In retrospect the fiscal year just ended was momentous in many ways. Two members of the staff, Dr. Stephen Spongberg and Dr. Richard Weaver, Jr., completed one and one-half months of field work in Japan and Korea, collecting seeds and plants for addition to the collections of the Arnold Arboretum. Their trip represents the first field expedition for horticultural purposes in temperate Asia since the last trip of E. H. Wilson in 1917-1919.

Dr. Shiu-Ying Hu, retired, made a personal trip to the People’s Republic of China, and Dr. Richard Howard was a member of the official delegation of the Botanical Society of America visiting selected botanical gardens and botanical, horticultural, and forestry institutions in eight cities of the People’s Republic during a twenty-eight-day period. Although only a few seed lots were collected from the wild during Dr. Howard’s trip, an official exchange of seeds and herbarium specimens was implemented. The possibility of expeditions and the exchange of personnel seems realistic in the near future; the exchange of specimens and literature and, certainly, freer communication appear to be immediate.

Within the living collections, phase one of the boundary improvements was implemented with reconstruction of gates and sidewalks in the Forest Hills- Arborway area. Unfortunately, the Adams-Nervine property could not be obtained for expansion of the collections.

Two major snowstorms set weather records for the Boston area, with the total snowfall in Boston in January recorded as 35.9 inches, and in February, 27 inches.

In Cambridge, the Harvard Corporation approved the plans for an addition to the Harvard University Herbaria building, and the building plans were placed for bidding at the end of June, with construction to begin in August.

Finally, as an end to one administration and the beginning of another, Dr. Howard requested relief from the administrative duties of director which he has had since February 1, 1954. The Dean and the President accepted this request effective June 30, and the Corporation approved the appointment of Dr. Peter Ashton, University of Aberdeen, Scotland, effective July 1, as the fifth director of the Arnold Arboretum with a concurrent appointment as Arnold Professor of Botany. After a sabbatical year as a Guggenheim Fellow, Dr. Howard
will be Professor of Dendrology on the staff of the Arnold Arboretum and within the University. Dr. Bernice Schubert was appointed acting director for Cambridge and Dr. Weaver, acting director for Jamaica Plain and Weston for the three-month period, July 1 through September 30, 1978.

Staff

June 30 marked the retirement of Mr. George H. Pride from the staff of the Arnold Arboretum. Mr. Pride joined the staff in July 1967 as Associate Horticulturist, with responsibility for the programs in education, the Friends of the Arnold Arboretum, and much of the publicity and film development. He represented the Arboretum well in community activity, especially in the Roxbury-Dorchester programs, and was honored by them at a special dinner. He also received a citation from United States Senator Edward Brooke and a gold medal from the Massachusetts Horticultural Society for his contributions to inner-city horticultural programs. The staff expressed its appreciation to George Pride in a retirement party, as did the participants in the highly successful lecture series which he conducted for many years at the Case Estates in Weston.

Mr. Alfred Fordham, who retired as propagator last year, received an Honorary Life Membership in the International Plant Propagators’ Society at a meeting in Columbus, Ohio. He is only the fourth distinguished horticulturist to be so honored.

Dr. Howard was doubly honored when he received the Liberty Hyde Bailey Medal from the American Horticultural Society at the annual meeting in Pasadena, California, and later, in Boston, when he was presented the George Robert White Medal by the trustees of the Massachusetts Horticultural Society for his work in horticulture and botany. Dr. Howard has received a Guggenheim Fellowship for the period June 15, 1978, through June 14, 1979.

Resignations were received during the year from Mr. Kenneth Shaw in horticulture, and Ms. Susan Farwell and Ms. Sandra McLeod in the library. Dr. Burdette Wagenknecht, while on sabbatical leave from William Jewell College in Liberty, Missouri, was appointed a Mercer Research Fellow at the Arnold Arboretum for the spring semester.

Horticulture

Inherent in the title Arnold Arboretum is the development, maintenance, and use of a collection of woody plants. In fact, the indenture establishing the Arnold Arboretum called for the acquisition of all the trees, shrubs, and herbaceous plants hardy in the vicinity of West Roxbury. The national and international reputation of the Arnold Arboretum is due largely to this excellent collection of woody plants, their accessibility to scientists as well as to the general public, and the publications of the staff derived from the study of these plants. The Arboretum staff over the years has not only acquired
Peter Raven, chairman of the Arnold Arboretum Visiting Committee, toasts the Howards at party in their honor. To his left is Bernice Schubert, who helped plan the affair held in the Harvard Faculty Club on June 30. Photos: P. Chvany.

