



Annual Report 1979-1980

To the President of the University:

The year 1979-1980 marked major progress at both Cambridge and Jamaica Plain. The new extension to the Harvard University Herbaria building was opened on May 23, 1980, at a ceremony attended by President Derek Bok, Dean Richard Leahy, Chairman of the Biology Department Professor Farish Jenkins, and the Directors of the Arnold Arboretum and the Gray Herbarium. The building extension provides new rooms for faculty and other staff, further research laboratory space, and expansion room for the libraries as well as for the herbaria. This has been mentioned in previous reports and receives further comment in this report in the sections on the herbaria and libraries. Plans are being prepared for reorganization of the interior of the Administration Building at Jamaica Plain which, although it contains adequate space for current needs, is not suitable for receiving visitors. With an increase in the number of visitors to the Arnold Arboretum, it is urgent that a separate reception area be provided for them. At present it is impossible to safeguard the library collection, part of which is located in a room where visitors have free access. The absence of public lavatory facilities is a source of constant and justified complaint. In June 1980 a Manager for Buildings and Public Services was appointed, one of whose responsibilities is to seek funding for and to oversee these alterations. Work is expected to start in the coming year.

A three-year renewal of the National Science Foundation curatorial grant to the herbaria and the receipt of a grant for curation of the living collections will assist us in bringing all our collections up to the highest standards of excellence for research and instruction. With their integration as a single facility having a common library and records system, their accessibility to the scientific community will be increased.

Work has begun on restoration of the living collections of the Arnold Arboretum at Jamaica Plain, the policy for which was outlined in my previous annual report. The Arboretum is an integral part of the Boston Parks system, and this year played host to an increased number of visitors, partially on account of the celebrations honoring the three hundred fiftieth anniversary of the City of Boston, but partially due, also, to the fact that travel distances are limited by increasing costs of gasoline. Our expanding public program, when established, will be self-financing from the revenues of services it will provide. Our Manager of Buildings and Public

Services is charged to coordinate and oversee these developments and to seek grants for their implementation.

A new Assistant Supervisor has been appointed, who is responsible for the Case Estates at Weston. He has concentrated this year on renovating the nurseries of the Arnold Arboretum that are situated there, and on integrating the work at the Case Estates more effectively with operations at Jamaica Plain. The work has been carried out in preparation for the new plant material that will result from current collecting expeditions by our staff as well as from accessions expected during restoration of the living collections. Complete reorganization of the nurseries will take several years, but in the coming year we plan to define future policy for the Case Estates.

We have been fortunate in receiving some major and unexpected gifts. Mr. Charles Mead has donated his house at Weston, together with a generous endowment. The house, designed by his father, a distinguished architect, stands on a hilltop in eleven acres of woodland garden. This fall Mr. Mead's fine rhododendron collection, many specimens of which were donated by the Arboretum in the past, will be augmented by new cultivars from the Case Estates.

St. Joe Minerals Corporation provided us with an unexpected gift of five electric trams, three with trailers. This has allowed us to install an internal public transportation system, silent and pollution free, several years earlier than we had projected.

THE LIVING COLLECTIONS

Policy was defined and accepted in the previous year. In the first half of the current year, Dr. Richard Weaver, Horticultural Taxonomist, Ms. Sheila Geary, Library Assistant at Jamaica Plain, and Ms. Jennifer Hicks, Curatorial Assistant for Mapping and Labeling, prepared a long-term plan for the restoration of the living collections. In September 1979, a feasibility study was completed in draft. This document addressed three problems: the best means by which to restore the collections in a manner commensurate with their original and continuing purpose and with Olmsted's and Sargent's design; the current state of the records and the best means for their reorganization to enhance access and reliability; and, more briefly, ways in which the collections can be interpreted for the public. In June 1980 the National Science Foundation granted us \$99,998 over a two-year period, for the purposes of unifying the currently unnecessarily complex records system, acquiring a computer (jointly with the Harvard University Herbaria), and devising a means of entering the records into computer storage. The award will permit us to begin verifying records of current holdings and entering them into the computer. At the present time we maintain records for our living collections in the Plant Sciences Data Center computer of the American Horticultural Society in Mt. Vernon, Virginia. This arrangement will continue, for the North American center provides us with the only available simple access to the records of other major collections, and access for others to ours;

but storage of all our records in the PSDC computer would prove too expensive and inconvenient.

One hundred eight maps, on which the positions of all our living accessions are recorded, form an essential adjunct to the records that must be curated continuously if the plants are to be located easily for monitoring and for research. They have not been fully revised since 1969. They are not based on a precise land survey, and consequently have suffered progressive distortion in subsequent revisions that have followed Olmsted's original plans. Preliminary to preparation of a completely new set, precisely surveyed and on metric scale, the boundaries of the Arboretum were surveyed and fixed points established. A grant proposal has been in preparation for the rest of the operation. This will involve complete remapping with the aid of photogrammetry, and production of a simplified color-printed map on a single sheet for public sale, as well as a new set of reference maps.

Under the direction of Mr. Gary Koller, Supervisor of the Living Collections, and Chairman of the Living Collections Committee, the summer of 1979 saw marked further improvement in the level of maintenance on the grounds. This was largely thanks to the fine teamwork and enthusiasm of the grounds crew under the leadership of Mr. Henry Goodell, the Superintendent, and to an exceptional group of summer trainees who succeeded a good group in the previous year. A drive was initiated to eliminate certain invasive weeds, by combining increased manual removal with judicious use of selective herbicides. The level of maintenance in the nursery has increased dramatically as well.

Owing to the geographic position, long boundaries and accessibility of the Arnold Arboretum, vandalism will continue. Although ground fires were of the usual extent and frequency, little damage was incurred. There has been a decline in the number of stolen cars that have been rammed through the gates at night, and dismantled or torched. Beer parties and litter remain continuing problems; litter has been controlled satisfactorily by the diligent efforts of the grounds staff, except in the Peters' Hill area where there is much neighborhood dissatisfaction and need for new initiatives. Increased collaboration with our neighbors is a principal task for our new Public Relations Officer beginning work in July. Several concrete benches were destroyed or damaged in the spring; some were repaired by the Parks Department, others removed. Vandalism to the collections has not increased, although we wish we could understand the motive of the person who, unsuccessfully, attempted, with kerosene-soaked rags, to torch the best of our old katsura trees, and of the people who uprooted and scattered all the young Philadelphus, which had been repropagated and planted out to replace our declining collection. Several young and dwarf conifers were decapitated during the Christmas season; fortunately they did not represent an outstanding accession.

There have been major improvements to the facilities at our greenhouse complex. Air-cap insulation has been applied to glazed vertical walls, and air-inflated double polythene covering has been installed over roof areas. The insulation, along with careful cultural practices,

appears to have effected a 15% reduction in oil consumption, although this is a conservative estimate in view of the cold and open winter.

The Southwest Corridor Project, which was discussed in my previous report, began reconstruction operations on the section of the line abutting our South Street Tract. Mr. Koller assisted Mr. John Frey, the landscape architect for the new station, in plant selection, and worked with the Massachusetts Bay Transportation Authority architects in site planning for a projected land link between the new station and the Arboretum through the South Street Tract. Two further negotiations involving use of the tract are in process. The city Water Department is searching for downstream sites in the Stony Brook drainage where dams can be constructed for temporary impoundment of floodwater, in order to reduce the backup of polluted water that occurs in the Back Bay Fens following heavy rain. Goldsmith Brook, which flows through the meadow between the Administration Building and the Arborway, and Bussey Brook, which flows from the Arboretum through the South Street Tract of the Arboretum, drain into Stony Brook. A dam has been suggested along the boundary between the South Street Tract and adjacent city land, and this would lead to periodic short-term flooding of the wetlands that occupy the northern sector of the tract. Meanwhile, the Boston Police Department is considering building additional stables on the same city land. An alternative site for the stables, in and toward the southern end of our South Street Tract, would be advantageous as it would not, like the first, impede our projected access to the new Forest Hills station. At the same time it might encourage greater visitation of the Arboretum by the mounted police.

Following the approval of a new accessions policy by the Living Collections Committee, which is in line with our plan for eventual restoration of the Sargent and Olmsted plan, additions have been placed on the grounds following the sequence in the original Bentham and Hooker botanical classification, wherever conditions have allowed.

Dr. Stephen Spongberg earlier listed 2,500 potentially hardy woody plant taxa not currently represented in our collections. Our long-term objective will be to introduce these anew from the wild. Meanwhile, we aim to acquire propagants from genotypes already in cultivation, where possible of known provenance. Mr. Harold Hillier, whose nurseries in Hampshire, England, contain one of the most comprehensive collections of wild woody taxa in cultivation, and to which Arnold Arboretum collectors have contributed new material over many years, has generously agreed to make available to us, over a period of five years, propagating material of those taxa to which he has access. We take note of this example of the mutually beneficial collaboration that we continue to enjoy with the nursery trade.

Dr. Weaver has been proceeding with detailed plans for the restoration of individual collections. Several major additions and relocations have already been started. During the summer and fall of 1979, 465 plants were added to the living collections in Jamaica Plain. These plants were from 114 different accessions representing 86 botanical taxa and 14 cultivars. The large number of individual plants relative to the number of accessions is due to the fact that several taxa were planted in large masses. During the spring of 1980, 523 plants were added to

the living collections in Jamaica Plain. These plants were from 285 separate accessions representing 251 botanical taxa and 5 cultivars.

