

A SURVEY OF THE WORK OF THE ROYAL BOTANIC GARDEN EDINBURGH IN 1983

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GENERAL REVIEW

An organization like the Royal Botanic Garden Edinburgh is rarely the subject of dramatic changes, but in 1983 we began to look forward to the organization becoming a quango with a Board of Trustees, in line with the changes taking place at Kew. At the same time 1983 has been a year of looking back over the last 7 years since the last Review Group visit in 1976, in preparation for a Review Group in September of the year under report. The Garden was visited by a Group chaired by Professor W. W. Fletcher and consisting of Mr C. D. Brickell, Professor C. H. Gimingham, Dr E. J. Balfour CBE, Dr D. Martin, Professor J. P. Brennan, Mr D. C. M. Corbett, Dr T. W. Hegarty, and Mr R. Wilson, during the week beginning Monday 26 September. The report of the Group was not to hand by the end of 1983.

The long-term taxonomic projects, which always take time to develop without much production in the early stages, made a good contribution in 1983. The first part of the *Flora of Bhutan* by Grierson & Long was published and with many other parts of the work well prepared, the appearance of regular parts of the Flora can be looked forward to. Although the first volume of *The European Garden Flora* will not be formally published until 1984, all the work for it was completed in 1983 and the preliminary work on the next part is well in hand. Dr Page's involvement in conifers and ferns was deflected to producing accounts for this Flora and his main research lines can now be resumed.

In south-west Asia, the general high level of activity goes on with involvement in many Floras where Edinburgh plays a key role. Unfortunately, although we have received continued materials from Arabia, which will be invaluable for writing a Flora of Arabia, the specific arrangements with Arab research councils have not yet been finalized.

In the Gardens the general policy of refurbishing old plantings with

collections of scientific value has continued apace. The lepidote *Rhododendron* collection is becoming well established at the East Gate. Work on the Copse has started and will proceed in 1984 and 1985. Planting of conifers and rhododendrons especially has gone on at Benmore Garden to Mr Hall's master plan for collections there. At Logan we have been more concerned with restoring some of the old plantings of Cordylines and repairing some of the disastrous frost damage of a year or two ago. After some misgivings, the shelter belt plantings now seem to be becoming established satisfactorily. At Dawyck most of the building work is now complete except for two staff houses. The much needed shelter belt to the south-west was planted in a very difficult spring but established remarkably well. Spring 1984 should see some more modest planting in Dawyck but the development there will always require to follow effective eradication of scrub and we will have to exercise care not to overstretch our maintenance resources.

The planhouses in Edinburgh continue to cause trouble. One feels that perhaps we are suffering from having built houses too early in the development of the technology to control their environments. All indications are that they probably require a totally new control system.

In September Dr Page, and Dr Dyer of the University Botany Department, organized a very successful International Conference on the Biology of Pteridophytes which was based both in the Garden and the Department of Botany. This was but one specific example of close collaboration with the university world and of the Garden's general concern in education and training. There are the closest relations with many individuals especially in Scottish universities and continual interchange of help and collaboration, especially on the Garden's part in helping research students both in the Herbarium and the Library. It is pleasing to realize also that our own course in horticulture seems to pass the hardest test of all more than satisfactorily. Our students, even in the difficult economic times at present, continue to get suitable jobs within relatively few months of their completing the course.

Visitors numbers continue to be satisfactory at about 650,000 in Edinburgh and 35,000 at Logan, representing a more or less steady state, and 36,000 at Benmore—an increase of over 15% on 1982.

TAXONOMIC RESEARCH

SOUTH-WEST ASIA: FLORISTIC STUDIES

The close links with many of the ongoing Floras of SW Asia continued: *Flora of Cyprus*, *Flora of Pakistan*, *Flora of Turkey* and *Flora Iranica*. In the latter part of the year I. C. Hedge & J. M. Lamond were much involved in their contributions to the Umbelliferae for *Flora Iranica*, including the preparation of dichotomising and synoptic keys to the c.140 genera. As in many previous years substantial quantities of *Flora of Pakistan* manuscripts were sent here from Karachi and Rawalpindi for checking and surveillance; a total of over 150 fascicles have been published since the project started.

Routine naming of SW asiatic specimens mainly involved material from Turkey, Iran and especially, Arabia. Keeping up-to-date with handling

and naming the incoming collections from the Arabian peninsula is increasingly difficult, but we now hold a very important representation of its flora and an excellent reservoir of research material. The series of papers under the umbrella title 'Studies in the Flora of Arabia' is well under way; contributors are both local and international. Miss R. King, with Dr Kay (Edinburgh), submitted a paper (no. 12 in the series) to the *Arab Gulf Journal* (Riyadh) on the Caryophyllaceae of the peninsula. A further four papers in the series (i.e. up to no. 16) are now ready for press.

LÉVEILLÉ CATALOGUE

Part XVII of the Catalogue was published in 1983; it contained the last of the dicotyledonous families to be covered, i.e., Betulaceae, Fagaceae and Salicaceae, the last family with D. R. McKean. An index to all 17 parts was also published. Work on the Gymnosperms and Monocotyledons has started and the manuscript for Coniferae has been prepared. Evaluation of Hydrocharitaceae, Zingiberaceae and Orchidaceae was carried out. Orchidaceae, with about 1000 specimens in the Léveillé herbarium, contains several types of species described by such orchidologists as Schlechter, Finet and Rolfe; only one species, however, is attributed to Léveillé. The monocotyledons referred to above have all been mounted and incorporated into the herbarium.

ERICALES

Dr Chamberlain continued his studies on *Rhododendron* subgenus *Anthodendron* (the 'Obtusum Azaleas') and on the Old World species of *Berberis*. An account of the genus *Ferula* for *Flora Iranica* has been submitted for publication. He also assisted with the planning of the proposed new plantings of *Rhododendron* subgenus *Hymenanthus* at Edinburgh.