Associates fete George Pride on the occasion of his retirement. Photo: P. Chvany.
and grown plants but has shared these material resources in an uninterrupted program. Most of the plants, in fact nearly all those noted for their colorful flowering characteristics, were acquired from eastern Asia at the beginning of this century in a series of expeditions by Ernest H. Wilson, Charles S. Sargent, Joseph Rock, and John G. Jack for the Arboretum staff. The propagation staff kept excellent records of the treatments used to attempt germination of newly acquired seeds, and the horticultural staff maintained records on their growth, performance, and survival. It is these records that serve as background information on the treatment of new introductions, or the need to seek more hardy plants from northern sources or to share marginally hardy plants with other gardens in more suitable locations.

During September and October Drs. Spongberg and Weaver traveled in Japan and Korea, collecting seeds and plant material for propagation. They assembled and returned expediently by air mail 504 collections representing 326 taxa and sixty-eight families of flowering plants; the majority of the collections represented potential additions to the living inventory. The speed of transport, one week by air on the average, contrasted with the slow boat passage employed by the early collectors. Fresh seed requiring no stratification could be germinated immediately, while other seed could be cleaned or properly stored in Boston, eliminating much of the arduous effort previously expended in the field. Germination has been excellent except for the maples, and some seedlings have already been distributed.

A notice of thirty-two taxa to be distributed was published in the Newsletter of the American Association of Botanical Gardens and Arboreta, and resulted in requests from thirty-three institutions for 226 plants. Seedlings in shorter supply were made available to a
more select group of fifteen institutions. A large number of taxa will be retained at the Arnold Arboretum for mass plantings in our nurseries for evaluation of form, variation and hardiness. The director and staff are grateful to colleagues in Japan and Korea for the assistance afforded Drs. Weaver and Spongberg, and in particular for the help of Mr. Carl Ferris Miller of Korea and Dr. Katsuhiko Kondo and Professor Kankichi Sohma of Japan.

In anticipation of Dr. Howard's trip to China, the staff prepared units of seeds of twelve taxa for distribution to appropriate botanical gardens in the People's Republic. In addition, leaves of various cultivars of *Streptocarpus* introduced by the Arnold Arboretum, and plants of *Cyrilla racemiflora* were given to the botanical garden at Kamchow (Canton) for internal distribution. From Nanking Botanical Garden Dr. Howard was able to obtain a few seeds of *Sinocalycanthus sinesis*, not known in the United States, and to present in return seeds of *Calycanthus floridus* from the United States. A few additional seeds were collected from wild plants near Kunming. Earlier during the year Dr. Y. C. Ting of Boston College had obtained seeds of *Magnolia biondii* from China. The Arboretum staff was asked to handle these, and the plants developed will be distributed at a later date.

The living collections in Jamaica Plain are subject to continuous, systematic or casual examination by the staff responsible for maintenance, records, and labels, or for the nomenclature of the plants. New additions, or deletions or name changes, are recorded in Arboretum files and reported to the Plant Sciences Data Center of the American Horticultural Society. A new printout of the plants living in our collections is in preparation, and will incorporate additional information on sources. Maps of the plantings are revised on a regular basis, and additional color-coded or display labels are provided systematically. The collections of the Arnold Arboretum remain the best named and labeled cumulation known to the staff. Special attention this year was given to the identifications of the *Carpinus* and *Betula* species, and to an evaluation of the *Syringa* (lilac) taxa. Many unnamed, spontaneous seedlings were evaluated and marked for further study, or removed as undesirable plants. A list of taxa represented by single plants has been prepared, and these plants are being propagated in order to have additional specimens in the collection and for distribution to other gardens. Many of the plants within the Arboretum inventory seem particularly desirable for horticultural use, but for a variety of reasons are not available to the public from commercial sources. The techniques of propagating such plants are being studied, and small plants will be made available in the future.