Approximately half of the existing *Philadelphus* collection was propagated in 1976 and the successful propagants, exclusive of cultivars, were planted this spring. Eighty-five individuals, representing 34 accessions of 16 taxa, were planted out.

A collection of putatively hardy bamboos, mostly *Phyllostachys* species, was selected this winter from the United States Department of Agriculture Plant Introduction Station in Savannah, Georgia, where the extensive collection is being closed down. The plants were collected on a trip to Georgia sponsored jointly with the Boston Zoological Society and the New Alchemy Institute, Woods Hole, Massachusetts. Thirty-three individuals, representing 19 accessions of 17 taxa, were planted out this spring.

Restoration of the following collections to their proper position in the Bentham and Hooker sequence was begun with the fall 1979 and spring 1980 plantings: Ranunculaceae, with species of *Clematis* on the parking lot fence; Guttiferae and Theaceae, with species of *Hypericum* and *Stewartia* in the azalea border; Berberidaceae, with species of *Berberis* just beyond the *Liriodendron* collection; Staphyleaceae, with species of *Staphylea* as understory shrubs in the *Acer* collection; Celastraceae, with species of *Euonymus* along the woods at the edge of the *Aesculus* collection; Vitaceae, with species of *Vitis* and *Ampelopsis* on the Arborway wall in the *Acer* collection; Hamamelidaceae and Araliaceae, with species of *Corylopsis* and *Fothergilla*, and *Aralia* and *Acanthopanax* around the middle pond; Rosaceae, with species of *Spiraea*, *Holodiscus*, *Aronia*, *Photinia*, *Amelanchier*, *Neillia*, *Aruncus*, *Prunus* and *Pyrus* around the first pond, the area of the shrub collection, and the Forest Hills bank; Scrophulariaceae, with *Paulownia* along *Catalpa* Path (these are the first plants resulting from the Japan-Korea trip to be planted on the grounds); Verbenaceae, with *Vitex*, and Loganiaceae, with *Buddleia* along the walk through the tree legume collection; Saxifragaceae, with species of *Deutzia* and *Ribes* along the woods behind the tree legumes; Caprifoliaceae, with species of *Viburnum*, *Lonicera*, *Weigela* and *Sambucus* connecting the remnants of the collection on the tree legume slope with the present *Viburnum* collection by 1090 Centre Street, and the traditional *Lonicera* collection along *Linden* Path; and Ericaceae, with species of *Kalmia*, *Rhododendron*, *Vaccinium* and *Elliottia* along the base of Hemlock Hill and on the hill itself.

During September 1979, many *Malus* were diseased and partially defoliated; those that were found to be at least 70% defoliated, and regarded in the literature to be disease susceptible, were removed. In addition, 30 "species" of *Crataegus* and 22 species and varieties of *Malus* were planted.

Dr. J. B. Phipps, of the University of Western Ontario, has offered to verify the identities of the *Crataegus* in our collection. We have started an herbarium collection program from our holdings for this purpose. The goal is to collect five specimens in flower and five in fruit from one plant of each accession. Half of the first phase has been completed. Horticultural trainee

Ms. Elizabeth Robertson, with help from Ms. Kelley Kearns, managed to make 77 collections this past spring.

Members of the New England Rose Society, notably Mr. Malcolm Lowe, have kindly agreed to verify our holdings in the genus *Rosa* at Jamaica Plain and Weston. The collection has been in serious decline, but thanks to their advice and assistance the level and quality of maintenance is to be improved, and species accessions are being repropagated. The Society has donated new plants for our collection, and we have provided propagating materials for their use.

Dutch Elm Disease has affected 18 elms in the collection this last year. Twig samples were collected for pathological analysis; a consulting plant pathologist reviewed the trees and made recommendations. To conserve genotypes, cuttings have been taken from the most significant accessions that remain healthy. Pine Needle Blight (*Diplodea pinea*) has affected several plants in the conifer collection and appears to be spreading. As a result, we have initiated periodic applications of fungicidal sprays and fertilizer. The spread of the disease seems to have been retarded. The *Corylus* collection was reviewed taxonomically and plants of questionable identity were removed. The remaining plants are suffering from an unidentified fungal root infection and are to be repropagated for replacement. Areas of the Arboretum that were neglected and had become overgrown have been reviewed: improvements have been initiated in the *Berberis* and *Viburnum* border near the Centre Street gate, the Centre Street beds, the *Taxus* border along Bussey Street and at the base of Hemlock Hill, and the dwarf conifer collection. Mr. Koller put major effort into relabeling and repropagating the existing *Populus* collections, which are deteriorating, and spent several days reviewing, evaluating and relabeling the *Alnus* collection.

Among the more outstanding plants lost during the year were a large linden, *Tilia petiolaris* (4968), broken in a storm; an *Acer saccharinum* (12562A) which was removed after several years of decline; *Corylus avellanacv. contorta* (4845), *Pinus bungeana* (1404-5) and *Kalopanax pictus* (12456) from unknown causes; *Laburnumcv. Watereri* (187-41-a) which had been hit earlier by a stolen car, was destroyed in a storm; and *Sorbusalnifolia* (3626-A) which had declined with fire blight.

In view of the remarkable comprehensiveness of the records of our living collections, it has been regrettable that the history recorded in their growth rings has not been retained when plants have been removed. The Center for Wood Anatomy Research at the U.S.D.A. Forest Products Laboratory, Madison, Wisconsin, has agreed to accept, in the future, and store such samples for anatomical, dendrochronological and other research.

I alluded last year to the report written by the Kew botanist, W. J. Bean, following his visit to the Arnold Arboretum in 1909, when he noted that the native field flora was in those days allowed to grow and flower beneath the trees. In due course the trees shaded out much of this flora. During the 1930's, labor shortages made it increasingly difficult to manage this rank

vegetation; and after the neglect of the war years, a policy of more frequent mowing led to its replacement by the ubiquitous grasses that came from northern Europe with the early settlers. F. L. Olmsted's carefully planned path system, which was defined on gentle topography merely by close scything along the trails, thus disappeared. It is our eventual intention to reintroduce natural herbaceous flora in selected areas and simultaneously to regrade and redefine Olmsted's paths, thus encouraging more general use of the Arboretum by the public. We believe that this may in turn ameliorate our security problem. The overall plan is included in the Feasibility Study completed in 1979.

Thanks to the generosity of an anonymous benefactor, we have been enabled to proceed with restoration of Olmsted's Oak Path, and to begin to introduce an interpretative oak woodland wild garden along part of its length. This restoration will serve as a prototype for the others we hope to implement if public support is forthcoming.

Several short collecting expeditions by staff members were made within North America. Dr. Weaver and Mr. James Nickerson, Head Pruner, visited North Carolina for two weeks in September 1979, returning with 108. collections from wild sources, woody plants and a number of herbs as well. During December 1979, 34 taxa, of which 30 were of wild origin, were obtained by Mr. Koller and Mr. John Alexander, the Propagator, in southern

(W. J. Bean, "A visit to the Arnold Arboretum." Kew Bulletin 8: 261-269. 1910.)

Missouri following a meeting they attended at the Missouri Botanical Garden. Mr. Robert Nicholson, Greenhouse Technician, sustained his reputation as a plant hunter by completing four trips. Three were to Vermont in connection with his project on sugar maple, which is discussed later. The fourth was a trip to the mountains of California for the purpose of collecting genotypes of tender species from their limits of cold hardiness as in his British Columbia expedition of the previous year. This expedition yielded 35 collections from six localities. Of greatest potential interest were *Sequoiadendron giganteum*, *Leucothoe davisiae*, *Arbutus menziesii* and *Lithocarpus densiflorus*.

The Propagator received for propagation 160 shipments, consisting of 839 taxa from 23 countries, including material collected by staff members. Three hundred sixteen taxa were also propagated from our own accessions, to replace deteriorating specimens or to increase numbers pending collection from new wild provenances.

Acquisition of materials for propagation in general has been carried on in the routine manner. However, almost without exception, no seeds were ordered from indices semina unless they had been collected in the wild. A generous gift from Forest Farm in Williams,

Oregon, has added wild collected plants of 18 species to our collections. These plants are all native to the western United States, and all are new to our collections.

Two hundred shipments, comprising 783 taxa, were distributed to cooperating institutions, nurseries, and individuals in 15 countries. Further 723 were propagated to fulfill special requests; excess material resulting from these was also distributed.

Ms. Hicks accomplished much during the year. Her painstaking review of the living collections record system, and her planning for its rationalization, verification, and computerization have already been mentioned. She was able to redraw four of the collection master maps and to complete rechecking of a further seven. Also, the existing master maps have been photo reduced to half scale and cleaned up for reproduction as new map books for use on the grounds. In addition to the label requirements for plants being newly added to the living collections, one or more replacement labels were prepared for and mounted on each of approximately 1,500 existing specimens in the Jamaica Plain collections, and extensive label replacement is underway at the Case Estates. Six hundred fifty-eight plants were withdrawn from our computerized records, and 448 changes were made to existing records.

Mr. James A. Burrows was appointed Assistant Supervisor of the Living Collections, with charge of the Case Estates, on July 9, 1979. During his first year he has concentrated on reviewing and reorganizing the nurseries, which were in a state of relative neglect, and on integrating his program closely with the planting and propagation programs at Jamaica Plain. This is a vital preliminary to the expected future increase in accessions.

