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Cover: Mrs. Sylvia Grey, a RSVP volunteer. Photo: P. Chvany.
The dictionary definition of an arboretum as a place where trees and shrubs are cultivated for scientific or educational purposes is an inadequate description of the Arnold Arboretum today. While neither the largest nor the smallest of America's botanical gardens and arboreta, it is among the most active in the use of its collections for these purposes. The living collections have been designated a National Historic Landmark; and the herbarium, a National Scientific Resource. The use of the collections is not limited to the staff: the general public finds the Arnold Arboretum a pleasant place to visit, and it is a source of information for education, science and industry, with the staff handling requests and visitors from many states and foreign countries.

The Arnold Arboretum functions in three areas: Jamaica Plain, Weston, and Cambridge, with staff members in each location. Most of the land in Jamaica Plain is owned by the City of Boston, and used by the Arboretum for a token rental fee on a long-term agreement. Since the Arboretum is considered a part of the Boston Department of Parks and Recreation, the City is supposed to maintain the roads, fences, and benches, and to offer police protection. The Arboretum staff and funds maintain the collections, with the agreement that they be open to the public at reasonable hours. The Arnold Arboretum is considered a charitable trust administered by Harvard University as a department. Neither the City of Boston nor Harvard contributes directly to the financing of its operation. Gifts and bequests from the public in the past have created an endowment, with the income and contributions from current Friends forming the operating budget. Accounting procedures and benefit programs are those of the University, and Arboretum funds are assessed for them. Staff members may have academic or nonacademic appointments, and the grounds staff is represented by a union. The complexity of these interrelationships is evident in many items of this report.

A grant from the National Science Foundation for the past three years has supported curatorial work in the herbarium and library in Cambridge. None of the money could be used for horticulture or for the care of the living collections. In an application for a renewal of this grant, information was requested and supplied on the number of professional visitors who used the herbarium or the library. Their
location in a closed building permitted the tabulation of use by means of a guest book with visitors' signatures. The living collections in Jamaica Plain are partially surrounded by a fence. However, the gates are not operable and the general regulations of being open sunrise to sunset cannot be enforced. With 265 acres and many gates, no accurate count of the visitors is possible. The Case Estates of the Arnold Arboretum in Weston are not fenced at all, and a visitor record is impossible to acquire. We have police department estimates of fifty to sixty thousand people in Jamaica Plain for a fine Sunday in May when the lilacs are in bloom. Parking of cars around the periphery of the Arboretum is a problem on such days. Although no reliable figures are available for the total number of visitors in the course of the year, it seems likely that sixty per cent of them visit the grounds during May when most of the shrubs are in flower.

With the aid of volunteers this spring, a questionnaire was compiled and visitors were interviewed to determine who they were, where they came from, and why they were here. A random sample of three hundred revealed fifty-one per cent female and forty-nine per cent male visitors, twenty-three per cent alone, thirty-three per cent with friends, thirty-nine per cent with family, and five per cent as part of an organized group. Daily visitors numbered ten per cent; twenty-five per cent came once or twice a week; twenty per cent, once a year. The largest age group was eighteen to thirty-four, representing fifty-five per cent of the visitors interviewed. Towns inside Route 128 produced sixty-four per cent of the visitors, with twenty-two per cent from Jamaica Plain and eighteen per cent from Boston. Visitors from out of the state were twenty per cent of the total and included some from twenty-four states besides Massachusetts. Newspaper publicity and radio or TV announcements accounted for only six per cent of the visitors. When asked about the labels, ninety-two per cent of the visitors responded that they looked for and read the labels on the plants. The information they found was useful to eighty-six per cent and only twenty-eight per cent wished for more information; yet forty per cent reported they came to the Arboretum, in part at least, to learn more about plants. Every visitor interviewed responded to a question concerning the problems at the Arboretum, which were listed in order: litter, vandalized labels and plants, dogs, bicycles, and skateboards. It is of interest to the staff that eighty per cent of the visitors indicated they would pay a nominal entrance fee to visit the grounds. Much of this information and additional items elicited by the questionnaire will be used in developing methods of operation and education programs.

*Dr. Richard A. Howard presents gifts to Alfred J. Fordham at the latter's retirement party. Photo: M. Reynolds.*
Staff

Several University departments and special committees were active during the year considering the larger problems of employment at Harvard. Arboretum staff members received questionnaires relating to their job classification and compensation. Recommendations received subsequently from the Personnel Office were implemented, with changes of job title, level of classification, and increases in salary rate.

June 30 marked the retirement of Mr. Alfred Fordham, who joined the staff on February 1, 1929 as assistant in the propagating department, and served for many years as the plant propagator for the Arnold Arboretum. As an expert propagator of plants for our collections, Al Fordham handled equally well a role as a lecturer, writer, and talented representative of the Arboretum to the horticultural profession. During the last year he was given the appointment of research horticulturist, with freedom to continue his writing, while being available to help his successor as needed. The staff expressed appreciation to Al in a cooperative retirement party attended by many of his friends.
Resignations were received from Dr. Kenneth Robertson of the Generic Flora of the Southeastern United States project, Miss Jackie Smith and Mrs. Marsha Knoll of the herbarium staff, Miss Rebecca Rohr, Miss Nancy Karasik and Mr. Patrick Pancoast from the library, and *Journal of the Arnold Arboretum* technical editor, Miss Kathleen Clagett. New employees included Miss Carolyn Hesterberg in the herbarium office, Miss Sandra McLeod and Mr. Mark Belson in the library, Miss Laura Frank providing secretarial assistance, Mr. Kenneth Shaw as assistant supervisor of the living collections, and Mrs. Elizabeth Schmidt as assistant editor of the *Journal*.

Dr. Peter Stevens received an academic appointment for three and a half years as assistant professor of biology in addition to his curatorial appointment. Dr. Stephen Spongberg and Dr. Richard Weaver were given appointments of unspecified duration as horticultural taxonomists at the Arnold Arboretum. Mrs. Ida Burch was reclassified as a staff assistant.

Dr. Bernice Schubert and Mr. Michael Canoso were recognized by the University in a special ceremony honoring those who had served the University for twenty-five years. Mr. Fordham was honored by the Massachusetts Horticultural Society with a Certificate of Appreciation. Dr. Richard Howard received a citation from the American Horticultural Society for services to that organization; he also was elected an honorary life member in the Garden Club Federation of Maine. At the commencement exercises of Framingham State College, Dr. Howard received an honorary Doctor of Science degree with the citation:

> "Scholar, interpreter of the world of plants to people of all ages, botanical explorer in the world's remote corners, entrusted with the care of our botanical treasures, he has taught us survival in the wilderness and the beauty of civilized nature."

Four committees have been functioning during the year to consider the problems of operation of the Arboretum. The horticultural committee meets weekly and has been chaired jointly by Dr. Weaver and Mr. Koller. All staff members in Jamaica Plain, including the superintendent and union representative, are invited to attend the discussions. The library committee, chaired by Mrs. Lenore Dickinson, librarian jointly for the Arnold Arboretum and Gray Herbarium, has as members Drs. Schubert and Spongberg of the Arboretum staff, and Dr. Elizabeth Shaw of the Gray Herbarium. Dr. Alan Erickson attends as Science Specialist in the Harvard University Library. The herbarium committee is chaired by Dr. Norton Miller, a joint appointee of the Arnold and the Gray Herbarium, and includes Mr. Canoso, also a joint appointee, Drs. Weaver and Wood of the Arnold, Dr. Rolla Tryon of the Gray Herbarium staff, and Dr. Donald Pfister, representing the Farlow Herbarium. The *Journal of the Arnold Arboretum* committee functions under the leadership of Dr. Schubert.
with staff members Drs. Spongberg, Stevens and Wood; Mrs. Schmidt, the assistant editor, serving as secretary. An educational committee for Jamaica Plain comprises staff members Burch, Canoso, Koller and Mr. George Pride, volunteer Mrs. June Hutchinson, and Mrs. Margaret Savage representing the Neighborhood Coalition of Jamaica Plain. Miss Margo Reynolds serves as chairperson. Reports of the committee meetings are posted; and plans, programs, and recommendations are circulated in the staff-produced Arboretum Newsletter edited by Miss Reynolds. Through these media of communication, the staff is informed of the diverse activities of the three locations and the responsibilities of the staff members.

Horticulture

The care of the living collections and the appearance of the grounds are the responsibility of the Arboretum staff. However, by legal agreement almost a century old, the protection of the collections by fences and gates, the care of the roads, paths, and benches, and the surveillance by the police are the responsibility of the City of Boston. The care of the living collections is becoming increasingly difficult through the failure of the City to fulfill its obligations. In spite of meetings with City officials last year, there has been no improvement, and little cooperation beyond that of Station 13 of the Police Department. Fences in conspicuous locations, damaged by automobiles, remained unrepaired during the full year, although a section of stone wall was restored. The City asked for bids to repair the driving and pedestrian gates which are so deteriorated as to be unsightly, and the Arboretum staff cooperated in determining priorities. However, no contract was awarded and nothing was done. The macadam paths are so fractured in many areas that they are dangerous for pedestrians, and pieces are used regularly by vandals as missiles. Almost in desperation the director requested permission from the President and Fellows to spend Arboretum funds on a three-year program to repair those gates, fences, paths and benches which are the City's responsibility. A proposal, legally acceptable to the University, and one which would protect the Arboretum, was submitted to the City in the spring, with no response by the end of the fiscal year.

Another time-consuming episode of the past year involved the Adams-Nervine property. These eight acres, with seven buildings, jut into the Arboretum property and form part of the boundary between the Administration Building-Greenhouse area and Centre Street. The Adams-Nervine property was no longer needed by the Faulkner Hospital and was placed on the real estate market. Acquisition of the land by the Arboretum would have permitted expansion of our collections on contiguous land; the development of special collections; the possibility of a new entrance, of parking, of a reception center, of dormitory space for student employees, and even public toilets. Ac-
Accordingly, permission was obtained from the President and Fellows, and a bid was submitted and accepted by the Adams-Nervine trustees. The proposal had to be withdrawn on the day the agreement was to be signed when the Boston Landmarks Commission designated the property, including the buildings, an Historical Landmark. The Arboretum would have demolished many, if not all but one of the buildings on the site. The Landmark designation required the preservation of all of the buildings and would have prevented clearing any land for expansion of the Arboretum collections. Many hearings and appeals were involved. The Arboretum acquired the support of the local residents through the Jamaica Hills Association but was opposed by the Boston Redevelopment Authority, the Landmarks Commission, and many of the local political officers. Subsequently, the Mayor signed a "temporary designation," and a bid was accepted by the Adams trustees from a developer who agreed to create taxable condominiums within the large buildings. We shall watch with interest the duration of the "temporary designation" and the alteration of zoning regulations on the property. We regret that neither the Mayor nor the Park Department felt able to support our desire for this property as an addition to the Arnold Arboretum.

