A SURVEY OF THE WORK OF THE ROYAL BOTANIC GARDEN EDINBURGH IN 1975

CONTENTS

General Review

Each year brings both problems and satisfactions. The Garden pressed on with developments and activities on many fronts and there are some, of greater or lesser importance, worthy of particular mention. 1975 was a particularly active year on the national and international level. By specific invitation three members of staff advised on overseas projects—an international banana collection in Papua New Guinea (Dr Argent), a new botanic garden in Shiraz, Iran (the Regius Keeper) and a new rock garden in Newfoundland, Canada (Mr Evans). The Ministry of Overseas Development asked us to undertake a floristic work for Bhutan (Mr Grierson and Mr Long) and arranged a collecting expedition there—a welcome return by Edinburgh botanists to a flora of great interest to British botanists and horticulturists.

The project on Ericaceae sent two members on research and collecting travel; to the rhododendrons of N India (Dr Chamberlain) and to the Ericaceae of Northern Colombia (Dr Burbidge). Miss J. M. Lamond spent some weeks plant collecting in Tunisia with Dr P. H. Davis and Mr B. L. Burtt spent a working holiday in South Africa in January and February and visited Sarawak in May and June to pursue research on Gesneriaceae and Zingiberaceae. At the same time we have continued help and advice with many overseas Floras—*Flora of Pakistan*, *Flora Iranica*, *Flora Bangladesh* etc.

We sent representatives to two important international meetings: the XIIth International Botanical Congress in Leningrad preceded by the meeting of the International Association of Botanical Gardens in Moscow (the Regius Keeper); and a NATO financed symposium at Kew on the Function of Living Plant Collections in Conservation and Conservation Orientated Research and Public Education (papers given by the Curator, Assistant Keeper and Regius Keeper).

To reinforce contacts with major European botanic gardens and see their schemes at first-hand the Curator visited widely in W Germany under the auspices of a Western European Union Study Grant.

Whilst there were all these outgoings from the Garden there was also a constant stream of specialist visitors to us. Some came to study the herbarium collections, others the exhibition glass-houses and the exhibition hall. Some foreign botanists sent manuscripts for amendment by our experts in specific plant groups. There is also a constant and growing demand for informal

individual technical training from overseas, mostly in herbarium methods or in amenity horticulture. These are stimulating activities but we necessarily have to limit their number.

Surrounded, as it is, by houses and roads the Edinburgh Garden seemed eternally bound in size until there was a chance to buy the site of the adjoining private tennis club in spring, 1975. Successful purchase means that we have acquired a flat rectangular area of 0·8 acres which lends itself to a relatively formal treatment. It will take some years to plan, and bring to fruition the original designs in mind. Whilst this small development is starting it is a relief to see the approaching end of a long and often frustrating building programme which started as long ago as 1962. From mid-1976 there should be more man-hours spent on plants rather than plans.

The framework for building-up the plant collection has proceeded in 1975. The role of collections for conservation was exhaustively discussed at the Kew Conference. We already hold collections of potential conservation importance. We have concentrated on reassessing these collections of known wild origin and acquiring more of groups in which we have taxonomic expertise rather than launch into completely new taxonomic or geographic groups. At the same time the curatorial staff has proposed guidelines for plant acquisition taking account of display, research, educational and conservation needs.

In 1974 the public visitors to the Edinburgh Garden increased by 10% over those of the previous years. In 1975 the corresponding increase was 7%, a total of 680,631 in the year and 9,299 on the busiest day. The exceptionally fine summers of the last two years have undoubtedly been a major reason for these annual increases and we cannot expect them to continue. In addition to the good weather drawing people to the Garden, the light-hearted publicity that the Scottish Information Office ran for us may also have had an effect. We did, however, derive some reliable information about our visitors as a result of surveys conducted on two days in August 1974 and two days in spring 1975. The following are the more important points from their findings:

1. Visitors to the Botanic Garden in August came equally from Edinburgh and from other places, but in winter the proportion from Edinburgh was higher.
2. Visitors were either on their first visit (33%) or had first come to the Garden over ten years ago (40%). Intermediate visiting frequencies were less common. A weekday (Wednesday was surveyed) was the day for the first-time visitors (45%), while only 22% of Sunday visitors were there for the first time.
3. Most visitors came with others (normally in groups of two), and a quarter brought children with them.
4. Most visitors spent over an hour in the Garden, especially if they were on their first visit.
5. Nearly all visited specific buildings or displays in the Garden, though very few actually purchased any souvenirs or other materials.
6. Visitors liked the general peace and quiet of the Garden, as well as specific displays and layouts (especially the rock garden, hot-houses and trees).
7. There were few specific dislikes, and these related to the administration of the Garden (sign-posting, opening hours, tea room) rather than the displays.

8. Two-thirds of visitors were satisfied with the information provided on exhibits.
9. The leisure/recreation and scientific research functions of the Garden were felt to be equally important.
10. Only 20% of visitors had seen advertising for the Garden—more in the Tourist Office and on tourist leaflets than in the press or on bus cards.

To enable more members of the public to learn something of the whole activities of the Garden a display 'The Garden, 1975' was staged in the old herbarium building for the three weeks of the Edinburgh Festival; thereby an estimated 5,000 people saw it rather than some 1,000 under the previous arrangement of two 'Open Days' in the present herbarium. The Exhibition Hall staff extended their activities with schools in collaboration with the Zoo and the Royal Scottish Museum. Children came to these special sessions and help was given to many of the parties of schoolchildren who visited the Garden with their teachers.

As every year, the Garden received continuous requests for botanical and horticultural advice. The police increasingly refer samples of *Cannabis*; the general public, including a high proportion of knowledgeable plantsmen, send in consignments (anything from one to thirty specimens) for naming, or ask for advice on plant diseases. Cultural queries present problems as we often cannot advise; we are increasingly aware of the lack of an agency with this responsibility.