The nurseries at the Case Estates comprise both temporary and permanent beds. First priority has been given to the temporary beds, which contain the plants that are grown until big enough to plant out in the Arboretum. An inventory of the holdings was completed, followed by a review of records in order to identify plants that fail to comply with our current accessions policy. Plants that meet present criteria are to be moved to the Arboretum as soon as possible, while the remainder will be distributed to our Friends and to other institutions. In the future, the nursery area is to be planted on a rotation basis to improve operational efficiency and to allow easier control of soil fertility.

Because of the serious shortage of outside space for young plants in the Saran house at Jamaica Plain, occasioned by the recent increase in accession rate, a Saran house was reestablished in July 1979 inside the old ericaceous nursery area at the Case Estates; here the plants will be protected from wind by the tall, enclosing coniferous hedge. This new area, which is already nearly full, has also facilitated integration of operations at the two nursery locations. Half of the plants will be ready for transplanting out into the temporary beds in spring 1981.

In view of the growing demand for nursery space, a new nursery area will be prepared in the coming year, replacing the now derelict pruning demonstration plot.

As stated in my first Annual Report, the permanent nurseries were set out as a collection, partially transferred from the Arboretum itself, of taxa considered not to be of ornamental value. In line with our present accessions policy, a complete inventory is being made and collections worthy of replanting in the Arboretum are being identified. Major collections of *Berberis*, *Philadelphus* and *Rosa* in particular were found. As an emergency measure, more intensive maintenance of these nurseries was scheduled to begin this summer, and plants in imminent danger were to be repropagated. The complete propagation or transfer of the valuable accessions will take five to six years.

Now that urgent renovations are in hand, Mr. Burrows, in collaboration with Mr. Koller and Ms. Wendy Marks, Manager of Buildings and Public Services, will review critically the operations at the Case Estates to prepare a financially viable plan for their future use.

At the end of 1980 the Arnold Arboretum will complete its term as cultivar registration authority for those genera of cultivated woody plants that lack authorities, under the auspices of the American Association of Botanical Gardens and Arboreta; thereafter the United States National Arboretum will act on behalf of the Association. Dr. Stephen Spongberg has continued meanwhile to act as registrar for these, as well as for those genera for which the Arboretum continues to serve as International Registration Authority.

The living collections are being used increasingly for research, as will become apparent to readers of the section on research. Taxonomist Dr. Spongberg has continued to use the collections for his own work. Bullard Fellow Dr. Amor Singh Hans pursued studies on the pollination biology of *Ulmus*. Graduate student Mr. Michael Donoghue continues his research on *Viburnum*. His studies of growth problems in the living collections have furthered understanding of infra generic relationships and have led to his being awarded the Cooley Prize by the American Society of Plant Taxonomists. Similarly, Mr. Paul Groff's senior thesis, completed during the year under Professor Peter Stevens' supervision, made use of our collections to throw light on generic limits in *Ericaceae* tribe *Phyllodoceae*. Graduate student Mr. Steven Rogstad is making studies of the growth and branching pattern of *Asimina*, *Annonaceae*, preliminary to studies in the tropical *annonaceous* genus *Polyalthia*. Professor Otto Solbrig's students continue to use space in our greenhouses for their biosystematic research into *Viola*. Among the several scientists from other institutions to use our collections, Dr. Lester Nichols, Plant Pathologist at The Pennsylvania State University, conducted his eighteenth annual disease survey of our *Malus* collection; Dr. Frank Santamour, Research Geneticist at the National Arboretum, gathered specimens of various *Acer* species for chemical analysis; and Dr. Harold Pellett, University of Minnesota, conducted controlled tissue-hardiness tests utilizing specimens supplied by the Arboretum.

Supervisory staff members continue to be encouraged to develop their own research or to participate in the work of others, as far as time allows. Projects undertaken this year include the initiation of a program to breed mildew-free *Syringa*, by Mr. Alexander; a morphogenetic study of branching in *Tsuga canadensis* var. *pumila*, by Mr. Peter Del Tredici, Assistant Plant

Propagator, and hybridization experiments in Hamamelidaceae and studies of sugar maple by Mr. Nicholson.

Those are Chaenomeles, Cornus, Fagus, Forsythia, Gleditsia, Lantana, Malus (ornamental varieties only), Philadelphus, Pieris, Ulmus and Weigela.

The Royal Horticultural Society honored the Arnold Arboretum by awarding it the Reginald Corey Memorial Cup for the Magnolia cultivar 'Merrill', a hybrid that had been developed by former director Professor Karl Sax and named in honor of his predecessor, Mr. E. D. Merrill.

Members of the living collections staff have made extensive and appreciated contributions to our Friends and Public Service Programs, propagating thousands of cuttings and seeds as gifts, giving lectures and tours for private groups, contributing to our public education program, preparing and erecting our prizewinning exhibit at the Spring Flower Show of the Massachusetts Horticultural Society, and assisting numerous students, nurserymen, horticulturists, botanists, and landscape architects by telephone and by letter.

The Supervisor, Mr. Koller, presented a paper at the Annual Meeting of the International Plant Propagators' Society, Eastern Region, at St. Louis, and lectured at Blithewold Gardens and Arboretum. Mr. Alexander also attended the IPPS Annual Meeting, participated in the Annual Convention of the International Lilac Society at Medina, Ohio, and that of the American Rhododendron Society at Hyannis, Massachusetts. Ms. Hicks visited the Fairchild Tropical Garden, the U.S.D.A. Subtropical Plant Introduction Center, and the University of Georgia Botanical Garden to study their records systems.

Three staff members at Jamaica Plain left during the year. Mrs. Eileen Twohig had worked as Custodian of the Administration Building for 22 years. Of tireless energy and cast-iron reliability, she brightened our lives with her good humor and her honest, no-nonsense frankness. Mrs. Mildred Pelkus, who had been Secretary and Accounting Clerk at Jamaica Plain for 14 years, retired at the end of December 1979. Her place was taken by Mrs. Anne Johnson, who had joined the staff in October. Horticultural Secretary Mrs. Jeanne Sattely, who resigned in January, has been replaced by Miss Margaret Quinn. The reappointment of Mr. Burrows has already been reported. Mr. J. Patrick Willoughby filled the vacant post of Assistant Superintendent in March, and Mr. James Papargiris filled a vacancy on the Grounds Staff.

A special tribute should be paid to the 14 summer horticultural trainees of 1980. Carefully selected from over 70 applicants, they came from nine states, and most were college students in plant sciences. Five started early in the growing season, the others arriving as usual

at the beginning of June. Careful attention to supervision and organization, and a stimulating program of talks, contributed to high morale and a superb job.

THE HERBARIUM

Dr. Norton G. Miller for five and one-half years held the position of supervisor of the herbaria of the Gray Herbarium and the Arnold Arboretum. This appointment ended on June 30, 1980, as did his chairmanship of the Herbarium Committee. Associate Professor Peter F. Stevens will assume both responsibilities. Dr. Miller will continue on the staff as Botanist in the Arnold Arboretum and the Gray Herbarium.

Among major curatorial accomplishments was the compilation of an identification list for R. C. Barneby's monograph of *Dalea* (Leguminosae); this was used as a basis for annotations of 1,000 sheets in the combined herbaria. T. C. Whitmore's revision of *Macaranga* (Kew Bull., 1980) was used as a source for annotations of 600 sheets of this genus in our collection. Using the identification list of Ding Hou (Flora Malesiana, 1980), 1,200 sheets of western Malaysian Anacardiaceae were annotated. Part of our holdings of the same family from Papuasias and the Philippines have also been annotated. The Merrill collection of rubbings and fragments (Anacardiaceae only) has been mounted, annotated, and inserted into the general and type collections. Numerous annotations in the Amaranthaceae (especially cultivated species) were added. Annotations of 759 specimens of Neotropical Rubiaceae, tribe Psychotrieae, were completed. Materials representing 40 genera new to the herbaria were added. Type folders were replaced in families 92 to 125. Geographical tags for the four New World regions were added to folders of families 105 to 127. There has been no insertion in the herbarium in Cambridge since preparations for the herbarium move have already begun.

The National Science Foundation awarded a further curatorial grant to the combined herbaria, which will enable us to continue to curate families recently monographed, to search for unrecognized types, and otherwise to bring the collections to a condition of better annotation. In combination with the grant to be implemented for curation of the living collection records, the current grant provides for acquisition of a small computer in which, in the beginning, the records of our type collection are to be stored.

An inventory of the herbarium and storage at Jamaica Plain, preliminary to a proposed renovation of the Administration Building, was made in autumn of 1979. Volunteers under the supervision of Ms. Ida Hay Burch have been working on a project to collect specimens of the Arboretum's living accessions that are of documented wild origin in eastern Asia. Ten sets are being collected, and the duplicates will be used for exchange; collections so far number 214. The group, headed by Mrs. Cora Warren, includes Ms. Susan Davis and Mrs. Mary Wolcott, as well as staff member Miss Kristin Clausen.

By the end of the fiscal year there were 1,102,306 sheets in the Arboretum herbarium at Cambridge. During the year 10,357 sheets were mounted, 75 added directly, 12 removed. In Jamaica Plain there were eventually 168,048 sheets in the herbarium of cultivated plants, 810

having been added during the year. Thirty-one sheets were repaired in the two herbaria. Of the accessions, 4,827 were received by exchange, 392 as gifts, 447 by subsidy, and 721 for identification by staff members. The major provenance was South America (1,250 sheets), followed by East Asia (981), India (963) and Western Malesia (657), Europe (626) and Papuasia (603). Staff members made 1,187 collections; 147 sheets were sent on exchange; 30 orchid collections were placed on indefinite loan in the Oakes Ames Orchid Herbarium; 1,187 specimens were received on loan for staff members of the combined herbaria, and a further 4,676 for students; 7,969 sheets, received on loan for staff members in previous years, were returned, and 3,112 likewise for students. The combined herbaria sent out 30,463 specimens for study at other institutions, and received back 14,647.