Dr Argent continued work with researches on the Ericaceae particularly *Vireya* *Rhododendrons* and the handbook of *Rhododendrons* of Sabah was completed and sent off to Sabah by the middle of the year.

Proposed fieldwork in Brazil with Dr J. Ratter was delayed repeatedly due to problems beyond our control but a shorter than planned visit of five weeks was concluded by December and a vegetational survey of an extreme southern outlier of cerrado vegetation was successfully completed. Additional visits were made to two areas of Atlantic forest which may repay further collaborative study.

ORCHIDACEAE, ETC.

Mr P. Woods recommenced work on New Guinea Orchids and *Aeschynanthus* (Gesneriaceae) immediately after completing his contribution to the orchid account for *The European Garden Flora*. A specimen of *Dimorphanthera kempteriana* (Ericaceae) collected originally in New Guinea (Woods 2101) was exhibited with the help of Dr Robson (BM) and Mrs Robson at a Royal Horticultural Show on 29 March and was given an Award of Merit. An illustration of this plant was prepared by Miss Rodella Purves and an accompanying account written with Miss J. Lamond for the *Kew Magazine*.

Mr Woods gave a series of lectures to the Irish Garden Plant Society at Glasnevin, and continued his collaboration with Dr R. Warren, Edinburgh (micropropagation of New Guinea orchids and other rare and/or endangered orchid species) and Professor A. Cassells, University College, Cork (micropropagation of Gesneriaceae).

THE EUROPEAN GARDEN FLORA

The typescript of Volume II of the Flora (the first to appear) was sent to press in January; the volume will be published on March 16 1984. Taxonomic work has continued on Volume I, with staff from the Garden having produced accounts of Agavaceae, Iridaceae, Taccaceae, Pteridophyta and various genera of Gymnosperms. It is hoped that the typescript for this volume will be submitted to press in the summer of 1984.

In spring, Dr Cullen visited the United States and Canada and lectured on *Rhododendron* classification, and on *The European Garden Flora* at Dalhousie University, Halifax, the US National Arboretum, Washington and the Arnold Arboretum, Boston.

In conjunction with the preparation of *The European Garden Flora*, work has continued on the identification of plants from the living collections and from the general public. During the year some 600 identifications were made by Miss Matthews and colleagues, about two-thirds of them from the living collections.

ZINGIBERACEAE

Miss R. M. Smith's account of the Zingiberaceae for the *Flora of Australia* went to press this year. She is currently revising the family for Borneo, and hopes to complete the first part (tribe *Alpineae* p.p.) in 1984. As usual a steady flow of requests for advice and identifications occupied much time.

BHUTAN FLORA PROJECT

The first part of Volume I of the *Flora of Bhutan* by A. J. C. Grierson & D. G. Long was published in April. Work on Part 2 of this volume is nearing completion and it should be published during 1984. Revisionary work for Part 3 is well in hand.

During the year, many of the orchids collected in Bhutan in 1982 flowered for the first time in the Propagation Department. Valuable herbarium, spirit and photographic records have been made from them.

CONIFERS AND PTERIDOPHYTES

Loss of supporting staff for much of the year and the need to continue with standing commitments made the year a particularly difficult one for Dr C. N. Page. Involvement in outstation development of conifer collections in Britain, teaching commitments and the role of co-Organizing Secretary for an International Symposium on Pteridophyte Biology (held at the RBG for the week 12-16 September) and consequent editorial work, all made heavy demands on Dr Page's time. Single-handed, it was impossible to make much headway on other duties, including taxonomic or experimental research, plant identification, flora-

writing or herbarium curation, and a considerable backlog of materials and requirements accumulated in these areas. Simultaneously, demand for these duties has increased through the loss of conifer specialists at both Kew and the British Museum, and this has done little to help the Edinburgh situation.

BRAZILIAN FLORA STUDIES, CYTOLOGY, ETC.

Dr Ratter's research time was spent on the identification of the collection made in Brazil in 1982, and in the preparation of three chapters of *Resources & Development in Belize* and the accounts of *Spergula* and *Spergularia* for the *Flora of Great Britain and Ireland*. He also visited Brazil for five weeks in November and December, financed jointly by the British Council and the Brazilian CNPq, and was accompanied by Dr Argent. A survey of one of the southernmost cerrado areas in the state of São Paulo was carried out in collaboration with staff of the University of Campinas and, in addition, a visit was made to the University of Brasília.

Dr Ratter also gave a short course of lectures on the savanna and forest vegetation of Brazil to students of the Department of Geography, University of Edinburgh, and lectures on the same subject were given in ecology and tropical biology courses of the Universities of St Andrews and Aberdeen respectively.

As in previous years, virtually no cytological work was carried out because of lack of assistant staff.

BRITISH HERBARIUM

Most of the specimens from the extensive Robert Mackechnie herbarium have now been mounted and are well on the way to being incorporated. Interesting Scottish records are being laid aside for vice-county recorders. Mr McKean was involved in identifications of critical groups for the new *Flora of the Lothians*.

Field surveys in Scotland this year included an assessment of sites on Ben Dearg in Wester Ross and a freshwater macrophyte survey of some of the machair lochs in South Uist and Benbecula. Reports on both were written up and sent to the Nature Conservancy Council.

BASIDIOMYCETES

Dr Watling's work on members of the Bolbitiaceae, and Boletaceae (particularly from India and Australia respectively) continues, and papers covering certain groupings within these families have been or are being prepared. A study of the British and Australian *Armillaria* spp., and of British island fungal floras progressed. Field work was undertaken in Shetland during August. Joint studies on the chemistry of *Cortinarius* with Strathclyde University Forensic Science Dept. continue.

Miss Judy Downe, formerly of Victoria Plant Research Institute, Melbourne spent six months in the laboratory, extending the studies on agaric-development. With Mrs N. Gregory a study of Royle's Indian fungi was completed and has been submitted for publication, and in addition to general assistance Mrs Gregory has helped towards lists of fungi for various western Scottish islands. Two parts of the *British Fungus Flora* are well on the way to completion, one authored by P. D. Orton (Associate).

