shrubs and herbaceous perennials. Plantings were made from northern hemisphere stock.

This reflected the consciousness of the times which saw European gardens and plants as the ideal and the local native vegetation as unknown and foreign. In fact some gardens have only recently established areas of local native plants. Newer gardens such as the Australian National Botanic Gardens in Canberra, (opened in 1970) and Mt Annan Botanic Gardens in Western Sydney, (opened 1985) contain Australian native plants only, as do some of the smaller recent provincial gardens.

This trend demonstrates a growing understanding and appreciation of our native flora. We value our Australian plant heritage - it is so different from the soft, bright greens of Europe.

### **Education**

In Australia today botanic gardens are experiencing a reduction in resources and, while education is a stated objective, educators often work alone with little support. They sometimes also have other

responsibilities such as supervising rangers, volunteers, and friends' organizations. Recently attempts have been made to set up a national network of botanic gardens educators for mutual support.

In a number of gardens the principal of "user pays" is being introduced. This may include the payment of entrance fees and charges made for materials and services provided by the education officer. This, combined with rising unemployment, is likely to see reduced numbers of students visiting gardens - particularly those from economically disadvantaged areas.

Professional development courses help to meet the needs of local students and teachers. They provide ideas for teachers on ways to integrate their classroom work into activities in the botanic gardens. In the long term such courses also free the education officer to prepare better quality written materials and to have more contact with groups from further afield.

Some gardens provide venues for schools to conduct staff meetings. At these meetings the education officer presents ideas for activities which can be integrated into the broader environmental education curriculum.

### **Environmental problems in Australia**

Land degradation is a serious environmental problem in Australia. It may involve wind or water erosion, salinization and acidification. Such habitat destruction leads to loss of biological diversity and in some cases extinction of species. At least 100 plant species and 20 mammal species have become extinct since Europeans arrived in Australia. Awareness of the damage done to the fragile Australian environment in the first 200 years of European settlement has led to the formation of several agencies whose programmes aim to prevent further damage. These include the Save the Bush programme, Greening Australia, Landcare and local revegetation groups. With some 52% of our agricultural and pastoral lands in need of reclamation, it is now accepted that trees and shrubs are essential for healthy, productive land.

The Save the Bush programme is primarily concerned with the maintenance of biological diversity. Many species of Australian plants

and animals are not conserved within National Parks and Reserves - they exist in small rural and urban areas of remnant native vegetation - along railway lines, stock routes, roadside verges and in cemeteries and school grounds. The Save the Bush programme provides funding for local groups to investigate, protect and manage native vegetation.

Greening Australia is a national community organization dedicated to helping all Australians conserve and establish trees and associated vegetation. Greening Australia is administering the One Billion Trees Project announced by the Commonwealth Government in 1989. This project aims to have one billion trees planted by the year 2000 and in the process hopes to engender a tree and landcare ethic in the community.

They aim to ensure that the value of trees and vegetative cover is understood; growing and caring for trees becomes a way of life, and the practice of indiscriminate removal of vegetation becomes a thing of the past.

### **Botanic gardens and environmental education**

Since environmental education is fast becoming a basic requirement at all levels in Australian school curricula, more and more educationalists are seeing botanic gardens as useful resources. Education of the young must be one of the long term answers to our environmental problems.

Botanic gardens can provide an ideal venue for encouraging positive attitudes about conservation and the environment. This will help to ensure that remaining native habitats, whether remnant or extensive, will be retained and many cleared areas will be revegetated.

At the Royal Tasmanian Botanical Gardens in Hobart, the education officer has developed a number of programmes which provide opportunities for personal action by school students and adults. Some of these activities are undertaken at the botanic gardens, some within schools and others in the wider community.

One project involves students in a series of activities which begins with a visit to the gardens, includes a field trip to collect seeds, then sessions on propagation techniques and finally the planting out of propagated material.

At the Royal Melbourne Botanic Gardens upper primary students can take part in Earth Education programmes - Earth Caretakers and Earth Secrets - with the Gardens' education officer.

These are environmental programmes which encourage students to understand, enjoy and live in harmony with the natural world. These programmes have been designed and developed by the Institute for Earth Education. Students learn basic ecological concepts and in the process develop a caring attitude to the environment. To ensure the success of this programme teachers are expected to attend in-service sessions which suggest pre-excursion and follow-up activities. These in-services sessions provide background information about current environmental problems, assistance with the development of a unit of study ideas for improving teaching skills as well as a list of resources.

### **Teaching about the importance of the eucalypt**

The gum (or Eucalyptus) tree represents the Australian landscape more than any other plant. There are about 600 species and they grow over much of the continent, from alpine to arid areas. They show many interesting adaptations to Australian environments, notably their adaptation to bushfires. They are amongst the world's finest honey plants and their hardwood timber has many uses.

A series of activities can be undertaken in botanic gardens where a variety of eucalypt species are grown to help students to get to know these plants, as well as to understand their importance in many Australian ecosystems. Some activities are, for example, making rubbings of different bark patterns, crushing and smelling their leaves, holding leaves up to the light to see the tiny oil containing pores, making spatter prints of leaves, exploring the trees while blindfold, hugging them and gently feeling their textures, observing the animals which live on or visit the tree.

An important part of these activities is for participants to look upon gum trees as home and food for many animals. In spring several parrot families may be seen nesting in the hollows of just one tree. Small possums, such as sugar gliders, also nest in the hollows, so do owls and smaller animals, including reptiles and insects. The tree provides food

for many animals. For example, insects eat the leaves, bore into the wood and feed on the nectar and pollen. Large mammals such as koalas and gliders also eat the leaves. Some smaller animals seek nectar from their flowers, as do a large number of different birds. Thus a gum tree provides a perfect example of the interdependence of plants and animals. Drawing and creative writing can be an effective means to enable students to express their attitudes to and understanding of the environment. Lying on the ground beneath a gum tree can be an inspiration.

Plant propagation can be a useful extension of the eucalypt study activities. Teachers can learn propagation techniques at the botanic gardens, then conduct classes using the facilities of the gardens. Involvement of students in the entire process from collection and cleaning of seeds to the planting out and care of the young trees gives them a sense of owning the project. In some schools this is being extended to students designing and planting their school gardens.

Educators from a number of the major botanic gardens are actively involved in the planning of school gardens. In recent years the clear felling of old growth eucalypt forests for wood chip has become a controversial issue in Australia. Whilst the re-growth forests have a superficially attractive appearance they inevitably lack the diversity of flora and fauna of the old growth forests. For example, 80% of all marsupials in the forests of south eastern Australia require the hollows of old gum trees for their homes. So programmes that help students to learn about eucalypts are extremely relevant to current environmental issues.

Environmental education in botanic gardens can give new power to young people by giving them skills and ideas for strategies for doing something constructive for the environment. The gardens can provide the materials to propagate and the venue to see how a variety of plants grow. As well as that, they can provide the opportunity for people to learn about particular plants suitable for their areas. Children can have an investment in the project, making decisions as to which plants to grow. Schools are encouraged to plant local species so that the plants will have a greater chance of survival.

## **Use of Australian plants by Aboriginal people**

This is an area of special interest to many. Trails enable people to learn about the uses Aboriginal people have made of plants. Aboriginal cultures and their relationships with the environment are being studied in many schools and students can extend this study at botanic gardens. Some gardens also have collections of Aboriginal tools and utensils, eg. woomeras (spear throwers), coolamons (wooden dishes), grinding stones, boomerangs (returning sticks), shields and didgeridoos (musical instruments). These materials help students understand the importance of plants to Aboriginal cultures.

## **Special facilities for people with disabilities in botanic gardens**

All gardens encourage participation by people with disabilities and many have special trails, eg. for people with poor vision and people in wheelchairs. Two Australian botanic gardens, the Royal Tasmanian Botanical Gardens, Hobart and the Australian National Botanic Gardens in Canberra, have horticultural therapy centres. In 1982, the Banksia Centre opened at the Australian National Botanic Gardens.

### **The Banksia Centre**

This Centre has a garden made up of alcoves of coloured, scented, textured and bird-attracting Australian plants. There is also an area of raised beds which allows access for disabled people so they can practice horticultural techniques, standing, sitting or kneeling.

Programmes at the Banksia Centre are designed to achieve broad educational, vocational, recreational and rehabilitation goals. They include a vocational training programme which offers places for about 10 physically and intellectually disabled students aged from 18 to 20 years. In 1990, they propagated 10,000 annuals (native paper daisies). These were grown from seed, much of it having been collected and cleaned from plants grown the previous season. The seedlings were potted on, cared for and planted out in prepared sections of the gardens using specially adapted tools. Appropriate signs tell visitors about the

programme and the input of the students. These young people spend 6 hours at the Gardens each week and the programme is set up to help them develop skills which may enable them to continue horticultural pursuits in their work or leisure. The flowers from these plants are cut and stored and along with the fruits (seed capsules and pods) of many other plants they are used in a wide variety of craft activities which are enjoyed by clients with disabilities as well as other student groups.

Another programme in which people with disabilities are involved is the propagation of local plant species for revegetation projects. Students visit sites on the hills and open spaces around the city to collect seed and inspect the plants. Then they clean the seed, sow it, pot up the seedlings and participate with local community groups in planting them out.

This year a pilot project will involve large scale propagation of native shrubs and herbs, some of which are quite difficult to grow. This enterprise aims to become self supporting, with the plants being sold through Greening Australia.

Other activities at the Banksia Centre assist the frail, the aged and people undergoing rehabilitation to help maintain their own home gardens.

*Australian National Botanic Gardens, GPO Box 1777,  
Canberra, ACT 2601, Australia*

## THE ROLE OF PUBLIC INFORMATION AND EDUCATION IN PROMOTING THE IMPORTANCE OF NATURE

### - a responsibility of botanic gardens

#### Summary

This paper illustrates some of the educational and public information programmes that are carried out at the Botanic Garden of the Institute of Biology of the National Autonomous University of Mexico. Important aspects required for planning programmes as well as ideas on how to organize workshops are summarized. One of the main objectives of these activities is to motivate people about the importance of conserving nature as our cultural heritage.

#### Introduction

Today scientific education is necessary to understand the ecological basis of our existence and the steps that we will need to take in order to improve to improve the quality of our lives (Raven & Johnson, 1986). The implementation of this idea produces complicated results.

In developing countries such as Mexico we have to ask ourselves some questions before we design an educational programme related to nature. In order to optimize the results we need to consider the following questions: At what level can we educate the public so that they are more conscious of the importance of the environment? Who is going to be responsible for making this decision? Is our educational system designed to accomplish this challenge? What institutions are going to participate in this programme in addition to those of the conventional system of education?

All these questions are urgent and need to be answered now because of the human-generated deterioration of nature. It is imperative that we solve these problems right now, especially in developing countries where the population is increasing rapidly.

Botanic gardens always have played an important role in education and dissemination of public information concerning plants. There are several examples where gardens have developed complex programmes for the conservation of nature. One example is the programme at the Jardín Botánico Canario, Viera y Clavijo in Las Palmas de Gran Canaria

where biologists, lawyers and architects acting together have rescued areas with endangered species (Willison, in press). Other examples are the programmes that have been developed in two USA. gardens, the New York Botanic Garden and the Missouri Botanic Garden. Each year they show different aspects of the importance of nature. Other exemplary programmes related to desert plants are those developed by the Desert Botanic Garden in Phoenix and the of Arizona-Sonoran Desert Museum, both in Arizona, USA.