The extension to the Harvard University Herbaria building was completed, although the air conditioning continued to malfunction as it had done off and on through the two years during which alterations were being made. The paired compactor banks in each of the twelve new compactor rooms have been installed, and apart from the absence of gaskets, locking mechanisms, and a thorough cleaning, they are ready to receive the mounted sheets. A major effort was made to finalize plans for the transfer of specimens to the new compactor space and rearrangement in cabinets in the original building. The basement curatorial area was completely reorganized and new metal cabinets from elsewhere in the building were put in place of the old tin-covered storage cases, which were in large part discarded. When the herbarium move is completed, there will at last be adequate storage for specimens awaiting processing or insertion, although the mounting/materials storage room was reduced to half its original size during construction alterations. Ultimately, it will be necessary to make an accommodation for new storage space for our inventory of large-volume mounting and packaging supplies.

One hundred forty-four Polaroid photographs of specimens were made for staff members, 21 for others. Information on in-house curatorial methods at the herbaria was supplied to six visitors representing five herbaria. Three artists visited the combined herbaria to consult specimens. The staff answered 39 special requests for information or specimens during the year. Visitors to the herbaria numbered 182.

Miss Rita Silverman, Herbarium Secretary, left during the autumn and was replaced on a temporary, part time basis by Mrs. Anita Fahey who worked nearly to the end of the fiscal year. Miss Colleen Sliney was hired on June 18, 1980, as the Herbarium Secretary. Mrs. Olga Peixoto, part-time Mounter, resigned in the autumn before the birth of a child; no replacement was sought. Ms. Laurie Feine-Dudley was hired as a Curatorial Assistant to replace Mr. R. James Hickey, who resigned to undertake graduate studies in botany at the University of Connecticut. Miss Sarah Mellen, Curatorial Assistant, resigned and was replaced by Miss Patricia Adakonis. The present curatorial staff of the combined herbaria consists of Mr. Michael A. Canoso, Manager of the Systematic Collections; Mr. Walter Kittredge, Senior Curatorial Assistant; Ms. Feine-Dudley; Miss Adakonis; and Ms. Zepur Elmayan and Mrs. Edith Hollender, Mounters. Ms.

Burch serves as Staff Assistant in the herbarium at Jamaica Plain; Mrs. Anne Sholes and Mrs. Helen Fleming are Mounters there.

THE LIBRARIES AND ARCHIVES

There is a joint Library Committee for the Arnold Arboretum and the Gray Herbarium. Arboretum members are Mrs. Lenore Dickinson, Librarian and Chairman; Professor Richard A. Howard and Dr. Stephen A. Spongberg; and the Director ex officio. The total number of volumes and pamphlets at the end of the fiscal year was 87,565; 172 added at Cambridge and 96 at Jamaica Plain by cataloguing, and 170 and 106 respectively by binding. In addition, 110 reprints were catalogued. Four hundred twenty journals are currently received at Cambridge and 223 at Jamaica Plain; 7 represent new subscriptions. Fifteen microfiches were added at Jamaica Plain; we now have 10,867 microfiches and 179 microfilm reels, acquired jointly with the Gray Herbarium; and 20,095 other non-book collections.

Loans were made to the extent of 4,739 internal and 1,171 external; 2,019 photocopies were supplied at Cambridge in lieu of loans. In addition, there were 238 interlibrary book loan and photocopy requests received, and 82 sent out to other libraries; 56 volumes were borrowed by our Cambridge library from Jamaica Plain; only 4 in reverse.

Eighty-eight of the volumes added this year were gifts. We acknowledge with thanks the donation of books by Mr. A.I. Baranov, Mr. Norton T. Batkin, Mr. Charles Boewe, Mr. Paul A. Cox, Dr. Otto Degener, Mr. Peter S. Green, Mrs. John D. Houghton, Dr. Richard A. Howard, Dr. S.Y. Hu, the Korean Ginseng Research Institute, Dr. Elbert Little, Mr. C.R. Long, Dr. Michael Madison, Dr. Ernst Mayr, Dr. and Mrs. Norton G. Miller, Dr. J.K. Morton, Dr. Lily M. Perry, Dr. L.S. Plotnikova, Mr. Calvin Sperling, Dr. Stephen A. Spongberg, Dr. Peter F. Stevens, Mrs. Edward J. Thompson, and Dr. Carroll E. Wood.

The addition to the Herbaria Building in Cambridge has alleviated space problems in the library. Cambridge staff members started reorganization of the library when the new space became available for occupancy in August 1979. To create a more efficient work area for library staff, a wall between two of the three library offices was removed, and the new space was reorganized to provide separate work space according to functions. Shelving for periodicals in various stages of preparation for the bindery was installed. Three tables were arranged to provide a large work surface for processing material for the stacks. The new work area for staff is proving to be an efficient and satisfactory arrangement. Storage space, however, remains a problem.

The library privileges policy which provides only access to the Harvard University Herbaria libraries for outside users, and requires payment of a user fee, has been in effect for 15 months. Whether or not the policy has had an effect on screening visitors is hard to measure because of the unusual circumstances of the past year. Construction in the three weeks during which the library was closed, and the ongoing work on the addition to the building for most of the academic year, may have discouraged outsiders from visiting. However, 220 visitors did

register --an increase of 43 over last year. Coordination with the Herbarium Office when visitors from other institutions register to work in the herbarium has also helped to monitor visitor use.

A continuing project of removing pamphlet material from highly acidic covers and rebinding in cloth will ensure that the material will be in good condition for hundreds of years to come. The University has received a third grant for microfilming rare or deteriorating library material under the Strengthening Research Libraries Program provided by Title II-C of the Higher Education Act. The Arnold Arboretum is continuing to submit titles for microfilming under this program.

At Jamaica Plain, space has not been as much of a problem as the arrangement of the collection in it. At present, the collection is divided between the first and third floors of the Administration Building. Ms. Geary, Assistant Librarian there, made an inventory of existing shelf space and of files, documents and archival materials. From this, as part of a preliminary plan for the reorganization of the interior of the building, she derived a projection of future library space needs, which she assembled in collaboration with Ms. Burch and Miss Eugenia Frey, Public Information and Education Coordinator. Mrs. Dickinson and Ms. Geary devised a simple form which will be used to gather information regarding the use of the Jamaica Plain library by visitors.

Much work was done on the important negative and slide collections at Jamaica Plain. Volunteers Mrs. Barbara O'Connor, Mrs. Marie Dempsey and Mrs. Mary Ashton, under the expert direction of Mrs. Dodie Loomis, spent 214 hours on the curation and maintenance of our extensive slide collection. Ms. Geary reorganized the section of the collection that depicts general views of the Arboretum, following the Bentham and Hooker botanical classification by which the living collections themselves are ordered. Special topics are now grouped by subject at the end of the sequence. Ms. Geary photographed some of the living collections and added approximately 250 slides, aiming to fill deficiencies and to record the restoration now beginning on the Olmsted path system. In this she had the cooperation of staff members Dr. Weaver, Dr. Spongberg and Ms. Hicks. One hundred slides of trees in the Arnold Arboretum were also provided by the Chanticleer Press, whose representative took the photographs for The Audubon Society Field Guide to North American Trees: Eastern Region.

Mr. Norton Batkin and Ms. Geary made a survey of the materials while gathering information for a grant proposal to support their curation. They undertook an inventory and identified target problem areas, including deteriorating nitrate negatives in danger of becoming hazardous. Additions to the collection included a duplicate of portraits in the Jamaica Plain library, from Dr. Spongberg; and a collection of portrait photographs of staff members, made by Dr. Michael Dirr who spent the previous year at the Arnold Arboretum as a Mercer Fellow.

Several projects were undertaken using the archives and photographic collections at Jamaica Plain. In preparation for our successful grant application to the National Science Foundation for curatorial support for the living collections records, Ms. Geary pursued research

into the early history and collections policy of the Arnold Arboretum. This research was then extended, with Ms. Burch, Volunteer and Visiting Committee member Mrs. B. June Hutchinson, and Mr. Batkin, to prepare a further grant application to the National Endowment for the Humanities for funds to prepare a Guidebook to the Living Collections. This project will be discussed under Publications.

The portions of the guide for which we are seeking funding will draw heavily on archival material. In preparation for this work Mrs. Geary and Mrs. Hutchinson searched not only our own archives, but also the Harvard University Archives and those at the Graduate School of Design, the Massachusetts Horticultural Society, the Northeastern Genealogical Society, the Massachusetts Historical Society and the Federal Records housed at Waltham, Massachusetts. We are grateful to these institutions for allowing us access to their records. Ms. Geary and Mrs. Hutchinson also spent over 70 hours at the offices of Olmsted Associates, examining the original planting plans of the Arboretum; 164 complete and sectional maps were duplicated for our archives. The written records associated with the plans were acquired by the Library of Congress several years ago. They therefore visited the National Archives on February 8 and 9, 1980, to review the records and to assess their importance to our work. This year the Olmsted offices in Brookline became a National Historic Site, under the jurisdiction of the National Parks Service. Owing to the collaboration that Ms. Geary and Mrs. Hutchinson have now established with the Parks Service staff, special permission has been granted for their continued access to the material. A precursory article, entitled "Jackson Thornton Dawson, Plantsman," has been submitted to *Arnoldia*. This served as additional documentation for the guidebook grant proposal, and as a test case to establish whether the research undertaken would, as envisaged, document the history of the Arboretum in humanistic terms.