The extremes of weather that Boston can experience were well exemplified during the year. The four months, October through January, proved to be the coldest Boston has endured since 1918. The January temperature averaged officially 23.3° F with a high of 47° and a low of 3° at the airport, but was below 10° on fourteen evenings and reached 20° only one night during the month. On January 7 Boston attained an official reading of 13.8 inches of snow and the Arboretum in Jamaica Plain had over 15 inches, the most snow for one January day since 1897. March and April proved to be warmer than normal, and by April 21 the plants were two weeks ahead of schedule. April rains in excess of normal caused flooding on the grounds due to blocked drains. On May 9 the only measurable snow ever recorded in eastern Massachusetts for May caused great damage in Weston but none in Jamaica Plain. A total of 11 inches of wet, heavy snow was recorded at the Case Estates, with the plants in full leaf and in flower. The remainder of May and the month of June proved to be exceedingly dry and we were plagued with fires on the grounds. The grounds crew and the pruner were extremely busy following each storm, for plants were broken and twisted, requiring much repair work. Electric power was lost in both storms, although the use of emergency generators saved the greenhouse collections in both Jamaica Plain and Weston.

The foul winter weather did permit indoor work, and the lecture room and the lunchroom in the Administration Building in Jamaica Plain were redecorated. New display panels were installed in the lecture room to permit larger exhibitions, and a new storage cabinet for folding tables and screen was built in a stairwell. During May
the roof of the cold storage unit was resurfaced, and the heating-
cooling system replaced.

Following the storms, the living collections were reexamined care-
fully. As a result, a number of damaged or deteriorating plants, weed
trees, and duplicated plants were identified. Many have been removed
and others will be. One-of-a-kind plants and those representing living
types were selected for propagation to place an additional example
on the grounds or for distribution to other institutions. The nursery
inventory had also increased during the past few years, and a careful
survey of our needs revealed that about half of the accessions were
already on the grounds or were unneeded. All surplus plants are
offered first to the University. Large numbers were accepted by the
College, through the office of the Landscape Architect, and by the
Business School; the remainder were then offered to other arboreta
and botanical gardens and to local colleges or towns, including Cam-
bridge and Weston. The final disposition of surplus plants was made
to the Friends of the Arnold Arboretum.

Several generic collections in Jamaica Plain and Weston received
special attention in association with taxonomic work of the staff. The
entire Philadelphus collection was reproduced during the summer
of 1976, when the plants are large enough, they will be used to
replace the existing collection which lacks vigor and is not visually
attractive. The birch collection was checked for identification, for
representation in our herbarium, and for evidence of infestation by
the bronze birch borer. This insect is among the most serious pests
now in the Boston area, and there is a question whether plants in
any area of the grounds can be protected against infestation.

Every plant placed in the collections in either the spring or fall
planting program must be recorded, not only in the inventory main-
tained locally, but in the records of the Plant Sciences Data Center.
Maps are annotated regularly and redrawn at intervals. Several types
of new labels are being developed, and some are being tried experi-
mentally on the grounds. Color-coded, embossed labels, larger than
those used previously, are being provided for staff use and visitor
reaction. Plants introduced by the Arnold Arboretum bear an orange
label. Deciduous plants are marked in yellow, and evergreens in red.
Plants representing living type specimens have blue labels. An in-
formation kiosk is planned to explain the coding of the labels, refer
to outstanding floral areas or plants, and display a map of the grounds
as well as the rules and regulations. Larger labels, stressing uses,
culture and propagation, and origin or availability, are being placed
in the ground cover plots at the Case Estates, and some will be placed
in Jamaica Plain to determine visitor reaction. A “strip printer” was
purchased and labels are being prepared on “Scotch-cal” to obtain
a negative that will permit ready and replicated reproduction on
“Foto-foil.”
In response to requests for plant materials for growth or for experimental projects, 130 shipments were made representing 630 taxa, and 54 shipments of seeds of 160 taxa. Most requests came from the United States, but some also from fifteen other countries in North America, Europe, Asia, and the West Indies. Two hundred nine taxa were propagated to prepare replacements for specimens that appeared to be failing or were represented by insufficient numbers in the collections.

At the request of the office of the Landscape Architect, a section of land on the Case Estates has been designated for the use of that department to grow selected plants for University use. Many desirable landscape plant materials are not available in quantity from our surplus plants or in large size from commercial sources. The land chosen will be used to set out smaller plants and give them sufficient time to develop larger stature, to be available when needed. Dr. Weaver completed a project of identification and mapping of all the plants on the grounds of the Harvard Business School. The greenhouse staff propagated mulberry seedlings to be held in our greenhouses for a silkworm research project of the Harvard Medical School. The greenhouses are also used to aid graduate student research, and materials in the programs of seven graduate students are being cared for.
In cooperation with the City of Boston, a portion of the South Street tract of Arboretum land is being studied for the establishment of neighborhood vegetable gardens on a temporary basis. The land involved cannot be developed for the Arboretum collections until the final plans are made for the relocation of the Orange line and the Forest Hills rapid transit system operations of the Massachusetts Bay Transit Authority. The line’s relocation and the associated highway development will alter the drainage and the boundaries of the property. The temporary use for “victory gardens” can be implemented, provided the City will install pipes and supply water.

The staff also is developing plans for a walk to be constructed on top of a storm conduit through the meadow near the Administration Building. Such a walk through a marsh-swamp area would offer convenient observation of the swamp plants and the wild life that abounds in the area. The actual installation of the walk will require permission of the City of Boston, and it is hoped this can be acquired in the fall to permit completion during the winter when the ground is frozen.

In association with their professional work, three staff members attended a University of Massachusetts Extension Service meeting on labor-saving devices; three attended a Management Workshop Series offered by Harvard’s Career and Organizational Development Training Center; and six attended a series of meetings on pesticides and plant nutrition sponsored by the Massachusetts Nurserymen’s Association.

The Arnold Arboretum serves as the International Registration Authority for specific groups of cultivars, and as the National Registration Authority for woody plants not otherwise represented by registration appointees. Dr. Spongberg is chairman of the American Association of Botanical Gardens and Arboreta plant nomenclature and registration committee, and of the comparable committee for the American Horticultural Society. A two-day conference was sponsored by the Arnold Arboretum for those persons involved in such activities. Dr. Howard serves on the Plant Sciences Data Center committee of the American Horticultural Society. Records of plants registered are published in the Bulletin of the American Association of Botanical Gardens and Arboreta.

A special gift from Mr. Paul Bernat has permitted the development of a plant propagation unit in the cold storage house in the greenhouse area. The experiment is designed to root cuttings under artificial lighting, and with controlled temperature and humidity so that the plants, once rooted, can be held at low temperatures until the weather permits direct transplanting to outside beds. If successful, this project will reduce the intensive labor requirements of hardening off rooted cuttings and several transplanting sequences.

Mrs. Constance Derderian, honorary curator of the bonsai collection, offered several courses in bonsai at the Arboretum greenhouses,
and donated much time to the care of the special plants during the year. In addition, she edited a handbook on bonsai for the Brooklyn Botanic Garden series, *Plants and Gardens*, writing many of the articles herself.

Mr. Peter Chvany was commissioned last year to produce a film for the Arnold Arboretum on the subject of plant propagation. The filming and editing were completed during the year, and the prints for showing should be available in the fall. Mr. Chvany's interest in E. H. Wilson as a photographer led to an issue of *Arnoldia* on the subject, and a special exhibition of Wilson's photographs. The year 1976 marked the hundredth anniversary of Wilson's birth. The work may be continued in the production of a book, and Mr. Chvany is transcribing many of Wilson's field notebooks and diaries and re-examining the photographs and negatives taken in Asia. Regrettably, both Wilson's daughter and son-in-law died during the year, before they could be interviewed in depth on their reminiscences. There is an attempt to establish a Wilson garden in Chipping Campden, England, Wilson's birthplace. The Arboretum is preparing copies of Wilson artifacts for the exhibition there.

**Case Estates**

An open house was held at the Case Estates on May 8. The grounds and flowering trees were magnificent following the early warm weather, and a large number of visitors enjoyed a perfect day. However, the following day the record-breaking snow storm hit the Case Estates. Forty trees were so badly damaged that they had to be removed from the organized collection. The pruning crew from Jamaica Plain spent the rest of the month in Weston, aiding the Weston staff in the cleanup and repair operation. Damage was most severe in the birch, ash, and maple collections. Trees that were not broken, such as many of the cherries and mountain ash plants, were badly strained and required tying and bracing. Damaged plants in the wooded and less conspicuous areas will be pruned or removed during the coming fall and winter. The staff is to be commended for carrying through the extra labor required to handle the effects of this storm. However, the full year's work program was set back. Plans to reorganize the nursery area had to be postponed, although one additional section of the ground cover plots was removed, the area was lined with boards, and the soil treated for replanting in the fall.

The long-planned work on Wellesley Street was completed by the Town of Weston during the summer of 1976. The Corporation approved the gift to the town of one quarter of an acre total land to permit the straightening of Wellesley Street, improvement in street drainage, and the location of a sidewalk within the boundaries of the Case Estates. Both curves and rises were eliminated in the reconstruction, and the road level raised in other places. The single stone wall, which has been a feature of the boundary of the property along
Wellesley Street, was not moved, but the raising of the road level by a foot or more reduced the optical impression of the size of these boulders; however, the magnificence of these stones can be seen from the Case Estates side. In all, the addition of a safe walkway for visitors is an asset to the property, and flooding has been eliminated from a section of the nursery by the installation of drains.

A new brochure for a self-guiding tour of the Case Estates was prepared and is available to visitors. New labels have been placed on many of the trees and shrubs, and informative signs have been installed on many of the ground cover plots. Several volunteers have undertaken an inventory of the perennial garden area and the preparation of up-to-date maps for the collection. Volunteers also began a study of the flowering times of the plants in this garden.

The small lecture room in the Red School House was used for lectures in the fall and winter class program, and was available for special meetings of several visiting groups as well as for meetings of the American Rock Garden Society, the Rhododendron Society, and the American Hemerocallis Society.

The clonal plantings of the Cabot Foundation in one section of the Case Estates have been maintained for nearly thirty years for the study of growth rates and hardiness in *Populus, Quercus,* and *Pinus.* With the death of Mr. Scott Pauley several years ago, and of Dr. Albert Johnson during the year, the responsibility for the continuing observations has been given to Dr. Harrison Flint of Purdue University and Dr. Frank Santamour of the United States National Arboretum. Material is taken on a regular schedule for hardiness testing and other studies. One recent observation is of interest: *Pinus strobus,* the native white pine, is subject to attack by the white pine weevil, which causes shoot dieback and a slow growth. The Balkan pine, *Pinus peuce,* although slower growing, appears to be resistant to the weevil. A hybrid of these two species, produced by Dr. Johnson, has proved to be resistant to the weevil and to have a better growth rate than either of the parents. A new series of resin acids, present in *Pinus peuce* and in the hybrid, have been found through chemical studies. This may be significant in the production of weevil-resistant trees for New England forests as well as for ornamental plantings.