In Mexico, we have several gardens that have an educational programme and now there is a growing interest in increasing the scope of the themes covered by them. The Mexican reality demands more action, and the community in general is interested in fields related to the conservation of nature. Mexican botanic gardens have developed courses, lectures, workshops, guided tours, and varied research programmes. We have planted the seed that will bear fruit in the future.

Our educational programmes have been constantly improving, Nevertheless, the current necessities demand more attention. Moore (1974) mentions that the botanic gardens in the future must have a responsibility for public education. Frankel and Soule (1981) draw

attention to the opportunity that botanic gardens have to teach young and old people who visit the garden, about the problems that exist today, such as the endangerment of the plant species. The time is right when botanic gardens must work with teachers of public education at all levels, especially from elementary



*Medical doctors analyzing and learning botanical aspects of medicinal plants*

school to high school, to enrich public knowledge about nature. Those children will be the adults of the future, and it is important that they realize the plants and animals are a very important part of their cultural inheritance, that our ancestors cultivated and amplified (Linares, 1985).

We know that trying to convince people about an idea, a concept, or new theories is not easy. It takes continuous effort. It is not enough to organize isolated programmes; they need to be repeated again and again. The proven experiences should be repeated as long as we know that the message is reaching a larger public.

### **The Mexican background**

Mexico is a multicultural country where several ethnic groups live in the same region. For that reason we have to work with all of them at the same time, in order to accomplish the goal of the conservation of our resources for future generations.

Another distinctive characteristic of Mexico is that most of the population live in cities. Mexico City alone has about twenty million inhabitants. The total population of the country is around eighty million people. In 1980 there were six million children under fifteen years of age (INEGI, 1980).

Promoting a message about the importance of environmental conservation is a high priority for a developing country such as Mexico. We must make an effort to increase awareness about the problems that are threatening ecosystems now, such as pollution, the over-collection of species and the over-exploitation of our forests. If we wait too long, it will be too late to organize conservation action for resources that have disappeared.

Since the creation of the Botanic Garden of the Institute of Biology of the National Autonomous University of Mexico (UNAM) 32 years ago, education and public information in the field of botany have been part of its fundamental objectives. Nevertheless, only in 1981 was its Department of Education formally organized and charged with managing all the activities related to the public. The philosophy in the UNAM's Garden has always been to distribute the results of its research

programmes and to focus on several aspects that are important to our country. We believe that in this way we can create a public sensitive to the importance of plants and of nature. Up to the present time we have organized public lectures, workshops, symposia and congresses, as well as other events for various sections of the public. We have worked with illiterate people, students, as well as housewives, children of several age groups, biologists, medical doctors, botanists and others for whom specific programmes have been developed.

For instance, if we want to create awareness about the importance of protecting the forest, we must work with woodcutters, plant collectors, farmers, rural communities, lawyers and the governmental officers and other people who are associated with problems that now are facing the forest.

We have found that the techniques and elements we have developed for our programmes can be applied to other fields of botany, making some modifications according to the objective and the public to whom we are speaking.

The main objective of this paper therefore, is to point out some ideas on the organization and application of programmes that can be useful in the field of biological education of biology and especially in the conservation of nature in countries similar to Mexico. We hope that our experience can be adapted and applied in other regions.

### **Important factors in designing an educational programme**

Based upon our seventeen years of experience, we have found that in Mexico, people are interested in every topic related to nature. We believe that it is important to consider the following points before planning a programme;

- the section of public to be reached
- the focus of the problem or subject
- the choice of didactic technique most suitable and accessible (games, corporal expression, television programmes, radio, printed material, etc.
- the obtaining of advice from the specialists in the field of study

- the outline of the programme to be used
- the choice of an appropriate schedule for the target audience
- the advertisement of the programme.

In the UNAM Botanic Garden we have carefully considered each of these aspects which have resulted in successful programmes.



### **Who must be included in the programmes?**

*As part of the children's Medicinal Plant workshop we take them to the market to learn about the most important plants*

This is an important aspect that has to be analyzed before the initiation of every programme. Generally educational programmes are expensive and one mistake could be very costly. Sometimes, if this question is not answered on time, it could cause the failure of the programme.

The programme must be aimed at people who:

- have the opportunity to take some action in the field of interest under study
- are going to gain advantage from the programme
- can multiply the information they have gained
- will appreciate and better understand the major themes.

Actually in a country like Mexico, it is urgent to design programmes for teachers from elementary school to high school who are working with a large number of students. The botanic gardens in Mexico are very few and personnel working in the educational field are even fewer. That is why direct actions oriented toward a public sector that can not multiply and spread their experience would have a limited impact. We do not

want to imply that courses of limited focus are not useful, but we want to emphasize the importance that our effort should address a larger public.

In the UNAM Botanic Garden now we are working mainly with children from elementary and high schools, as well as with groups with special interests. Recently we have implemented programmes for teachers and personnel from other botanic gardens so that they can take advantage of the techniques we have developed and the knowledge from our programmes, and we are repeating our programmes in other Mexican botanic gardens. We are currently organizing a group of volunteers who have been participating in the different activities of the garden. We hope in the future these volunteers can multiply their experiences by sharing what they have learned with new groups.

### **Educational experiences carried out in the UNAM Botanic Garden**

In addition to the daily work undertaken at the botanic garden, such as guided tours and attending to the general visiting public, we organize a series of workshops of one or two days in length where we cover specific areas such as: "Know the grasses", "Know the orchids", "Know the agaves", "Know the aquatic plants", "Know the plants used to make handicrafts", "Know the medicinal plants", "Know some plants uses as natural dyes", "Know the seeds used to make handicrafts", amongst others. Normally participants know little about each of the subjects under study and these workshops give them much new additional information. If they participate in more than one workshop they will gain complementary information about several aspects of the sametheme.

These workshops have been planned at several levels. For instance, the medicinal plants programme has been presented to specialized healers (some of whom are illiterate) who normally use the medicinal plants empirically, but have little knowledge of the botany of the plants they use. A similar workshop on medicinal plants was organized for housewives and another for nurses and doctors from the United States who are working with immigrant Mexican labourers. Also, this workshop has been presented to holistic doctors, children and biologists.

The key has been to choose the different aspects that could interest those particular groups. Specific examples have been modified according to each group focus. For instance, in the case of the healers we use plants from their local areas in order to motivate them to know more about the plants that they use. In the case of the children, we choose plants that are not poisonous and can be used without any problems. In the case of the housewives we demonstrate plants that are used normally as home remedies, and so on.

The people who work with the Department of Education in these programmes are academic members of staff who carry out research in the botanic garden or in the Institute of Biology. Others are, for example, researchers from other Mexican institutions or from other countries. However, we insist that the instructor be a specialist in each field and we always provide support.

One aspect that we think has been the key of our success is that we always include a practical activity where the participants can touch the material, smell it or, if that is possible, eat parts of the plants. Those activities help participants to feel familiar with the plants and with the garden environment, and will encourage them to return to the botanic garden on further occasions.

Another fundamental aspect of our programme is that we link every activity with our living plant collections. We normally include a guided tour as part of the course so that the participants can recognize the particular features that had only been mentioned in theory while using



*Housewives identifying the common medicinal plants by smelling*

the living plants from the garden. One example to illustrate this is from the workshop "Know the agaves". In the beginning, participants gain a theoretical introduction to this plant group which includes botanical information of the family and its genera. Audio-visual material and written information are always used which include mention of ethnobotanical aspects relevant to our culture. Later, the teacher demonstrates a series of products made from agaves, and the students can taste them. After those activities they visit our living collection of agaves where they can see a sample of the variety of agaves that grow in Mexico. These workshops have had very productive results and are being continued as an ongoing programme.

Our "Golden Rules" for these programmes have been as follows:

1. be as well organized as possible
2. be punctual (in Mexico that is unusual)
3. include in the workshop everything offered beforehand
4. maintain the instruction area clean and comfortable
5. provide written information that the students can use in the future
6. be courteous to the participants so that they feel at home and that they are invited to come back again.

This last recommendation is obvious in most cases. Even though sometimes we might overlook some minor points, we realize that they affect the reputation of our Institution.

## **Conclusions**

The most important aspect in the field of education and public information is that we, the educators, have to teach the truth in the most attractive way possible. It is important to know how to create attractive material to call attention to even the most arid subjects.

Today the botanic garden plays a fundamental role in the field of conservation, by motivating people and creating interest in nature and its protection. In this way educators and teachers can go to the botanic gardens with their ideas and look for more information. Together their efforts can have a multiplying and far reaching effect.

Unfortunately, in Mexico the programmes that are used in elementary and secondary level teaching need improvement with regard to their content in the field of nature conservation. That is the reason why the programmes carried out in other institutions such as botanic gardens are complementary. In the garden we can prepare teachers who work directly with students and in this way they can motivate the students and encourage them to share their knowledge about conservation. If we work today to conserve nature, we will have a better world for the future.

## Bibliography

- INEGI, 1984. *Censo General de Población y Vivienda*. México D F
- Frankel, O H, Soule, M E, 1981. *Conservation and Evolution*. pp. 169. Cambridge University Press, Cambridge.
- Linares, E, 1985. La Difusión y la Educación, Objetivos fundamentales de los Jardines Botánicos. *Memorias de la Primera Reunión Nacional de Jardines Botánicos*. pp. 92-102. Secretaría de Desarrollo Urbano y Ecología y Asociación Mexicana de Jardines Botánicos, México D F
- Moore, J K, 1974. Botanic gardens and arboreta. In: Radford, A E *et al*. *Vascular Plant Systematics*, pp 775-790. Harper & Row Publishers, New York.
- Raven, P H, Johnson, G B, 1986. *Biology*. pp. 1195. Times Mirror/Mosby College Publ, St Louis.
- Willison, J, in press. La Educación en los Jardines Botánicos es la Raíz Misma de la Conservación. Instituto de Biología, Universidad Nacional Autónoma de México, México D F

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*Jardín Botánico, Instituto de Biología, de la Universidad Nacional Autónoma de México, Apdo. Post. 70-614, 04510 México DF, Mexico*

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## **PART THREE**

# **Practical Workshops**

## THE SCENT TRAIL

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### Introduction

One of the most successful activities of recent years at the Utrecht Botanic Gardens has been the Scent Trail. It was also one of the first examples of a project set up in close co-operation with an external organization, an interlink project. The scent trail was part of the festival Scent and Smell, a project initiated by the bureau Explorama. During the summer of 1990, Explorama organized a series of events; a play, an exhibition at the University Museum and various symposia as a way of interesting the general public in science. The bureau supported the Gardens by providing leaflets and with advertising. Their contacts with organizations outside the university had a very positive effect on the Trail and in particular their media contacts were very effective.

### Developing the trail

The trail consisted of a set of two different routes. The first route through the Garden could be followed by each individual visitor. Signs at intervals, near several plants provided information on the type of scent, its use and origin. The second part of the trail was a guided tour. The guides received training which enabled them to answer most, if not all, of the questions about the role of scent in the plant kingdom. The tours were held in the evening, starting at 19.00 hours.

The scent trail presentation answered the following questions:

- what is the basic philosophy to this kind of activity?
- how can such an activity be implemented?
- do we have the right plants?
- do we have enough guides?
- what kind of signs do we use?
- how should we promote such an activity?