The New England area escaped the ravages of hurricanes during the fall season and damaging ice storms during the winter. However, new records for snowfall were experienced when 22 inches of snow fell on Jamaica Plain and Weston on January 28, and 29 inches on February 6 and 7. Windblown drifts piled the snow deep, and an emergency situation was declared by the governor of Massachusetts.
after the second storm. Staff members were not permitted to travel to work, and a special commendation is due Mr. Robert G. Williams, superintendent of buildings and grounds, and Mr. Thomas Kinahan, superintendent of the Case Estates, for the attention and care they gave to the facilities of the Arnold Arboretum. Several of the crew were able to walk to work, and their efforts in digging out the greenhouse area and the administration building for oil delivery prevented a serious situation from developing when oil supplies ran critically low. The clear skies that followed the storm were accompanied by strong winds that caused burning and desiccation of the tops of plants above the snow line. Many broadleaved evergreens were seriously damaged, and flowering of others in the spring was restricted to the lower branches. Rodent damage under the snow was particularly severe. The grounds at Jamaica Plain and Weston were inaccessible for many weeks after the storm as our own equipment could not handle the deep snow. The staff took the occasion to do inside work with the refurbishment of the administration building display areas, library, and locker room for the grounds staff. A combination internal fire alarm and emergency alarm system also was installed in the administration building.

A previous report mentioned the effort to acquire the land adjacent to the Arnold Arboretum known as the Adams-Nervine property. Restrictions on the use of the buildings in their designation of historical significance led to the withdrawal of an offer presented to their trustees. Subsequently the property was sold to a consortium of commercial developers who are proposing a change in zoning to permit the construction of high-rise apartments. The proposal to create a boardwalk over a storm sewer through the meadow in front
of the administration building, also reported previously, was approved by the Harvard Corporation. It was determined that the conduit had been installed by the Arnold Arboretum; therefore, city approval, which had been sought, was not necessary. Before the contracts could be prepared, however, a second proposal to the city was approved to permit the Arnold Arboretum, through its own funds, to reconstruct deteriorating sidewalks and gates. Although these are stated in the lease to be the responsibility of the City of Boston, their poor condition was not only unsightly but hazardous. During the spring two contracts were completed to renovate the large driving gates and the pedestrian gates along the Arborway, and to remove and replace two 1,000-foot units of sidewalk from the Forest Hills gate to the lilac collection on one side and the ponds on the other. Renovations provided better entrances for handicapped persons, and improved the appearance of the areas.

For many years the Arboretum has hired students for work on the grounds in Jamaica Plain and in Weston during the summer months. For some students this was graded work as part of the work-study requirements of their own educational programs. Others had requested certification or academic credit. During the spring and summer of 1977 a Horticultural Trainee Program was organized on a trial basis, permitting the students to enroll in the Harvard Extension Division, pay tuition, and receive a formal training with four hours of academic credit. The course Biology E-146C, Botanical and Horticultural Practices at Arboreta, was developed and supervised by Drs. Spongberg and Weaver, with the participation of many other members of the staff. Regular class meetings were scheduled as lectures, tours of the Arboretum collections, and tours of other plant
collections in the New England area. Each student chose a special research project and, in addition to taking an examination, presented an oral and written report on the project. Thus, thirty-two hours per week were devoted to regular assigned work on the grounds, and eight hours to instruction and research. Special noontime lectures and weekend field trips were optional opportunities. Eleven students from seven colleges and universities participated for credit; four students were not eligible for college credit, being high school students. Several research projects were deemed worthy of publication, and one on *Cornus dunbarii* was published in *Arnoldia*. On the basis of staff experience with the 1977 program, that of 1978 was revised and restricted to students working in Jamaica Plain. The transportation requirements of students employed in Weston proved excessive. The entire program will be reevaluated at the end of the summer of 1978. In order to give students additional attention and to judge work habits, Mr. Henry Goodell, assistant superintendent of buildings and grounds, assumed full responsibility for ground crews and student work assignments, freeing some time for the other responsibilities of the superintendent, Mr. Williams. A new staff position for a pruner was advertised and filled.

During the spring of 1978, a three-quarter-acre section of the South Street tract was made available on a trial basis for community gardening projects. The area was plowed in the fall, top dressed with leaf mold, and disc harrowed in the spring. A local committee of interested persons was established to assume full responsibility for the garden area. They will attempt to have the city, through the Boston Urban Garden Program (BUG), install a water supply. At the end of the spring over seventy-five garden plots had been assigned and seemed to be productive.
The horticultural staff in Jamaica Plain, with the help of volunteers where possible, handles all visitors to the grounds, answers questions in person and by telephone and letter, supplies identifications of plant specimens, and conducts guided tours for professional visitors and interested groups. To ease one aspect of this work, an answering device, delivering a recorded message on a twenty-four-hour basis, has been installed on the primary telephone line. In future telephone directories this will be designated as a recorded message. Ms. Nancy LeMay prepares the recording weekly, supplying informa-
tion on hours, directions, exhibitions, lectures and classes, and the plants in flower. Specific requests are referred to a second line, and frequently callers have commended the message in a second call. The service has reduced the number of office-hour calls for general information, and has provided coverage outside of regular hours and on weekends. To determine the nature of specific calls, a record form to be filled out following each call has been in use this spring. The compilation of the data has indicated the nature of specific plant queries: e.g., outbreaks of disease, potentially poisonous plants, and elaboration of news items of botanical or horticultural interest.