Against this background of more noteworthy events the long-term research programmes proceed: the work on Gesneriaceae, Zingiberaceae, Ericaceae, Conifers and the flora of SW Asia. The living collections of the Conifers have been appraised in detail and young stocks of wild origin are being acquired. The plans for hitherto underdeveloped areas of Benmore allow for space for some of this material but it will be eight or ten years before we have these new noteworthy collections established. Taxonomic research with living plants can be a slow process.

In recruitment over the last few years, four botanists with particular expertise in the British Flora joined the staff. One (P. Harrold) is now in charge of the British herbarium; but we can also deal authoritatively with lichens (B. Coppins), ferns (C. Page) and mosses (D. Chamberlain). This places the Garden in a much stronger position in identifying British plants and advising the Nature Conservancy and regional and local authorities.

Towards the end of the year Mr B. L. Burtt retired; much of the present scientific stature of the Garden derives from his work and advice. His retiral produced some small organisational changes but everyone hopes that he will continue to work at the Garden and complete his great work, his major personal research on the Gesneriaceae.

Taxonomic Research

South-west Asia: floristic studies

Several members of staff who had prepared accounts of genera for vol. 5 of P. H. Davis's *Flora of Turkey* were involved in the finalising and proof-correcting of their contributions during the earlier part of the year. In particular, Mr Grierson, with major accounts to his credit, and Miss Lamond

spent much time in these final stages. The relevant volume, entirely devoted to Compositae and running to 890 pages, was eventually published in mid-December.

A yearly ever-increasing number of small, medium and large collections from different parts of SW Asia arrived for naming: from Iran, Turkey, Yemen, Afghanistan, Pakistan. These came either from botanists resident in these areas or from travelling collectors. Although this more or less routine naming of collections is time-consuming, it nevertheless provides us with useful research material and clearly enhances the value of the herbarium. The appointment of a new S.O. (in autumn 1974), Mr A. Miller, has lessened the time spent by others on general routine naming of these SW Asiatic collections.

Accounts for the actively progressing Floras of SW Asia have continued: a first draft of *Ferula* for *Flora Iranica* was prepared (Dr Chamberlain); the account of several of the hemi-parasitic genera of Scrophulariaceae (13 in all) for *Flora of Turkey* was completed (Mr Hedge); preliminary work was done on other accounts for these Floras in the families Primulaceae, Boraginaceae and Umbelliferae (Miss Lamond, Dr Chamberlain and Mr Hedge).

In addition to the very close ties that we have with the *Flora of Turkey* and *Flora Iranica*, the collaboration with the *Flora of Pakistan* project has continued as in previous years and a regular stream of manuscripts has come from Karachi and Rawalpindi for surveillance and critical comment.

Because of the many commitments to the Floras mentioned above, progress with broader based revisions or monographs has almost inevitably been slow, a fact of life which is almost certain to continue for the next decade or so.

CATALOGUE OF THE NAMES PUBLISHED BY LÉVEILLÉ

Mr Lauener's work on the last three tribes of Compositae—Anthemideae, Mutisieae and Cichorieae was completed during the year and part IX (Compositae) of the *Catalogue* is currently in press. The total work involved the examination of over 1,800 specimens in the Léveillé herbarium and an assessment of about 340 taxa described by Léveillé. Because of pressure of his main work, particularly the return of loans, Mr McKean was unable to assist in the Léveillé project during 1975.

ERICALES

Progress in taxonomic research in this group has continued. Further sections of the genus *Rhododendron* have been revised, and an exhibit, illustrating the work in progress, designed by the Exhibition Hall staff in consultation with Dr Chamberlain and Dr Cullen, was exhibited in London during the Royal Horticultural Society's Rhododendron show in April. Work on the chemical constituents of *Rhododendron* has been continued by Dr B. A. Knights of the Dept. of Botany, University of Glasgow, in collaboration with Dr Cullen and Dr Chamberlain; the results, which require further analysis, are very encouraging. Dr Burbidge spent the first three months of the year in Colombia making special collections of Ericaceae as well as more general gatherings of the whole flora; he has continued research on the taxonomy of *Gaultheria* and *Pernettya*. Dr Chamberlain studied Rhododendron populations in the field in northern India during March and April;

in geographical and taxonomic contrast, he has also continued work on the bryophyte flora of the Lothians.

Dr Argent's work on Stereoscan electron micrography of *Vaccinium* has been held up through lack of facilities, but the recent acquisition of a Stereoscan microscope should allow this work to proceed; he has continued study of this genus with emphasis on the species in cultivation, and has completed the writing up of work on bananas outstanding from his previous appointment.

Dr Cullen's work as a member of the NATO ECO-Sciences Working Party on Electronic Data Processing and Herbaria came to an end with the completion of the pilot project on a Type Register of the family Papaveraceae which was published in December. At the conference on Conservation held at Kew in September, he agreed to chair a working party to look into methods of co-ordinating the records of endangered species as they exist in botanic garden living collections.

GESNERIACEAE, ZINGIBERACEAE AND S. AFRICAN STUDIES

Gesneriaceae. The delay in return of Mr B. L. Burtt's crate from Sarawak (only received in November) and other pressures have held up his progress on the two main items currently being written up: a revision of *Monophyllaea*, and the re-casting of the genus *Boea* and its allies. Each will probably require 6–8 weeks steady work for completion. In September Dr Anton Weber (University of Vienna) who is particularly interested in the morphology of *Monophyllaea* and its allies paid us a visit. This was extremely profitable to all. Fortunately, Mr Burtt had brought back a few specimens of the genus with him from Sarawak and he was able to examine this material. Dr George Gillett (University of California) paid us another visit for about 3 weeks in August to work on *Cyrtandra*. He is following up earlier studies in the genus in South Pacific and Melanesian areas by working westwards into New Guinea. Work with Mr P. Woods on *Aeschynanthus* has made some progress and he is now describing the only species known from the Solomon Islands.

Zingiberaceae. Work with Miss Smith on the account of this family for the revised *Flora of Ceylon* is nearing completion. While Miss Smith has been largely concerned with the Flora account and keys, Mr Burtt has investigated and written up reports on the identity and nomenclature of some of the taxonomically troublesome plants that have long been in use as condiments and spices. These will be sent to Dr Fosberg, Smithsonian Institution, Washington, who controls the Flora of Ceylon project, for comment and advice on publication. A fair collection of Zingiberaceae was made during the Sarawak trip and Miss Smith will be able to turn to these after the Ceylon work is over.