### Basic philosophy of the Trail

Initially the Gardens were asked to provide fragrant plants for the exhibition. If we had restricted ourselves to this, then we would have been little more than a flower shop, which we did not want. We chose to work within several limits, partly because of practical reasons, partly

out of principle:

- the trail had to be "on-site"
- all plants would remain in their normal locations in the Gardens
- every plant used would illustrate something
- every story had to be directly related to the plant
- visitors had to be able to smell (or see) what the guides were talking about
- the trail had to invite people to actively participate.

## Organization

The main problems we found in organizing the trails were:

- Which plants to use.  
The total collection of the Garden is large, but not all plants are accessible and in some periods many plants do not have flowers.
- The short preparation time.  
The first contact was on April 12th, the idea appeared on May 22th and the first tour took place on June 21th. This gave use four weeks to do the research, instruct the guides, produce information panels and organize the publicity.
- How to anticipate the number of visitors per evening.

## The plants

We have one of the few systematic gardens in The Netherlands. It contains many different species of plants from many different families, which gave us a wide choice of suitable plants concentrated in one part of the garden. This was very important because we could not, and did not want to, adjust any part of the garden in such a short time. It enabled us to present a scent trail of approximately 1½ hours. Control of the duration was important because the trails did not start until the evening at 19.00 hours. Visitors start to lose interest after 1½ hours and tend to wander off into the Gardens. Normally this is no problem but in the evening we wanted to prevent people getting trapped inside the Gardens! The restriction did mean that other parts of the Gardens were hardly accessible. An unexpected side-effect was that sometimes the systematic garden appeared overcrowded. However, we were able to

make practical use of the Rock Garden and although it does not contain many fragrant plants, it did give us the opportunity to by-pass possibly overcrowded areas. It also is one of the most beautiful parts of our gardens.

### **Preparation time**

To organize such an activity in only four weeks is difficult. We had to organize the work in different parts: advertising, research, guide-instructions, making the signs. A scent trail of 1½ hours can include approximately 10 plants. We first chose a small number of plants and then instructed the guides. This does not take too much time. For a number of plants we made signs. Together with a map these signs enabled visitors to enjoy the trail without using a guided tour (@1,500 of the maps were used) The signs were effective landmarks for our guides. New plants were added to the tour and for each new plant, instruction-leaflets were issued and given to the guides.

This arrangement enabled us to work on the trail for more than two months. We asked our regular guides to co-operate in the scent trail and nearly all of them were prepared to lead some extra tours in the evenings. We also recruited and instructed several extra guides, especially for the evenings.

### **Visitor-numbers**

One of the major problems of the tours is the number of visitors and the number of guides needed. As we were not able to sell tickets in advance or make reservations, the number of visitors could not be checked effectively. The number of visitors can be influenced by the amount of publicity. The first wave of publicity was taken care of by "Explorama" who incorporated the trail in their publicity for the festival. At first this was not very effective. Following a week of very poor attendance, the Gardens advertised once in several local papers which resulted in an increase in numbers of visitors. Initially we received approximately 30-40 but this steadily increased until over 80. The increase was due to word-of-mouth advertising and very good weather. Only three guides were available each evening. When over 60 visitors were received by the Gardens this became a slight problem as guiding tours of over 20 persons is not very easy, particularly if the guides need to show several

details of the plants. However, a self-regulating mechanism took control, visitors either decided to come back another evening or to use our alternative, the non-guided walk (described above).

## **Evaluation**

Several points need to be taken into account:

- The preparation needed to have been longer.  
This would have given us more time to think out the programme more carefully. Rushing tends to make people nervous, limiting the amount of research and leaving several questions unanswered. Generally this is not a problem as nearly everything a guide relates is new to most visitors and they also do not mind if the guide does not know everything.
- The large number of guided tours, over 100, placed a heavy burden on the 23 guides, especially as these were extra tours - our standard-tours had to be guided too.

An important detail is that the number of guided tours rose during 1990. The trail took place during the summer, at which time many people (including guides) are on holiday. We did manage to train extra guides, but one should be aware of not asking too much from voluntary guides.

## **The keys to success**

The success of the trail could not be put down solely to the special opening-hours of the gardens. Important factors included:

- The use of a familiar subject.  
Nearly everyone can detect the special scent of a plant.
- The theme was consistent with the basic work of the botanic gardens.  
The difference between most gardens and our university botanic garden is that we support research. We try to make scientific data available to the general public. We do not only show plants but we also give details about the function of the things people see.
- People were able to feel, touch and smell the plants.  
This was probably the most important factor. The Gardens have to

compete with television programmes on plant and animal lives but although the television can give excellent pictures, it cannot supply scent or touch and this is our advantage

- The trail gave the visitors surprising explanations for familiar phenomena.  
People tend to think that whatever smells nice has to be nice. They very rarely realise that secondary plant metabolism is often used as a defensive mechanism. For instance, cumarine (the smell of fresh hay), is very poisonous.
- The fact that we did everything ourselves.  
We made our own signs, our leaflets were designed to be photocopied on our own machine etc. This gave the organization much flexibility. As soon as we noticed a change (e.g. a plant lost its flowers) we were able to react. It also reduced the costs. The decision to do everything ourselves forced us to keep the project comparably simple. Combined with the desire to be correct, it produced an elegant project which was very attractive to many people. It is something they still talk about.

## **Conclusion**

We are very satisfied with the evening-tours. It takes some extra work but it is worth it. They can be as expensive as you want them to be and in return provide the Gardens with good publicity. Linking the Garden with activities outside the garden is useful as it attracts visitors who do not usually visit the Gardens.

The Scent trail had such a positive effect that we decided to use the same formula for a new tour. The subject is "Plantlore" which explores different kinds of folkstories all about plants.

*Utrecht Botanic Gardens, Harvardlaan 2, Postbus 80.162, 3508  
TD Utrecht, The Netherlands.*

## YOU CAN TASTE WHERE IT COMES FROM

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### Introduction

This programme was set up in cooperation with "Junior Science Week" (Wetenschapsweek junior), an organization which brings children aged 11/12 years in contact with science. The organization selects primary schools and scientific institutions and brings them into contact with each other. Together, the school and the institute design a programme which will give young children an introduction to science.

### History

Junior Science Week is an initiative of Utrecht University. It has its roots in the National Science Week, a programme aimed at 15 to 16 year old children which was also started at Utrecht University. Junior Science Week incorporates all scientific disciplines and this includes languages, history and social studies. It was started in 1989.

### Programme organization

All programmes have the same main structure. Beginning with the school and scientific institute meeting, participants are introduced to each other and the meeting is used to exchange ideas and make a first selection. A few weeks later a choice is made. The teacher plays a major part in the programme as at least two-thirds of the programme takes place at school. The children spend only one morning in the institute which serves as a spectacular end to the programme. Using the knowledge they have acquired throughout the programme in school, the children use the time in the institute for something special, which can vary from a press-conference, to a lecture, to an audience of university staff.

### Why participate?

This may seem an unusual question. At our botanic gardens the emphasis is on adult education and this has an historical background. Until 1989, our Gardens were open to the general public, but there was hardly any active support. The gates were opened when the first gardener appeared and closed when the last one left and the few leaflets

we had were made by the gardeners in their own spare time. The first job of the education officers (all volunteers at the time) was to update these leaflets and to start a campaign to improve our public relations. This has been done by using our regular visitors as target-group.

The development of education asked for a widening of our target-groups. The University rarely actively supports working with children, so by using Junior Science Week, which is a university initiative, the Gardens were able to take advantage of the occasion to develop programmes for children.

### **The theme**

In 1990 during Junior Science Week the Gardens faced a special challenge. Out of the 24 children in the class we received, only one was Dutch. The other children came from three ethnic groups. The majority were from Turkey, several were from Morocco and one was from Surinam.

The Gardens' task was to find a subject that would be attractive to all children. The origin of food was our first choice. It is something very familiar and yet strange. Not many children wonder where their food comes from or about the difference in diet between countries.

This gave us the opportunity to tell something about the origin of food, and the different parts of plants which are used as food (leaves, stems, bulbs etc.).

Several factors needed to be taken into account with the design of the programme:

- Many of the children were behind in their Dutch language development. At school, all lessons are given in Dutch, but at home and on the street the children use their own language, as such their vocabulary was limited.
- Diets vary a lot between different cultures. Comparison of Turkish and Moroccan diet for instance can reveal striking similarities and all kinds of differences.

The language problem was the most easy to solve. The children learnt botanical Dutch and if the teacher noticed any problems, she asked us

for the solutions. Much could be done with simple drawings of plants, accompanied by a list of terms.

The choice of the theme "You can taste where it comes from" proved to be very convenient. Food is something everyone needs and is in contact with every day. It is also something most children in our society take for granted. Hardly any child wonders what he or she is eating and where it comes from. The element of surprise is not in the subject but in the questions.

The programme at our Gardens did not confront them with major problems. Many preparations were made at school and the children received classes in their school gardens. They kept record of the things they ate during one week which was evaluated at school and which helped to give them the knowledge they needed during their visit to the Gardens. At the Gardens they prepared a meal with courses from each of their home-countries.

The children were divided into ethnic groups, each preparing parts of the meal. The ingredients were provided by us. The children sorted the ingredients to see which parts of the plants each course contained.

Occasional waiting time was filled with a task in the tropical greenhouse, for example looking for several food-plants (bananas, cocoa, vanilla etc.) and answering questions on the origin of the plants, parts used as food, etc. A large map of the world was used to indicate the origin of the food-plants. On this map the children also indicated the origin of the ingredients they used in their meal. Dinner was served on specially prepared tables. Photographs of the home-countries gave each table a special touch. The children wandered from table to table to try each other's cooking.

## **Evaluation**

A programme like this is quite unusual in our Gardens as we do not work with young children very often. The result was that we are more confident about the possibilities of working with children than before. It is fun and it gave us materials with which to develop a school-programme without too much trouble.

The programme has been very successful. The large amount of preparation time at school gave the children a good grounding for their visit. They were able to come to the Gardens without having to learn too much. For many of the children this was one of the few times that they left their own street. Weeks later their teacher informed us that the children were still talking about the event and remembered it as something very pleasant.

*Utrecht Botanic Gardens, Harvardlaan 2, Postbus 80.162, 3508  
TD Utrecht, The Netherlands*

## THE SCULPTURE TRAIL

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### Introduction

Sculptures are a well-known addition to gardens. A sculpture can turn a somewhat feature-less lawn into something exciting. In this way it makes gardens more attractive to both art and plant lovers. An art-exhibition is something different. It takes careful examination of the sculptures and the gardens to arrive at an attractive exhibition.

The sculpture trail at Utrecht Botanic Gardens has been the result of careful and close co-operation between the organizing foundation "Arte Facto" and the garden-staff. Several questions had to be answered such as, what kind of sculptures? how many? where? etc. This paper explains how we answered these questions.

### The trail

The initiative for this exhibition was taken by one of our staff-members, Mr Nieuman. It was supported by nearly everyone as a means of promoting the Gardens and maybe obtaining an interesting piece of art as a result! We could not do it ourselves as we did not have the experience nor the time. So we contacted a foundation which organizes exhibitions in Amsterdam and through them we were contacted by a foundation called "Arte Facto" who organizes exhibitions for artists in Utrecht. This contact led to the actual "Sculpture Trail" we now show.

### What kind of sculptures?

This was a question which was difficult to answer. We wanted the exhibits to be made specially for the occasion. A jury was set up that would select a number of drafts.