In the previous annual report, reference was made to a questionnaire that was distributed to the visitors on the grounds. The information obtained was often specific as to conditions on the grounds or the goals and needs of the visitors, and has prompted some changes and improvements in the facilities. A new questionnaire, distributed by mail to the Friends of the Arnold Arboretum, produced a good percentage of returns, with references to services, facilities, publications, and programs. We can respond with changes that will increase the support of the Arboretum, improve our contributions, and provide programs to meet the needs of the public. The often-stated request for a guidebook to the living collections has spurred staff efforts to produce such a publication within the next year.

No count of the visitors to the Arnold Arboretum is possible. The pedestrian gates to the grounds are open twenty-four hours a day, and visitors desired and undesired are present from daybreak to late night hours. Professional visitors are many, who come to use the herbarium or consult the living collections and the staff. Special tours during the year were arranged for such professional groups as the annual convention of the American Nurseryman’s Association, the Garden Writers’ Association, and the Massachusetts Horticultural Congress. Groups of students with a capable instructor, or requiring a staff or volunteer guide, represented twenty-one colleges, high schools, and technical or vocational schools, and came to the Arboretum to study the general collections or for some specific reason, e.g., a visit to the herbarium, library, or greenhouses. Tours were arranged for garden clubs, plant societies, and alumni or special study groups from city educational programs. A special gift for the purchase of a voice projector has eased the tour leaders’ task.

During the fiscal year 225 shipments of plant materials, comprising 1,004 taxa, were distributed to cooperating institutions and nurseries, or supplied following specific requests for study material from individuals in thirteen countries. In addition, approximately two thousand rooted plants of Salix melanostachys, the Black Pussy Willow, were mailed to Friends of the Arnold Arboretum. The Arnold Arboretum also contributed seeds to the distribution program of the American Horticultural Society. A total of 197 shipments, consisting of 1,293 taxa, were received from twenty-seven countries as gifts or
distributions, or in response to requests from the staff for plant material for research programs. Following an examination of our living collections, 263 taxa were propagated to prepare replacements for specimens that appeared to be failing, or that suffered severe winter damage. Another 141 items were propagated for distribution programs or for staff research programs.

The greenhouses of the Arnold Arboretum are primarily for research. While the grounds and collections around the greenhouses are open to the public during regular hours, the glass areas are open for general visitors one afternoon a week, with information and surveillance supplied by volunteers. Sections of the greenhouses are available for research associated with thesis preparation of students working with staff members. Such diverse plants as Brunfelsia, Lyonia, Portlandia, and Viburnum currently are maintained for study; propagations of tropical species not hardy in the Boston area will be distributed at a later date to more appropriately located gardens. Staff members maintain plants in the greenhouses in work associated with research projects on the Gentianaceae and Gesneriaceae, and on the floras of southeastern United States and the Caribbean Lesser Antilles. The greenhouse staff is largely responsible for the acquisition and preparation of plant materials to be used in educational programs and exhibits. The Arnold Arboretum exhibit at the Spring Flower Show of the Massachusetts Horticultural Society was entitled “Up Against the Wall,” and involved urban space of walls and small garden plots treated in four different ways. The walls supported vines, espaliers, or hanging plants, while the garden areas were developed for vegetables, herbs, pot plants, and living space. The plant materials for this exhibit were prepared by the greenhouse staff.

The Arboretum staff was represented at many meetings of professional societies during the year, usually presenting contributed papers or taking part in symposia. Included were the annual as well as regional meetings of the American Association of Botanical Gardens and Arboreta, the International Plant Propagators’ Association meeting and meetings of the American Horticultural Society, the Hemerocallis Society, and the Massachusetts Horticultural Congress. Staff members served as judges at the Spring Flower Show of the Massachusetts Horticultural Society and took part in the programs of the Roxbury-Dorchester Beautification Committee, the Massachusetts science fairs, and the Worcester County Horticultural Society Daylily Show. Mr. Gary Koller was elected to the board of directors of the Jamaica Hills Association, the neighbors of the Arboretum in Jamaica Plain, and was elected a trustee of the New England Wildflower Society. He also organized and chaired the Plant Collections Committee of the American Association of Botanical Gardens and Arboreta. The Arnold Arboretum has collaborated for many years with societies and individuals in the registration of new cultivars, primarily of woody
plants. Dr. Spongberg serves officially as the chairman of the Nomenclature and Registration committees of the AABGA, and those of the American Horticultural Society. In such capacity he is also a member of the International Commission on Nomenclature and Registration of the International Society for Horticultural Science.