African Compositae. Mr Burtt read a paper at the International Symposium on Compositae held at the University of Reading, July 14–19. This symposium was extremely profitable, both for its formal proceedings and in the many informal discussions. After the symposium Dr O. M. Hilliard (University of Natal) came up to Edinburgh for 3 weeks and a further paper on S African plants was completed.

FLORA OF BHUTAN

In accordance with a request made by the Royal Government of Bhutan to the Ministry of Overseas Development that an annotated checklist of the flora of their country should be prepared, the matter was discussed with the Ministry and a plan for up to 4 years devised (Mr Grierson). A visit to Bhutan was made in June by Mr Grierson accompanied by Mr D. G. Long, then on the staff of East Craigs. Assisted by Forest Officers, three weeks were spent in the field in west central Bhutan during which 700 specimens were collected, over half of them flowering plants and ferns. This collection has now largely been identified and lists of determinations prepared.

A longer expedition to Bhutan for four months was planned to begin in February 1976 in which a large proportion of the time was to be spent collecting in the warmer southern foothills of the country but, because of various difficulties, more intensive work on herbarium collections may have to be substituted temporarily. Mr Long was officially seconded to the Ministry of Overseas Development in October to work on Bhutan flora while based at the Garden.

CONIFERAE AND PTERIDOPHYTA

In terms of the conifer and, to a lesser extent, the pteridophyte programme, 1975 was a particularly successful year (Dr C. Page). Many aspects seem to have rather suddenly gathered momentum, and these promise well for the future.

Good links have been maintained with the MRC Research Unit at the Western General Hospital, Edinburgh. This has led not only to the use of their computer-scanning system for trials on plant chromosome preparations but also helped towards their acquiring a Cambridge 600 scanning electron microscope. Arrangements have been made for the availability of time on this machine where its particular facilities can benefit our own SEM work. Their elemental analysis system has been used on *Equisetum* material already (possibly amongst the first uses of this technique for taxonomy anywhere). Collaboration on SEM work with the MRC Unit will continue and seems likely to be of mutual benefit.

Conifer identification work for outside bodies has continued steadily throughout the year, including checking or naming specimens from the Forestry Commission Arboretum at Westonbirt.

The Conifer survey of the Edinburgh garden has been completed, and the identifications of virtually all conifer material at Benmore and Logan has been checked. Recommendations for the removal of less valuable conifer trees at Edinburgh have been made, and thinning of marked trees at Benmore is now under way. Conifers at Edinburgh have been classified into 3 groups of relative scientific importance so that it is quite clear which specimens are valuable and which are not. The living conifer collections at Edinburgh have thus been set on a taxomonically reliable basis.

Much of the basic curation and expansion of the conifer collection in the herbarium has now been completed: the incorporation of adequate specimens of the most common species in cultivation; the inclusion of specimens from all known existing wild-origin trees at Kew, Wakehurst, Westonbirt, Edinburgh and Benmore (mostly Chinese).

Pteridophytes were given less emphasis during the year but some progress was made. This included a paper reviewing bracken on a world-wide basis; editing *Equisetum* for the new *Pteridophyte Atlas of the British Flora*; taking over editorship of the *Fern Gazette* (Dr Page); proceeding with chromosome work on *Doodia*, *Cheilanthes* and *Adiantum*; collecting British material for exchange; identifying the living fern collections at St Andrew's Botanic Garden and leading a week's fern field course.

CYTOLOGY (and Brazilian flora studies)

The year was essentially one for the completion of former projects by Dr J. Ratter whilst maintaining momentum on newer long-term ones (Dr Ratter & Miss C. Milne).

During the year, the summation paper on the biosystematic study of *Spergularia* was written and is now in press. The work on chiasma frequencies in *Senecio* species was also written up and published in a joint paper with staff of the Botany Department, University of St. Andrews. Chromosome studies have been carried out in Ericaceae, *Oxalis*, *Tropaeolum* and primitive angiosperms. A short paper reporting the results for primitive angiosperms has just been submitted for publication. The project on floral morphology in Papaveraceae (particularly *Hypecoum*) has continued and information is being accumulated steadily.

Identification of the 1972 collections from central Brazil has been completed apart from a few groups which are being determined by specialists. Early in the year, the collection was split into sets and five of these have already been distributed to other institutions. Work has continued on the papers reporting the results of the 1972 expedition and two of these are now ready for publication. During the last two months of the year a tentative key to the woody genera of the Brazilian *cerrado* flora was prepared.

BASIDIOMYCETES

Studies on the Bolbitiaceae continue (Dr R. Watling) with further papers in preparation or in press, particularly ones dealing with *Conocybe* sects *Gigantae* and *Locellinia*. Arising from the Garden's Ericaceae-project and Dr Watling's trip to Australia, a study of the phyto-pathologically important genus *Armillaria* has been undertaken. This is already giving interesting results; the studies are backed by cultural and developmental studies. Miss Jill Griffin, British Council Student from Sydney, studied with Dr Watling for 8 weeks and it is proposed to prepare a check-list of Australian Bolbitaceae from her results. A check-list of field records and herbarium material of all Dr Watling's finds in Australia will be soon completed for duplication and distribution to selected centres in Australia.

Interesting investigations have been completed on puffballs (Lycoperdaceae) from several archaeological sites dating from between 100 B.C. and 100 A.D. Dr Watling chaired meetings at the Biorec Scotland '75 symposium early in the year and was a speaker at the Commonwealth Phytopathological Conference, Kew.

Mr P. D. Orton (Honorary Associate) and Dr Watling are in the final stage of completing the account of *Coprinus* for the *British Fungus Flora*; Dr Watling has almost completed the account of the Bolbitiaceae for this work.