**Herbarium**

There is little progress to report on the basic problem of cramped quarters and less-than-desirable storage conditions for herbarium specimens in the Harvard University Herbaria building in Cambridge. As reported earlier, the Corporation did approve an addition to the building, and preliminary drawings were made by consulting architects in collaboration with the Planning Office to permit cost estimates and the quest for funding. A descriptive appeal brochure was prepared and an advisory committee appointed. Dr. John Torrey is chairman of the committee, yet full, active support of the Uni-
versity is lacking. No significant progress has been made in acquiring the funds for the building construction.

The curatorial work in the herbarium and library in Cambridge has been supported in part by a grant from the National Science Foundation to the University for the collections of the Arnold Arboretum, Botanical Museum, Farlow Herbarium, and Gray Herbarium. The portion assigned to the Arnold and Gray permits the employment of extra mounters and inserters, the acquisition of some supplies, and retrospective binding and cataloguing in the libraries. At the end of the initial grant, permission was obtained from the National Science Foundation to purchase sixty-one herbarium cases, which were placed in the area formerly devoted to the fern collection before that was relocated. This required a considerable shift in the herbarium with the result that some of the families are now inconveniently out of sequence. Although it has been possible to remove all of the Compositae from cardboard box storage, since this family is particularly susceptible to insect infestation, 2,400 cardboard boxes are still used on tops of cases to store mounted material. The type specimens have now been placed alphabetically by genus at the end of each family. Work continues on dividing overfull folders and replacing worn genus covers throughout the herbarium. With the help supplied through the grant, it has been possible to reorganize and annotate specimens associated with recently published monographs when these specimens had not been studied by the author.

The original curatorial grant expired and an application was prepared for a new grant, which was approved in part. The new grant contains an allotment for the purchase of compactors to be utilized in the addition to the building. However, if the building is not ready for occupancy, the significant grant item may be lost.

The recent acquisition of a Polaroid MP-4 camera and equipment, through a grant from the Tozier Fund, has permitted the staff to photograph type specimens before material is sent on loan, as well as specimens on loan from other institutions. Frequently, photographic information can be supplied in response to requests, thus eliminating the need for shipment of specimens. A large negative file of herbarium specimens maintained in Jamaica Plain has been taken to Cambridge for inclusion in a general file of such material. Over two thousand other negatives have been catalogued and placed in new glassine envelopes.

The herbarium staff has maintained a listing of new genera represented in the herbarium that have been described or brought into current use since the publication of Della Torre and Harms Genera Siphonogamarum. Such genera lacking the Della Torre and Harms serial numbering had been placed generally at the beginning of each family. As part of the curatorial work, each genus has been checked in the literature to determine its proper position within the phylogenetic sequence of genera maintained in the herbarium. New family boards have been prepared for many genera, the recent additions
placed in proper sequence, and the data included in a new in-house supplement to Della Torre and Harms for use in the herbaria.

A curatorial inventory was made of the fruit, seed, and cone collections maintained separately from the herbarium but cross-referenced in it. There are at present 13,846 such items in Cambridge, and 3,682 units associated with the herbarium of cultivated plants in Jamaica Plain.

Specimens totaling 9,573 were received as accessions during the year, representing exchange, gift, subsidy, identification, and staff collections. Through mounting and direct insertion, 13,203 specimens were added to the herbarium, bringing the total in the Arnold Arboretum herbarium to 1,068,027 specimens, of which 163,268 are of cultivated plants housed in Jamaica Plain. Specimens distributed to other institutions in an exchange program were 2,790.

The herbarium is used on a daily basis by the staff of systematic botanists comprising the Arnold Arboretum professional staff. Myriad questions are answered directly or the answers sought from the plant material preserved as herbarium specimens. The specimens are fundamental to monographic or floristic studies, as recent publications show. Specimens are borrowed from other herbaria to supplement our own holdings in special studies, and are loaned to other institutions or scientists for study and annotation, and are cited in their publications. Fragments of material may be used or supplied for special studies. One of the most interesting is the recent study of mineral accumulations in leaf tissue by Dr. Robert Brooks of New Zealand. The abundant collections of the Arnold Arboretum from tropical Asia have aided in his study of hyperaccumulation of nickel by plants growing on such deposits in Celebes and the Moluccas. Some plant collections revealing large amounts of nickel have even suggested areas worthy of mineralogical study and possible commercial development.

No record is kept of the daily use of the herbarium or the number of specimens consulted or annotated. The activity of the staff and students, however, is indicated in the incoming and outgoing loans. During the past year, 170 loans were made to 56 different institutions in the United States totaling 13,993 specimens. Loans totaling 8,676 specimens were sent to 37 institutions in 16 countries. At the present time, 94,589 specimens from the Arnold/Gray herbaria are on loan. During the year 200 loans were returned totaling 21,989 specimens. It is this type of activity that merits the support of the curatorial grant from the National Science Foundation. However, the cold, numerical statistics do not express fully the work involved in handling the correspondence; locating, extracting, repairing, fumigating, photographing types, counting, packaging and shipping the specimens; and repeating most of the processes when the material is returned. The manager and the curatorial staff are the devoted and uncredited aides to the scientific work that results from the use of herbarium specimens. Now one more regulation has been added to their obliga-
tions: The adoption by the United States government of the goals of an international program for the conservation of natural resources includes the recognition of threatened and endangered species and the regulation of trade or movement of these species. The list of species so controlled includes many specific plants, those difficult to distinguish from the endangered species, and even such general groups as cycads, cacti and orchids. The regulations apply not only to whole organisms, living or preserved, but to parts as well, and to herbarium specimens. There is a provision for scientific institutions to loan or exchange such material, and application was made on behalf of the Arnold Arboretum for permission to send herbarium specimens from our collections on loan. This, in practice, requires the annotation of all packages with the code designating this permit. Although the Arnold Arboretum now has this permit, it is not yet clear how this affects the field work of botanists who may collect for scientific study such general groups as cacti or orchids. As an example of the lack of clarity of present regulations, Dr. Howard, on a field trip to the West Indies, found a cactus not previously reported on the island of St. Maarten, and a second on the island of Saba. In theory, permission to collect these new records should have been obtained before the field work was started.

Library

All staff positions in the library were reviewed by the Personnel Office during the year, and library assistants were raised to grades 3 and 4. Under the supervision of Mrs. Dickinson, librarian, Mrs. Sheila Geary is in charge of the library in Jamaica Plain; and in Cambridge, Mr. Belson, interlibrary loan assistant, Miss Susan Farrell, bindery assistant, and Miss Sandra McLeod, public services assistant, hold appointments made jointly with the Gray Herbarium. A library committee of staff members of the Gray Herbarium and the Arnold Arboretum offer advice and guidance. Under discussion at the present time is possible participation in a computer-assisted cataloguing system and conversion of the library to the Library of Congress system of classification. The former would eliminate the present hand-processing system, while the latter will produce cataloguing that conforms to national standards, and will provide such by-products as union and subject lists.

With the aid made possible by the NSF curatorial grant, retrospective cataloguing and revision continued, and old volumes were rebound or restored. Pamphlets of the eighteenth century were removed from old bindings and rebound in cloth with acid-free end papers. All bookplates now used in the library are also printed on acid-free paper.

Work continued in Jamaica Plain, with the help of volunteers, in cleaning and treating the volumes of the library. We are grateful for this contributed help in maintaining the resources of the library.

Grounds crew member Vincent Antonovich and a morning's collection of litter. Photo: M. Reynolds.
During the year 725 volumes were added to the library, received by purchase, in exchange for our publications, for review, or by direct gift. The library now contains 85,829 volumes and pamphlets. Of particular interest was a sizable number of books, pamphlets, and artifacts associated with the work of Charles Sargent, given to the library either outright or on permanent deposit by the Sargent-Murray-Gilman-Hough House of Gloucester, Massachusetts. The Worcester County Horticultural Society presented several original letters of Charles Sargent, while other individuals allowed such letters to be copied. Use of the library in Cambridge can be judged by the number of volumes borrowed from the shelves by staff, students and visitors. This number increased by eight per cent during the year.

Three numbers of the Combined Accessions List, Selected Titles, were prepared during the year for staff information. A new intra-library loan form was developed to improve record keeping of material requested and supplied between the libraries in Cambridge and Jamaica Plain. Among the staff contributions to the development of systems and procedures for managing the collections are: a program to expedite binding of paperbacks, pamphlets and rare books; a system to control the use of unbound or recently received periodicals; reorganization of the Kardex periodical check-in system; and improved interlibrary loan record keeping. For the latter item, 626 total requests were received for interlibrary loan of materials, of which 383 were on standard ILL forms. Although some requests had
to be refused due to the condition of the items, many could be handled by photocopying, and only a few volumes actually were loaned.

The librarian completed work as a member of the Council of Botanical and Horticultural Libraries committee on Union List of Serials. At the annual meeting at the Morton Arboretum, Mrs. Dickinson was a member of a panel discussion on preservation. She also attended the annual meeting of the Guild of Book Workers, the meeting of the American Library Association, and that of the American Society of Indexers. She continues to serve on the Harvard University Library's Committee on Bibliographic Control and Computer Applications.

Miss Farwell was awarded the M.S. degree, completing the requirements at the Simmons College School of Library Science. She and Mrs. Geary attended a workshop sponsored by the New England Technical Services librarians. Miss McLeod and Mrs. Geary attended a workshop on the Conversion of Serial Records, a national project in which Harvard University libraries participate.

The library of the Arnold Arboretum is rich in historical and archival materials which still require a great deal of work in cataloguing and maintenance. A special room is proposed in the herbarium addition for such materials to be assembled. When space is available, grants may be sought to expedite this work. Among the archival material, reference is made to historical letters in response to many requests for information during the year. For example, the Big Horn Commission issued during the year a volume entitled Rediscovering the Big Horns, based on rephotographing the scenes taken during the expeditions of John George Jack, dendrologist on the Arboretum staff in 1900. The photographs show the changes between 1900 and 1975, and the archival material in the Arboretum library revealed many of Professor Jack's notes on the vegetation seen in the photographs. In another project Peter Chvany has undertaken a transcription of the field notes and diaries of E. H. Wilson, and a reexamination of the photographs and negatives taken by Wilson in Asia. It is hoped that a biography may be assembled.

Volunteers

The Arnold Arboretum staff is very fortunate to have a group of willing helpers called "Volunteers," who donate their time, effort, and talents to many phases of our operations. They are a diverse group, male and female, young and old, retired or still working for a living, talkative or quiet, single or now alone, and a husband and wife team. Some live nearby, while one is unique in being the wife of a college professor living in Switzerland. When her husband spends several months here each year, our volunteer reports for duty at the Arboretum. Many do report on a regular schedule, and others are available on call. We keep no records of the hours they devote to the Arnold Arboretum, and their real reward seems to be in the satisfaction of being part of this staff. They receive no compensation.
other than an occasional surplus plant, but all have our sincere
thanks and deep appreciation. They are a real help to the staff and
are one of the Arnold Arboretum's assets.

When the volunteers were loosely organized five years ago, an
informal lecture series was prepared to introduce them to the nature
of the organization and its facilities and resources. They learned
more on the job. During the past year another introductory lecture
series was held for a new group. Their own interests soon became
evident and they found their own place to contribute, although most
are willing to do what is asked.