A survey of funding sources for Mr. E.H. Wilson's plant exploration expeditions to China, including a list of donors, was prepared and added to our archives.

In her capacity as archivist at Jamaica Plain, Ms. Geary handled a variety of reference questions.

When the addition to the Herbaria Building was opened formally on May 23, the Library mounted a small exhibit of staff publications.

Miss Anne D. Thacher was appointed Library Assistant in August 1979, filling the vacancy which existed following the resignation of Miss Jill Skarstad as of June 30, 1979.

The Librarian attended two institutes at the Simmons College School of Library and Information Science: one on the use of statistics in library management; the second on the Anglo-American Cataloguing Rules, second edition: analysis and application.

RESEARCH

The official visit to the Arnold Arboretum by a party of botanists from the People's Republic of China in May 1979 has been followed by a welcome and increasing collaboration in

research. In August 1979, Professor Ching-yung Cheng, of Peking Medical College, and a former student of Professor Reed Rollins of the Gray Herbarium, came to extend her work, in the herbarium and library, on Chinese Celastraceae. Professor Cheng, who remained until the end of November, was the recipient of a Mercer Fellowship. We are looking forward to additional and longer-term visitors within the next two years. Dr. Spongberg in June 1979 attended the California meetings terminating the visit of the Chinese party. In the next fiscal year he is scheduled to represent the Arnold Arboretum, one of five American institutions which together will mount the first Sino-American field expedition since the 1950 Chinese revolution. The expedition is being sponsored by the Botanical Society of America; while in China it will be hosted by the government of the People's Republic.

The Director, with assistance from the Atkins Fund of Harvard University, visited Indonesia in June, 1980, where he completed his taxonomic revision of the Dipterocarpaceae of the Far East. Following this visit he attended the second Dipterocarp Round Table at the Forest Research Institute, Malaysia, where he presented a paper and chaired the final session. The publication of his semi-monographic revision of the family for Flora Malesiana is imminent. A further paper was published, with Dr. Bassett Maguire of the New York Botanical Garden, on the new American Subfamily Pakaraimoideae. While in Indonesia, Professor Ashton had discussions with the director and staff of the National Biological Institute, and an agreement was drafted for collaboration in research and training. With Professor Stevens, Professor Ashton has been awarded a grant by the United States Department of Agriculture Forest Service to supervise a postdoctoral appointee who will conduct research on wild bread fruits and tree figs (Moraceae) for the Sarawak, East Malaysia, Forest Department over two years. Dr. Richard Primack, a former Harvard student and now an Assistant Professor at Boston University, was appointed in April 1980, with departure for Sarawak scheduled for early July. Dr. Primack is interested in future collaboration with the Arnold Arboretum in the research training of botanists from the Far Eastern tropics; this field research will, therefore, provide him with a useful opportunity to broaden his experience of this region.

Dr. Ashton continued to serve on a committee of the National Academy of Sciences, chaired by Dr. Peter Raven, charged to establish research priorities in tropical biology. He convened and chaired a panel of Asian biologists in Thailand to select an Asian site for long term ecosystem research, and coauthored the final report of the Committee which was published in 1980. Dr. Ashton gave the Barnes lecture at the Morris Arboretum of the University of Pennsylvania, as well as invited lectures at Duke University, the University of Massachusetts at Amherst, the Universities of Western Ontario and of Guelph, and the Missouri Botanical Garden. He talked to the New England Botanical Club and the Society for Expeditionary Biology at Harvard. He presented a paper at a workshop on the aging and measurement of growth of tropical trees, sponsored by the National Research Council and held at Harvard Forest. He also attended the annual convention of the American Association of Botanical Gardens and Arboreta at Atlanta, Georgia. While in Indonesia, Dr. Ashton gave a

seminar at BIOTROP, the regional center for tropical biology of the South-East Asian Ministries of Education Organization.

First-year graduate student Mr. Steven Rogstad is advised by Professor Ashton; he is investigating the infrageneric classification of *Polyalthia* (Annonaceae), understory trees in Old World tropical forests, with a view to pursuing field research on niche differentiation among closely allied species sharing the same physical habitat. With Prof. Solbrig, Director of the Gray Herbarium, Professor Ashton advises Mr. Paul Cox, who is completing research on the reproductive biology of *Freycinetia reineckii* (Pandanaceae), a Samoan epiphytic vine; and, with Professor Thomas Givnish, first-year graduate student Mr. Paul Rich.

Professor Richard A. Howard has concentrated this year on his research into the flora of the West Indies. A grant from the National Science Foundation supports this study. The third volume of his *Flora of the Lesser Antilles* appeared in July 1979. This volume treats the families of Monocotyledoneae; work is continuing on Dicotyledoneae. He is engaged also in two studies in historical botany: the transliteration, editing and eventual publication of an unpublished "Hortus of the West Indies," written by Alexander Anderson in 1803 and on loan from the Linnean Society of London; and biographical and bibliographic research on William Hamilton, with an evaluation of his *Prodromus Plantarum Indiae Occidentalis* of 1825. Dr. Howard has prepared a checklist of the flora of Montserrat for the Montserrat National Trust, and is engaged in collaborative ecological studies on the changes in the vegetation following the 1977 eruption of the Soufriere of Guadeloupe with the staff of the Office of Forests. Dr. Howard studied in the libraries and herbaria at Kew, the British Museum, the Linnean Society, Royal Society and Royal Geographical Society in London in July and August 1979. In February and March 1980 he was in the West Indies, conducting field work in Jamaica, Puerto Rico, St. Thomas, Barbados, St. Vincent and Montserrat. He was able to search church and government records in Barbados and St. Vincent for information on Anderson. He climbed the Soufriere of St. Vincent to photograph, collect and record data on the 1979 eruption. He collected in Montserrat in cooperation with the National Trust of that island; there he rediscovered the shrub *Xylosma serrata*, previously known only from the original nineteenth century collection.

Dr. Howard also found time to complete a manuscript on E.H. Wilson as a botanist, discussed further under publications. As a member of the Editorial Board, he attended the meeting of the Organization Flora Neotropica held in January 1980 in Jamaica, where he gave a seminar; that of the American Institute of Botanical Sciences at Stillwater, Oklahoma, in August 1979, also presenting a paper; and that of the American Association of Botanical Gardens and Arboreta, of which he is a past President, in Atlanta, Georgia, in April 1980. At Atlanta he was the recipient of an Award of Merit from the AABGA. He attended meetings, as scientific advisor, of the board of the Bloedel Reserve of the University of Washington Arboreta; and of the Dallas, Texas, Arboretum Society where he lectured. He lectured also at the Brooklyn Botanic Garden; at Framingham State College, Massachusetts; and at the Winterthur, Delaware, Gardens Conference.

Dr. Shiu-ying Hu, although retired, continues her research on Chinese medicinal plants. She attended the third annual symposium of the Society of Herbs at the University of California, Santa Cruz, in August 1979, presenting a paper at the ginseng session. At this meeting she was honored with the Agnes Arber Distinguished Service Award. In September she participated in the first International Conference on Traditional Asian Medicine at Canberra, Australia, where she helped organize the International Association for the Study of Traditional Asian Medicine. She later visited New Zealand where she gave a seminar at Christchurch University, and Fiji. In May 1980 she spoke on Chinese women in the practice and knowledge of herbal medicine at a celebration of the role of women in herbs at Cornell Plantations and the dedication of a sculpture "The Yarb Woman" by Elfriede Abbe, in the Robinson York State Herb Garden of Cornell University. Dr. Hu received a Certificate of Honor from the Holly Society of America for her outstanding contributions to the greater appreciation and scientific knowledge of that genus.

Dr. Norton G. Miller identified bryophytes (22 species) in an assemblage of fossil plants recovered from early or middle Illinoian sediments (ca. 100,000 years old) located in southern Illinois. The assemblage is comprised of calciphilous mosses of various upland and lowland habitats. The species are now largely restricted to north temperate and boreal latitudes, and thus their occurrence in mid-latitude North America represents a disjunction of considerable significance. The results of this study will be integrated with other kinds of data in an effort to define the paleoenvironments and paleoecology of the region. Few other data from this region and period of time are available. The project was undertaken in association with Mr. S.T. Jackson, a graduate student at Indiana University. An additional 300 pounds of sediment from the Columbia Bridge deposit has been processed for plant fossils, and many new additions to the flora were discovered. These have been identified in part by use of the scanning electron microscope, and in part by other techniques. When the new material has been studied thoroughly, it will be the basis of a paper in which the paleoecology of the site will be discussed in much more detail than was possible earlier. Information from specialists on the animal groups Ostracoda and Coleoptera, fossils of which are present in the sediments, will also be integrated. During April and May, work on a revision of the taxonomy of the Australasian moss genus *Trachyloma* was resumed. In spite of some knotty problems, the solution of which is hampered by inadequate herbarium collections, progress has been made, and it is expected that the revision will be complete by the end of the summer.