ASCOMYCETES AND LICHENS

Mr Coppins has continued taxonomic and phytogeographical studies in lichenised and non-lichenised ascomycetes, with special emphasis on the lichen genera *Bacidia* and *Micarea*, and the flora of native Scottish pinewoods. He has collected material from several parts of Scotland, particularly Inverness, Ayr, Banff and E Lothian. Largely in connection with the British Lichen Society's Distribution Maps scheme and other projects, over 2,000 specimens were received for identification.

Dr J. Sheard, visiting lichenologist, returned in August to Saskatoon, Canada, after completing his studies on *Dimelaena* and coastal species of *Ramalina*; he prepared a review of phytogeographical aspects of lichen distribution whilst working in the laboratory for almost nine months.

The Herbarium

ACCESSIONS, LOANS, SPECIMENS MOUNTED

Our exchange accessions in 1975 came from 30 different institutes. There were 1,337 Himalayan specimens from the British Museum (Natural History), 173 from Tokyo University, and 1,219 New Guinea specimens from Lae; from Leiden we received 741 Thai and 287 Sri Lankan specimens, from Helsinki 621 Finnish and 111 Turkish specimens, from Göttingen 361 Turkish and from Pietermaritzburg 400 S African specimens.

There was a considerable increase in the number of specimens gifted to us and among these were 1,100 British lichens from P. Harrold, 2,500 British lichens and fungi from B. Coppins and 1,000 British fungi from R. Watling.

In addition, staff expeditions to various parts of the world brought in the following collections of phanerogams and cryptogams: P. H. Davis & J. Lamond—1,190 specimens from Tunisia; P. H. Davis—1,618, Algeria; R. B. Burbidge—750, Colombia; D. Chamberlain—340, Assam; B. L. Burtt—350, Sarawak; A. Grierson & D. Long—700, Bhutan; G. Argent—180, Papua New Guinea.

Other gifts were 372 Iranian specimens from Ariamehr Botanic Garden, Tehran, 132 Spanish and Peruvian plants from P. E. Gibbs and many British specimens from Miss M. McCallum Webster and Miss E. P. Beattie. The Falconer Museum, Forres, donated a long-lost interesting collection of 450 Fungi collected by the Rev. J. Keith in the late nineteenth century.

Purchases included 1,000 plants of Iran collected by P. H. Davis, 464 Iranian from K. H. Rechinger and 230 Alaskan from G. Halliday.

	1974	1975
Accessions	9,944	21,479
Distributions	4,963	2,143
Loans: in	3,673	2,212
Loans: out	3,693	6,839
Specimens mounted	19,000	18,800

VISITORS

Prof. S. I. Ali (Tripoli); Mr M. Assadi (Tehran); Dr B. Briggs (Sydney); Mrs J. Cowley (Kew); Canon N. Crutwell (Papua New Guinea); Prof. J. Damboldt (Berlin); Dr G. W. Gillett (University of California); Mr E.

Groves (British Museum); Prof. H. Hara (Tokyo); Dr O. M. Hilliard (Pietermaritzburg); Dr K. F. Kenneally (Perth W.A.); Prof. M. S. Khan (Dacca); Dr Y. N. Lee (Seoul); Dr J. McNeill (Ottawa); Dr V. C. Moran (Grahamstown); Dr B. R. Maslin (Perth W.A.); Dr B. Malekpour (Tehran); Dr H. Ohashi (Tokyo); Mr P. S. Phiri (Zambia); Dr K. Ramachandran Iyer (Delhi); Dr R. G. Strey (Durban); Prof. T. Shimizu (Matsumuto); Dr R. R. Stewart (Michigan); Dr P. Stevens (Boston); Dr R. Tryon (Harvard); Dr P. Uotila (Helsinki); Dr D. Wasshausen (Washington); Dr A. Weber (Vienna); Dr A. J. Womersley (Papua New Guinea); Prof. K. Yamamoto (Kagawa Univ. Japan); Dr J. Zielinski (Poznan).

Throughout the year several parties of University students were shown round the herbarium as were other parties interested in learning about the scientific work and functions of the R.B.G.

The Library

1,551 volumes and 203 separates were added to stock. 1106 current periodical titles are now taken. We currently exchange publications with 632 institutions; during the year 293 items were borrowed and 588 items lent; 509 volumes were bound. 330 people visited the library. In addition, students from Colleges of Librarianship in Aberystwyth, Edinburgh, Liverpool, Newcastle and Sheffield visited the Library as part of their professional training. All the universities in Scotland, the staff of DAFS Agriculture Scientific Services, East Craigs, the Nature Conservancy, Forestry Commission and students of Landscape Architecture and Planning from Edinburgh College of Art remain our frequent customers.

The compilation of a bibliography of the Ericaceae has continued—it now contains five thousand entries.

Publications

As in previous years most of the general responsibility of editing and seeing through press of the Garden's publications has fallen to the lot of Mr Hedge, with Miss Meadows dealing with the artwork.

Notes from the Royal Botanic Garden, Edinburgh

Three parts of *Notes R.B.G. Edinb.* were published during 1975: vol. 33,3: 341–543; vol. 34,1: 1–148; vol. 34,2: 149–251.

The varied nature of the scientific papers published reflected the interests of the Garden staff and our colleagues elsewhere. There were, for example, papers dealing with the flora of SW Asia, the flora of southern Africa, the Gesneriaceae, *Rhododendron*, the ginger family Zingiberaceae and the fungus family Bolbitiaceae. Individual mention may be made of the major revision of *Rhododendron* sect. *Lapponicum* by the New Zealanders Professor & Mrs Philipson (much of whose work was done on a prolonged visit to Edinburgh), the important account of the central and SW Asiatic grass genus *Piptatherum* by Professor Freitag, Göttingen, and the review of certain species of the tropical genus *Alpinia* by Miss Smith.

PUBLICATIONS BY MEMBERS OF STAFF DURING 1975

BURTT, B. L. Streptocarpus stemandrus. *Bot. Mag. NS.* tab. 690.

——Studies in the Gesneriaceae of the Old World XL: the genus Loxostigma. *Notes R.B.G. Edinb.* 34:101–105.