Several restrictions were made; the sculptures should not alter the gardens irreversibly or make access to the plants impossible and the Rock Garden would be kept out of the exhibition. This enabled the artists to make their own design for whatever place they desired. The number of sculptures was set at a maximum of 25 and was an estimate based on the area of the Gardens and on the precondition that each sculpture would have enough space. Eventually 17 designs were approved and 16 were realised.

### **Where did we want the sculptures?**

The only part of the Gardens which we considered a restricted area, was the Rock Garden. Any sculpture would have disrupted the view. The artists designed their sculptures for specific spots in the Gardens and at times we were surprised by them choosing locations as far away as possible from any botanically interesting features! It was good for the artists to have a lot of freedom as they were able to work on blending their work into the Gardens.

For example, the picture opposite shows a structure, which from certain angles looks solid and closed. A closer look reveals that it is very open and that it reflects its surroundings. This sculpture was placed at the edge of the Fort, overlooking the moat. It reflects the impression the botanic gardens made on the artist, Egon Kuchlein.

The picture on the next page shows work by Anne-Marie van Sprang. She was inspired by the scientific work carried out in the greenhouses and made a group of lenses allowing visitors to have a closer look at the plants - so they could do their own research!

### **Extra activities**

Arte Facto saw one problem in the long term exhibition. The media often pay attention to the opening of an event and then loose interest. After a few weeks the exhibition then loses its "news-value". To prevent this several activities were organized.

- **weekend-walks**

These were guided tours along the "sculpture-trail" held every Saturday and Sunday at 11.00 and 14.00 hours.

The publicity value of this is that news about the trail is spread through word-of mouth, which is often a very good means of attracting new visitors. Also visitors who come during weekdays are motivated to return during a weekend to join a guided tour.

- **activities for children**

Two weekends were chosen as special "children's weekends". On Saturday, children were invited to come to the Gardens to make their own sculpture. This was carried out in the adjacent "Environment -

monitor", an agricultural area maintained by our staff. Here children were able to build their own art using materials found in the area.

## **Publicity**

Our intention was to use the sculptures to attract public attention to the Gardens. It worked very well and the exhibition was highlighted in





many magazines and newspapers. To prevent the newspapers giving a wrong image of our Gardens, we took some precautions. Together with "Arte Facto" we agreed on a well defined message for the media. For us promotion of the Gardens was important and for Arte Facto, the sculptures were the prime subject. The publicity-campaign was left to Arte Facto and they were free to advertise in any newspaper or magazine they thought appropriate. This could have been a risk as they target different audiences to the Gardens. To prevent confusion we agreed on a type of message.

We told our contacts that we are a large botanic garden with an interesting collection in a beautiful setting and that we were hosts to a

sculpture exhibition. Arte Facto emphasized that the sculptures were inspired by the work and lay-out of the Botanic Gardens.

## **Evaluation**

The exhibition is not yet over, so a full evaluation is not possible. However, several remarks can be made. There is a distinct increase in the number of visitors to the Gardens. Visitors are not asked whether they come to see the Gardens or the sculptures so it is difficult to estimate the actual number of extra visitors. However, as this year is the first year that the Gardens are open on Sunday, the increase in visitors cannot be attributed to the art-exhibition alone. Possibly we will know next year if there is a decrease in visitor-numbers.

Visitor reactions were diverse. At the information-desk near the entrance a book was placed in which visitors could write their reactions to the sculptures. Most comments were positive, both on the sculptures and on the Gardens. During a guided tour, some plant-lovers who knew the Gardens were explicit in their disapproval but fortunately these people are the exceptions. In general, the sculpture trail has had a positive effect. We wanted to reach a broad audience and new target-groups, which we achieved. Many visitors told us that they did not know the Gardens and that they will certainly come again. The percentage of younger visitors also seems to have risen.

## **Conclusion**

It is important to recognise that we could never have done this ourselves. The people of Arte Facto were able to invest much more time than we would ever have been able to, they also had the experience to investigate the best media for promoting the exhibition. The sculpture-trail was an experiment and, although we will not hold one each year, the results have definitely encouraged us to try out these types of ventures more often.

*Utrecht Botanic Gardens, Harvardlaan 2, Postbus 80.162, 3508  
TD Utrecht, The Netherlands*

## KUMQUAT IN MOTION

### changing dietary habits in Limburg in relation to a changing environment

#### Summary

The "Kumquat in Motion" project uses a new approach and demonstrates that even with few personnel, a low budget and a small garden, interesting environmental projects can be set up.

#### Introduction

The Botanic Garden of Kerkrade is a private garden, not linked to a university and subsidised by the local authorities. The garden has an educational service which shares responsibility for the promotion of the garden and supporting nature and environmental education in schools.

At primary school level, lessons about nature are essential. They form the basis for nature education, environmental education and health education.

Professor Johann Galtung from Oslo, a contemporary philosopher involved with questions of peace, security and environment, has distinguished four systems in which a human being functions and carries out his or her responsibilities.

- Me and myself. In particular my own body and my responsibility for my own health and lifestyle.
- Me and my direct environment. Including my responsibility for my family and other people depending on me.
- Me and my fellow human beings. My responsibility for fellow human beings determines my social behaviour to a high degree.
- Me and all other living beings on earth. My responsibility for them determines environmental conscious behaviour.

From these four systems, in which the human being functions, Galtung draws an understanding of rules that rise above the commandments and prohibitions of most religions, since it appeals to the responsibility of every single human being.

These four systems will not make life less complicated. After all, "it is much easier to be told that something is not permitted than to understand that something is immoral and therefore impossible".

### **The project "Kumquat in Motion"**

The project "Kumquat in Motion" - changing nutritional habits in Limburg in relation to a changing environment" is based on the theory of Galtung. The *Citrus* fruit Kumquat (*Fortunella* spp.) symbolises the wealth of exotic vegetables, fruits, herbs and luxuries which have become so popular over the last decennium.

The project involves the use of a small self-made exhibition, the garden and a two hour lecture. The project aims to involve students as much as possible through practical work, experiments and research. The lecture, though complete in itself, leaves the teacher ample opportunity to explore the subject more deeply. Before giving the lecture, teachers receive a few hours of instruction in which the aims of the project are explained by someone from the education service staff.

### **Structure of the lecture**

#### **Me and myself**

Health education aims to change children's behaviour. Since our basic needs are eating, drinking and breathing, the first part of the project deals with food and in particular, vegetables, fruits and herbs. Everything has to be of good quality and is taken from nature. But the question we ask the children is - Is nature inexhaustible? The project emphasises that green plants are important but that our consumer habits influence our natural environment. The by-product of consumption is waste.

In spite of the richness and variety of food on offer and in the sense of choosing what is healthiest, it is becoming more and more difficult to choose the right thing. Wrong eating habits may lead to: weight gain resulting in joint pains, varicose veins, gallstones, diabetes, high blood pressure, increase of heart and vascular sicknesses (the number one cause of death, accounting for 46% of all deaths) and finally tooth-decay

(97% of small children have problems with their teeth).

The project does not intend to make students afraid of sicknesses that they may get through faulty eating habits, but it is to make them aware of the dangers of unbalanced nutrition.

### **Me and my direct environment**

The supply and variety of fruits and vegetables have increased enormously in the last 50 years. This can be put down to changes in the environment such as; increases in numbers of foreigners in The Netherlands; travelling introducing us to foreign food; better and faster means of transport; improved cooling and storage techniques. The environment also changes due to changing nutritional habits.

This part of the project looks at how food is offered and how packing causes problems for the environment. The first system already states that waste is a side-effect of consumption. Considering that children have responsibility for their direct environment, the lecture aims to raise this awareness.

### **Me and my fellow human beings**

This system is a component of peace education, with which this project is not directly involved. Peace education is linked directly to environmental problems in The Netherlands as well as in developing countries (we are responsible for those as well) and this brings us to system four.

### **Me and all other living beings on earth**

Our changing eating habits directly influence our environment in far away countries. The forests of Costa Rica, for example, are cut to graze cows which are then slaughtered for hamburgers; in Malaysia, the rainforest is replaced by palm trees which provide palm oil; on the Philippine island, Negros, sugar beet is grown for Coca Cola and in Guatemala enormous coffee plantations have arisen. Where rainforest is cut, the natural environment disappears, a bare, destitute area remains, the sun dries the soil out, animals disappear and the soil is washed away. The result is a change in climate which has an effect on the whole world.

Once, the necessary information about the above mentioned systems was given at home. Much the way monkeys teach their off-spring by

setting examples. Unfortunately, for humans something went wrong with this example-setting, as far as nature education is concerned. Many children, as well as adults, are destitute of any knowledge of plants and animals. For example, in Kerkrade, a small town of ex-mineworkers, some youths believed that salami sausages grow on trees, and juniper berries are produced in factories!

## **Conclusions**

There is a lack of basic knowledge. This basic knowledge cannot easily be taught again. Learning from one's grandmother or grandfather while playing happened without effort and once upon a time was essential. If one did not recognise which were edible plants, then one was in big trouble! Nowadays this knowledge seems unnecessary as all foods can be bought.

We, who have knowledge about nature are therefore called upon to transmit this knowledge to future generations. Only if one sees for oneself that nature is more than just a blade of grass, a big tree and a singing bird, will one be able to begin to understand it. Astonishment plays a big role in this.

At the Botanic Garden Kerkrade we are therefore trying to transmit our message to students and other visitors by astonishing them. We do this with reduced means but with a lot of enthusiasm.

*Foundation Botanic Garden Kerkrade, St Hubertuslaan 74,  
NL-6467 CK Kerkrade, The Netherlands*

## HOW CAN WE GET MORE YOUNG PEOPLE INTERESTED IN PLANTS?

### Introduction

The importance of plants in a global economy is increasingly being realised and as a result we are having to face difficult plant science problems. These include the effect of global warming on plants especially on crops, the conservation of habitats and of germplasm, the problem of how to feed a projected world population of 10 billion by the year 2100 and decisions about the release of genetically engineered plants into the environment.

Science education has a vital role to play in cultivating a positive approach to these problems. However, many young people think that plants are boring, few of them understand the importance of plants and only a very small number of them consider a career in plant science.

The Science and Plants for Schools (SAPS) programme has been set up in the UK to work with school teachers on the development of exciting practical work in plant science. SAPS is funded by the Gatsby Charitable Foundation which is one of the Sainsbury Family Charitable Trusts.

### The SAPS programme:

- is working with science teachers to develop practical investigations in plant science for the National Curriculum and at "A" level
- runs workshops for teachers which show, through hands-on practical work, how teachers can use plants to support exciting science teaching
- offers secondment to suitably qualified and experienced teachers so that they can help to develop curricular material for plant science. The seconded teachers also help to organize and run workshops
- has developed an educational kit which schools can use to grow a rapid cycling variety of *Brassica campestris* (syn. *rapa*) L.

These remarkable plants, which were produced by Professor Paul Williams at the University of Wisconsin-Madison in the USA, are grown under lights and complete their life-cycle, from seed to seed, in just five weeks. The plants are suitable for studies of plant reproduction, genetics, growth and development, nutrition,

evolution and ecology and are being grown in well over 100 schools in the UK

- sponsors selected schools which, in exchange for a grant towards the cost of building a light bank and a free kit for growing rapid-cycling *B. campestris*, are asked to work on specific areas of interest in plant science and to provide feed back to SAPS
- publishes a regular newsletter containing ideas for interesting practical work in plant science, a forum for the exchange of ideas
- is forging links with universities, college and other plant science research institutions in order to provide a channel through which science teachers can have access to information on the very latest discoveries and techniques in plant science.