Case Estates

The Case Estates of the Arnold Arboretum in Weston, Massachusetts, are located thirteen miles from the principal living collections in Jamaica Plain. The 110 acres of the Case Estates are open to the public, are used for classes and research, and serve primarily as nursery areas for developing plants and as a holding area for plants that cannot be accommodated easily in Jamaica Plain. We were very much pleased when the Case Estates were awarded a gold medal by the Massachusetts Horticultural Society with the citation: "A long overdue award to a valuable teaching and testing resource, including natural areas specializing in herbaceous and woody materials of year-round interest." In addition to the annual spring open house, the grounds were included in a tour of the prizewinning gardens, and the number of visitors seems to increase as the area becomes better known. One of the showy portions of the Case Estates plantings in recent years has been the result of the breeding work of Mr. Pride with *Hemerocallis*, the daylily. Two of his selections received Junior Citations as seedlings during the year. His work with tetraploids has had national recognition, and several of his selections recently introduced have been featured in horticultural publications during the year.

Herbarium

The herbarium collection of the Arnold Arboretum is divided, with an herbarium of plants under cultivation housed in the administration building in Jamaica Plain, and noncultivated specimens, representing the native floras of the world, located in Cambridge. The herbarium in Jamaica Plain is housed adequately in metal cases, and has room for expansion. Currently it includes the majority of the specimens of *Crataegus* assembled in support of the work of Charles Sargent and Ernest Palmer, and the collection of *Yucca* gathered for the studies of Susan McKelvey. Specimens are first filed systematically and secondarily in geographic arrangements; thus during the past year a collection of cultivated plants from Kenya and from New Caledonia could be identified readily from the plants assembled in the herbarium, even though the taxa were not represented among the holdings from the two countries. A collection sent in exchange by Longwood Gardens proved rich in herbaceous material cultivated in Pennsylvania, and was added to the cultivated herbarium. An attempt was made to represent in the herbarium all taxa included in Rehder's *Manual of Cultivated Trees and Shrubs*, and as new cultivars are registered and herbarium specimens supplied, these, too, are added.

*Peter Stevens (left) and Norton Miller examine specimens in Arboretum's herbarium collection in Cambridge.* Photo. M. Reynolds.
to the herbarium of cultivated plants. Specimens added during the year numbered 1,707, bringing the total number of sheets to 163,268.

The herbarium collection in Cambridge is housed with that of the Gray Herbarium, and represents one of the most significant collections in the United States. As of June 30, 1978, the total number of accessioned herbarium sheets in the combined herbaria is 2,860,070, of which 1,780,682 are the property of the Gray Herbarium, and 1,079,388 belong to the Arnold Arboretum. Crowded cases and inadequate housing have been mentioned in many previous reports, and "temporary" housing in cardboard boxes has increased annually to the present total of 2,677 Merrill cartons so employed.

Within the last two years some steps have been taken to improve conditions to help resolve curatorial, educational, and research problems created by the limited space in the Harvard University Herbaria building. Preliminary approval by the University permitted the employment of architects to consider the problems and propose solutions. In last year's report it was indicated that the Corporation had approved an addition to the front of the herbaria building, and preliminary plans were used as a basis of cost estimates and a quest for funding for the construction and for the establishment of an endowment to cover future maintenance and operations. The search for funds was less than successful, but after further consideration of our needs, the Corporation approved the construction of the building with funds available. The future operational charges are to be handled in annual budgets unless, or until, additional money becomes available.
The addition to the building will represent 19,950 square feet gross space, and 14,450 square feet of programmed space in a basement and four floors compatible with and freely connected to the present building. The present building has 41,500 gross square feet. Our new professorial suite will be designated, but remain unfinished. Office-laboratory units numbering twelve will be included in the addition. The library area will gain 1,360 square feet in the present building, with renovations increasing the reading room space, and developing an archival area and a workroom. The herbarium will lose space in the present building, but will gain 5,200 square feet in the addition. The use of a compactor storage system of movable cases will provide ultimately the equivalent of approximately 1,176 new cases. The Crataegus and Yucca collections housed in Jamaica Plain will be moved to Cambridge. All material currently held in cardboard boxes will be accommodated in steel units. Although space will be available for twenty-four compactor units, available funds may limit the initial installation to sixteen units or fewer, the equivalent of 784 cases. Additional compactors will be purchased when funds are obtained. A large lecture room of 1,152 square feet and a smaller conference room will be created on the ground floor. The present basement seminar room will be renovated as a second laboratory, replacing one lost in the development of the professorial suite. A cold room, a growth chamber area, an instrument room, and a chemical room will be built. A small lift will aid the access of handicapped persons to the lecture and rest rooms. Construction documents were distributed in June for bids returnable July 13, 1978, with construction to be completed for occupancy by December 9, 1979.