BURTT, B. L. & DICKISON, W. C. The morphological relationships of Seemannaralia (Araliaceae). *l.c.* 33:449–464.

BURTT, B. L. & HILLIARD. O. M. Studies in the Gesneriaceae of the Old World XXXVIII: a new species of Streptocarpus from East Africa. *l.c.* 33:467–469.

BURTT, B. L. & HILLIARD, O. M. Notes on some plants of Southern Africa chiefly from Natal: IV. *l.c.* 34:73–100.

BURTT, B. L. & JONG, K. The evolution of morphological novelty exemplified in the growth patterns of some Gesneriaceae. *New Phytologist* 75:297–311.

BURTT, B. L. & SMITH, R. M. The rediscovery of Cenolophon rubrum. *Notes R.B.G. Edinb.* 34:107–111.

BURTT, B. L. & WOODS, P. J. B. Studies in the Gesneriaceae of the Old World XXXIX: towards a revision of Aeschynanthus. *l.c.* 33:471–489.

CULLEN, J. The Phyllodoce problem. *Journ. Scot. Rock Gard. Club* 14:192–202.

——*Type specimens of Papaveraceae in European herbaria* (International Type Register Pilot Project) 66pp.

CULLEN, J., BRENAN, J. P. M., FRANKS, J. W., & RAYNAL, J. Report of Working Party on Electronic Data Processing in major European Plant Taxonomic Collections. *Adansonia* 15:7–24.

COPPINS, B. J. & JAMES, P. W. Distribution maps of lichens in Britain. Maps 9 & 10. *Lichenologist* 6:172–177.

GRIERSON, A. J. C. Anacyclus & Anthemis in Davis, P. H., Materials for a Flora of Turkey XXXI: Compositae II. *Notes R.B.G. Edinb.* 33:410–411; Gnaphalium, *op. cit.* 421–424; Inula, Logfia & Tanacetum, *op. cit.* 425–427.

HEDGE, I. C., BRECKLE, S.-W., & FREY, W. Botanical literature of Afghanistan: supplement I. *l.c.* 33:503–521.

HEDGE, I. C. & BOKHARI, M. H. Anatomical characters in Capparis spinosa and its allies. *l.c.* 34:231–240.

HEDGE, I. C. & DAVIS, P. H. The Flora of Turkey: past, present and future. *Candollea* 30:263–283.

LAUENER, L. A. A new variety of Aconitum laciniatum from Nepal. *Journ. Jap. Bot.* 50:242.

LAUENER, L. A. & PANIGRAHI, G. A new Himalayan species of Anemone. *Notes R.B.G. Edinb.* 33:491–492.

MILNE, C. 1975. Chromosome numbers in the Gesneriaceae. V. *Notes R.B.G. Edinb.* 33:523–525.

MILNE, C., GIBBS, P., & VARGAS CARRILLO, M. Correlation between the breeding system and recombination index of five species of Senecio. *New Phytol.* 75:619–626.

PAGE, C. N. British ferns and their cultivation. *Journ. Scot. Rock Gard. Club* 14:263–276.

——Equisetum in Stace, C. A., ed., *Hybridization and the Flora of the British Isles*, 99–103. Academic Press.

RATTER, J. A. A survey of chromosome numbers in the Gesneriaceae of the Old World. *Notes R.B.G. Edinb.* 33:527–543.

——Spergularia in Stace, C. A., ed., *Hybridization and the Flora of the British Isles*, 176–178. Academic Press.

SMITH, R. M. A preliminary review of the large bracteate species of Alpinia. *Notes R.B.G. Edinb.* 34:149–183.

WATLING, R. Observations on the Bolbitaceae 10: the enigma of the perispore, *l.c.* 34:131–134; *op. cit.* 11, a species of Bolbitius with ornamented basidiospores. *l.c.* 34:241–243; *op. cit.* 12, the affinities of two anomalous species. *l.c.* 34:245–251.

——Mushrooms and toadstools of broad-leaved forests. *Forest Record* 106. Mushrooms and toadstools of coniferous forests. *Forest Record* 107. Forestry Commission.

——Studies on fruit-body development in the Bolbitiaceae and the implications of such work. *Nova Hedwigia Beihefte* 52:319–346.

Generic contributions of staff members to *Flora of Turkey* vol. 5, ed. P. H. Davis:—

CHAMBERLAIN, D. *Scorzonera*, *Urospermum*.

CULLEN, J. *Artemisia*.

GRIERSON, A. J. C. *Amphoricarpus*, *Anacyclus*, *Antennaria*, *Anthemis*, *Aster*, *Asteriscus*, *Bellis*, *Bellium*, *Carpesium*, *Chamaemelum*, *Chlamydophora*, *Chrysanthemum*, *Chrysophthalmum*, *Conyza*, *Crinitaria*, *Dichrocephala*, *Erigeron*, *Eupatorium*, *Galatella*, *Gnaphalium*, *Inula*, *Lachnophyllum*, *Leucanthemum*, *Leucocyclus*, *Matricaria*, *Otanthus*, *Pallenis*, *Phagnalon*, *Psychrogeton*, *Pulicaria*, *Santolina*, *Siebera*, *Solidago*, *Tanacetum*, *Telekia*, *Tripleurospermum*, *Uechtritzia*.

Usage of terms (with P. H. Davis); key to tribes; synopsis of tribes and genera; dichotomous key to genera.

HEDGE, I. C. *Echinops*.

LAMOND, J. M. *Aetheorhiza*, *Crepis*; multi-access key to genera.

In addition Miss V. A. Matthews completed her accounts of sixteen genera which were begun when she was a member of Dr Davis's Flora of Turkey unit; Miss R. M. Smith and Miss G. A. Meadows each contributed several illustrations.

GARDEN GUIDES AND OTHER PUBLICATIONS

A new printing of the main guide to the Garden, *The Garden Companion*, appeared in late summer; because of the ever-increasing production costs HMSO were forced to raise the price from 21p to 55p.

The semi-popular leaflet *The Garden* was produced each month from April to September; sales of this were poor, and the future of information leaflets and guides to the Garden is currently under review.