Dr. Miller has directed the research of three graduate students. Mr. Peter Alpert's thesis research, cosponsored with Professor Robert E. Cook, has been pursued with the assistance of an NSF Doctoral Dissertation Improvement Grant. It concerns the general scarcity of bryophytes in arid environments, which he considers to be a function of a plant's inability to maintain a positive carbon balance under such conditions. Although bryophytes are physiologically poikilohydric, and therefore might be assumed to flourish in deserts and semi deserts, they are restricted to favorable microenvironments by factors Mr. Alpert has under study in an area east of San Diego, California. He made a detailed habitat assessment, collected microclimatic data,

and is using infrared gas analysis methodology to investigate respiration and photosynthesis in selected mosses. Mr. Alpert has now spent over a year on the field phase of his research project. Miss Cecilia Lenk is investigating the postglacial population dynamics of *Fagus grandifolia* at its northernmost distributional limit in northeastern North America by use of a combination of ecological and palynological techniques. She has completed two field seasons with support of the Anderson and Fernald funds, and has obtained detailed quantitative stand data and information on the present pollen rain of northern Maine and adjacent parts of New Brunswick and Quebec. Mr. Brent Mishler's dissertation research is a taxonomic study of *Tortula* (Musci: Pottiaceae) in North America and Mexico. This complex genus presents many problems at the species level. These will be investigated in the field by population sampling techniques and in the laboratory by culturing, cytology, and chemistry. This summer is the beginning of the research phase of his graduate program. With support of the Anderson Fund, Mr. Mishler has been in Canada and in part of the western United States, locating and observing populations and gathering materials for study in Cambridge.

Dr. Miller presented a paper at the AIBS meeting at Stillwater, and another at the Taxonomic Workshop of the International Association of Bryologists at the Geneva Botanic Gardens in late August, when he also chaired the session on Bryophyte floristics in the temperate Americas and in the polar regions. While in Switzerland he participated in an excursion of the Bryologisch-Lichenologische Arbeitsgemeinschaft für Mitteleuropa. He also lectured at Wake Forest University and at Duke University, North Carolina, and to the New England Botanical Club. With Dr. T. Webb of Brown University, he organized the Northeastern North America Palynology Workshop which was held at Harvard Forest in September 1979.

Dr. Schubert acted as advisor for seven undergraduates, two of whom graduated this year. She has been able to give full attention to her research in Leguminosae subtribe Desmodieae; a study is soon to be completed. A treatment of *Desmodium* for the Flora of Panama was completed and submitted for publication. This treated 24 species; the large number of recent collections necessitated extensive study. Critical studies on three difficult Central American species groups in the same genus are in progress. A larger range revision of the species occurring in Oaxaca, Mexico, will be Dr. Schubert's contribution to a collaborative effort, with colleagues in the National Herbarium at the Institute of Biology, University of Mexico, to a treatment of Leguminosae of Oaxaca.

Through the kindness of Professor B. Ownbey, University of Minnesota (Saint Paul), the Arnold Arboretum was the recipient of that portion of the botanical reliquiae of the late Dr. Temple Clayton pertaining to *Dioscorea*, and consisting of specimens, photographs, manuscripts, observations, and other materials. The process of evaluating this material and incorporating whatever possible into our collections has begun and should be completed by the end of the summer; any part of this gift added to our collections will consequently be appropriately labeled. Since Dr. Clayton studied and photographed many types of *Dioscorea*, this material will be most useful in continuation of the current studies of that genus. A good

many other interesting specimens, including species previously unrepresented in our collections, have been curated and added. Some progress has, nevertheless, been made toward a revision of *Dioscorea* for the Flora of Veracruz, in collaboration with colleagues in the Instituto Nacional de Investigaciones sobre Recursos Bioticos (INIREB) at Xalapa. Dr. Schubert spent two weeks in Mexico during November 1979 on this work.

Dr. Schubert visited Mexico again between February 22 and April 12, 1980, when she was sponsored by the University of Mexico to run a course in botanical nomenclature and taxonomic techniques. This gave her the opportunity also to study recent collections of *Desmodium* at the University herbarium, and particularly those from Oaxaca. She served there on a degree committee, and also lectured to the Sociedad Botdnica de Mexico and again, briefly, visited Xalapa.

In September 1979, Dr. Schubert attended the national convention of the American Begonia Society.

Dr. Spongberg's research has continued to be centered around the theaceous genus *Hartia*, but has expanded to include the simple-leaved species of *Sorbus* from eastern and southeastern Asia. The large number of unidentified specimens in the herbarium of the Arnold Arboretum have been tentatively identified, and work toward a revision of the Asian species will be continued.

In connection with his own work, and to facilitate the taxonomic studies of other Arboretum staff members, Dr. Spongberg has regularly scanned all incoming periodicals in the combined libraries of the Arnold Arboretum and Gray Herbarium in Cambridge and Jamaica Plain. Bibliographic references have been made to all articles pertaining to woody plants of the northern and southern temperate zones for addition to the set of "Rehder Cards" housed in Jamaica Plain. Over the past year 1,283 references have been added to the card file. At the end of the year Dr. Howard kindly volunteered to collaborate in this time-consuming but invaluable task.

Work also progressed toward a new book on the poisonous plants of northeastern North America, a project that is a collaborative effort between Dr. Spongberg and Ms. Burch. This is reported under publications.

During a visit to England in February 1980, Dr. Spongberg was able to spend four days at the Royal Botanic Gardens, Kew, where he worked in the library and herbarium, examining their holdings of *Sorbus* and also genera in the Theaceae and Magnoliaceae. He also visited the Westonbirt Arboretum where he examined living collections.

Dr. Peter F. Stevens was promoted from Assistant to Associate Professor effective July 1, 1980. At the same time he was appointed to supervise the herbaria of the Arnold Arboretum and the Gray Herbarium. Much of his time during the year was spent in seeing his monograph of *Calophyllum* through to publication in the Journal of the Arnold Arboretum; this is now

imminent. Preliminary work has begun which will lead ultimately to a monograph of *Mesua*, also in Clusiaceae. A manuscript on how to determine which character states are advanced and which primitive has been submitted and accepted for publication.

Mr. Paul Groff completed his senior thesis, for which Professor Stevens was advisor, on aspects of the growth patterns of Ericaceae tribe Phyllodoceae. Additional data now being collected, and a survey Dr. Stevens is making of other characters, will culminate in evaluation of phylogenetic relationships in the group. Mr. Groff's work has demonstrated the great benefit to be obtained from making observations of growth characters on living plants, many of which were growing in our collections. The characters Mr. Groff observed proved of systematic value at generic, infrageneric and infraspecific levels, of considerable intrinsic morphological interest, and of importance in providing a basis for the better understanding of the ecology of the plants. Dr. Stevens is extending his own observations on the morphology and dynamics of branching with particular reference to Sapotaceae and the Urticales. In both these groups there seem to be common patterns of lateral branch construction that are maintained despite their different methods of growth. As a result of this, each group can apparently be recognized by certain inconspicuous but constant characters, their consistency seemingly consequent on developmental constraints. Ms. Elizabeth Taylor completed her first year as Dr. Stevens' advisee; Dr. Stevens also continued, with Professor R. E. Schultes, to advise Mr. Jeffrey Hart on his research into some South American Labiatae.

Dr. Richard Weaver, notwithstanding commitments to the planning and implementation of the restoration of the living collections as well as their curation, and to the compilation of a guidebook to the Arboretum, has continued his taxonomic revision of *Staphylea*. A popular treatment has been submitted to *Arnoldia*, and a formal one will follow before the end of 1980.

This spring Dr. Weaver, with Dr. Alice Tryon, collaborated with and advised graduate student Mr. William Buikema, who made chromosome counts and studied pollen in Hamamelidaceae from the living collections and from herbarium material. Mr. Buikema verified previously reported numbers in several taxa and successfully made the first-known count of *Loropetalum chinense*. The work is to be extended in the fall of 1980 before being written up.

Professor Carroll E. Wood pursued no personal research during the year, but advised three graduate students, Mr. Christopher S. Campbell, Ms. Elizabeth Coombs and Mr. Michael Donoghue, and a junior, Mr. Roger Cantu. Mr. Campbell completed his thesis, entitled "Biosystematic Studies in the *Andropogon virginicus* complex (Gramineae)" in May, receiving his doctorate in June. He has been appointed Assistant Professor at Rutgers University, in Newark, New Jersey. Mr. Donoghue received the George R. Cooley Award for the best paper presented at the annual meeting of the American Society of Plant Taxonomists in Stillwater, Oklahoma, in August 1979. His paper, "Growth Patterns in *Viburnum* (Caprifoliaceae) and Their Taxonomic Significance, was based in large part on plants of the 60 species of *Viburnum* growing in the Arboretum. A second paper based on these living collections has been published in *Arnoldia*. He is continuing his studies in *Viburnum*, extending his observations on our living

collections by two trips for field work in Jamaica, Central America and southern Mexico; these were supported by a Doctoral Dissertation Grant in Systematic Biology from the National Science Foundation. He expects to submit his thesis in 1981. Ms. Coombs started in the fall of 1979. She was awarded a grant by the National Science Foundation to support field research on the biosystematics of the Poasandbergii complex, work that she had initiated at the University of Idaho. Ms. Taylor accompanied her in May and June to the coast ranges of California, working from San Diego northward, from where Ms. Coombs returned briefly to the University of Idaho to transfer her living collections to Cambridge; they were found to have received an application of volcanic ash from Mount St. Helens.