Watling delivered the invited address at the British Mycological Society meeting at York University in September. He also chaired a session and delivered a paper at a meeting on mycogeography, organized a workshop (Bolbitiaceae) and a historic foray for the same national society.

UREDINALES

Mr Bennell completed his experimental investigation into the pathology and host range of *Chrysomyxa* on *Rhododendron* in Britain. With Prof. Henderson he compiled a review of fungal parasites on ferns and their allies and presented a paper on these fungi and their significance to host taxonomy at the International Symposium on Pteridophyte Biology in September.

Under Prof. Henderson's direction, and jointly with Dr J. Lennard of Edinburgh School of Agriculture, Stephan Helfer (PhD student) commenced a study of micromorphology and cytological variation in cereal rusts.

ASCOMYCETES AND LICHENS

Dr Coppins has continued work on *Micarea* (extra-European collections) and on miscellaneous studies on lichenized and non-lichenized fungi, including a revision of the Trapeliaceae in Britain. Field studies included visits to Coll and Tiree and northern Scotland in connection with a review of sites of importance for lowland, terricolous lichen communities being prepared by the British Lichen Society for the Nature Conservancy Council. Prof. P. M. Jørgensen (Bergen) left in April after 9 months work in the laboratory.

GENERAL MYCOLOGY

All members of the laboratory staff played important roles in the success of the Dutch Jubilee foray and Nordic Mycological Congress which were held concurrently in Scotland in September.

LABORATORY

The installation of a new photomicroscope in the laboratory will greatly facilitate comparative EM and LM studies. In its first full year of operation, supervised by Mr Bennell, the scanning electron microscope has contributed to more than twenty research projects ranging from structure of spores and pollen, to leaf and seed surface morphology and infection processes in cereal rusts. This research has involved 10 members of staff and 7 visiting collaborators. Mr Bennell carried out a study on the pollen morphology of two new genera of Labiatae. Archaeological studies in collaboration with Mr R. McCullagh of the Central Excavation Unit and Mr B. Moffat of the Border Burghs Archaeology Project continue.

THE HERBARIUM

ACCESSIONS, LOANS AND SPECIMENS MOUNTED

Incoming exchange accessions in 1983 came from 20 sources and amounted to 3390 specimens, including 1127 from Vienna. Our 'distributions' were well up on last year with the sending out of over 3000 duplicates mostly from SW Asia to 23 institutes; also a number (c.1100) of

cultivated duplicates were sent to such places as Wisley, Arnold Arboretum and Ithaca, New York.

Gifts or collections by staff members numbered c.7883, with the largest number being specimens from the Arabian Peninsula collected by Sheila Collenette, Robert Western, Michael Gallagher, Ken Naylor, Klaus Müller-Hohenstein, Wolfgang Frey, Harald Kürschner and others. The steady flow of important collections from southern Africa (O. M. Hilliard & B. L. Burt) continued (c.1400 specimens).

A total of 1223 specimens were purchased this year, 800 Turkish specimens collected by Dr Kit Tan from Edinburgh University Botany Department (Flora of Turkey unit) and 423 Flora Iranica specimens from Professor Rechinger in Vienna.

	1982	1983
Accessions*	12010	11273
Distributions	919	6008
Loans: in	6000	4430
Loans: out	5869	6239
Specimens mounted	14239	13029

*These figures do not include material of fungi, lichens and bryophytes collected by members of staff (c. 2000 specimens).

PHOTOGRAPHIC SLIDE COLLECTIONS

About 800 slides were added to the collection. Six new cabinets were incorporated to allow for much-needed expansion.

STAFF CHANGES

Mr L. A. Lauener retired in April after 46 years (incl. war service) at the Garden. Because of financial restraints we were unable to fill his post in the herbarium.

Another long-serving member of staff, Mrs Gladys Millar, senior mounter, retired in February. Her replacement is Miss Rita Calder.

An ASO board was held in August for two replacement posts. Those appointed were Miss Jane Nyberg (records office and herbarium) and Miss Ruth Hollands (laboratory and cryptogamic herbarium); both took up their posts in late autumn.

VISITORS

Some of the longer term visitors in 1983 were Professor P. M. Jørgensen (Bergen), Dr Naruhashi (Toyama), Mr Y. Ayasliğil (at Munich), Miss J. Downe (Melbourne) and Dr L. Musselman (at Khartoum).

Four PhD students who were frequent users of the herbarium/laboratory were Mr A. Doroszenko (*Satureja*, Edinburgh), Mr J. Shah (*Swertia*, Aberdeen), Stephan Helfer (rust fungi, Edinburgh), and P. Hadfield (bracken, Edinburgh). The Flora of Turkey trio of Professor Davis and Drs Kit Tan and R. Mill, together with Mr Burt, Mr Davidian and Mr Lauener, were regularly in the herbarium. Mrs O. M. Stewart was a frequent visitor to the British Herbarium.

There were the usual visits of groups of university students from Edinburgh, Aberdeen and Stirling; various other professional groups

visited the herbarium building. Such visits have increased appreciably in recent years.

Not included in the lists below are the participants in the autumn fern symposium, the Dutch jubilee foray, or the Nordic mycological congress.