THE LIVING COLLECTIONS AT EDINBURGH

ARBORETUM DEPARTMENT (Mr S. J. Armstrong)

A survey of the Betulaceae in the Garden is well under way and some 45 specimens of *Betula* have been re-named, and their heights and girths measured. Other genera will be treated similarly, and it is planned to gradually build up our collection of the family.

Since the report of Dutch Elm disease in the west of Scotland, an inspection of our *Ulmus* collection was carried out. All our trees appeared in good health but it was decided to keep a close watch on them during July and August. During this exercise it was found that out of some 37 species in the genus, we grow only 8 at Edinburgh; none of our specimens is of known origin.

The two sections of the Rhododendron Walk nearest the West Gate have been completely renovated with a number of overgrown shrubs cut out, and large bays left for a display of herbaceous material. The Rosaceae development on the south borders has continued and many ground-cover plants have now been planted.

A programme of tree feeding has been started. Initially, only specimens that are not growing well are being treated; because of the dry weather for much of the year, only a small number were dealt with.

As in previous years the greatest amount of the Department's time was spent on general maintenance.

GLASS DEPARTMENT (Mr A. Snoddy)

In the display houses the policy of removal and replacement of plants has continued; this is a delicate process which requires considerable care so as to maintain plants in a healthy condition and provide a good representation of those most worthy of display. In the cactus and succulent houses the *Pelargonium* collection is being renewed and some modification of rock-work is taking place. The temperate aquatic-house required fairly severe cutting-back or removal of too vigorous plants; the *Hibiscus* species and *Ficus religiosa* were particularly rampant. In the temperate house we had to reduce some of the woody species to allow more light for sun-loving shrubs. There has been a marked improvement in the performance of plants in this house following removal of some large *Eucalyptus* and Acacias. In the tropical section, some herbs have been divided with the planting of new display houses in mind. The fern house has caused considerable problems over the last few years. Several of the tree ferns have died and we have had to take steps to raise replacements. In an effort to overcome these difficulties a mist-unit has been installed in the roof of the house and this seems to be having some effect. One of the few climbing ferns, *Lygodium*, has performed particularly well. In the orchid and cycad-house there has been a remarkable coning by the cycads. The overhead canopy of tropical climbers is important in maintaining the environment of this house and particular attention has been paid to its distribution and display. After many years of work with the heating system in the Palm Houses, completion seems to be drawing near. In the temperate palm-house, with more space and light and new informal pathways, the plants are showing good growth. A leaflet guide to this house is now available at the door. The tropical-house is still in the hands of the engineers but will be finished in the coming year. The orchid collection is housed temporarily in one section of the new research range before its move to its eventual permanent site in the new service glass-houses. There have been difficulties during this period but the collection does not seem to have suffered unduly. The glass department dealt with despatches from the Garden and during the year sent out 3,000 plants, 1,875 scions and cuttings and 150 packets of seed.

HERBACEOUS AND ALPINE DEPARTMENT (Mr A. Evans)

The main task in spring was the re-planting of areas which had been re-designed in autumn. The new lay-out on the site of the old family beds in the Demonstration Garden was completed and the beds were furnished with the appropriate plants.

Planting up of the limestone wall and raised beds in front of the west range also took place. The choice of plants was selective as only lime-tolerant species could be expected to flourish. By autumn the plants were well-established, even those in the cracks in the faces of the walls. Lastly, bulbs favouring the drier conditions of raised beds were planted among the permanent, above-ground species. There is now little room left for extra plants and the setting awaits the erection of the long-proposed Alpine House.

As long ago as 1958 a development at the west side of the Garden later known as the Rhododendron Walk was carried out. Since then, a growing imbalance between the plants has developed: many have become too large and others, often the most interesting, have been suppressed. Work is now in hand on these beds to restore the balance and to improve their collection of plants.

With the loss of the natural order beds in the Demonstration Garden the plants were given temporary space in the Experimental Ground. In that area, a section is now being prepared to hold this collection of plants in a differently organised, educationally interesting way. The preparatory work is almost completed and by spring and before the growing season is very far advanced the planting should be finished. Work is now in progress on four mounds in the Rock Garden to improve the soil and realign some of the rocks; work that had to be postponed last year.

Mr Evans was invited by the University of St John's Newfoundland, Canada to assess part of their botanic park and report on its suitability as a natural alpine area and to give advice on a number of other aspects of botanic garden lay-out using the local flora. He spent a week in the province and a report on his findings and recommendations was sent to Canada on his return. While there, he had an opportunity to see a number of ericaceous genera growing in the wild and was able to collect plants, cuttings and seeds for the Royal Botanic Garden.

Mr Evans also lectured to the Royal Horticultural Society in London on the genus *Tricyrtis* and was busy with his duties as president of the Scottish Rock Garden Club.

Plant Records Department

Routine work continued on the plant record system at Edinburgh, Benmore and Logan, with the subsequent updating of the computer print-out. With its aid, checking of living material in the Garden has progressed throughout the summer. Approximately 3,000 plant-labels were engraved. During the year, 750 specimens for identification passed through the records office and were directed to the appropriate botanist to deal with.

PROPAGATION (Mr L. E. Bisset)

This department has worked under very considerable difficulties during the year and serious plant losses could have occurred but for the outstanding

effort by supervisors, staff and students. In the midst of all the changes involved in the destruction of existing glass-houses and the erection of new ones, staff shortages earlier in the year were added difficulties. The first of the new service buildings was handed over for our use in late summer but there have been endless difficulties with the heating and the ventilation system which at first was only manually controlled and then later ineffectively automatically controlled. Nevertheless the new houses give every promise of being suitable once preliminary difficulties have been overcome.

Progress in the experimental ground has been less disturbed during the year. Two Hartley greenhouses transferred from their old site in the Garden have proved very useful in holding young stock, but their re-erection was not completed until later in the year. The very large task of propagating rhododendrons of the Lapponicum and Saluenense series was worked on with Dr Cullen; plants are now available for the main Garden. The department has also had useful experience in growing a very wide range of plants in containers; this, of course, aids planting out-of-season and has many other advantages.