Many groups of visitors come to the Arnold Arboretum and request
a guided tour. Volunteers who like to teach and to answer questions
have been the guides for groups of school children and visiting
garden clubs. They have been so effective that one has been re-
quested by name as a guide on a subsequent visit. Several have
assisted in staff-taught courses or have offered those of their own.
Volunteers have helped staff the building on weekends during the
spring; are present when the greenhouse area is open; or are on the
grounds during open house occasions or visits by conventions. Their
help was invaluable in gathering data for the visitor questionnaire
previously mentioned.

One volunteer assembles the most interesting plants on the grounds
into seasonal arrangements, properly labeled, in the entrance to the
Administration Building. Information tables at flower shows have
been staffed by volunteers who answer questions about the exhibit
or the Arnold Arboretum. In fact, these are usually the people who
helped prepare and stage the exhibit.

One of the outstanding exhibits on permanent display in the Ad-
ministration Building, a collection of flowers, fruits, and cones em-
bedded in clear plastic, is the work of a volunteer. This exhibit attracts
so many questions that she prepared an article on the technique for
Arnoldia. This volunteer also is implementing a suggestion that the
Arboretum have traveling exhibits for school libraries or bank win-
dows.

The greenhouse is an area popular with volunteers, and their
efforts are diverse. They collect seeds and propagating material on
the grounds to help fill requests or for research needs. They clean
the seeds, keep records, and do germination experiments. They weed,
take inventories, package plants for mailing, including the massive
distribution of small plants to the Friends. They spray rabbit repel-
lent, tie up plants for the winter, record flowering and fruiting times,
inspect for disease, and check labels. They pot plants, transplant
seedlings, and prepare grafts and rooted cuttings. The greenhouses
are open to the public one afternoon a week, and volunteers offer
this tour.

Volunteers have helped with the mapping of the grounds, even
with the aid of snowshoes and skis in midwinter. One has a special
interest in the conifer collection, which extended to putting a large herbarium collection of cones into proper order, and is now preparing an article on the conifers. He also compiles the annual *Arnoldia* index.

The herbarium has a few devotees among the volunteers. Sorting and inserting herbarium specimens does not appeal to all, but when it does we have an excellent assistant. Others go on the grounds to collect herbarium specimens for addition to our collection or for distribution to other institutions. They prefer to be out of doors, and specimens are collected from plants in flower, in fruit, and in winter condition on a regular basis.

In the library two volunteers have devoted many hours to restoration activities. They received special instruction from the University Library's consultant on conservation, and have systematically dusted, cleaned, and oiled leather-bound volumes. Volunteers have helped prepare shelf lists, alphabetized and located folio volumes, devoted their linguistic talents to translations of titles or articles, relabeled and helped shelve volumes, and are now preparing many of the reviews published in *Arnoldia*. The collection of kodachrome slides has been reorganized by the volunteers who keep up with the additions; one volunteer attended a seminar on the care and preservation of slide collections, sponsored by the Rocky Knoll Nature Center, to compare our procedures with those of others. The scrapbooks of clippings relating to the Arboretum are in excellent shape and up to date through volunteer help.

Last but not least, some volunteers type, and complete clerical work and stuff envelopes. All of these many services are valued and contribute to the efficiency and effectiveness of the staff and the Arnold Arboretum.

**Education**

The role of the Arnold Arboretum as an educational organization is expressed in many ways, ranging from an active teaching role within the University to the passive role played by the labeled collections or the several publications. Formal courses were offered in the Department of Biology by Dr. Howard (Biology 209, The Phylogeny of the Flowering Plants) and Dr. Wood (Biology 103, The Taxonomy of Vascular Plants); while Drs. Miller and Wood each had a series of lectures in Biology 18 (Diversity in the Plant Kingdom). Drs. Howard, Miller, Stevens, and Wood were guest lecturers in other courses in the Department of Biology, in the School of Design, in Seminar series, and in the graduate student-organized "Society for Expeditionary Biology." Drs. Robertson and Wood both lectured in the special seminar series sponsored by the Harvard Summer School, and Dr. Howard taught a portion of the Summer School course, Plants of The Tropics (Biology S-105), offered in Miami, Florida. Each staff member with an academic appointment offers a numbered research course in the 300 series, which represents individual instruc-
Richard Stomberg, third-year horticultural trainee, at work in saran house. Photo: M. Reynolds.

Education at the graduate level. Staff members also served as undergraduate advisors for the Department of Biology in the College. Weekly seminars are held in Cambridge, and were arranged during the year by Dr. Stevens. Informal horticultural seminars for the staff have been initiated in Jamaica Plain.

A formal course entitled "Botanical and Horticultural Practices at Arboreta" was offered for the first time in 1977 as part of the Harvard University Extension program. Drs. Spongberg and Weaver organized the course, which included lectures, field trips, laboratory sessions, and individual projects under the guidance of a staff member, in addition to assigned work on the grounds. The course allowed the students selected for summer employment to earn four hours of academic credit. One day a week was devoted largely to lectures, laboratory sessions, and field trips. The students were graded not only on their work on the grounds but also on the oral presentation and written reports of their projects. Lectures were given by staff members Alexander, Geary, Howard, Koller, Lynch, Pride, Spongberg, Wadleigh, and Weaver, and by an occasional outside speaker. The summer employees represented thirteen colleges, and the group included two work-study students.
Some New England colleges conduct a "Jan-plan" program, wherein students are required to participate in a professional organization during the month of January vacation. Other colleges use a "student intern" program in which a semester or one day a week are devoted to learning about a profession. The Arboretum staff agreed to accept students in these programs from Connecticut College, Colby College, Pine Manor Junior College, the University of Massachusetts, and the Buckingham-Browne and Nichols School. Depending on the length of time available, the students were assigned to one or more areas of Arboretum activities. At the request of the Cambridge Economic Opportunity Committee, two individuals reported for work-training at the Arboretum for a short period of time. Neither proved to be interested in horticultural work.

Many horticulture classes from other colleges come to the Arnold Arboretum on prearranged visits. A staff member offers a tour of the facilities and the grounds. Many of these groups are interested in career opportunities, while others are concerned with operations or with the plant material. During the year requests for one to three such visits were received from the Universities of Vermont, Connecticut, Massachusetts, New Hampshire, and Maine, Springfield Technical College, Veterans Administration Hospital Horticultural Therapy program, Thompson School, Smith College, Essex County Agricultural and Technical Institute, Minuteman Regional Vocational Technical School, Ontario-Niagara Agricultural and Technical College, five high schools in Massachusetts, and the students of Longwood Gardens. When Boston is the location of a national meeting, many organizations now include a tour of the Arnold Arboretum in their programs. The volunteers may serve as guides for some tours, but the staff will meet other groups such as the American Nurseryman's Association, the Landscape Design Critics Council of the Garden Club of America, the Parks and Recreation Congress, and the Bristol and Norfolk County Tree Wardens, where the interest is professional rather than tourist. The Harvard Club schedules an annual visit to the Arboretum, and Innings and Outings, a newly formed group of Harvard employees, offered trips to Jamaica Plain and to Weston. The Arboretum is listed among the places to visit during Commencement week, and special tours are arranged for the alumni who attend.

The Arnold Arboretum occupies a conspicuous place in Jamaica Plain and in Weston. The staff attempts to cooperate with local groups in supplying speakers, advice, tours, or surplus plants. Open house occasions are scheduled each spring, with the staff on the grounds to answer questions. We have had direct contact with citizen groups in Jamaica Plain, West Roxbury, Roxbury, Roslindale, Cambridge, and Weston. Dr. Shiu-Ying Hu has been active in bringing groups from the Chinese community to the Arboretum. Mr. Robert G. Williams served as a judge at the Massachusetts science fairs, and Mr. Pride at the 4-H horticultural competition in Franklin Park. Each
year the Arboretum donates a dozen or more plants of special interest and value for the fund-raising auction of WGBH Channel 2 TV, the educational channel in Boston. Dr. Howard has served as an auctioneer for several years, and staff member Mr. James Burrows and volunteer Mrs. Elinore Trowbridge manned the telephones on a horticultural hotline.

The Arboretum staff answer telephone calls on a twenty-four-hour basis relating to possibly poisonous plants. Calls are referred to the Arboretum office in the daytime by the Boston Poison Information Center, and to individual staff members at their homes in the evenings. Mr. Pride gave a recorded telephone interview for a local radio station, regarding poisonous plants, which was used in segments over a period of several weeks. The Arboretum film, Poisonous Plants, is used frequently in staff lectures and is available from several film libraries or from the commercial distributor. The film was reviewed very favorably in the American Association for the Advancement of Science film review issue, and has had special publicity in a booklet issued by the distributor of the film. Miss Reynolds appeared on the TV show, “Woman 76,” talking about poisonous plants, and later on the show, “Place,” spoke about the Arboretum.

A cooperative educational program continues with the Massachusetts Horticultural Society. A series of tours called ArboRambles is conducted jointly at the Arboretum. The Arboretum staff have also participated in a lecture series held at Horticultural Hall, and staged an exhibition there of the photography of E. H. Wilson. Joint horticultural workshops involved greenhouse gardening, and techniques of bonsai. The Arboretum staff helped stage a midwinter Orchid and Camellia Show, while the Arboretum exhibit at the Spring Flower Show displayed a map of the world with cultivated ornamental plants in their area of origin. Volunteers at the Arboretum not only helped assemble and label the exhibit, but were present during show hours to answer questions. The exhibit was awarded a first prize, an educational merit certificate, a gold medal, and the coveted Bulkeley Award for educational excellence. Another exhibit, at the Christmas Show held in Horticultural Hall, was also prepared jointly by staff and volunteers and manned during show hours. That also received a first prize.

Four exhibitions were held in the lecture room of the Administration Building of the Arnold Arboretum in Jamaica Plain. “Wilson as a Photographer” was prepared by Mr. Chvany. “Bark is Beautiful” featured the color photography of Mr. Albert Buszewitz. “Flowers — Art or Science?” displayed the paintings of Mrs. Eudoxia Woodward; and the final staff exhibit was on “Poisonous Plants.” Each exhibit was preceded by a special open house, a reception, and a lecture.

During the spring and the fall, the Arboretum staff offer a series of courses open to the Friends and the general public. Thirty-nine courses, ranging from one two-hour session to five weekly meetings
of varying duration, totaled three hundred hours of instruction. The smallest class was limited to five students; and the lecture series in Weston, to forty-five. Field walks were limited and had an enrollment of sixty people. The average class had twenty-five participants. Radio and press coverage of the course openings has been good. An attractive brochure with a new format on colored paper is eligible for the educational institution mailing rate, and so has been distributed at a much more reasonable rate than was previously possible.