Other visitors:

A. A. Abdullah (Edinburgh), Mr L. G. Adams (Canberra), Mr A. Al-Alawy (Riyadh), Prof. A. Al-Rawi (Kuwait), C. Bas (Leiden), Mr D. Bellamy (Doncaster), Dr I. Belolipov (Tashkent), Mr T. K. Bhattacharya (Kathmandu, at Kew), Dr R. W. Boden (Canberra), B. J. Brock (Adelaide), Mr D. Byres (Edinburgh), Dr P. F. Cannon (CMI, Kew), Mr Chan (Nanking, at Reading), Mr A. D. Chapman (Canberra), X. Y. Chen (at Reading), M. A. Clements (Kew), Dr Cody (Ottawa), Mrs I. S. Collette (Sway, Hants), Dr R. W. M. Corner (Penrith), Dr W. D'Arcy (Missouri), Dr U. Deil (Bayreuth), Dr J. Dickson (Glasgow), Prof. J. G. Duckett (London), Prof. M. N. El-Hadidi (Cairo), Dr A. El-Oqlah (Yarmouk, Jordan), Prof. G. Felipe (Campinas), Dr R. E. C. Ferreira (Cumbria), Prof. W. Frey (Berlin), Mr M. D. Gallagher (Muscat, Oman), L. D. Gomez (Costa Rica), Dr J. Grainger (Jiddah), Mr P. S. Green (Kew), Dr C. Grey-Wilson (Kew), Dr O. Haas (Pennsylvania), Mr Haddad (Basrah), S. Hadiuzzaman (Dacca, at Nottingham), Prof. T. F. Hewer (Bristol), Miss R. Hoffman (Munich), Mr A. Huq (Bangladesh), Mrs R. D. I'Ons (Cambridge), Mr R. Islam (Bangladesh), P. W. James (BM), Dr A. C. Jermy (BM), Mr Z. Jin (Peking, at Kew), Dr B. Jonsell (Uppsala), Dr K. Kay (Edinburgh), Mr M. S. Khan (Karachi), Dr H. Kürschner (Berlin), Dr E. Leblebici (Izmir), L. T. Lock (Perak), Dr J. McNeill (Ottawa), Mr P. Maudsley (Durham), Prof. R. Monteiro (Rio Clavas), Dr B. Morley (Adelaide), Prof. K. Müller-Hohenstein (Bayreuth), D. Munro (Dundee), Mrs C. W. Murray (Prabost, Skye), Dr L. Musselman (Virginia, at Khartoum), Mr Y. Nasir (Rawalpindi), Mr M. Newman (Aberdeen), Mr M. Parille (Paris), Prof. D. Podlech (Munich), Dr A. C. Podzorski (Landskrona, Sweden), Dr C. Preston (Monks Wood), Dr Puttock (New South Wales), Prof. & Mrs K. H. Rechinger (Vienna), Mr A. Rhaman (Riyadh), Dr D. Richardson (New York), Dr N. Robson (BM), Dr C. Sargent (Monks Wood), Dr G. Schumaker (New York), Dr A. J. Silverside (Paisley), P. Siriruga (Hatyai, Thailand), Dr & Mrs A. Skene (Dubai), Dr P. M. Smith (Edinburgh), Dr F. Sorger (Vienna), Dr & Mrs M. Stanley-Price (Oman), Dr G. A. Swan (Newcastle), Prof. N. Taroda (Campinas), Mr G. Taylor (Glasgow), C. Thompson (Brisbane), Dr J. I. Ubena-Jimenez (Cordoba), Mr B. Verdourt (Kew), Mr B. M. Wadha (Indian Liaison Officer, at Kew), Dr H. Walter (Dresden), Dr K. Walter (New York), Dr P. F. Yeo (Cambridge), Dr G. S. Yonzon (Darjeeling).

THE LIBRARY

The purchase of some 500 back numbers of journals to fill up gaps in our holdings was a major event this year. The work related to it took up a good deal of time, and the transaction reduced our budget for other purchases so considerably, that no purchases were made after August. This, together with the restrictions on inter-library loans, provided some spare time which was used in processing some of the stock that had been in store for a long time. In particular, more volumes were sent to the binders than in previous years. The number of visitors using the library rose again this year. Shortage of staff continued to deteriorate further the standard of management and service. Lack of suitable office accommodation and furniture has also affected the library adversely. The Librarian and Asst. Librarian continue to put in many extra hours of work.

Statistics of library transactions were as follows (the figures for 1982 are in brackets): acquisitions 2326 (2911), indexing 2911 (3746), exchanges 1063 (1054), interlibrary loans 686 (824), binding 1061 (233), and visitors 894 (783).

PUBLIC EDUCATION

1983 was a difficult year as the post of Education Officer was not filled until July when Dr Ian Edwards joined the staff. He was previously at Aberdeen University and at the Forestry Research Institute of Malawi.

The main new exhibit in the Exhibition Hall entitled 'Ancient Land Plants' deals with the ferns and their allies. It was organized to coincide with the international fern conference in September. Also in September the Scottish Rock Garden Club celebrated its Golden Jubilee with a buffet meal and presentations in the Exhibition Hall. Temporary exhibits included a display of easily grown house plants for low light conditions, an exhibit on liverworts, an explanation of the effect of rainfall and temperature on vegetation, and an exhibit on mistletoes.

The Garden contributed to three primary school Interlink programmes entitled 'South America', 'Wood and Trees' and 'Attack and Defence'. A total of 1156 children from 47 schools took part. An 'Interlink' for 5th and 6th form students involved 93 students from four schools.

We received many requests for guided tours of the Garden, planthouses and herbarium from schools, universities and professional organizations. It was usually possible to meet these requests and frequently members of the scientific and horticultural staff were involved when specialist knowledge was needed. As in the previous years there were many postal and telephone requests for information on a wide variety of biological topics.

PUBLICATIONS

Three parts of *Notes RBG Edinb.* were published during 1983: vol. 40(3): 425-558; 41(1): 1-208; and 41(2): 209-399. These contained a total of 43 papers and 11 book reviews. In addition the *General Index* for vols. 31-39 was published and material for another part of the *Notes* sent to press.

Late in the year Dr Ratter handed over the editorship to Dr Coppins but Mrs Gregory remained as Assistant Editor, thus preserving the continuity of the editorial team.