One junior school teacher has written "The plants captured the imagination of very mixed groups of ten and eleven year old juniors in a way I had not thought possible. By popular request the children are repeating the work this term with their own self-harvested seeds in order that they can try further investigations of their own devising. Mustard and cress have never had this impact!"

A high school teacher said "The bright lights and yellow flowers were marvellous publicity. The biology staff were particularly impressed and are using "fast plants" for the applied genetics option. The outcome is considerable enthusiasm for plants and a number of students are using the plants for their projects."

## Conclusion

We believe that, in addition to rapid-cycling brassicas (fast plants) many other plants make good experimental material for use in schools and we are anxious to hear from anyone who has developed interesting and stimulating practical work in plant science.

## References

Williams, P H and Hill, C B (1986). Rapid cycling populations of *Brassica*, *Science*, 232, pp. 1,385-1,389.

Tomkins, S P & Williams, P H (1990). Fast plants for finer science an introduction to the biology of rapid cycling *Brassica campetris* (rapa) L. *Journal of Biological Education*, 24(4): pp 239-250.

Price, R (1991). Perfect Plants for Projects. *Biological Sciences Review*, 4(1) pp. 32-36.

*Science and Plants for Schools*

Homerton College, Cambridge CB2 2PH, UK

Royal Botanic Garden, Edinburgh EH3 5LR, UK

## **GREEN INHERITANCE WORKSHOPS**

### **WWF Green Inheritance Education Pack**

In 1990, the World Wide Fund for Nature (WWF UK) Education Department commissioned Ian Edwards and Karen McDonald of the Royal Botanic Garden, Edinburgh to write an education pack which would encourage school use of botanic gardens. The pack would be aimed at 9 - 13 year olds and have a strong conservation emphasis.

The resulting resource is based on the excellent book by Anthony Huxley, called *Green Inheritance*, which provides teachers and students with much factual information about plants, their habitats, cultural value and uses. Working from this the authors produced teachers' notes, resource lists and activity sheets for use in the classroom and during class visits to a botanic garden or arboreta. Thirty-seven activities span the eleven subject areas covered in the book, namely: plant diversity, environmental protection, plant dispersal, staple foodstuffs, luxury foods and cosmetics, industrial uses of plants, natural medicines, aesthetic uses of plants, ethnobotany, genetic resources and plant conservation.

Other items in the pack include a set of black and white photographs showing the wide range of everyday plant uses and a colour wall chart illustrating the main vegetation zones in the world and a selection of threatened plant species. The workshops at the Natural Environment for Learning conference included a demonstration of two activities from the pack: *The Chinese Herbalist* at the KNVB Sportscenter Utrecht (Activity 7.2) and *Ring o'Roses* at Leiden Botanic Garden (Activity 5.4). Since the Conference the pack has been used as the basis of in service training for some UK primary and secondary school teachers.

### **The Chinese Herbalist**

This activity demonstrates the traditional use of eight important herbs in Chinese medicine. The objectives is to explore connections between living plants, medicinal products derived from them and conditions for which they are applied. It also enables participants to experience the texture, taste and smell of different herbs and spices. It follows an activity which introduces the idea of preventative and curative medicine.



# CHINESE HERBAL BENCAO

有毒性本草

## COMPLAINT

SEA SICKNESS

TIREDNESS

COUGH

STOMACH ACHES

SPRAINS

FLATULENCE (FARTING)

TOOTHACHE

RHEUMATISM

## CURE

CINNAMON

TEA

CORIANDER

FENNEL

WITCH HAZEL

GINGER

CLOVES (or STAR ANISE)

CAMPHOR



Like many activities in the pack, the Chinese Herbalist involves an element of fantasy. In this case the class imagine they are on a school visit to China when several members fall sick. Fortunately they have with them a Chinese herbalist (usually played by the class teacher or another adult) but unfortunately she does not speak any English. The children have to mime their complaint which generally causes much hilarity. Once the herbalist has diagnosed the problem and consulted her herbal

bencao (see illustration) she leads the group to the plant or, if the activity is carried out indoors, finds the appropriate herb or spice on the dusty shelves of the Herbalist Shop. In some cases preparation of the material can be demonstrated, eg: coriander or fennel seeds can be ground; ginger grated or tea infused with hot water.

Although at Utrecht the activity took place entirely indoors, ideally there should be an opportunity to visit and see the living plants in a botanic garden collection. The plants become much more interesting when the participants have discovered their properties.

## Ring O'Roses

This activity involves exploring non-visual senses, especially touch and smell. It was designed for use in outside areas of a botanic garden but due to the very wet weather on the day of our visit to Leiden Botanic Garden the activity took place with equal success in a tropical planthouse.

Half the group lay a trail through a small area of garden using a ball of string to connect plants which provide interesting textures, smells or tastes. The other half of the group are blindfolded. Blindfolded participants are given a "sighted" partner from the first half of the group who lead them carefully around the trail. Instructions such as "smell the flower by your knees" or "rub the smooth bark by your left hand" are used to encourage the blind partners to get the most from the experience. Working together the partners also develop a dependence which involves trust.

In the planthouses at Leiden even experienced botanists were surprised by some of the interesting smells and textures they discovered among familiar plants. This opportunity to open up to different sensations has hopefully helped them to develop new ideas to interpret their own collections.

## Reference

Edwards ID & McDonald K, 1991. *Green Inheritance Education Pack* (including *Green Inheritance* by Anthony Huxley) WWF Education Distribution, PO Box 963, Slough, SL2 3RS, UK  
(Cost £19.95 + £4.00 p & p)

*Royal Botanic Garden, Edinburgh EH3 5LR, Scotland, UK*  
*Chelsea Physic Garden, 66 Royal Hospital Road, London SW3 4HS, UK*

## VEGETABLES - A HANDS ON PROJECT

### Summary

A teaching concept has been developed by the School Biological Centre in Hannover (Schulbiologiezentrum Hannover) which aims to raise the environmental awareness of adults and children.

The school proposes an educational framework which uses seven integrated "fields of experience", it takes into consideration that everyone experiences the world differently, both intellectually and emotionally. The project described below uses vegetables to illustrate this educational framework.

### Introduction

How do we make children and adults aware of the problems facing our environment, so that they feel personally involved? How do we convince them that they are themselves responsible for taking part in the care of the environment?

The founders and the staff of the School Biological Centre in Hannover believe that to achieve this students cannot only learn scientific skills - they need to feel emotionally affected as well. One way is to use an integrated teaching approach such as the one developed by Winkel (1990) who equally emphasizes mental, emotional and manual skills.

Two definitions of an integrated teaching approach will be considered here:

1. **Self integration.** As every person experiences life mentally, physically and emotionally it is appropriate to direct teaching towards the whole person, not just towards certain parts of a person.
2. **World integration.** Everyone is an integral part of the environment. Teaching has to consider the environment as a whole first and then later analyse the integral parts to rebuild them.

### The concept of "Fields of Experience"

Winkel and others (1990) developed a concept which provides a framework for integrated teaching. The aim is for this concept to be used as an aid to stimulate the imagination of teachers and group

leaders. For any given topic there are often many different viewpoints all of which result in different teaching approaches. However, when one experiences the environment, similar areas can be identified which Winkel calls "fields of experience" ie:

1. five senses of perception
2. games
3. aesthetics and fine arts
4. natural sciences
5. practical applications
6. representation
7. social and cultural importance.

Winkel suggests that these "fields of experience" need to be thought about and incorporated into lesson plans wherever possible. They are considered important for the development of standards and rules which lead to future stimulation of action and will be more successful in increasing students motivation.

The concept of the "fields of experience" is not a complete system. It is possible to argue that the number and the sequence of "fields of experience" are interdependent and cannot therefore be completely separated from each other. The system needs to be regarded simply as a framework which invites teachers to be creative, to use different viewpoints and to plan an integrated curricula. *Vegetables - a Hands on Project* will be used to explain this concept.

This project is not fixed, it consists of a collection of already proven ideas and is, as such, open for development. It serves as a stimulus for teachers to organize a concrete lesson plan centred around the topic of vegetables or gardens.

Certain factors, such as age, have to be taken into consideration when addressing a specific group, but the concept can be used for all ages, from elementary school students to adults.

During the workshop in Utrecht only seventy five minutes were allowed for the presentation of the project. The people who took part were only able to sample a small amount of materials presented.

## **Vegetables - a hands on project**

Events that happen every day are often so familiar to us that they are overlooked. Vegetables belong to everyday experiences and are an essential part of our daily diet. However, in school they are often only studied as a topic by elementary school students, for example Exploring a Farmers Market, but rarely are vegetables discussed on a biological level and even more rarely are they used as a theme within an integrated teaching approach; an approach which will be suitable not only for elementary school students, but for all age groups as well.

As this paper does not allow for a detailed description of how to organize the Vegetable Project, only a few elements and steps will be explained.

Although the stated order of the "fields of experience" appears didactically to make sense, and after testing has proven to be functionable, one does not have to stick to the specific order and can limit the number of species of vegetables to a few examples or to one group of vegetables (e.g. pumpkin, melon, egg-plant (aubergine), courgette (zucchini), tomato, peppers, cucumber). Creativity has no limits when it comes to letting the students experience the subject-matter intensively and in-depth.

### **Materials**

Have available the following materials:

- At least two of each vegetable for each student.  
If possible chose different coloured vegetables.  
Shop at the farmers' market, local store or harvest vegetables in the school-garden or botanic garden.
- One white sheet, a cooking knife, a cutting board, pencils, coloured markers, crayons, dye, watercolours, paintbrushes, paper, material, glue
- Magnifying glasses and chemical indicators
- Kitchen utensils, dishes, and cutlery
- Spices, sugar, salt, vinegar, etc.

## **Fields of experience 1 and 2**

### **Five Senses of Perception and Games Introductory Game**

Before the participants arrive, put various kinds of vegetables on the table. Allow at least two of each vegetable for each participant. Cover everything with the large sheet. Ask all the participants to sit around the table and to reach under the sheet and touch the vegetables.

Ask them to identify the vegetables without calling out the vegetable's name. Nothing else apart from the form, shape and surface texture of the vegetables can be described.

From this the participants can be asked to collect a certain species of vegetable. With the vegetables still hidden under the sheet, they have to describe them and guess what is being handed to them.

The players are then asked to close their eyes while the leader pulls away the sheet. When the participants open their eyes encourage them to see whether the vegetables have been sorted correctly and whether there any vegetables remaining. Often their first impression is of the diversity and intensity of colour!

### **Suggestions for other activities**

- guessing-games and identification-games with covered eyes, like those described by Cornell (1979), identifying vegetables by smell and taste
- memory games, inventing puzzles
- making musical instruments
- word games: riddles, scrabble, dominos
- rhymes and stories, making up adverts, stories or fairy tales
- carving of pumpkins into jack-o-lanterns (the fruit pulp can be used later)
- stories such as "Gurkenkönig (king of cucumbers)" (Lohf and Sailer, 1985) or the "Bohnen-Jim" story (Nüstlinger, 1986) can be dramatized.