Dr. Wood served on the thesis committees of Mr. Campbell; Mr. Craig Green, who was pursuing research in *Calamagrostis* (Gramineae); and Mr. Philip Cantino, who continues his work in *Physostegia* (Labiatae); both students finished. Mr. Cantu took a 90r course in supervised research with Dr. Wood; he reviewed the literature on carnivorous plants, paying particular attention to their physiology.

On January 28 a reception was held in the Harvard University Herbaria library to celebrate the publication of Dr. Lily M. Perry's monumental and long-awaited treatise on the medicinal properties attributed to plants in East and Southeast Asia. Miss Perry was on the staff of the Arboretum between 1937 and 1979; this work is the product of a painstaking search for information on herbarium labels and in the literature.

Ms. Karen Stoutsenberger, who was on the Arboretum staff from November 1970 to March 1980, at first as botanical illustrator for the Generic Flora of the Southeastern United States, edited by Dr. Wood, and more recently as botanical illustrator on the staff of the Arnold Arboretum, married Mr. David Ku of Atlanta, Georgia, on March 15. Many of Ms. Stoutsenberger's accurate and beautiful illustrations have been published in the Journal of the Arnold Arboretum and in A Student's Atlas of Flowering Plants: Some Dicotyledons of Eastern North America. Her strong sense of design can be seen on the covers of the Journal of the Arnold Arboretum, 1972-1980. Ms. Brooke Thompson-Mills, Research Assistant to Dr. Howard, resigned on August 24, 1979; her place was taken by Miss Kristin Clausen. Miss Katherine Holland, Secretary to the research staff, resigned on August 22 and was replaced by Miss Lisa Frost.

EDUCATION

The contribution of our Faculty to the advising of graduate students is reported in the section on research.

Professors Wood and Miller, with Professors Donald Pfister and P. Barry Tomlinson, gave Biology 18, "Diversity in the Plant Kingdom," in the fall; it was rated highly by students. Professor Wood's Biology 103, "The Taxonomy of Seed-Bearing Plants," again received superb ratings in all categories; graduate student Mr. Cantino earned high acclaim for his contributions as a teaching fellow in the spring of 1978. Professor Wood also gave Biology 313, "Systematics

of Vascular Plants," to three graduate students, and supervised one junior in a Biology 90r research course.

In addition to his contribution to the highly rated Biology 18, Dr. Miller gave an undergraduate research course 91r, "Readings in Bryology"; and two Biology 305 courses, "Topics in Systematics and Paleobotany," and "Topics in Paleoecology and Bryology."

Professor Stevens gave, with zoologist Professor William L. Fink, their course Biology 148, "Systematic Biology," in the fall semester. Professor Stevens taught 300-level courses and Biology 90r in both semesters. He also supervised two students' reading on aspects of plant growth, a Biology 91r course, and gave an Honors Tutorial. In the summer of 1979 he taught Biology S105 with Dr. J.B. Fisher of the Fairchild Tropical Garden, Miami, a Harvard summer school course that is based at the Fairchild Garden. This course, as always, was attended by several Harvard students.

Professor Richard A. Howard taught his course Biology 209, "Phylogeny of the Flowering Plants," in the fall semester. He also presented a guest lecture, entitled "Survival and Poisonous Plants," in Professor Schultes' Biology 104, "Plants and Human Affairs."

With Professor Rolla M. Tryon of the Gray Herbarium, Professor Peter S. Ashton participated in Biology 147, "Biogeography." In addition, Professor Ashton gave a research course, Biology 387, "Tropical Botany," in both semesters.

Miss Eugenia Frey, who joined the staff in July 1979 as Plant Information Coordinator, has taken over responsibility for our public education program in preparation for expansion, which began in the spring. Our staff members have continued to make an important contribution to instruction. This year, in addition, graduate students Mr. Donoghue, Ms. Coombs, Mr. Cox and Mr. Campbell contributed, as did several outside speakers.

Several courses, tours and workshops were offered in collaboration with other organizations in the Boston area; these included the New England Wildflower Society, the Massachusetts Horticultural Society, and Habitat. Our aims here are to demonstrate the cooperative spirit that exists between our organizations, to highlight the distinct role that each of us plays, and to work together in fields where collaboration will manifestly be to our mutual benefit. In order to attract more good speakers for our growing program, and to operate on an equal footing with our collaborators, this spring for the first time speakers were offered honoraria. This necessitated an increase in the fee charged to participants. With assistance from Mr. Batkin, an elegant, new, two-color course brochure was designed.

Four exhibitions were shown in the exhibition hall at Jamaica Plain. Volunteer Mrs. Cora Warren's exhibit, "Spreading Roots," spanning the history of plant introductions and exchanges in North America, was presented between August and October 1979, followed in the period from November through January by "New England Gardens Open to the Public," a selection of photographs by Mrs. Cymie R. Payne and from the Arnold Arboretum collection. Between

February and May an exhibit entitled "Roots," prepared by the Morris Arboretum of the University of Pennsylvania, was shown. This exhibit presented the growth, distribution, function and cultural needs of tree roots. Finally, "The Tallgrass Prairie: An American Landscape," was loaned to us by the Smithsonian Institution Traveling Exhibition Service from May to July. The Arboretum exhibit at the Massachusetts Horticultural Society's Spring Flower Show is described in the section on public service.

With the help of Harvard senior Miss Debbie Van Ryn, Miss Frey organized an education program to complement the work schedule of our Summer Horticultural Trainees. The active participation of many staff members and volunteers made this a valuable course.

PUBLICATIONS

Our current publications policy was summarized in my last Annual Report. There I discussed our intention to increase the circulation of *Arnoldia*, and our plans for the future publication of four books. Mr. Batkin assumed the position of Publications Officer in August 1979.

In July 1979, the third volume of Dr. Howard's *Flora of the Lesser Antilles*, which treats the Monocotyledons, appeared with family revisions by himself and several collaborators.

Dr. Spongberg and Ms. Burch continued their work on a book on the poisonous plants of the northeastern United States. (Thanks to a donation from Mr. Walter Hunnewell and the Gillette Company, plans to illustrate the book with fine photographs are proceeding.) Mr. David C. Twichell is collaborating in the photographic work. The text will be based partly on study of references at the Countway Medical Library.

The illustrations for a book on the China of Ernest Wilson, the great plant explorer who worked for the Arnold Arboretum between 1908 and 1930, have been prepared by photographer Mr. Peter Chvany. Research for the text has been completed by Dr. Howard, and two preliminary articles were scheduled to appear in the May-June and July-August 1980 issues of *Arnoldia*. The publication of this book, and of a collection of Mrs. Esther Heins' watercolors of plants growing in the Arnold Arboretum,

Final transaction August 1980.

has been delayed by the absence of a source of funding. Grant proposals are to be prepared.

The Editor of the *Journal of the Arnold Arboretum* is Dr. Spongberg; Ms. Elizabeth B. Schmidt, formerly Assistant Editor, has been appointed Managing Editor. During the past year

the Editorial Committee was reorganized to include Dr. Ashton and Dr. K.S. Bawa of the University of Massachusetts, Boston, as an outside member.

The Journal's long association with the Harvard University Printing Office ended in 1979 with the publication of the October number of Volume 60. For reasons of economy, as well as the eventual phase-out of hot type composition at the Printing Office, the Editorial Committee decided to give the contract to Edwards Brothers, Inc., of Ann Arbor, Michigan. While paper and cover stock remain the same, cold type composition is being utilized, requiring a different type face. The January 1980 number attests to the quality of Edwards Brothers' work; despite the distance between the editorial office and the printer, work has continued to run smoothly and at considerable savings.

The Editorial Committee also determined that, as of March 1980, a page charge of \$20.00 is to be levied. Acceptance of manuscripts for the Journal will continue to be based solely on appropriateness and scientific merit rather than on an author's ability to meet page costs. As a result of these changes the subscription price of \$25.00 per volume will be maintained for the time being. Our custom of providing authors with free reprints will be continued (50 for outside authors, 100 for those in-house). Further, the use of standardized bibliographic abbreviations may be introduced. Subscriptions, including library exchanges, currently number 706.

During the last fiscal year three numbers of the Journal have been published. The last number has been delayed intentionally and will be published simultaneously with the July 1980 issue. Both numbers will be devoted exclusively to Dr. Stevens' "A Revision of the Old World Species of *Calophyllum* (Guttiferae)," and together will have more than 600 pages. Publication of this large manuscript is consistent with the emphasis on monographic taxonomic research at the Arboretum. The Journal, with its wide and established circulation in Asia where *Calophyllum* has its center of diversity, is clearly the most appropriate medium of publication.

The three numbers of the Journal (Volume 60, numbers 3 and 4; Volume 61, number 1) published during fiscal year 1979-1980, include 334 pages devoted to seventeen articles by nineteen authors. Dr. Hu and Dr. Spongberg were Arboretum staff members who published in the Journal during this period. The majority of articles report studies that have directly or indirectly utilized the herbarium and associated collections held by the Arnold Arboretum and other botanical institutions at Harvard University. Manuscripts are at present on hand for issues into Volume 62, which will appear in 1981.