PUBLICATIONS BY MEMBERS OF STAFF IN 1983

- BENNELL, A. P. A note on the pollen morphology of *Dauphinea* and *Puntia*. *Notes RBG Edinb.* 41:123-125.
 — & HU, C-M. The pollen morphology and taxonomy of *Lysimachia*. *Ibid.* 40:425-458.
 — & — Two new Asiatic species of *Lysimachia*. *Ibid.* 40:461-466.
 — & WATLING, R. Mushroom poisonings in Scotland. *Bull. Br. Mycol. Soc.* 17:104-105.
 BUCHAN, L. J. Glasshouse management. *Roy. Cal. Hort. Soc. Yearbook and Journal* 1983: 55-57.
 COPPINS, B. J. A taxonomic study of the lichen genus *Micarea* in Europe. *Bull. Brit. Mus. Nat. Hist. Bot.* 11:14-214.
 — A new corticolous sorediate *Rinodina* from Swedish Lapland. *Lichenologist* 15:147-150.

- & JØRGENSEN, P. M. The nomenclature of *Xanthoria lobulata* (Flörke) B. de Lesd. (Lichens). *Taxon* 32:462–464.
- & PENTECOST, A. R. Key to Opegrapha in Great Britain. *Bull. Brit. Lichen Soc.* 53:27–35.
- & ROSE, F. Lichens of Colonsay. In BOYD, J. M. & BOWES, D. R. (eds) *The Natural Environment of the Inner Hebrides. Proc. Roy. Soc. Edinb. B Series* 83:403–413.
- GRIERSON, A. J. C. & LONG, D. G. *Flora of Bhutan*. Vol. 1. Part 1. 186 pp. Edinburgh.
- HEDGE, I. C. Two new monotypic genera of Labiatae. *Notes RBG Edinb.* 41:115–121.
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- *Paraleptodontium*, a new genus of Pottiaceae. *J. Bryol.* 12:179–184.
- Notes relating to the Flora of Bhutan: VI. A new species of *Erycibe* (Convolvulaceae). *Notes RBG Edinb.* 41:127–131.
- & DAMSHOLT, K. Notes on some Scandinavian *Cephalozia* species; *C. rubella* (Nees) Warnst. var. *arctogena* Schust., new to Europe, the identity of *C. norvegica* Douin and typification of *C. stellulifera* (Spruce) Schiffn. *Lindbergia* 9:65–69.
- & HILL, M. O. *Tortula solmsii* (Schimp.) Limpr. in Devon and Cornwall, newly recorded in the British Isles. *J. Bryol.* 12:159–169.
- & ROBSON, N. K. B. Notes relating to the Flora of Bhutan: VII. Notes on *Hypericum* L. *Notes RBG Edinb.* 41:133–139.
- McBEATH, R. Scotland's Native Treasures. *J. Scot. Rock Gard. Club* 18:234–243.
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- & BIGELOW, H. E. Observations on the Bolbitiaceae—22. Eastern North American members of the family. *Mycotaxon* 7:377–397.
- & CHANDRA, A. Studies in Indian *Armillaria* (Fries per Fries) Staude (Basidiomycotina). *Kavaka* 10:63–84.
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THE GARDEN, EDINBURGH

Total admissions to the Edinburgh Garden were 645,048—a decrease of just over 25,500 on the 1982 figure.

ARBORETUM DEPARTMENT (Mr G. Broadley)

The first stage of the new *Azalea* project was completed by the end of April. This involved the construction of 32 new beds to accommodate the various species and hybrids. The final stage, which involves the introduction of other species and hybrids, should be complete by spring of 1985.

The work to concentrate the lepidote rhododendrons in the East Gate area, continued throughout the year. With a few exceptions, all the plants selected for this scheme are now on site. As they become available, younger rhododendrons and ground cover plants will be phased in to upgrade this planting.

The reorganization of the elepidote rhododendrons started in October, work being centred in the Copse, where the subsections *Fortunea*, *Glischra*, *Neriiflora* and *Pontica* will be planted. Inevitably this will cause disruptions in other parts of the garden as large plants are moved to other

areas. The total project will be spread over several years. The Copse phase should be complete by spring 1985.

During the year, mainly because of the disruptions caused by the *Rhododendron* reorganization, many other fairly large trees and shrubs had to be re-sited.

In September the first confirmed victim of Dutch Elm Disease was recorded. This was an old specimen of *Ulmus glabra* 'Camperdownii' that grew on the north side of Inverleith House near the Oak Lawn.

The weather during the year was generally favourable, with only minor gale damage being recorded.

GLASS DEPARTMENT (Mr L. A. Buchan)

Even after the major maintenance programme in 1982 by PSA on the display houses faults have occurred in the cactus, temperate and fern houses. The rack and pinion boxes replaced in 1982 were renewed this year. This problem produced poor ventilation and resulted in scaffolding having to be erected once again to complete urgent repairs.

The temperate palm house remained closed during most of the year owing to the non-arrival of special glass for the roof, and the lack of staff to maintain it.

The tropical aquatic house had to be closed to the public during March to allow PSA to repair the large glass viewing panel in the tropical pool. The panel cracked at one side after the pond was cleaned out and had to be laminated with thick sheets of glass to make an effective repair.

Biological control was tried out with limited success in House 2, and will be continued into 1984.

Due to substantial losses of *Vireya* rhododendrons an experiment was carried out in the Peat House to see how drainage and soil structure could be improved. Tile drainage pipes were used as a base after the removal of 18 in of soil. Different mixes of compost were added as a covering on top of the pipes. The areas has now been planted up and records will be kept of the growth of the plants.

Plants were supplied and arranged to decorate the DAFS building at the Royal Highland Show Ground and the Royal Scottish Academy. *Vanilla imperialis*, one of the vanilla orchids, flowered and produced seed pods in service house no. 20. This is the first time this has happened in the memory of anyone in the Garden.

Visitors to the Glass Department included Mr K. Morgan (Kirstenbosch), Professor Neville (Marseille), Mr K. Friis, Mr N. Bredmose and Mr A. Pilgaard (all from Danish Research Service), Mr P. Atkins (Duke University, N Carolina), Dr I. Belolipov (Tashkent) and student parties from Dundee Parks Department, Elmwood College, Durham and the National Trust Training Garden, Threave.