### **Field of Experience 3**

#### **Aesthetics and Fine Arts**

- draw pictures of vegetables with pencils, and/or coloured pencils and crayons
- make watercolour paintings of vegetables
- draw and paint pictures of vegetables using just various shades of one colour (e.g. green)
- decorate pumpkins or gourds
- print with half vegetables (red cabbage, brussels sprouts, cucumber, pepper, egg-plant) using either their natural colours or artificial colours
- print cloth (shopping bags) with vegetables and dye
- arrange and draw a still life
- use dried pumpkin seeds to make seed pictures
- model vegetables out of wood or clay
- look at pictures of paintings, in which vegetables are depicted, e.g. Arcimboldo, genre-paintings, still life of the 16th and 17th centuries, Max Liebermann, Picasso, and other modern painters.

### **Field of Experience 4**

#### **Natural sciences (measuring, analysing, counting...)**

- look at structures of fruits with their placenta, ovule, and pericarp, the development of seed after fertilization of the flower (Rauh, W, 1950)
- observe the development of a plant (scarlet runner) from seed to fruit (Strasburger, et. al., 1983)
- study and observe the life cycle of a cabbage (Winkel, ed., 1989)
- look at which parts of plants are edible
- compare various types of tomatoes focusing on propagation and genetics (including the effects of mutations (Winkel, ed., 1989))
- measure and compare the percentage content of vitamin C and nitrate in various vegetables using chemical indicators; sugar with Fehling's solution, starch with potassium iodide-solution
- determine the water content of various vegetables
- weigh and measure the giants to the dwarfs

- plant systematics (phylogenetic tree) - work out a simple classification for trees

## **Field of Experience 5**

### **Practical Usage**

- test vegetables with your nose and tongue (ie. smell and taste)
- decide which vegetables need spices
- decide which vegetables need further preparation before being eaten
- observe the changes that take place when cooking or stewing vegetables
- make salads
- create recipes and trying them out
- decide what vegetable matches what (regarding taste and colour)
- look at the significance for a balanced diet (vitamins, minerals)
- plant recommendations - looking at what grows well together
- wash, dry, sow, prick out, plant, cultivate, harvest, and process vegetables

## **Field of Experience 6**

### **Representation**

- create a play. For example how a scarlet runner develops (Grothe and Schultz, 1988)
- create a play showing various areas of conflict (see next field of experience)
- have a panel discussion
- make a map, e.g. vegetable planting in our community
- exhibit and demonstrate the results of other "fields of experience"

## **Field of Experience 7**

### **Social and Cultural Importance**

- research how long a particular species of vegetable has been in your country and where it originally came from (Franke, 1985)
- research the history of vegetable growing and distribution

- look at vegetables in mythology and religion (e.g. peas as a symbol for Mary or the former condemnation of the tomato as a devilish fruit by the Church)
- look at cultivation here and in other countries. Look at how old the market is (e.g. tomato growing in Italy, or a younger example, pepper growing in Hungary)
- look at the influences of cultivation on the economy and ecology of a country (Makowski and Buderath, 1983)
- calculate production statistics
- compare market prices. Look at how and when bargain or sale prices are offered. Look at how bargain prices effect the economic conditions of the consumer and the domestic vegetable farmer
- look at the effect on the economy of the cultivating regions due to changing consumer habits and/or marketing strategies (eg. change in transport)
- look at the ecological effects of specific cultivation methods (e.g. large monocultures in greenhouses, soil changes in tropical areas)
- look at alternatives to over-fertilization, landscape sealing and energy consumption in countries that cultivate in disadvantaged climates
- look at how eating habits have changed due tourism and the immigration of people from foreign countries.

## References

- Cornell, JB (1979). *Freude an der Natur*. (Sharing Nature with Children), Ahorn Verlag, Oberbrunn, Germany
- Franke, W (1985). *Nutzpflanzenkunde*. Thieme Verlag, Stuttgart, Germany
- Grothe, R and Schultz, S (1988). Erleben, wie eine Pflanze keimt und wächst. "Die Entwicklung der Feuerbohne" als darstellendes Spiel. In: *J. Unterricht Biologie*, 12, 137, p. 16-18. Friedrich Verlag Seelze, Germany
- Makowski, H and Buderath, B (1983). *Die Natur dem Menschen untertan. Ökologie im Spiegel der Landschaftsmalerei*. Kindler Verlag GmbH, München, Germany
- Rauh, W (1950). *Morphologie der Nutzpflanzen*. Quelle & Meyer,

Heidelberg, Germany

Steinbach, G (ed.) (1986). *Das Mosaik-Lexikon der Nutzpflanzen*. Mosaik Verlag GmbH, München, Germany

Straßburger, E et. al. (1983). *Lehrbuch der Botanik*. Gustav Fischer Verlag, Stuttgart, New York, 32nd ed., Germany

Winkel, G (ed.) (1988). *Gemüse (Vegetables)*. J. Unterricht Biologie, 12, 138, Friedrich Verlag, Seelze, Germany

Winkel, G (ed.) (1989). *Das Schulgartenhandbuch*. Friedrich Verlag, Seelze, 2nd ed., Germany

Winkel, G (ed.) (1990). *Leitlinien der Natur- und Umwelterziehung*. Schulbiologiezentrum Hannover, Germany

Winkel, G (ed.) (1991). *Entwurf zur Planung ganzheitlichen Unterrichts mit den Schwerpunkten "Garten, Früchte des Gartens, Gemüse"*. (2nd ed.) Schulbiologiezentrum Hannover, Germany

### **Books for Children**

Björk, Ch and Anderson, L (1986). *Die schnellste Bohne der Stadt*. (Linnéa planterar) Deutscher Taschenbuch Verlag, München, 6th ed., Germany

Lohf and Sailer (1985). *Wo der Gurkenkönig wächst - Ein Pflanzenjahrbuch*. Otto Maier Verlag, Ravensburg, Germany

Nöstlinger, Ch (1986). *Der Bohnen-Jim*. Beltz. Weinheim, Germany

Schulbiologiezentrum Hannover, Vinnhorster Weg 2, D-3000  
Hannover 21, Germany

## MULTICULTURAL HORTICULTURE

### **the educational use of plants in a multicultural society**

#### **Introduction**

Plants and their products are of fundamental importance to the human existence. However, modern urban lifestyles have led to a gradual isolation of people from natural environments, agricultural activities and the role of plants in general.

At the same time world societies are increasingly becoming more interdependent, these societies themselves often being multicultural and multilingual.

If the role of plants in education is to have an active and meaningful contribution within this modern context, strategies need to be used that introduce plants to children in a variety of interesting and dynamic ways. These methods must also take into account the individual experiences that children from multicultural societies can bring to the subject.

In multicultural societies, such as exists in the Outer London Borough of Ealing, diet is often a powerful cultural symbol, with certain plant food properties and their associated "heritage language" persisting throughout the life of an individual. This experience needs to be supported and celebrated in education and society at large.

Food can also traverse cultures, especially when it has become highly processed and packaged. Many processed plant products such as coffee, tea, sugar, originate from plants growing in tropical countries, usually countries poorer than those of Western Europe. Working with tropical plants and growing them successfully can provide powerful triggers for learning, leading children on to enquire such things as: How does the plant grow? Where does it usually grow? Who grows it? How is it processed? Who processes the product? Who consumes it? Is the trade in this product equitable and just?

This workshop explores ways in which plant resources at Norwood Hall are used with 5 - 12 year olds to support education in a multicultural society and an interdependent world.

## **Background to the workshop**

One of the skills in teaching is to make the curriculum as accessible as possible to the children we teach. One of the joys of teaching is when we can acknowledge to ourselves that we are achieving some success in this endeavour.

If we consider the accessibility of the curriculum in multi-ethnic and multilingual classrooms, there are two main hurdles that can impede that accessibility - language and culture. Of course, these are by no means exclusive to children from ethnic minority backgrounds. With this in mind it is worth considering the following questions.

### **Language**

Is adequate support being given to meet the specific language demanded of each subject in the curriculum? Is adequate support and provision being given to bilingual children in their first language?

### **Culture**

Does the curriculum start by reflecting the true nature of the society in which it operates? Does it go on to expand the horizons of all the children, reaching out to a global dimension? If the curriculum is set in an alien context, how accessible can it be?

These questions are pertinent to the way in which plants and animals are used at Norwood Hall.

### **Norwood Hall**

Norwood Hall is an institute of horticultural education situated in Southall in the London Borough of Ealing. Although its funding situation is about to change, at present approximately 50% of its work is based in the Department of Amenity Horticulture and involves the running of further education courses in amenity horticulture. The other 50% of its work is based in the Environmental Education Centre and consists of supporting environmental education in primary and secondary schools within the four Outer London Boroughs of Ealing, Hounslow, Brent and Richmond upon Thames. The Environmental Education Centre staff run courses for teachers, host school visits to

Norwood Hall and visit schools within its catchment area. The map gives a good indication of our facilities, which are used mainly to support environmental education across the curriculum and throughout the age range.

### Language support

Given the nature of the community Norwood Hall serves, language support for English and other community languages has to be a major element in our work. (See table below.)

### Schools language surveys

**Table 1.**

Pupils speaking at least one language other than English in their homes.

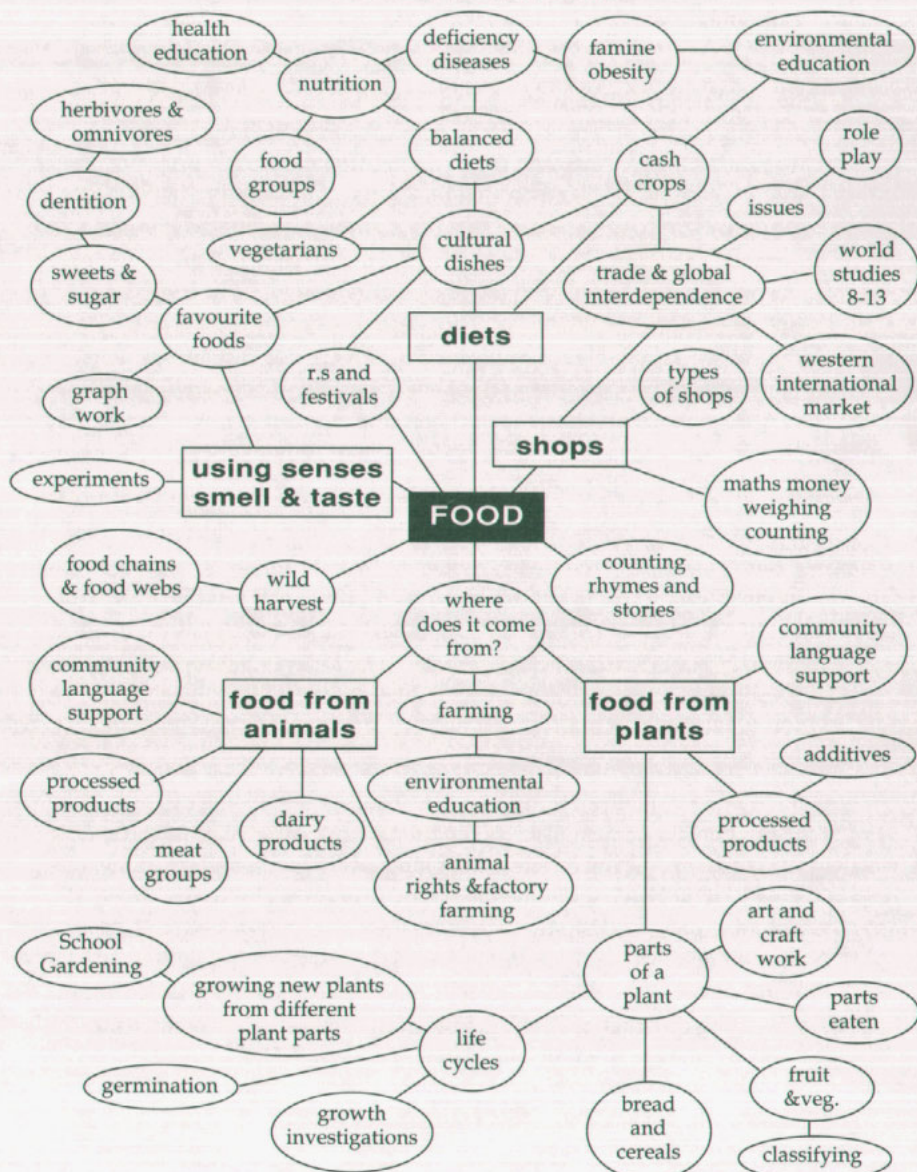
District	Percentage	Date
Brent:	35.3%	(1983)
Ealing:	41.7%	(1986)
Hounslow:	34.1%	(1988)

Surveys were made of all pupils attending nursery, primary and secondary level schools. Four major South Asian languages predominate in the surveys - Punjabi, Gujarati, Urdu and Hindi.