Two special seminars were organized by the staff during the year. Mr. Koller arranged a program entitled "Interpretation — What Do We Have to Offer," with speakers, Koller for the Arnold Arboretum, Mr. Charles E. Roth of the Massachusetts Audubon Society, Dr. Darrell Apps of Longwood Gardens, and Mr. Bruce McHenry of the National Park Service. Those attending represented thirty organizations from five states. Dr. Spongberg organized a two-day discussion for a group of invited participants on the subject of registration and nomenclature of cultivars. The meetings were held in Jamaica Plain and in Cambridge on successive days.

Travel and Exploration

The Arnold Arboretum is an institutional member of several national and international societies; staff members may be individual members of professional societies, serve on committees, or present papers that require their presence at annual or regional meetings. It is well for the Arnold Arboretum to be represented, and profitable for the individual to participate. Accordingly, partial financial support for attendance is shared among the members of the staff. Vacations for staff members are also apt to be "busman's holidays," for invariably the meeting provides the opportunity to collect specimens for research programs or for addition to our herbarium; to visit herbaria or libraries; or to take photographs that can be used in teaching or lecture programs, or be added to our slide collection. Visits to herbaria or other botanical gardens yield information of value to our organization, and permit the exchange or acquisition of material, and further staff research.

Mr. John Alexander is on the Board of Directors of the International Lilac Society, and attended the annual meeting as well as a preparatory meeting in Amherst, Massachusetts. He was a participant at the annual meeting of the International Plant Propagators Society, and attended the regional meeting of the American Association of Botanical Gardens and Arboreta at the Old Westbury Gardens on Long Island, New York.

Mr. Burrows visited the Brooklyn Botanic Garden.

Mr. Fordham spoke on propagation of the Hamamelidaceae at the International Plant Propagators meeting in New Jersey, and participated in the Connecticut Nurseryman’s Education Program in Connecticut.
Dr. Howard conducted field work related to his research on the Lesser Antilles in visits to Barbados, St. Vincent, and Grenada, and collected specimens. As a member of the Scientific Advisory Board of the Arbor Fund, he attended a meeting at the Bloedel Reserve in Washington, en route visiting the Denver Botanic Garden, the University of Washington Arboretum, the Pack Forest, and the University of British Columbia Botanical Garden. Dr. Howard represented the Arnold Arboretum at the dedication of the bonsai pavilion and collection at the United States National Arboretum, and spent time during this trip at the National Herbarium in Washington, D.C. He was the principal speaker at the dedication of the Mini-Arboretum of the City of Portland, Maine, established by the Longfellow Garden Club.

Dr. Hu has published two papers on the medicinally useful plant, ginseng. There is a recurrence of medical interest in this plant for its reputed value in the revitalization of elderly people and those under physical stress. She was invited to attend and speak at an International Gerontological Symposium held in Singapore, and en route visited gardens in Istanbul, Tehran, Bangkok, Sri Lanka, and India. At several herbaria she was able to renew her work on collections of Ilex. Later in the spring she spoke about ginseng at the National Institutes of Health in Bethesda, Maryland, and also presented a seminar at the University of Maryland.

Mr. Koller represented the Arboretum and spoke at the annual meeting of the AABGA held at the Missouri Botanical Garden, and at regional meetings at Old Westbury Garden and at the Frelinghuysen Arboretum. While on vacation he examined the collections of the Royal Botanic Gardens at Kew and at Edinburgh, and visited Hillier's Nursery in Winchester, England.

Miss Donna Lynch visited the Brooklyn Botanic Garden, the Morris Arboretum, the Longwood Gardens, the U. S. National Arboretum, and the facilities of the American Horticultural Society and the Plant Sciences Data Center in Mount Vernon, Virginia.

Dr. Miller worked on moss collections at the Natural History Museum in Ottawa, Ontario.

Miss Reynolds represented the Arboretum at the AABGA symposium, "Facing the Future," held at the Callaway Gardens, Pine Mountain, Georgia.

Dr. Robertson paid visits to the U. S. National Arboretum, the Baltimore Estates, and the Memphis Botanic Garden.

Dr. Spongberg reported on plant registration activities at the AABGA annual meeting in St. Louis. He also visited the U. S. National Arboretum when he was in Washington, D.C., as a speaker at the annual meeting of the American Magnolia Society.

Dr. Stevens spoke to the staff of the New York Botanical Garden of his work on the evolution of tropical Ericaceae, and to the Massachusetts Rhododendron Society on Malesian Rhododendrons.

Drs. Weaver and Spongberg are planning a collecting trip to Japan
and Korea in the fall of 1977, and consulted with Dr. John Creech, of the National Arboretum, regarding his recent experiences in the area.

Gifts and Grants

The Arboretum and its staff have been fortunate in the support offered in the form of gifts, grants, and materials from many individuals and sources. The Friends of the Arnold Arboretum respond to annual requests that they renew their membership contributions, and the staff is grateful for this continuing support. Such funds are without restrictions. Although most are used in the work associated with the living collections, some have been used in the production of an educational film on plant propagation; and during the present year, in the support of field work in Japan and Korea for additions to our living collections. A special gift was received from Mr. Paul Bernat for experimental work in plant propagation. A grant from the Stanley Smith Horticultural Trust enables artistic work associated with Dr. Spongberg's work on a manual of cultivated trees and shrubs. A grant from The Charles E. Merrill Trust was specified for the publication of Dr. Howard's Flora of the Lesser Antilles, Dr. Perry's treatment of the medicinal plants of Asia, and work on the manual of cultivated trees and shrubs.

Memorial gifts were received in memory of Mr. Thomas Matthews and Mrs. Allen Brailey. Mrs. Katharine Abbott Batchelder died on January 11, 1977. Mrs. Batchelder was, for many years, a member of the Committee to Visit the Arnold Arboretum. She supported, anonymously at her request, work on the taxonomy of cultivated trees and shrubs, and continued this support by a bequest. The obituary notice requested gifts to the Arnold Arboretum in her name, and thirty-four gifts were received.

Artifacts associated with the history of the Arnold Arboretum are always welcome. Special gifts of publications of Charles Sargent were received from the Sargent-Murray-Gilman-Hough House; papers of James Arnold, from Mrs. Charles Jackson, Jr.; letters of E. H. Wilson, from the Worcester County Horticultural Society. Gifts of books for the library were donated by Messrs. Fred Bonnie, Richard J. Eaton, Augustus Kelley, George Taloumis, Mrs. Derderian, and the Botanical Museum, Hunt Institute for Botanical Documentation, the Pennsylvania Horticultural Society, and the Wing Lung Bank. Several other donors wished to be anonymous.

We are grateful for gifts of plant materials from firms including Hillier and Sons Nurseries, Monrovia Nursery Company, Princeton Nurseries, and the Weston Nurseries.

The grant from the National Science Foundation, shared with other botanical collections at Harvard, is truly significant in the curatorial work in the library and herbarium. A grant for an additional three years was received during the year.
The two regular publications of the Arnold Arboretum are the Journal of the Arnold Arboretum, issued quarterly, and Arnoldia, issued six times a year. The four issues of the Journal published during the fiscal year comprised 523 pages and twenty-three articles by twenty-six authors. The assistant editor, Mrs. Schmidt, is supervised by Dr. Schubert and assisted by an editorial committee whose members, as well as other staff members, review manuscripts. A new cover, illustrating the cone-like follicetum of Magnolia tripetala, drawn by Mrs. Karen Velmure, was adopted for the Journal. A set of guidelines for authors was prepared, and this is sent to prospective authors who inquire as to the possibility of publication. A subscription increase to $25.00 a volume was announced for 1978. Dr. Schubert attended a meeting sponsored by the National Science Foundation, concerned with editorial processing centers and the improvement of dissemination of scientific and technical information.

Mrs. Jeanne Wadleigh edited the six issues of Arnoldia comprising 320 pages and thirteen articles by fourteen authors. Miss Reynolds was appointed assistant editor of Arnoldia; members of the staff supply the majority of articles and assist in proofreading. Issues of Arnoldia now regularly contain book reviews written by members of the staff and the Arboretum volunteers. Books received for review are added to the library, and the reviews are published if the volume is considered of interest to the readers of Arnoldia. Letters have been received regarding the reviews, many complimentary and some critical of the “honest reviews” and the opinions expressed. Two numbers of Arnoldia were regarded as special issues. In a photographic essay, Mr. Chvany considered E. H. Wilson as a photographer. For another issue, Mr. Fordham and Miss Leslie Spraker prepared a “Propagation Manual of Selected Gymnosperms,” based on experience in handling these plants at the Arnold Arboretum.

The second volume of the Flora of the Lesser Antilles was issued by the Arnold Arboretum. The Flora is part of Dr. Howard's research, and the volume on the Pteridophytes was prepared by Mr. George R. Proctor. A grant from The Charles E. Merrill Trust assisted in the publication.

Two publications of the Arnold Arboretum, long out of print, are again available through commercial sources. Contribution from the Arnold Arboretum #9, “Species of Tradescantia Indigenous to the United States,” by Edgar Anderson and Robert Woodson, is available as a microfilm or a xerographic reprint through University Microfilms of Ann Arbor, Michigan. A Monograph of Azalea, Rhododendron Subgenus Anthodendron, by E. H. Wilson and Alfred Rehder, has been reprinted in facsimile by the Theophrastus Publishers, Little Compton, Rhode Island. Otto Koeltz Antiquariat, The Netherlands, received permission to reprint Alfred Rehder's Bibliography of Cultivated Trees and Shrubs, a volume also out of print.

Richard A. Howard
### WEATHER STATION DATA FOR 1976

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* Temperature measured in degrees Fahrenheit
† Precipitation measured in inches
# Hurricane Belle — August 10

**Average Temperature**
- 49.89°F

**Precipitation**
- 42.89”

**Snowfall during winter of 1975-76**
- 31.56”

**Continuous snowcover December 21, 1975 — February 10, 1976**

**Warmest Temperature**
- 100°F on August 23

**Coldest Temperature**
- -8°F on January 23

**Date of Last Frost in Spring**
- April 13

**Date of First Frost in Autumn**
- October 20

*Growing Season*
- 190 days

*Growing Season — The growing season is defined as the number of days between the last day with killing frost in spring and the first day with killing frost in autumn. This time is determined by the last spring and the first fall temperature of 32°F or lower.