We had many visitors during the year including delegates to the annual conference of the International Plant Propagation Society and the Scottish section of the Horticultural Education Association. Mr Bisset acted as a member of the Royal Horticultural Society's Assess Committee "C" which assesses the merits of glass-house plants. This is a most useful link for the Garden with the national horticultural society of the UK.

All gardens are now trying to add plants whose origin from the wild is known, and the propagation department has moved some distance in this respect; in the year under review, of the total of 2,497 accessions, 1,392 were of known wild origin. Of the overall total, some 1,300 came as seeds, 1,000 as plants and 135 as cuttings. The most important introductions were obtained either from the Garden's staff travelling abroad or from our close contacts abroad. There were interesting collections from S Africa (Mr Burtt), the Himalayas (Dr Chamberlain), New Guinea (Dr Argent), and Colombia (Dr Burbidge). Waimea Arboretum in Hawaii sent exceptionally interesting plants and seeds, especially Zingiberaceae, and two rare plants of the Hawaiian flora *Argyroxyphium sandwichense* and *Pritchardia remota*. Kew supplied us with some 100 particular requests; Mr O. Valder of Sydney, Dr P. Kores of Papua New Guinea and the Botanic Gardens at Lae and Canberra all supplied noteworthy collections relating to the research project on the Ericaceae.

In spite of all the difficulties with glass-houses, many plants performed well and flowered spectacularly or flowered for the first time. Special mention should be made of—*Cadia purpurea* from east Africa; the potentially useful drug plant, *Camptotheca acuminata*; the spectacular *Dracontium gigas* with its very impressive spathe; the Hawaiian island *Hibiscadelphus giffardianus*, threatened with extinction in its native habitat; *Plectranthus crassus* introduced by Mr Burtt from Malawi; and 3 indoor rhododendrons, *R. jasminiflorum* and *R. solitarium*, both collected by Mr Woods in SE Asia, and the recently discovered Himalayan *R. santapaui* collected and introduced by P. A. Cox, Glendoick, Perthshire.

Horticulture Training Section

In July 1975, twelve students received Diplomas in Horticulture (one with Honours), the awards and prizes being presented by Mr S. A. J. Oldham, Director of Leisure and Recreation, Strathclyde Regional Council.

As a result of staff/student consultations, some particular aspects of the students' training both in regard to work in the Garden and the formal teaching have been standardized.

A further nine horticultural industrial staff have started the internal training scheme. Also a number of assistant gardeners from the three botanic gardens (Edinburgh, Benmore and Logan) have been enrolled for courses leading to the City & Guilds examinations at Elmwood College, Cupar, Fife.

Collaboration with other courses in amenity horticulture continues to increase; in addition to sandwich students from O.N.D. courses and graduate students from the University of Bath, Messrs Marshall and Anderson now give horticultural background instruction to graduate and post-graduate students of the University of Edinburgh and the Edinburgh College of Art.

Younger Botanic Garden, Benmore, Argyllshire
(Mr A. Hall)

Since the management of Benmore hill wood was transferred from the Forestry Commission to the Garden, a great deal of time has been spent by the staff involved studying the topography and flora of the area and, in subsequent discussion, on how to make the best use of it. Plans were laid to bring this area of 10–15 acres gradually into management and plant it with trees and shrubs relevant to overall R.B.G. policy. In 1975 we took the first practical steps in the development of the area by clearing tracks into the dense thickets of *Rhododendron ponticum* and marking individual mature trees for removal. Agreement was reached with the Forestry Commission on the timing and method of extraction, and contractors to the Commission commenced felling in November; this has progressed successfully. In the established parts of the Garden, continuation of the programme of high pruning and/or extraction of unsightly or diseased trees has been carried out by the garden staff whenever time could be spared from essential maintenance. Further windbreaks were erected in the nursery at Uig and about 650 young plants transferred to Benmore from the propagation department of the R.B.G. were lined out there.

Rainfall was high at the beginning and end of the year but generally below average in the spring and summer months and working conditions were more favourable than in 1974. The total rainfall for the year was 77·77 inches. A late frost in May caused damage to the soft young growth on a wide range of trees and shrubs. Attendance figures dropped by about 4,000 to 30,651 probably due to less tourist traffic, especially bus tours.

Final clearance of the site for two of three new staff houses to replace the substandard flats in the old clocktower building was completed in December and the building contractors are expected to make a start in January 1976. Edinburgh Corporation were given permission to install a new sewage treatment plant for Benmore Adventure Centre on Garden land. This

inevitably caused some upheaval in the vicinity of Benmore House during the season but work is virtually finished and final repairs to the lawns will be completed in the spring.

Logan Botanic Garden, Wigtownshire
(Mr M. Colledge)

Apart from routine maintenance, the main tasks in 1975 were the consolidation and improvement of recent major work. In the walled-garden, several overgrown borders were renovated and a number of plants transferred elsewhere. A collection of tender rhododendrons from Edinburgh mostly of the *Maddenii* series and some uncommon but botanically interesting species were added to the collection.

In the spring of the year, further plantings were made in the depleted western shelter-belts of 100 *Acer pseudoplatanus* and 60 *Sorbus intermedia* from Edinburgh together with a quantity of *Escallonia* propagated at Logan. The earlier plantings of hardwoods in this area are now beginning to make reasonable growth. Two teams of students from Edinburgh removed several old trees and thinned the pine shelter-belts. In the woodland, plantings were made of *Olearia*, *Leptospermum*, *Hebe* and *Myrtus*. A ten year old plant of the tender *Rhododendron dendricola*, planted against a wall, flowered for the first time. *Banksia serrata*, having withstood three winters in the open against a south wall, flowered in the late autumn.

The areas adjoining the new office complex, and the 3 new staff houses at Pine Cottages, were cultivated, levelled and seeded. Part of the area at Pine Cottages has been landscaped with shrubs requiring minimum maintenance.