There was much change in the editorial staff of *Arnoldia* during the fiscal year. Initially Dr. Weaver assumed all editorial duties and marked the manuscripts for the July-August 1979 issue for the printer. When Mr. Batkin was appointed Publications Officer, he became Managing Editor of *Arnoldia*, with Dr. Weaver remaining as Editor. Mrs. Barbara Epstein is Circulation Manager. An editorial committee was formed which now includes Dr. Weaver, Chairman, Dr. Ashton, Mr. Batkin, Mr. Burrows, Mrs. Epstein, Dr. Howard, and Dr. Roger Swain,

who is scientific editor for Horticulture magazine, as outside member. The principal responsibilities of the editorial committee are to review manuscripts before publication, to advise on policy matters, and to help solicit articles.

During fiscal year 1979-1980 the last three issues of Volume 39 were published, with a total of 134 pages. Only the first issue of Volume 40 has been published to date, with a total of 48 pages. In the past the great majority of articles were written by staff members. "Flowering Times in Viburnums," by Mr. Michael Donoghue, was the first article written by a graduate student to appear in *Arnoldia* in recent years, while "The Introduction of North American Trees into China," written by Prof. C.K. Sheng, represented the first article by a foreign author. This broadening is consistent with our plan to serve a larger and broader readership.

There have been other significant innovations in *Arnoldia*, but the regrettable lateness of the issues has counteracted the constructive changes. These include the use of an illustration on the back as well as the front cover (July-August, 1979); the use of a second color in cover photographs; the addition of a staff list on the inside front cover (September-October 1979); the institution of a regular series featuring outstanding plants of the Arnold Arboretum; and a list of books received from publishers to be considered for review (March-April 1980). Less tangible improvements include tightening up the format, more careful editing, and improvement in the quality of the photographs.

Ms. Geary, Ms. Burch and Mrs. Hutchinson have undertaken extensive research in preparation for a comprehensive guidebook to the Arnold Arboretum. It is intended that this be published in an innovative format: a core will describe the history, design and purpose of the Arboretum, and will be published in loose-leaf form. Additional chapters will address a range of subjects, from detailed guides to individual collections, accounts for the seasons, and botanical texts for teachers taking classes in the Arboretum, to descriptions of the ethnobotany of North American trees. These will be sold separately and added to the core; and can be independently reprinted or revised as necessary. Additions can be made as authors are found. A grant proposal for partial outside funding has been prepared and submitted.

As mentioned in the section on the living collections, a proposal has also been prepared for assistance in funding a new map for our collections. Simplified and reduced into one sheet, it will be printed and placed on public sale as an accessory to the guidebook.

We reestablished links with Mrs. Barbara Abbott, sole direct descendant of Ernest "Chinese" Wilson, and she has been made an Honorary Friend of the Arnold Arboretum. We were excited to receive the gift of a typescript by Wilson for a three-volume popular work which he had planned to publish on his best-known introductions. Incomplete, and in need of extensive editing to bring it to contemporary requirements, nevertheless it has considerable potential, and we hope, in due course, to have it prepared for publication.

The Harvard University Printing Office used the Arnold Arboretum as the theme for the photographs for the 1980 University calendar. Mr. Batkin and Ms. Geary assisted in the selection of the photographs from our collection.

PUBLIC SERVICE

The Arnold Arboretum is situated within the City of Boston and forms part of the City Parks System. Mr. Olmsted conceived of the Arboretum as the component within the Emerald Necklace which should have an educational function. Public education remains a major function of the Arboretum, but most visitors undoubtedly come mainly to relax: to jog, exercise the dog, walk with the children, or lie in the shade under the trees.

The future of the Arnold Arboretum lies in the hands of its visitors, and especially those resident in Boston. Without the participation of our neighbors, it will become increasingly difficult to maintain the collections and grounds in the healthy, tranquil and litter-free condition to which we all aspire. We are convinced that increasing visitation, and a close and active collaboration with our neighbors can do much to limit the vandalism and litter problems that we do suffer. We therefore have practical reasons as well as a moral responsibility to provide increased service to the community.

There have been several changes and additions to our staff this year. Miss Margo Reynolds, Public Relations Officer and Chairman of our Public Relations Committee, resigned at the end of April 1980. Ms. Hope Wise has been appointed in her place to begin in July. As noted previously, Miss Frey joined us as Public Information Coordinator in July 1979; her work in organizing the expansion of our public education program has already been described. Ms. Marks, Manager of Buildings and Public Services, is currently acting as Chairman of the Public Relations Committee.

It is intended that the Manager will negotiate funding sources for, and implement various special projects aimed at enhancing public facilities at the Arnold Arboretum. Owing to the unanticipated receipt of five electric trams, donated by the St. Joe Minerals Corporation, she has so far concentrated on establishing routing and a regular schedule for them, recording a tour, setting up and implementing a fee that will eventually insure their financial self-sufficiency, and planning the formal inauguration of the service with a special event in early July. Each tram carries ten passengers; three, provided with trailers, can take up to sixteen. For the present, they will be run on a schedule at weekends through November 1, with special tours for groups by appointment at other times. There have been technical difficulties, partially through our inexperience, and partially owing to the hilly terrain of the Arboretum.

Under Miss Frey's leadership, the Arboretum staff currently conducts free tours for professional plant people and high school and college groups. Trained volunteers provide garden clubs and other amateur groups with tours on payment of a fee. The 60 tours at the Arboretum this spring, a third of which were for schools, represent a threefold increase over those of the previous year. Five volunteer guides went through a training review program this

spring, which acquainted them with areas of the collections, history of the Arboretum, and the work of the staff. Plans are under way to improve considerably the training of our guides so that we can confidently offer a thorough and well-presented tour program.

Miss Frey has been reviewing the plant information service that the Arboretum offers the public. She has instituted a record-keeping system which documents the question asked, the method of inquiry, the time taken to find an answer, and the staff involved. At this stage, owing to incompleteness, the record probably indicates less than two thirds of the total number of inquiries. During the fiscal year a total of 955 inquiries were recorded, mostly by telephone and during the spring and summer; 362 of these were concerned with cultural questions, 293 with the poisonous properties of plants, 82 requesting sources of particular plants, 61 for identification, 35 regarding propagation, and 6 on library references; the rest spanned a variety of areas. Miss Frey established a plant information hot line, from 1:00 to 2:00 P.M. Monday through Thursday. During that times he answers simple questions quickly, and calls back or writes to those people who need more obscure information. The system appears to have been well received. With Ms. Burch she has established protocol and procedures for calls directed to the Arboretum by the Massachusetts Poison Information Center. She has also sought legal advice concerning liability for the inadvertent supplying of mistaken information; the current procedure appears to be the correct one. Miss Frey has had much continuing help in answering inquiries, from Mr. Koller, Dr. Weaver, Ms. Burch, the propagation staff, and others.

The Arnold Arboretum community gardens scheme made a degree of progress. As reported last year, during 1978-1979 there were serious problems of vandalism, shortage of water, and lack of coordination among the gardeners themselves. These still remain of concern, although much has happened this year to help the project run more smoothly. A steering committee was set up to share work and decision making. Vandalism will remain a problem at the garden sites because of exposure and accessibility from all sides, and because unlike most other Boston urban gardens, ours is not the responsibility of a single neighborhood. An arrangement has been established for quick relay of telephone messages from among gardeners. Two of the gardeners have set up and supervised a successful pilot children's garden.

On September 25, 1979, Miss Reynolds arranged a press breakfast in the Jamaica Plain Administration Building as part of an effort to apprise the various media of the Arboretum's facilities, programs, and other activities. Representatives of television, newspapers, and local magazines listened to a talk by Mr. Koller on fall foliage coloration, participated in a discussion during which information packets were distributed, and finally accompanied Mr. Koller on a tour of the Arboretum.

The Arboretum helped celebrate Arbor Day in a number of ways. On Friday, April 25, 1980, the Director and Miss Reynolds, along with Deputy Mayor Katherine Kane, City Environmental Coordinator Eugenie Beale, and members of the Friends of the Public Garden,

took part in a tree planting ceremony on Boston Common that honored both Arbortion of specimens for the herbaria, and assistance in mapping and labeling. Volunteers have also helped to get the perennial garden and the ground cover plots in Weston reestablished. The greenhouse continues to be a big attraction to the volunteers. Many are occupied in seed cleaning or potting. Others conduct the weekly guided tours there. Those who prefer indoor work have provided valuable assistance in the library and with clerical work.

FRIENDS

The Friends organization is coordinated by Mrs. Epstein, with the assistance of the Public Relations Officer, Miss Reynolds. We have continued in our effort to attract new membership, which currently stands at 2,200. As part of our policy to involve our neighbors more actively in our work and in the future developments at the Arboretum, special emphasis is now being placed on attracting increased membership from our immediate neighborhood.

As before, we offered course participation at special rates, preview receptions to the exhibitions, and our horticultural magazine to our members. On September 30, 1979, we held our ever-popular Plant Distribution, at which special plants, generally unavailable from nurseries and in excess of our needs, are offered to Friends in the barn at the Case Estates.

In April, Friends received their biennial plant dividend. This time 2,000 rooted cuttings of *Itea virginica* were sent out by mail. This beautiful plant is a native, and marks the first time that a North American plant has been distributed.

The series, Evenings with Friends, was again presented at the schoolhouse in the Case Estates during the fall, with five Friends sharing their horticultural experience with other members. Friends also received special invitations to our Wednesday luncheon lecture series through fall and spring; this year the series began with Dr. Ashton's talk, "Ceylon: Garden of Asia." Several Friends contributed to the program.

Many Friends attended the party given in honor of Coordinator Margo Reynolds, who resigned on April 30.

Peter Shaw Ashton, Director