HERBACEOUS AND ALPINE DEPARTMENT (Mr A. Evans)

Apart from general maintenance which takes up a great deal of time, a large part of the staff's winter energies was directed towards the construction of a stream to link the well-established water course in the Rock Garden with the large Pond. This entailed a great deal of soil excavation,

levelling the area, concreting the sides and bottom track of the proposed stream, shaping small pools and waterfalls and placing sandstone and conglomerate rocks on top of the stream sides to mask the hard line of the concrete. Much soil improvement went on down the edges of the stream and a large planting-up scheme is scheduled for the spring of 1984.

A large area of the Woodland Garden was renovated: a part that had received only minimal attention since it was designed and laid out in 1948. A number of rhododendrons and other woody plants in the vicinity were either rearranged or replanted elsewhere while at the same time efforts were made to improve the fertility of the soil. The planting of lilies, primulas, hostas, rodgersias and other herbaceous plants will be carried out during March and April of 1984.

Areas in the Rock Garden and Heath Garden were upgraded with fresh soil and many new plants were introduced into these re-designed parts of the garden.

Work continues on the redevelopment of the area known as the Rhododendron Walk and after much activity in spring a large replanting of plants, which had been suppressed in the last few years, should show improvements in their general health and vigour as they reap the benefit of this treatment. Another winter should see this area completed but little has been done this winter because of pressure to complete other more critical tasks, i.e. the Stream project.

The new Rose Garden at the west of the Demonstration Garden received attention and fresh areas were incorporated. These were planted up with a number of young cultivars and species. Some of the plants which are already established are growing strongly.

PROPAGATION DEPARTMENT (Mr J. A. R. Kerby)

Temperate Section. The propagation of rhododendrons from existing stocks by cuttings and grafting formed the basis of the winter programme, with new introductions from the wild raised from seed. Work continued with the propagation of plants for the garden departments, Benmore, Logan and Dawyck, as requested, with much time being spent on new wild source accessions.

Pterocarya forrestii originally collected by George Forrest in China in 1914 (Forrest 13378) was successfully grafted on to stocks of *Pterocarya stenoptera*. *Abies squamata*, the 'Flaky Bark Fir' from China, growing at Dawyck was successfully grafted on to stocks of *Abies homolepis*. Difficulties of varying kinds occur: one graft for example produced callus, then proceeded to drop its needles; another did the same after producing a flush of growth. *Picea likiangensis* (Forrest 6746) has been raised from cuttings of laterals, but leader formation may be a problem.

Plants from seed of *Acer nipponicum* from the only established tree in Scotland, at Dawyck, were successfully raised. Fresh seed was collected, the embryo excised and placed on moist blotting paper in the cold store at 1°C (34°F). Once germination had started the seed was sown in peat in a glasshouse with a night temperature of 12°C (54°F). The established plants are now 6in high.

Tropical & Study Collections. It was quite obvious that a more open,

'epiphyte type' compost was required for the *Vireya* section rhododendrons. There had been problems with root rot, overwatering, and the effect of slow release nitrogenous fertilizers. Rhododendrons have a preference for nitrogen in the form of ammonia salts and much of the soluble nitrogen available in slow release fertilizers is in the form of nitrate. A compost of 2 parts coarse peat, 1 part fine peat and 1 part 'Perlite' with the addition of micro nutrients has proved successful. Macro nutrients are provided by liquid feeding at weekly intervals.

A closed case was constructed to improve the cultivation of *Welwitschia bainesii* in accordance with advice from Herr Borges in Berlin-Dahlem. Under soil heating cables buried in peat with overhead misting was used. Plants already established in drain tiles were plunged in the peat, covering the surface with grit. Already there has been a significant increase in growth and further accessions of wild source material have been raised.

Much effort in this section goes towards the cultivation of plant introductions from abroad in the quarantine section.

Notable Plants. *Paramongaia weberbaueri*, the daffodil-like member of the *Amaryllidaceae* from Peru produced a solitary flower. It is apparently very shy to flower in cultivation but the two bulbs received in 1971 have rapidly increased in number.

Rhododendron salicifolium collected by Dr G. Argent and Mr I. W. J. Sinclair on Gunong Serapi, Sarawak in 1982 flowered late in the year. This is the first time this small yellow flowered species has been collected since 1912.

An Australian member of the *Goodeniaceae*, *Leschenaultia biloba* with dark gentian-blue flowers has flowered particularly well during the last two winters despite our low light levels. Cuttings root easily and it is necessary to propagate frequently to maintain a stock of young plants.

Accessions. Total accessions of living plant material in the form of seeds, cuttings and plants numbered 2754 of which 1867 were of wild origin.

Early in the year seed was obtained from Mr D. L. Binns, Garden Supervisor at Dawyck who organized an expedition to Pakistan during August and September 1982. Some interesting leontopodiums were collected and of particular interest the grey foliage, pink flowered *Waldheimia nivea*.

In July, Mr R. McBeath, Garden Supervisor in the Herbaceous Department, took part in an expedition to a part of East Nepal last visited by Donald Lowndes in 1951. Of particular interest were collections of seed and live plants of *Rhododendron lowndesii* and *Stellera chamaejasme*.

In October Mr S. Macpherson of the Herbaceous Department took part in the Alpine Garden Society Expedition to Sikkim. Both living plants and seed were collected including an interesting collection of cremanthodiums and the tight cushion plant *Tanacetum gossypinum*.

Mr N. Claugan, Garden Supervisor in the Arboretum, accompanied by Mr J. Fernie of the Propagation Department visited the Pyrénées in September returning with seed and plants.

In November a large consignment of woody plants was collected from Wakehurst Place.