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### WEATHER STATION DATA FOR THE FIRST SIX MONTHS OF 1977

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* Temperature measured in degrees Fahrenheit
† Precipitation measured in inches
Average Temperature 44.9°F
Precipitation 25.34"
Snowfall During Winter of 1976-77 60.9"
Continuous snowcover December 17, 1976 — March 6, 1977
Warmest Temperature 96° on May 25
Coldest Temperature −1°F on January 18, 19 and 30
Date of Last Frost in Spring May 10
Richard Alden Howard, Ph.D., Arnold Professor of Botany, Professor of Dendrology and Director

Donald Wyman, Ph.D., Horticulturist, Emeritus

Ida Hay Burch, B.A., Staff Assistant (New title effective March 1, 1977)
James Alvah Burrows, B.S., Assistant Plant Propagator
Michael Anthony Canoso, M.S., Manager of the Systematic Collections *
Kathleen Ann Clagett, M.A., Technical Editor of the Journal of the Arnold Arboretum (Resigned October 15, 1976)
Constance Tortorici Derderian, A.B., Honorary Curator of the Bonsai Collection
Lenore Mikalauskas Dickinson, M.S., Librarian *
Alfred James Fordham, Research Horticulturist (Retired June 30, 1977)
Sheila Connor Geary, B.F.A., Assistant Librarian
Arturo Gómez-Pompa, Dr. Sc., Honorary Research Associate *
Henry Stanton Goodell, Assistant Superintendent
Thomas Matthew Kinahan, Superintendent, Case Estates
Walter Tobey Kittredge, B.S., Curatorial Assistant * (Appointed October 15, 1976)
Gary Lee Koller, M.S., Supervisor of the Living Collections
Donna Anne Lynch, Curatorial Assistant
Norton George Miller, Ph.D., Associate Curator and Associate Professor of Biology *
George Howard Pride, M.A., Associate Horticulturist
Margo Wittland Reynolds, B.A., Staff Assistant
Kenneth Ray Robertson, Ph.D., Assistant Curator (Resigned October 31, 1976)
Elizabeth Belding Schmidt, M.A., Assistant Editor of the Journal of the Arnold Arboretum (Appointed August 23, 1976)
Bernice Giduz Schubert, Ph.D., Curator and Senior Lecturer on Biology
Kenneth Dwight Shaw, B.S., Assistant Supervisor of the Living Collections (Appointed September 1, 1976)
Jackie Marie Smith, M.A., Curatorial Assistant * (Resigned August 31, 1976)
Stephen Alan Spongberg, Ph.D., Horticultural Taxonomist (New title effective July 1, 1976)
Peter Francis Stevens, Ph.D., Assistant Curator and Assistant Professor of Biology (New appointment January 1, 1977)
Karen Stoutsenberger Velmure, B.A., Botanical Illustrator
Jeanne Stockbarger Wadleigh, B.S., Editor of Arnoldia
Richard Edwin Weaver, Jr., Ph.D., Horticultural Taxonomist (New title effective July 1, 1976)
Robert Gerow Williams, B.S., Superintendent
Carroll Emory Wood, Jr., Ph.D., Curator and Professor of Biology

* Appointed jointly with the Gray Herbarium
Bibliography of Published Writings of the Staff and Associates

July 1, 1976 — June 30, 1977


Alfred J. Fordham - Portrait of a Plant Propagator

by Margo W. Reynolds

It is, after all, a story of hands. Broad and calloused, they tell of one man's life work, a life well-spent. In their simple roughness they speak with uncommon eloquence of the untold numbers of beginnings that have passed between them. How humbling it is to know that life has been perpetuated — indeed, improved upon — by a mere touch, a laying-on of hands.

Given voice, the stories they might tell! The aristocratic and the common, the difficult and the untested, the foreign and the exotic: few are the plants that have not passed through Al Fordham's hands and have not been nurtured by him in turn.

A portrait of Al Fordham is not merely the portrait of a plant propagator; it is a portrait of the plant propagator, for Al Fordham is unique. His expertise in woody plant propagation is acknowledged throughout the country and his advice is sought, and much valued, by colleagues, both here and abroad. It would be easy to enumerate Al's professional accomplishments; to recite dates and length of service and papers published. To list his achievements, awards and research interests (which are numerous) would be so simple. They add to the portrait, to be sure, but they do not really illuminate the man. Those who wish the facts of Al Fordham's career can find them elsewhere. This is a portrait of the man.

Ask Al's friends and associates to characterize him in a word or two and they respond immediately, without hesitation. The adjectives differ somewhat but together they form a whole that all would recognize. "Inquisitive" and "curious" are oft repeated, and with good reason. There is nothing that does not arouse Al Fordham's curiosity. For many of us, our childhood sense of wonder remains just that — a fleeting phase of youth when everything is looked upon as new, exciting and oh-so-very-interesting. Al Fordham has never lost that childhood gift. It is what keeps him young and intellectually alive. Because propagation was never merely a "job" to Al, but rather an ongoing intellectual pursuit, his work (and by association, his life) has never become stale and routine. His curiosity has led him to develop numerous research interests. The resultant accomplishments have won him a well-deserved position of eminence in horticultural circles.
Al Fordham's greatest gift to the future will not be found in his writings or in the many plants he has brought to fruition. It will be preserved, instead, in the many young people with whom he has come in contact throughout his career. Some may not realize the full extent of his legacy until their careers are well along. Inevitably, however, all will recognize their enormous debt to the man who not only retained his own unique "sense of wonder" but kindled it in others whose lives touched his. Al delighted in the students who sought his advice and nothing pleased him more than seeing one catch a bit of his fire and go forth with enthusiasm and curiosity to make independent observations.

Al Fordham is ingenious, too. Where a machine for a particular operation didn't exist, he invented it. It was a constant source of amazement to all at the greenhouse to see what Al could do with some scraps of wire, a cast-off nut and bolt and a few assorted parts of other machines. None of his inventions was patented, but that doesn't necessarily mean that Rube Goldberg's reputation is safe!

Efficiency means a great deal to Al Fordham and he admired it and inculcated it in his staff. Two of them tell of being sent out on the grounds to collect seeds, and of being instructed to wear their plastic collecting buckets around their necks. This apparently was to serve two purposes: free both hands for picking, and eliminate the need of an extra motion to toss the seeds into a bucket on the ground.

A later Fordham scheme resulted in an even more efficient operation that eliminated the waste of one hand to hold down a branch while the other picked the seeds. A hook was attached to a rope at one end and thrown up to the branch that was to be bent. When it was sufficiently low, the other end of the rope was made into a loop that was slipped around the picker's foot. Both hands now were free for picking, and Arboretum visitors were able to view a most entertaining little operation.

Al Fordham's sense of humor is legend. Everyone who reminisced about him could call forth at least one occasion when one of Al's practical jokes made life at the Dana greenhouses a little more interesting. Once when Arboretum volunteers were packing small plants into mailing tubes for distribution to the Friends, Al played one of his most famous tricks. Spying one of the tubes, he surreptitiously removed it from the assembly line and substituted his bologna sandwich for the *Maackia amurensis* that should have been inserted. Fortunately, the prank was discovered and the mails (then faster than they are now) were not put to the test.

Al Fordham has given much to the Arnold Arboretum and long will be remembered by all who knew him. Someone once told me that "if it's alive and growing, then Al's interested." How fortunate for all of us.
Preserving Woody Plant Material for Winter Arrangements

by CORA L. WARREN

Many excellent books, pamphlets and articles have been written on the subject of preserving flora for winter arrangements, but it is far from an exact science. Only a few of the many hardy woody plants that respond to treatment are mentioned, although there are wide possibilities of achieving interesting and unique effects with such materials.

Branches treated in glycerine, in particular, can add a whole new dimension to the usual dried winter bouquets of grasses, statice and star flowers, or silica-gel dried flower heads, producing beautiful arrangements appropriate to a large variety of settings.

Almost all foliage can be dried by pressing the branches between sheets of newspaper and placing them under a light weight. This method will retain the leaf shape, but the color will be somewhat muted and the leaf will be unnaturally flat and difficult to use in a container.

There are some plants that may be air dried and will retain their interest. Hung by their stems in a warm, moisture-free environment until completely dry, they serve as a pretty contrast to the more dramatic glycerine treated material.

Many fruits dry naturally on the plants and need only be collected at the appropriate time. Some of this material becomes very fragile when dry and shatters with too much handling. This difficulty can be prevented to some extent by dipping the fruits after they are dry in a mixture of equal parts of clear lacquer and alcohol, or in an acrylic polymer medium thinned with water.

Most soft fleshy fruits such as berries do not dry well, but the few that do should be defoliated and placed upright in containers, or hung by their stems in a cool, dry place until thoroughly dehydrated. Their staying power can be improved by the use of lacquer and alcohol or acrylic polymer as described above.

Glycerine and water treatment will preserve foliage almost indefinitely, and leaves treated by this method can be used effectively for years. The color of the leaves changes, sometimes dramatically, but the form and texture retain their original aspect.

Cut or crush plant stems and place them in a glass jar containing a mixture of one part glycerine to two parts water. One part anti-
freeze to three parts water can be substituted if glycerine is difficult to obtain. The level of the liquid will drop quickly if large branches are absorbing it successfully, so it is well to check the liquid level daily, and top up with more of the mixture as needed. A tablespoon of charcoal added to the container will stop the formation of a grey film that sometimes appears on the surface. The liquid can be stored and used for another year if it is strained through fine cheesecloth and more charcoal added.

Not all woody plants will take up the glycerine successfully by the method described. Some authorities advise preserving certain materials by total immersion in a bath of glycerine solution; vines and other small plants that otherwise are a failure often respond to this treatment. Broad-leaved evergreens are particularly satisfactory at all seasons, except possibly in the dead of winter, and have the advantage of being available after deciduous trees and shrubs have become dormant.

Branches cut as the season advances toward autumn generally react better to treatment than if gathered earlier, but the conditioning takes somewhat longer as the sap is not flowing as freely.

The number of days taken to complete the absorption of glycerine sufficient for satisfactory preservation will vary greatly. Leaf color will continue to darken after removal from the liquid so a little experimentation may be needed to ascertain when to stop the process. Some books advise waiting until the leaves begin to ooze, but this produces an unattractive and dust-catching surface. A good test is to bend the leaves gently after they have been immersed in the solution for a few days; when they have reached the consistency of soft leather, they are ready for use.

It is well to cut considerably more material than will actually be needed, as the end product will vary from plant to plant, or even from specimen to specimen of the same plant.

Preserved branches may be stored flat in large boxes or hung until needed in a dry, airy place. If the leaves become crushed or limp on removal from storage, they sometimes can be restored by a light pressing with a warm iron, or by placing them between sheets of newspaper under a rug for a few days.

When one is planning a garden or adding to a collection, a new source of pleasure can be achieved by the discriminating choice of plants that lend themselves to preservation; for then, with little effort, the delights of the garden can be enjoyed indoors in a unique and intimate way during the long winter months.

Fagus grandifolia, Oxydendrum arboreum, Symphoricarpos albus. The white berries of the Symphoricarpos are added as a temporary accent though they do not dry well. Photo: P. Chvany.
Bibliography


Cora Warren, a volunteer and Friend of the Arnold Arboretum, is responsible for the beautiful seasonal arrangements that regularly appear in the entrance to the Administration Building.

Cryptomeria japonica lobbii, Mahonia sp., Carpinus orientalis. Photo: P. Chvany.
A Guide by Plant Family to Foliage Preservation

by Sheila Magullion

A comprehensive list of hardy woody plants that can be preserved by glycerine treatment has long been needed. Therefore, this guide has been compiled after experimentation with a wide range of plant materials drawn from the Arnold Arboretum's collections in Jamaica Plain; all are hardy in the Boston area.

Results of the testing showed that, with few exceptions, all members of a family react in much the same manner. Some families refuse completely to absorb the glycerine mixture; some absorb it, but with poor results; and some are outstanding in their response. Exceptions to the general rule could be vines, which are usually a failure — especially if they are deciduous — and broad-leaved evergreens, which nearly always give excellent results even though they may belong to a mostly deciduous family that otherwise has a poor response to glycerine. Some families may react in a different manner if treated earlier in the year.