One of the ways in which we operate is to run half-termly topic themes for primary schools. Visits have to be booked in advance. In the first half of the Autumn Term, the topic is usually "food". A compulsory pre-visit course for teachers precedes every topic. The topic web produced for the teachers' pre-visit course on "food" shows some areas where a global dimension can be introduced (see topic web -Food as a Topic, opposite).

During the food topic the vegetable gardens and the tropical economic house are two popular areas for school groups to visit. In both areas the plants are labelled multi-lingually. One worksheet, used in conjunction with a visit to the vegetable garden, asks children to label their drawings in English and Punjabi (see worksheet "Vegetables", page 134).

## FOOD AS A TOPIC



**There are three good pedagogical reasons for using this bilingual worksheet:**

1. In previous years, where worksheets asked for English labels only, quick witted children were able to label their drawings merely by recognising the sketches, with no compulsion to visit the plants. The function of the activity is for the children to visit the growing plants and to observe, for instance, that the orange edible bit of a carrot is a root that grows underground and that it also has a mass of green leaves sprouting out of it. Many children growing up in urban areas do not get the opportunity to see food plants actually growing, and consequently their knowledge of the origin of food can only be traced as far back as the supermarket! Therefore, if the children are not Punjabi speakers, they have to walk around and search to find the plant and its label. Any language could have been chosen for this exercise but Punjabi was chosen as it is the second most widely spoken language in the community after English.
2. For those primary children of Punjabi speaking backgrounds, the home register for food might well be in Punjabi. So here was an opportunity to reinforce both English and Punjabi vocabulary for food plants. Seeing one's community language supported so naturally on something as prestigious as a coach trip away from school and the home community, on a visit to a garden, can also do a lot to enhance a positive self-image for ethnic minority children. Sadly it is something that happens all too infrequently.
3. By using phonetic translations, teachers and students can all join in using Punjabi names. This can be used as a positive platform to elicit from other non-Punjabi speaking bilinguals what names are given to food in their language. Once again, by supporting bilingualism on a school trip we are helping to portray the community as it really is, ie. a multilingual one, and in so doing, we also contribute to helping all pupils grow up with a healthy and positive attitude towards learning and using other languages, eg. French or German. This point was unfortunately missed on one visiting teacher who had erased the instruction to label in Punjabi. When asked why, she commented "Can't you see, my children are all white!"

If the aim of the visit had been to develop literacy skills in Punjabi, then the Punjabi script would have been used. A balance has to be struck to avoid putting too much information on labels and in this case, where not many young children can read Punjabi script, it was decided to omit it.

### A load of green leaves

When plants are not in crop in the economic glasshouses, the coffee, cocoa, bananas, pineapples, etc. can be viewed as just a load of boring green leaves by some children. This makes labelling very important and here again, we use multilingual labels (see adjacent diagram of plant label). Even when students are told that they are standing next to a cardamom bush with pods on, it doesn't mean much to them. But when Hindi, Urdu and Punjabi speakers discover that it is also called "ilaichee" eyes light up with recognition, heads nod and an explanation is given of its uses in the home, both culinary and medicinal.

### Cash crops

Potted plants grown in school classrooms from seed or cuttings can be used as good triggers to introduce or sustain particular topics involving cash crops. Grow a plant successfully and pupils become more interested in matters to do with it. "What are its products and uses?" "Where does it usually grow?", "Who grows it?", "Who benefits most from the trade?" etc. Both ends of a chain can be established, the

Ilaaichee

Hindi / Urdu

الایچی

Aylaach

Bengali

Cardamom

English



Cardamoms are the fruits of a plant native to India and Sri Lanka. Today, they are also grown in Central America.

Cardamoms have many uses. They are used in preparing curry powders, flavouring sweets, chewing as a mouth freshener or boiling as a herbal tea.

## VEGETABLES WORKSHEET

Find these vegetables and label the drawings in English and Punjabi

 <p>sweetcorn makhi</p>	 <p>tomato tomaata</p>	 <p>leek shoutha ghandaa</p>	 <p>beetroot chakandar</p>
 <p>lettuce salaad</p>	 <p>celery celery</p>	 <p>carrot gaajar</p>	 <p>potato aaloo</p>
 <p>rhubarb rhubarb</p>	 <p>runner bean phalian</p>	 <p>Rat-tailed radish moongrai</p>	 <p>marrow khia</p>
 <p>onion ghandaa</p>	 <p>spinach palak</p>	 <p>Brussels sprouts shouthee bandgobhe</p>	 <p>Kohl Rabi gaahit gobhe</p>

student as a consumer and the plant as a primary product growing in the soil.

To help teachers grow plants successfully in schools, Norwood Hall runs very popular short courses on "Plant propagation in school classrooms". If cash crop plants can be grown successfully in schools, the relationship between the plant and the student can then be developed more imaginatively as shown below:

### *Cash Crops*

Its environment	The Plant	Its life cycle
History	Uses	Local and traditional/ multinational
How?	Cultivation and	Where?
At what cost?	Harvesting	By whom?
	Transporting	
	Processing	
	Retailing	
	The Consumer	

Multinational corporations dealing in tropical cash crops and organizations such as the London Coffee Information Centre and the Tea Council often produce, free of charge, very glossy educational material on tropical crops and their products. Much emphasis is placed on what happens during the processing and retailing of the product once it has arrived in the UK as an unprocessed product. The information about its cultivation often portrays an image of the "hapless happy picker".

Quotes from the Teacher's Handbook. Cocoa and Chocolate, Rowntree Mackintosh Ltd.:

*"(i) Village Life. The people in a West African cocoa farming area live in small villages.... Those not cooking (in the evening) may make baskets or shape hoe and axe handles while children fetch water for cooking and washing. Afterwards is the time for talking, hairdos, and playing draughts."*

Such a stereotypical presentation patronises the cocoa farmers themselves and is demeaning to the pupils in UK classrooms who may

have originated from similar geographical regions. If such material is to be used, it must be questioned and contrasted with other resources that help to portray a clearer picture of the realities of producing and trading tropical cash crops. In the World Studies 8-13 Teacher's Handbook, the chapter on unequal trade is a useful resource to this end; so too is "Whose Paradise? Tea and the plantation Tamils of Sri Lanka" by the Minority Rights Group.

### The banana in the curriculum

In many places around the world where the banana plant is grown, people have found uses for nearly every part of the plant. The banana has tremendous cross curriculum potential in primary and secondary education. The World Studies 8-13 Teacher's Handbook demonstrates how it can be used in humanities teaching, but it also has tremendous potential in problem solving science. For instance, a large percentage of the fruit is water. That water fell as rain from the sky in a tropical rainstorm. The banana has captured that water. The student has bought the banana. "Could we calculate the percentage of water in the banana?" "Could we find a way of separating and collecting the water from the banana?"

Plant Part	Use
The fruit	Food. The skins can be burnt and ashes used for making soap
Male flower head	Cooked for food
Leaves	Roofing material, religious use
Leaf bracts	Paper making
Stem	Floats for raft making
Fibres	Rope making

This year a local school collected Norwood Hall's banana plant after it had fruited. The plant was taken back to the classroom to be used as a focus for maths, science, geography and religious education.

Similarly, the sugar cane was collected by a school and pupils tried to extract the sugar from it. Cuttings were propagated and many stories

about sugar cane were exchanged by the students. In one case, a child's father, who had been a sugar cane farmer in Bangladesh, was invited in to tell stories of his experiences. It is doubtful if this rewarding event would ever have happened if the living plant material had not been the focus of classroom activity.

The leaves from Norwood Hall's sisal plant can be harvested and the fibres extracted. A couple of leaves can provide enough fibres for a whole class of students to use, to compare tensile strength with other natural and synthetic products and used for making ropes.

Norwood Hall is not the only local source of plant material. Asian greengrocers and health food shops are treasure troves of resources for germination and propagation investigations. With a little skill and a good compost, unroasted fresh peanuts, brown rice, unroasted fresh coffee beans, tamarind seeds will all germinate on a warm window-sill or in a thermostatically controlled propagator. Cocoa, yam, ginger and sweet potato will also spring into growth quite easily if planted in moist compost in a warm sunny room.

Such plants will need loving care if they are to survive long term in the harsh environment of most classrooms. It is perhaps better to aim for short term survival for as long as the topic lasts, and then distribute the plants to caring homes.

## **Conclusion**

To conclude, it is worth recapping on the approach that Norwood Hall takes in catering for visits by school groups. Our attempts to make visits relevant and appropriate to the needs of the community can be summarised by a series of questions that we try to address.

### **Making visits relevant**

- How appropriate is the language used, in worksheets, on labels, etc. compared to the language skills of the visiting children?
- Are the many languages at work in the community reflected in the work of the gardens, or does English dominate?
- What is the "cultural perspective" for activities? Do they focus on the "exotic" or upon sharing diverse experiences?

To ensure that these challenges are met, a set of guidelines are followed:

**Guidelines to cater for school visits**

- Teachers are trained to work with plants.
- A flexible labelling system is used in the gardens and glasshouses.
- Multilingualism is celebrated.
- A "hands-on" policy with plants is operated as much as possible. Children are allowed to touch plants and take samples back to school.
- It is acknowledged that children have a diversity of experiences. They are encouraged to share knowledge and not become merely the receptors of knowledge.

**References**

- Anonymous, (No date). *"Cocoa and Chocolate", Teachers' Handbook*. Educational Aids, Rowntree Mackintosh Ltd., England.
- Fisher, S and Hicks, D (1986). *World Studies 8-13: A Teacher's Handbook*. Chapter 4, pp. 54-65. Oliver & Boyd, UK
- Gerlach, L and Hillier, S (1987). *Whose Paradise? Tea and the Plantation Tamils of Sri Lanka*. Minority Rights Group Education, UK

*Norwood Hall Institute of Horticultural Education, Norwood Green, Southall, Middlesex, UB2 4LA, UK*

## WRAPPING - AN ALTERNATIVE APPROACH TO DESIGN AND TECHNOLOGY

### Introduction

A "wrapping" workshop was run in the Leiden Botanic Garden at the Utrecht Congress. The workshop was based on a project developed for teachers by the Royal Botanic Gardens, Kew, in conjunction with the Design Museum of London.