Dispatches. Live plant material within Britain and overseas:

245 seeds
2144 plants
1300 cuttings
71 bulbs
176 scions
12 specimens

3948

PLANT HEALTH (Dr Watling)

The interceptions were less than half the number made during 1982 probably because fewer major expeditions were in the field. The majority were again insects or nematodes some of which are rare or poorly known. *Puccinia celmisiae* on material from New Zealand was the only fungal record of note.

YOUNGER BOTANIC GARDEN

(Mr A. Hall)

Phase 1 of the development of the Courtyard buildings was completed and the accommodation was brought into use in November and December.

The first stage of a new road was constructed in Glen Massan. When complete this road will give access to tractors and equipment to speed development and ease maintenance, and will also provide all weather pedestrian access for the general public. The route has been cleared for the final stage of the road.

Approximately 450 specimens were planted out into the collections during the year. The staff were almost fully occupied with routine maintenance and only a small amount of development work was possible.

In a joint venture with the National Trust for Scotland Brodick Castle Gardens we staged an exhibition at the Royal Horticultural Society Spring Show on 28 and 29 March, in the Old Hall at Westminster. It was awarded a Gold Medal by the RHS Council and as a result received widespread coverage in the national press and in gardening periodicals.

Two members of staff resigned during the year and will be replaced in 1984.

The total number of visitors recorded from April to October was 36471, over 6000 more than in the previous year.

LOGAN BOTANIC GARDEN

(Mr J. M. Colledge)

Woodlands. The policy of removing by stages depauperate and dangerous trees continues. A further block of *Fuchsia magellanica* was cut back and in the space made hardwoods were planted. As a result of further training in arboricultural techniques the Supervisor and his staff are now competent to deal with all our arboricultural work. *Pittosporum tenuifolium* and *Griselinia littoralis*, now flower and fruit freely in the Garden, which

means that we can now provide from our own resources all our requirements of these valuable taxa for shelter belts. The Deer Hill plantation continues to make reasonable growth despite some damage caused by roe deer in 1982.

Walled Garden. In addition to routine maintenance, a gravel path near the Salad Bar was converted into a border, an aged specimen of *Pseudopanax laetum* removed, and other borders renovated.

Plant Collection. Gradually more taxa of known wild origin from southern Hemisphere sources are being introduced. Mr Burt's collections from Southern Africa have given a substantial boost to this aspect of the Department's work. Again in 1983 his new taxa were admired by visitors. Three new diascias *D. vigilis*, *D. megathura* and *D. anastrepta* were introductions of horticultural merit. Other new taxa of note are *Zaluzianskya* spp., *Felicia quinquinervia*, *Senecio macrocephalus* and, it was interesting to see. Mr Burt's wild collected *Nerine howdenii* in flower. *Xeronema callistemon* flowered again, and from Transvaal, *Bowkeria citrina*, a woody member of the Scrophulariaceae grown in a container and placed in the open for the summer, produced attractive lemon yellow flowers. *Echium wildpretii* from the Canary Isles made a five foot spike of bright red flowers.

Glasshouse. The installation of a thermal screen, insulating material and supplementary lighting, has proved worthwhile by reducing fuel consumption and providing more effective shading in summer. The lighting has improved the appearance ('finish') and the survival rate of young plants during the winter months.

Rainfall was below average; July and August were the driest months. In February a gale damaged a boundary fence and destroyed panes in dutch lights and the glasshouse.

There were no staff changes during the year and staff continued to produce a high standard of work.

Visitors numbered 35016, a slight drop from the total in 1982.

DAWYCK ARBORETUM (Mr G. Broadley)

Early in the year the shelter belt planting on the West side was completed. An area, approximately 170 × 46 m was fenced off to a height of 2 m. Some 5000 *Pinus* spp. were planted inside this enclosure and in adjacent areas. Species included *Pinus uncinata*, *P. nigra*, *P. nigra* var. *maritima*, *P. contorta* and *P. sylvestris*. It is hoped that many of those planted outside the fenced area will survive the attentions of the deer and rabbits.

Heavy digger equipment was again hired to clear more roots and scrub, particularly in the Chapel and Shaw Brae areas. The Policy Bank was also cleared, by hand, of dying trees, unwanted specimens and scrub, to make way for new conifer plantings. Several areas of bank on the lower reaches of the stream, were cleared and prepared, then planted with suitable herbaceous groups.

In April a new 'Argocat', 8-wheeled, overland vehicle was purchased.

This has proved invaluable for transporting men, equipment and materials into difficult areas.

Construction problems delayed the completion of the final stages of the service building, preventing proper use of the tractor sheds, workshops and yard. These buildings, which were scheduled for completion in June will not, now, be complete until April 1984. Another aspect of the building work that is causing concern is the exudation of a limey deposit from the blockwork on the external walls. This is very unsightly and is proving difficult to rectify.

Weather during the period was relatively good. Autumn being particularly favourable. This allowed much work to be completed in dry conditions. Early and late in the season minor gales blew down several old and diseased trees in the area, most of which were outside the Garden perimeter.

HORTICULTURAL TRAINING SECTION

The section continues under the full-time management of Mr G. Anderson and Mr D. A. Rae.

The annual presentation of awards to students was made by Principal N. F. Robertson CBE, of Edinburgh School of Agriculture on 8 July. Twelve students were awarded Diplomas (8 with Credit). The British amenity sector provided employment for the majority of students while one gained a one year scholarship to work in Jerusalem and two obtained posts in a lecturing and teaching capacity. Although only five had obtained jobs by the immediate end of the course, all were in employment by September.

The Section's involvement with SCOTEC and the Royal Horticultural Society's examinations continued as did their participation in Degree and Post-Graduate landscape teaching for Heriot-Watt and Edinburgh University.

The number of enquiries seeking advice on horticultural careers and courses increased as did the number of applications (c.140) for entry to the 1983-86 Diploma Course.