The following information has been compiled from experience gained during the months of July to November, inclusive. Genera tested are listed under each family. It was not considered possible to test all species in some of the large genera, such as Acer and Salix; therefore, in those and similar cases, conclusions were made after trials with half a dozen species. The total immersion method was not used in any case.

In order to keep the guide as concise as possible, the general remarks for the family apply to all members mentioned, unless otherwise stated. Additional information — often relating to the value of the fruits, when and how to dry them — will be found following many listings, and is indicated by an *.

ANACARDIACEAE  Cashew Family
Glycerine treatment of foliage improves toward the end of the growing season, but results will vary greatly. Fruits require no drying.

* Cotinus (smoke bush) — Red-leaved forms of C. coggygria are more effective than the green. Large plummy fruit panicles last very well if collected no later than July.
Rhus (sumac) — Large red fruit heads can be useful in large arrangements.

AQUIFOLIACEAE Holly Family
Evergreen foliage takes glycerine very well, becoming a dark brown in most cases. Deciduous types are not a success. Fruit is very long lasting.

Ilex (holly), *Nemopanthus

* Ilex — Fruit of I. pedunculosa is outstanding. Matures late and can be collected into November. I. verticillata and I. decidua have profuse fruits that dry well and can be collected into the winter months. The latter is the more desirable.

ARALIACEAE Ginseng Family
Handsome foliage takes glycerine but then droops unattractively. Fruit not suitable for drying.

Acanthopanax, Aralia, Hedera (ivy), Kalopanax *

* Kalopanax — Huge leaves on long petioles take treatment surprisingly well. Can be treated and used individually.

BERBERIDACEAE Barberry Family
Evergreen genera and species have excellent foliage that takes glycerine superbly. The colorful fruits are too fleshy to dry well.

* Berberis (barberry) — Contains deciduous species that are much less successful than the evergreens.

Mahonia — Assumes red winter coloring that is particularly attractive after glycerine treatment.

Mahoberberis — Evergreen hybrids between the two preceding genera.

BETULACEAE Birch Family
Contains good foliage that refuses treatment early in the year, but by August and September seems to be quite satisfactory. All have interesting fruit clusters that dry easily and last well if collected early.

* Alnus (alder) — Dry strobiles like small cones can be collected at any time.

Betula (birch) — Catkins should be collected by midsummer.

Carpinus (hornbeam) — Pendulous clusters of small nutlets enclosed in leafy bracts should be collected during July and August for best results. Can be dried or treated with glycerine for an olive-green effect.
Corylus (hazelnut) — The attractive nuts are beloved by squirrels and so should be collected green by late July.

BUXACEAE
Box Family
Evergreen foliage takes glycerine very slowly. Fruit of little interest.

Buxus (boxwood), Sarcococca

CALYCANTHACEAE
Calycanthus Family
Interesting fruit a dry pod somewhat resembling a fig. Sparingly produced but dries well. Foliage a failure.

Calycanthus (sweetshrub)

CAPRIFOLIACEAE
Honeysuckle Family
Contains many horticulturally popular genera. The foliage takes glycerine but then droops in some cases. Fruits are too soft to dry.

Abelia,* Dierelia, Dipelta, Kolkwitzia (beauty bush),* Lonicera (honeysuckle),* Sambucus (elderberry),* Symphoricarpos (snowberry),* Viburnum,* Weigela

*Abelia — Evergreen species give satisfactory results.

Kolkwitzia — Fuzzy seed heads are moderately attractive but must be collected in July.

Lonicera — Foliage of some of the small-leaved species and forms are very successful.

Sambucus — An exception in that it did not take glycerine.

Symphoricarpos — Foliage responds well.

Viburnum — Evergreen foliage of V. rhytidophyllum droops after treatment but is handsome enough to be worth wiring.

CELASTRACEAE
Staff-tree Family
Foliage takes glycerine but, except for the evergreen members, is not worthwhile. Excellent for fruit.

* Celastrus (bittersweet) — Well-known yellow and red capsules should be collected before they split.

Euonymus (spindle tree) — Capsules of various colors must be collected before they split, and treated with alcohol and shellac to help preserve color and prevent dropping. Includes some evergreen species.

Pachistima — Small evergreen foliage takes glycerine well.
Tripterygium — A deciduous vine that does not take glycerine. Long panicles of winged seeds are interesting if collected in August.

CERCIDIPHYLLACEAE
Katsura-tree Family

*Cercidiphyllum* (katsura) — Attractive foliage takes glycerine, but not always well. Results from individual specimens vary greatly. Clusters of small pods arranged along the branches are very useful, and can be collected into the winter months.

CHENOPODIACEAE
Goosefoot Family

*Atriplex* — Small gray leaves take glycerine.

CLETHRACEAE
White-alder Family

*Clethra* (white alder) — Foliage does not absorb glycerine, but the racemes of dry, long lasting capsules are attractive and can be collected into the winter months.

CORNACEAE
Dogwood Family

An extremely variable family.

*Corrus* (dogwood) — Results in this genus vary according to species.

*Helwingia* — This refuses glycerine altogether.

CRUCIFERAE
Mustard Family

Small evergreen foliage takes glycerine. Fruit is of no interest.

*Aethionema, Alyssum, Iberis*

CYRILLACEAE
Cyrilla Family

*Cyrilla* (leatherwood) — An interesting shrub that responds well to glycerine but the leaf arrangement makes it difficult to use effectively.

ELAEAGNACEAE
Oleaster Family

Foliage is inclined to droop after treatment, but the silver and grey colors provide such a welcome change from olives and browns that extra fussing is worthwhile. Spectacular fruit is too soft to dry well.

*Elaeagnus* (oleaster), *Hippophae* (sea buckthorn), *Shepherdia* (buffaloberry)

*Elaeagnus* — Offers the best results in the family.
ERICACEAE  Heath Family
All genera tried, both evergreen and deciduous, take glycerine beautifully. These have very neat foliage that is ideal for small arrangements. Fruits are most often dry capsules of minor interest; some genera have soft fruits that do not dry.

Andromeda (bog rosemary), Arctostaphylos (bearberry), Bruckenthalia (spike heath), Calluna (heather), Cassiope, Chamaedaphne (false daphne), Enkianthus, Erica (heath), Gaultheria, Gaylussacia (huckleberry), Kalmia (laurel), Ledum (Labrador tea), Leiophyllum, Leucothoe, Lyonia (fetterbush), Oxydendrum (sorrel tree),* Pieris, Rhododendron,* Vaccinium, Zenobia (dusty zenobia)*

* Leucothoe — Variegated form of L. fontanesiana is particularly good.
Oxydendron — Large leaves are very floppy.
Rhododendron — Large-leaved species and forms are inclined to droop.
Zenobia — Has grey foliage and long racemes of grey capsules that are very handsome.

FAGACEAE  Beech Family
Superb foliage is excellent after glycerine treatment and is well known to arrangers. Interesting fruits dry naturally but should be collected early before the squirrels take them.

* Castanea (chestnut) — Large leaves are inclined to flop and may need wiring. Collect the chestnuts in early September.
Fagus (beech) — The many forms of F. sylvatica make an interesting change and could be used more often.
Quercus (oak) — Acorns may need a drop of glue to hold them in their cups. Small-leaved species are generally easier to use.

GRAMINEAE  Grass Family
Not satisfactory in glycerine but the narrow-leaved genera air-dry quite well and the broader leaves can be pressed.
Arundinaria, Phyllostachys, Sasa, Sinarundinaria.

HAMAMELIDACEAE  Witch-hazel Family
A very satisfactory family that takes glycerine beautifully. Fruit mostly of little interest.
Corylopsis, Fothergilla, Hamamelis (witch-hazel), Liquidambar (sweet gum),* Parrotia, Parrotiopsis.
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* Liquidambar — Foliage and fruit is very different from the other members of the family. Long petioles permit the leaves to droop somewhat after treatment. Fruit a prickly globe-shaped collection of capsules popular for Christmas decorations.

HIPPOCASTANACEAE Horse-chestnut Family

* Aesculus (horse-chestnut) — Foliage does not respond to glycerine. The well-known nuts will need glue to hold them in their cases and should be collected in August.

LABIATAE Mint Family

Aromatic foliage and small flowers that are best dried by the hanging method.

Elsholtzia, Lavandula (lavender), Perovskia, Salvia (sage), Teucrium (germander), Thymus (thyme).

LARDIZABALACEAE Lardizabala Family

Foliage takes glycerine but then droops. Large fleshy fruits do not dry well.

Akebia,* Decaisnea

* Akebia — Deciduous vines that produce usable results late in the season.

LEGUMINOSAE Pea Family

A large family that includes many popular members that unfortunately are of little use for drying and preserving. Fruits are a pod interesting only for size in a few genera. Mostly compound foliage either closes up or refuses glycerine.

Albizzia (silk tree), Amorpha (false indigo),* Caragana, Cercis (redbud),* Cladrastis (yellow-wood),* Colutea (bladder senna),* Cytisus (broom), Genista, Gleditsia (honey-locust),* Gymnocladus (Kentucky coffee tree),* Halimodendron (salt bush), Indigofera, Laburnum (golden chain tree), Lespedeza, Maackia, Pueraria (kudzu vine), Robinia (false acacia), Sophora (Japanese pagoda tree), Wisteria *

* Amorpha — Fruits are small pods in dense terminal spikes

Cercis — Simple leaves that sometimes absorb glycerine.

Cladrastis — Does take glycerine but not satisfactorily.

Colutea — Interesting inflated pods.

Gleditsia — Fruit a very large flat, twisted pod.
Gymnocladus — Interesting heavy pods.

Wisteria — Attractive velvety pods that cannot be prevented from splitting.

**LEITNERIACEAE**

*Leitneria* (corkwood) — Has good foliage that responds well to glycerine. Fruit a drupe not often produced.

**LILIACEAE**

The two hardy woody members are very useful to the arranger.

*Smilax* (green brier) — Wonderful foliage takes glycerine superbly. Prickles should be snipped off before treatment.

*Yucca* — Sword-shaped leaves absorb glycerine very slowly and are probably better pressed or air dried. Fruit a cluster of capsules that dry very well. Collect by midsummer.

**MAGNOLIACEAE**

Has very handsome foliage that does not always absorb glycerine well but is worth perseverance. Large fruits are spectacular but difficult to dry.

*Liriodendron* — Foliage from young trees seems to respond to treatment better than that from older specimens. The long petioles permit the leaves to flop and will need to be wired, or the leaves can be used individually. Fruit is a pointed cone that dries well but needs shellac treatment to prevent shattering. Collect in August.

*Magnolia* — Some species have very large leaves that are better used individually. *M. virginiana* is the most satisfactory of the smaller-leaved species. Fruits should be collected as they begin to split, and treated with shellac to hold the seeds in place.