An automatic ticket machine was installed in March from which visitors purchase a ticket that covers the cost of car parking and the admission of driver and passengers to the Garden. This has been a successful venture, which has eased the pressure of work on the tea-room staff who in former years, as well as performing their tea-room duties had to sell admission tickets manually.

In August Mr Percy Thrower recorded, with Mr Colledge's considerable and skilful help, two Gardeners' World programmes for BBC television from Logan. A marked increase in numbers of visitors in late August and September could be attributed to this publicity. The number of visitors in the year increased by 3,500 to 34,107.

Staff List
(December 1975)

Regius Keeper	Mr D. M. Henderson	
Assistant Keeper	Dr J. Cullen	
Principal Scientific Officers	Mr A. J. C. Grierson	Dr J. A. Ratter
	Mr I. C. Hedge	Dr R. Watling

Senior Scientific Officers	Dr G. C. G. Argent	Mr J. M. Marshall
	Dr R. B. Burbidge	Dr C. N. Page
	Dr D. F. Chamberlain	Miss R. M. Smith
	Mr L. A. Lauener	
Higher Scientific Officers	Mr G. Anderson (Hort. Educ.)	Miss V. A. Matthews
	Mr B. J. Coppins	Dr C. C. Wood
	Mr R. Eudall	Mr P. J. B. Woods
	Miss J. M. Lamond	
Scientific Officers	Mr P. Harrold	Mr A. G. Miller
	Mr D. R. McKean	Miss C. Milne
	Miss G. A. Meadows	Miss D. E. Purves
Assistant Scientific Officers	Miss F. M. Blair	Miss E. H. Hamlet
	Mrs D. Brunton	Mrs H. Hoy
	Mrs N. M. Campbell	Miss L. McLuckie
	Miss G. F. Chamberlain	Miss L. F. Mitchell
	Mrs L. A. Gibb	Miss M. A. H. Paul
	Mr K. N. Grant	
Laboratory Attendants	Miss M. Bryce	Mrs G. Millar
	Mrs E. A. McAllan	Mrs G. Young
	Miss M. McLaren	
Curator	Mr R. L. Shaw	
Assistant Curators	Mr S. J. Armstrong	Mr A. Evans
	Mr L. Bisset	Mr A. Hall (Benmore)
	Mr J. M. Colledge (Logan)	Mr A. Snoddy
Garden Supervisors	Mr G. G. Broadley	Mr P. J. Maudsley
	Mr L. Buchan	Mr R. J. D. McBeath
	Mr R. U. Cranston	Mr W. Tait
	Mr J. M. Gardiner	Mr B. Unwin (Logan)
	Mr J. A. R. Kerby	Mr M. Welsh (Benmore)
	Mr G. Kirkpatrick	Mr J. Wilson
	Mr. G. Knott	
Librarian	Mr M. V. Mathew	
Assistant Librarian	Mrs L. Clark	
Higher Executive Officer	Mr T. C. Dobbie	
Executive Officer	Miss J. R. S. Renwick	
Clerical Officers	Mrs H. S. Boyes	
	Mr G. L. Leetion	
Clerical Assistants	Mr A. A. Gosden	Mrs J. S. B. Thomson
	Mrs E. C. Stivens	Miss J. Thomson
Senior Paperkeeper	Mr D. Ward	
Sergeant Park-keeper	Mr J. Y. Thomson	

Park Constables	Mr A. W. Brown	Mr D. C. Hogg
	Mr N. Campbell	Mr T. Maxwell
	Mr W. B. Connacher	Mr T. A. Nisbet
	Mr M. E. Fitz	Mr G. Sinclair
	Mr P. N. Fletcher	Mr R. Stevenson
Gardeners Special	Mr T. Y. A. Brown	Mr. T. G. Grieve
	Mr W. R. Caldwell	Mr J. McCluskey (Benmore)
	Mr C. G. Drawbridge	Mr A. J. Paxton
Gardeners I	Mr T. R. Burnett	Mr R. T. Newlands
	Mr A. M. Cameron (Benmore)	Mr I. M. Potts (Benmore)
	Mr W. Kocz	Mr R. M. Robertson
	Mr G. W. Lawson	Mr E. Smith
	Mr R. I. M. Mason	Mr J. Stewart
	Mr C. C. McCormick (Logan)	Mr E. F. Young
	Mr G. Murdoch (Logan)	
Gardeners II	Mr S. M. Boyd (Logan)	Mr D. Lumsden (Benmore)
	Mr W. A. Crowe (Benmore)	Mr J. Smith
	Miss L. R. Cunningham	Mr C. J. P. Taylor (Benmore)
	Mr A. Currie (Logan)	Mr H. R. Wallace
	Mr G. Godbert (Benmore)	
Assistant Gardeners	Mr J. Henderson	Miss F. L. Pringle
	Mr M. A. Horsburgh	Mr D. G. Ritchie
	Mr A. S. Jackson (Benmore)	Mr I. W. J. Sinclair
	Mrs E. M. McCluskey (Benmore)	Miss M. H. Stein
	Mr J. McElroy	Mr T. L. Sutherland
	Mr K. M. MacLeod	Mr J. Urquhart
	Mr J. K. Matthew	Mr R. Waddell
	Mrs R. M. Parker	
Junior Gardeners	Mr S. J. Ansdell	Mr R. S. Sibbald
	Mr P. R. Baxter (Logan)	Mr D. M. Stewart
	Mr J. McGibbon (Benmore)	Mr S. J. Stirling
Labourers	Mr S. J. Davies	Mr D. P. Mungo (Logan)
	Mr M. Fletcher (Benmore)	Mr R. S. Waddell
	Mr J. B. Henderson	
Driver	Mr W. D. Lewis	
Engraver	Mr J. R. Wright	
Storeman	Mr G. Roddex	
Male Cleaner	Mr F. Middlemass	
Female Lavatory Attendants	Mrs C. Horner	
	Mrs F. R. Horner	
Male Lavatory Attendant	Mr T. H. Potter	
Nightwatchmen	Mr P. F. Banks	Mr D. K. Lawrie
	Mr J. Brady	Mr W. Pringle