ANNUAL RAINFALL

Edinburgh	618.5 mm (24.7 in)
Benmore	2372.5 mm (94.9 in)
Logan	809.3 mm (32.3 in)

STAFF LIST (December 1983)

DA, Dawyck Arboretum; LBG, Logan Botanic Garden; YBG, Younger Botanic Garden

Regius Keeper	Prof. D. M. Henderson
Personal Secretary	Mrs A. M. Johnston
Assistant Keeper	Dr J. Cullen

Principal Scientific Officers	Dr G. C. G. Argent Dr D. F. Chamberlain Mr A. J. C. Grierson Mr I. C. Hedge	Mr D. G. Long Dr C. N. Page Dr J. A. Ratter Dr R. Watling
Senior Scientific Officers	Mr G. Anderson Dr R. B. Burbidge Dr B. J. Coppins	Miss V. A. Matthews Mr A. G. Miller Miss R. M. Smith
Higher Scientific Officers	Mr A. P. Bennell Mr R. Eudall Mrs N. M. Gregory Mr D. R. McKean	Mr D. A. H. Rae Mrs J. M. Woods (née Lamond) Mr P. J. B. Woods
Scientific Officers	Mr K. N. Grant Miss E. H. Hamlet Mrs H. Hoy Miss R. A. King	Miss S. J. Mackay Miss M. A. H. Paul Mrs D. M. Radcliffe
Assistant Scientific Officers	Ms D. Brunton Miss R. C. Hollands	Miss A. M. McRitchie Miss J. Nyberg
Laboratory Attendants	Miss M. Bryce Miss R. M. Calder	Mrs E. A. McAllan Miss M. McLaren
Curator	Mr R. L. Shaw	
Assistant Curators	Mr G. Broadley Mr L. Buchan Mr J. M. Colledge (LBG)	Mr A. Evans Mr A. Hall (YBG) Mr R. Kerby Mr J. Sandham
Garden Supervisors	Mr D. Binns (DA) Mr N. Claughan Mr R. U. Cranston Mr G. Kirkpatrick Mr G. Knott Mr R. J. D. McBeath Mr M. V. Mathew	Mr I. W. J. Sinclair Mr W. Tait Mr B. Unwin (LBG) Mr M. Welsh (YBG)
Librarian	Mrs D. A. Morrison	
Assistant Librarian	Mr J. Sinclair	
Higher Executive Officer	Miss J. R. S. Renwick	
Executive Officer	Mrs J. Archbold	Mrs R. Bell
Clerical Officers	Mrs A. J. Black	Mrs D. M. R. Mackay
Clerical Assistants	Mr M. Delaney Mr W. Nicholson	Mrs M. O'Brien
Senior Paperkeeper	Mr J. Y. Thomson	
Sergeant Park-Keeper	Mr A. W. Brown	
Corporal Park-Keeper	Mr W. S. Connachar	Mr W. Murray
Park Constables	Mr M. E. Fitz Mr P. N. Fletcher Mr D. C. Hogg Mr G. W. Lawson Mr J. McCluskey (YBG) Mr S. Macpherson Mr A. J. Paxton	Mr T. A. Nisbet Mr W. B. Scott Mr R. Stevenson Mr I. M. Potts (YBG) Mr J. Stewart Mr E. F. Young
Gardeners Special	Mr S. M. Boyd (LBG) Mr J. Fernie Mr G. Godbert (YBG) Miss M. Jones Miss E. A. Mackintosh Mr W. M. Milne (DA) Mr G. Murdoch (LBG)	Mr H. W. Paxton Mr R. M. Robertson Mr J. P. W. Smith Mr R. Stainthorpe Mr C. Thompson (YBG) Mr J. Urquhart Mr N. A. Wright (YBG)
Gardeners I	Miss J. M. Corden Mr A. J. Dunn (DA) Mr S. Hardman Mr N. McIntyre (YBG)	Mr D. J. Pearson Mr A. B. Sinclair Mr J. Smith Mr E. D. Traynor (YBG)
Gardeners II	Mr M. D. Cassidy Mr N. T. Carrington Mr A. M. Davidson	Mr N. A. Horsfield Mr J. Lamont Mr R. J. Milne
Assistant Gardeners		

	Mr E. Duff	Mr P. Russell
	Mr M. Geddes (LBG)	Mr J. Sherriff (YBG)
	Mr I. Herkes	Mr R. A. Wood
Engraver	Miss M. Laing	
Storeman	Mr W. Hoy	
Driver	Mrs M. Boyd	
Female Lavatory	Mrs. W. Connacher	Mrs C. Horner
Attendants	Mrs S. J. Dunn (DA)	
Male Lavatory	Mr L. J. Kelly	Mr H. McDonald
Attendants		
Cleaner/Handyman	Mr P. McCormick	
Nightwatchmen	Mr J. Brady	Mr J. McKenzie
	Mr J. Duffy	Mr W. Pringle
Students—Third Year	Mr Q. J. Allardice	Mr D. G. Knott
	Mr G. E. Bruce	Mr G. R. Ludgate-Castle
	Mr G. R. Croll	Mr A. A. MacDonald
	Mr E. T. Edwards	Miss S. McDermott
	Mr M. Flanagan	Mr D. A. Robertson
	Mr G. K. Hedger	Mr D. C. MacG. Wilson
Second Year	Mr A. Aubrey	Mr D. S. Paterson
	Miss J. D. E. Bradley	Miss J. A. Simmonds
	Mr K. A. Craggs	Mr M. R. Shaw
	Mr C. H. Fisher	Mr J. R. Tizzard
	Mr E. Harland	Mr W. A. J. Watkins
	Mr G. S. Kinniburgh	Mr K. Yapp
First Year	Mr D. I. Chavasse	Miss J. G. Queen
	Mr B. Corr	Mr N. J. Robertson
	Mr S. M. Davies	Mr T. J. H. Sharp
	Mr M. D. Ferriday	Mr C. A. Totty
	Mr G. Jones	Miss S. M. Trounson
	Mr D. Learmond	Mr S. Young