By training teachers to adopt a definition of design and technology which had the broadest cultural framework, the workshop sought to address the issues surrounding the fact that objects in the museum had developed in the Western World in isolation to the materials and processes from which they were originally conceived.



*Basket made from leaf.  
Reproduced courtesy of the British Museum.*

## **Workshop structure**

The structure for the workshop involved an introductory talk with slides and handling objects, followed by practical work and ended with a discussion and summary. The workshop was planned with the view to using natural forms and materials as a starting point.

The framework for the project was defined with the following aims.

1. To form a working partnership between an art based museum and a botanic garden.
2. To encourage an informed interest in other cultures, with an awareness of the contrasting opportunities and constraints that people face living in different places under varied physical and human conditions.
3. To encourage tactile and experimental work with plants.

Within this framework, the main objectives were to expand the profile of plants as a source for design and technology by looking at: plant adaptations to the environment, traditional forms of packaging using natural materials and shelters in varied landscapes using local flora.

The workshops encourage the development of the following skills:

- identification and analysis of problems
- researching (classifying, evaluating, formulating)
- recording (drawing, observing, writing)
- planning (analysing, co-ordinating, managing)
- creativity (flexability, imagination, initiative).

## **Conclusion**

The role of plants in native peoples material culture is often overlooked or considered secondary to the importance of plants as foods and medicines. "Wrapping" is a lively stimulating workshop which generates fundamental questions encouraging children to examine issues about cultures' relationships with nature.

*Royal Botanic Gardens, Kew, Richmond, Surrey, UK*

## MEET A TREE

### Introduction

During the Congress, this workshop involved some of the world's most renowned tree specialists and botanic garden educators meeting objects, around which their work is based, in a way they have never done before - by hugging them! "Meet a tree" is an excellent game to include in an education programme on trees or a walk through a garden.

### How to play

The group is divided into pairs, **A** & **B**.

**A** wears a blindfold and **B** is the guide.

The object of the game is for **B** to lead **A** to a tree and invite **A** to meet his or her tree.



Later, when the blindfold is removed, **A** will be asked to recognise his or her tree.

When **B** leads **A** to the tree, he or she can help **A** remember by asking

questions such as -

- How big is this tree?
- Can you reach the branches?
- How does the bark feel? etc.

When **A** has recognised his or her tree, **A** & **B** swap positions, **B** now wears the blindfold and **A** becomes the guide.

A nice way to finish the game is to ask the children to make a drawing of their own tree.

## Conclusions

By taking away the sense of sight, "meet a tree" helps encourage children and adults to become aware of their environment through the four senses - touch, smell, taste and hearing. Through being blindfolded and led, the game also encourages children and adults to develop trust in each other.

The participants at the workshop in May experienced that this game can be played at different levels. On meeting the tree blindfolded, not only did the participants feel, smell, listen and taste the tree, but most of them actually managed to identify it - to the subspecies! The workshop was a lot of fun and out of it came a great deal of appreciation for nature.

*Leiden University Botanic Garden, Nonnensteeg 3, 2311 VJ  
Leiden, The Netherlands*

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## DELEGATES

**Julian Agyeman**, Education Service, Barnsbury Complex, Islington, London NI 1QF, UK

**Mary Barton**, Westonbirt Arboretum, Tetbury, Glos GL8 8QS, UK

**Alan Bennell**, Royal Botanic Garden, Inverleith Row, Edinburgh EH3 5LR, Scotland

**Herman H Berteler**, Haydnstraat 44, 6561 EG Groesbeek, The Netherlands

**Kees Boele**, Hortus Haren, Postbus 179, 9750 AD Haren, The Netherlands

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

**David Bramwell**, Jardín Botánico 'Vierra y Clavijo', Ap. De Correos 14, Tafira Alta, Las Palmas, Gran Canaria, Islas Canarias, Spain

**Christine Brandt**, Head of Public Relations, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB, UK

**Jaap Brinkman**, Rembrandtlaan 76, 3723 BK Bilthoven, The Netherlands

**Gail Bromley**, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB, UK

**James Carter**, Centre for Environmental Interpretation, Manchester Polytechnic, Saint Augustine's, Lower Chatham Street, Manchester M15 6BY, UK

**Anne P Daly**, London University Botanic Gardens, Egham Hill, Egham, Surrey TW20 0BN, UK

**Ian Edwards**, Royal Botanic Garden, Inverleith Row, Edinburgh EH3 5LR, Scotland

**Romeo Fati**, Botanic Garden, 4675 Jibou, District Sălaj, România

**Vasile Fati**, Botanic Garden, 4675 Jibou, District Sălaj, România

**Lena Fernbrink Garder**, Bergius Botanic Garden, Box 50017, S-104 05 Stockholm, Sweden

**Mogens Fonnesbech**, University Garden, Bülowsvej 13, DK 1870 Frederiksberg C, Denmark

**Julie Foster**, Australian National Botanic Gardens, GPO Box 1777, Canberra, ACT 2601, Australia

**Brian A Gale**, London University Botanic Gardens, Egham Hill, Egham, Surrey TW20 0BN, UK

**Alba Fransi Gallart**, Avda. Marquès de Comillas s/n, Montjuic, Barcelona 08038, Spain

**Steve Gamble**, University of Oxford Botanic Garden, Rose Lane, Oxford OX1 4AX, UK

**Bente Garbers**, Botanisk Skoletjeneste, Botanisk Museum, Gothersgade 130, DK-1123 Copenhagen, Denmark

**Laura Giuffrida**, Exhibitions Co-ordinator, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB, UK

**Alberto Gomez-Mejia**, Jardín Botánico de Quindío, Apartado 123, Armenia, Colombia

**Bill Graham**, Birmingham Botanical Gardens, Westbourne Road., Edgbaston, Birmingham B15 3TR, UK

**Renate Grothe**, Schulbiologiezentrum Hannover, Vinnhorster Weg 2, D-3000 Hannover 21, Germany

**Isolde Hagemann**, Bot. Garten und Bot. Museum, Berlin-Dahlem, Königin Luise Strasse 6-8, W-1000 Berlin 33, Germany

**A. Heijnen**, Botanische Tuin Kerkrade, St. Hubertuslaan 74, 6467 CK Kerkrade, The Netherlands

**Vernon H Heywood**, BGCI, Descanso House, 199 Kew Road, Richmond, Surrey TW9 3BW, UK

**Andrew Jackson**, Royal Botanic Gardens Kew, Wakehurst Place, Ardingly, Haywards Heath, West Sussex RH17 6TN, UK

**Lucy E Jones**, Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, NY 11225-1099, USA

**Michael S Kristiansen**, Honolulu Botanical Gardens, 50 North Vineyard Boulevard, Honolulu, Hawaii 96817, USA

**Claude Lefèbvre**, Jardin Experimental, Université Libre de Bruxelles, Chaussée de Wavre, 1850, B-1160 Brussels, Belgium

**W van der Ley**, Hortus Haren, Postbus 179, 9750 AD Haren, The Netherlands

**Edelmira Linares**, Jardín Botánico, Instituto de Biología de la Universidad Nacional Autónoma de México, Apdo. Post. 70-614, 04510 México D.F., Mexico

**Antonio Lopez-Quintana**, Lab. Botánica, Facultad de Ciencias, Aptdo 644, 48080 Bilbao, Spain

**Vijko P A Lukkien**, University of Utrecht Botanic Gardens, Harvardlaan 2, Postbus 80.162, 3508 TD Utrecht, The Netherlands

**Stefano Mazzoleni**, Instituto Botanico, Facoltà di Agraria, Via Università 100, Portici (NA) 80055, Italy

- Susan Anne Minter**, Curator, Chelsea Physic Garden, 66 Royal Hospital Rd., London SW3 4HS, UK
- G Morel**, Arboretum de Chèvreloup, 30 Route de Versailles, 78150 Rocquencourt, France
- Richard Price**, SAPS, Homerton College, Cambridge CB2 2PH, U K
- J L Reinhard**, Hortus Haren, Postbus 179, 9750 AD Haren, The Netherlands
- Jackie Roberts**, Royal Botanic Garden, Inverleith Row, Edinburgh EH3 5LR, Scotland
- Trevor Roach**, Norwood Hall, Institute of Horticultural Education, Norwood Green, Southall, Middlesex UB2 4LA, UK
- Didier J Roguet**, Conservatoire et Jardin Botanique, Chemin de l'Impératrice 1, Case Postale 60, CH-1292 Chambésy, Geneva, Switzerland
- Dawn Sanders**, Royal Botanic Gardens, Kew Richmond, Surrey TW9 3AB, UK
- Nico Schellevis**, Van der Lindelaan 125, 1217 PJ Hilversum, The Netherlands
- Manuela Seifert**, Institut für syst. Botanik, Zollikerstr. 107, 8008 Zurich, Switzerland
- Selma Sengönül**, Atatürk Arboretumu, 80895 Bahçeköy Orman Isletmesi/Istanbul, Turkey
- Daan Smit**, Hortus Botanicus VU, v.d. Boechorststraat 8, 1081 BT Amsterdam, The Netherlands
- Karl Josef Strank**, Hubertusstr. 8, 5112 Baesweiler 3, Germany
- Suhirman**, Botanic Gardens of Indonesia, Kebun Raya, P.O. Box 110, Bogor, Java, Indonesia
- Ruth Taylor**, Chelsea Physic Garden, 66 Royal Hospital Rd., London SW3 4HS, UK
- Leslie Tjon Sie Fat**, Leiden University Botanic Garden, Nonnensteeg 3, 2311 VJ Leiden, The Netherlands
- H van Ginkel**, Utrecht University, Heidelberglaan, 8, 3584 CS Utrecht, The Netherlands
- San van der Molen**, Dutch Botanic Gardens Foundation, Harvardlaan 2, Postbus 80.128, 3508 TC Utrecht, The Netherlands
- Ineke van Noordwijk**, Schulbiologisches Zentrum, Botanischer Garten in Brüglingen, Brüglingen 1, 4052 Basel, Switzerland

**Stans van der Veen**, Leiden University Botanic Garden, Nonnensteeg 3,  
2311 VJ Leiden, The Netherlands

**K Verhoeff**, Ministry of Agriculture, Nature Management and Fisheries,  
PO Box 20401, 2500 EK, The Hague, The Netherlands

**Lajos Vigh**, 2040 Budaörs, Beregszászi út 2, Hungary

**Francisco Villamandos**, Jardín Botánico de Córdoba, Avda. de Linneo,  
s/n, Appdo. 3048, 14080 Córdoba, Spain

**Jaap Vos**, Utrecht Botanic Gardens, Harvardlaan 2, Postbus 80.162, 3508  
TD Utrecht, The Netherlands

**Timothy Walker**, University of Oxford Botanic Garden, Rose Lane,  
Oxford OX1 4AX, UK

**Gunnar Weimarck**, Göteborg Botanical Garden, S-413 19 Göteborg,  
Sweden

**Martina Weiser**, Siesmayerstrasse 61, Palmengarten, 6000 Frankfurt,  
Germany

**J A B Wensing**, Burgers' Zoo, Bush and Safari, Schelmseweg, 85, 6816  
SH Arnhem, The Netherlands

**Julia Willison**, BGCI, Descanso House, 199 Kew Road, Richmond,  
Surrey TW9 3BW, UK

**Nicholas J Wray**, University of Bristol Botanic Garden, Bracken Hill,  
North Road, Leigh, Woods, Bristol, Avon BS8 3PF, UK



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