**MALVACEAE**

*Hibiscus* (shrubby althea or rose of sharon) — Has unremarkable foliage that takes glycerine quite well. Fruits are attractive capsules popular with arrangers.

**MYRICACEAE**

Excellent foliage absorbs glycerine well. Fruit dries readily.

*Comptonia* (sweet fern), *Myrica* (bayberry)
OLEACEAE  Olive Family
Foliage takes glycerine well with some variations. Fruit is not exciting.

*Abeliophyllum, Chionanthus (fringe tree),* Fontanesia, Forsythia, Fraxinus,* Ligustrum, Syringa*

* Chionanthus — Foliage is very good. The blue fruits dry well.
Fraxinus — Foliage is a complete failure.
Syringa — Foliage is not very satisfactory.

PINACEAE  Pine Family
With the exception of the very resinous genera, most members of the Pine Family absorb glycerine well. However some turn a dark brown that is not particularly attractive. Since many last so well untreated, the family is included here primarily for its deciduous members; all have cones invaluable to the arranger.

* Abies (fir) — Heavy resin inhibits the absorption of glycerine.
Cedrus (cedar) — Too resinous for success.
Chamaecyparis (false cypress) — Takes glycerine but some species and forms turn brown. Foliage of C. squarrosa is interesting after treatment.
Cryptomeria — Turns a dark brown.
Cupressus (cypress) — Takes treatment well.
Juniperus (juniper) — Takes glycerine but also lasts indefinitely without any treatment.
Larix (larch) — Very successful.
Libocedrus (incense cedar) — Takes treatment fairly well.
Metasequoia — Very successful.
Picea (spruce) — Too resinous for success.
Pinus (pine) — Too resinous for success.
Pseudolarix (golden larch) — Young specimens seem to react best.
Pseudotsuga (Douglas-fir) — Too resinous for success.
Sciadopitys (umbrella pine) — Turns an attractive tan color.
Sequoiadendron (redwood) — Very successful.
Taxodium (bald cypress) — Moderately successful.
Thuja (arborvitae) — Very satisfactory in all forms tried.
Thuja  — Turns a dark brown.
Tsuga (hemlock) — Takes glycerine but drops many needles.
Leucothoe fontanesiana 'Girard's Rainbow', Mahonia bealei, Liriodendron tulipifera, Castanea pumila. Photo: P. Chvany.

**PLATANACEAE**

*Platanus* (plane tree) — Large foliage takes glycerine particularly well. The spherical seed heads on long pendulous stalks are long lasting if collected no later than August.
RANUNCULACEAE  
Buttercup Family

Foliage absorbs glycerine but droops too much to use. Fruits interesting and useful.

* Clematis — Plumy seed heads should be collected as soon as they form.

Paeonia (peony) — Foliage can be pressed or single leaves wired after glycerine treatment. Collect the attractive pods after they open in September.

Xanthorhiza (yellow root) — Fruit too filmy to be effective.

ROSACEAE  
Rose Family

A large, horticulturally important family that gave some of the most outstandingly successful results of any family tested. Foliage of most members quickly turns a very dark reddish-brown. Most of the spectacular fruits are too soft and fleshy to dry well.

Amelanchier (shadbush), Aronia (chokeberry),* Aruncus,* Chaenomeles (Japanese quince), Cotoneaster, Crataegus (hawthorn),* Cydonia (quince), Exochorda, Kerria, Malus (apple), Neillia,* Photinia,* Physocarpus (ninebark),* Potentilla (cinquefoil), Prinsepia,* Prunus (plum, cherry, etc.),* Pyracantha (firethorn),* Pyrus (pear),* Rhodotypos, Rosa (rose),* Sorbaria,* Sorbaronia, Sorbus,* Spiraea, Stephanandra *

* Aronia — Some species have fruits that dry well.

Aruncus — Fruit clusters are useful if collected in July.

Crataegus — Among the larger fruits offers the best hope for successful drying. Contains many different species that ripen from July to October. Collect at the first sign of color and hang to dry.

Neillia — Foliage is inclined to droop.

Photinia — Red berries that ripen late and last well treated with alcohol and shellac.

Physocarpus — Heads of dry follicles are of possible use.

Prinsepia — Uncomfortably thorny to work with.

Prunus — P. laurocerasus foliage is particulary good.

Pyracantha — Too thorny for comfort.

Pyrus — P. calleryana 'Bradford' foliage is outstanding.

Rosa — R. multiflora and R. virginiana fruits dry and last extremely well.
Sorbaria — Seed follicles in branching clusters that are very useful.

Sorbus — Contains species such as S. alnifolia and S. hostii with fabulously successful foliage. Fruits of the former and a few others dry well, but most are too soft.

Stephanandra — Small foliage on arching stems is good for small arrangements.

**RUBIACEAE**

Madder Family

*Cephalanthus* (button-bush) — Foliage is successful in glycerine but is not particularly interesting. Seeds arranged in a spherical head.

**RUTACEAE**

Rue Family

Foliage refuses glycerine. Some members have attractive fruits that dry well.

*Evodia,* *Orixa,* *Phellodendron* (cork tree), *Poncirus* (hardy orange), *Ptelea,* *Zanthoxylum*  

* Evodia — Outstanding large clusters of numerous seed pods should be collected as soon as they mature around mid-September, and treated with alcohol and shellac to prevent seeds from dropping.

*Phellodendron* — Blue fruits in large bunches shrivel but do dry fairly well.

*Poncirus* — Small oranges must be collected in July while still green.

*Ptelea* — Fruits are clusters of round samaras that are interesting, but difficult to use.

**SALICACEAE**

Willow Family

Foliage refuses to absorb glycerine. The familiar furry catkins are always popular.

*Populus* (poplar), *Salix* (willow).

**SAPINDACEAE**

Soapberry Family

Foliage refuses glycerine. Fruits dry well.

*Koelreuteria* (golden raintree), *Xanthoceras* (shiny yellowhorn)  

* Koelreuteria — Large panicles of papery pods are good for large arrangements. Collect in August.
**Sapotaceae**

*Bumelia* (chittamwood) — Has good foliage that takes glycerine well. Fruit has no interest.

**Saxifragaceae**

Foliage absorbs glycerine but droops too much to use. Fruit is of no interest except in *Hydrangea*.

*Deutzia, Hydrangea,* *Philadelphus* (mock orange), *Ribes* (flowering currant), *Schizophragma*.

*Hydrangea* — Contains many species with either white, pink or green sterile flowers that dry naturally on the plant, and are extremely showy and useful.

*Philadelphus* — Small-leaved species produce usable results.

**Staphyleaceae**

*Staphylea* (bladdernut) — Compound foliage responds well to treatment. The green inflated pods are different and interesting. Collect from July to September.

**Styraceae**

Foliage does not take glycerine successfully. Fruit attractive but too fragile to be of great value.

*Halesia* (silverbell) — Fruits are dry, winged drupes that drop from the branches very easily. Treat with alcohol and lacquer.

*Pterostyrax* — Pendulous panicles of furry drupes shatter quickly. Treatment with alcohol and lacquer helps somewhat.

*Styrax* (snowbell) — Fruits are small ovoid drupes that dry easily. Collect in July for best results.

**Symplocaceae**

*Symplocos* (sweetleaf) — Foliage takes treatment very well. Fruit dries well and although small is very effective because of the brilliant blue color. Collection time in August is very short.

**Theaceae**

Foliage is not satisfactory after glycerine treatment.

*Franklinia, Stewartia* *

*Stewartia* — Fruit a beaked capsule that is attractive in some species.
THYMELAEACEAE  
Foliage takes glycerine well in the only species tested.  
*Daphne, Dirca* (leatherwood)

TILIACEAE  
*Tilia* (linden) — Handsome foliage absorbs glycerine fairly well at some times of the year. Fruits are small nutlets attached to a leafy bract.

TROCHODENDRACEAE  
Two uncommon trees that take glycerine well. Fruits are winged nutlets that are not attractive when dried.  
*Eucommia, Euptelea*

VERBENACEAE  
Members are inclined to be tender in the Boston area and usually kill to the ground; new growth is too lush and soft to take glycerine. Fruits unusual and useful.  
*Callicarpa* (beautyberry), *Caryopteris, Clerodendron,* *Vitex*  
*Callicarpa* — Collect the long sprays of small violet berries before frost and lay flat or hang to dry.  
*Clerodendron* — Blue berry-like fruits surrounded by bright red calyx remain attractive when dried. Mature very late in the season.

Following is a list of families and their hardy members that have little or nothing to recommend them for preserving purposes.

ACERACEAE (Maple Family)  
*Acer* (maple)  
ACTINIDIACEAE (Actinidia Family)  
*Actinidia* (silver or fleecevine)  
ANNONACEAE (Custard-apple Family)  
*Asimina* (pawpaw)  
ARISTOLOCHIACEAE (Birthwort Family)  
*Aristolochia* (birthwort)  
BIGNONIACEAE (Bignonia Family)  
*Campsis* (trumpet vine), *Catalpa*  
BORAGINACEAE (Borage Family)  
*Ehretia, Lithospermum*  
EBENACEAE (Ebony Family)  
*Diospyros* (persimmon)  
EUPHORBIACEAE (Spurge Family)  
*Andrachne, Securinega*
GINKGOACEAE (Ginkgo Family)
GUTTIFERAE (Garcinia Family)
   Hypericum (St. John's-wort)
JUGLANDACEAE (Walnut Family)
   Carya, Juglans, Pterocarya
LAURACEAE (Laurel Family)
   Lindera (spice bush), Sassafras
LOGANIACEAE (Logania Family)
   Buddleia (butterfly bush)
MENISPERMACEAE (Moonseed Family)
   Menispermum (moonseed)
MORACEAE (Mulberry Family)
   Broussonetia (paper mulberry), Macluranaia, Cudrania, Maclura
      (osage orange), Morus (mulberry)
NYSSACEAE (Tupelo Family)
   Nyssa (tupelo), Davidia
POLYGONACEAE (Buckwheat Family)
   Polygonum (knotweed)
RHAMNACEAE (Buckthorn Family)
   Berchemia, Ceanothus, Hovenia, Rhamnus (buckthorn)
SCROPHULARIACEAE (Figwort Family)
   Hebe, Paulownia (empress tree)
SIMAROUBACEAE (Quassia Family)
   Ailanthus, Picrasma
SOLANACEAE (Nightshade Family)
   Lycium (matrimony vine)
TAXACEAE (Yew Family)
   Taxus (yew)
ULMACEAE (Elm Family)
   Celtis (hackberry), Hemiptelea, Ulmus (elm), Zelkova
VITACEAE (Grape Family)
   Ampelopsis (porcelain vine), Parthenocissus (Virginia creeper),
      Vitis (grape vine)

A member of the Friends of the Arnold Arboretum and an active volunteer,
Sheila Magullion has collaborated with Cora Warren on the exhibit of
holiday arrangements using preserved plant materials, currently on display
through December 30 in the lecture room of the Administration Building.

Betula jackii, Rubus sp., Staphylea elegans hessei, Celastrus sp., Castanea pumila,
Corylus sp., Aesculus glabra. Photo P. Chvany.
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