Much staff time has been spent in committee meetings planning the details of the herbarium addition. The use of compactors for storage often requires explanation to those who have not seen these mobile units. The compactor saves floor space by utilizing custom-built units of herbarium file cabinets on tracks that permit units to be moved together for sealed storage or separated for access to the specimens. Although such units are commonly used for storage in libraries, and by various companies for records, their use in herbaria is less well known. The earliest units were in use fifteen years ago in Geneva, Switzerland, and they have been adopted recently for herbarium use by the Missouri Botanical Garden and the California Academy of Sciences. The compactors proposed for the herbarium addition will not be motorized, but will be operated by hand levers. The units are to be housed in small rooms that can be fumigated individually to overcome problems of insect infestation and leakage of fumigants.

During the year 8,335 specimens were received for the herbarium of the Arnold Arboretum: 5,623 in exchange programs; 412 as gifts; 460 purchased by support of expeditions; 1,522 collected by the staff; and 318 accessioned from material sent for identification. The largest numbers came from the United States and Canada, Australia, Papua
New Guinea, India-Pakistan, South America, and the West Indies. Specimens mounted totaled 11,459, representing another slight inroad on the backlog of accumulated specimens.

The activity of the herbarium may be judged by a number of items. Professional visitors, as recorded in a visitors' book, numbered 123 people using the herbarium, and represented sixty-four institutions and twelve countries. Many visitors stayed for more than a single day. A total of 263 loans were made in response to requests, 161 domestic and 102 international, representing 14,261 and 12,469 specimens respectively, or a total of 26,730. Loans of 1,099 specimens were received by staff members, and 1,795 returned. Loans for students represented 1,166 specimens, with 2,196 specimens being returned as students finished their work. The total number of specimens from the combined herbaria remaining on loan at the end of the fiscal year numbered 104,670, 60% to domestic institutions, and 40% international.

The crowded conditions in the organized herbarium necessitated the removal to dead storage of specimens unidentified at the genus level, to permit fully identified material to be inserted. Since this practice is clearly undesirable, individual staff members attempted, when time permitted, to supply identifications at least to the generic level. Dr. Peter Stevens devoted considerable time and identified the great majority of the Western Malesian material, and in a series of meetings with graduate students and staff in informal sessions once a fortnight began identification of undetermined material from South America.

Shifting and splitting over-full folders continued to occupy a substantial amount of curatorial time. Specimens from the geographic area we recognize as "India" have been put in new genus covers, replacing an inferior quality paper cover used initially.

Work continued on integrating photographic negatives, formerly housed in Jamaica Plain, with the larger negative file in the combined herbaria. A total of four thousand negatives of types or authentic specimens have been catalogued and curated, with about one thousand remaining to be done. New photographic negatives added to the file numbered ninety-three, representing twenty-nine specimens on loan to staff members, and the remainder taken of material requested by botanists in other institutions.

During the administration of Dr. E. D. Merrill, and before the days of convenient photographic methods, rubbings were made of herbarium specimens in many European herbaria, and fragments of the specimens were obtained. A substantial number of these are types, and those from Berlin may be especially important because the original specimens may have been destroyed. A collection of four thousand additional rubbings and fragments were found in storage, and curating work on them is under way. Labels are prepared for the rubbing and/or fragment, and the material is placed in acid-free envelopes or packets for appropriate insertion in the herbarium.
Much of the herbarium curatorial work is possible through a grant from the National Science Foundation which supports work in several herbaria as well as in the libraries of the Gray Herbarium, Botanical Museum, Arnold Arboretum, and Farlow Herbarium. A sum for the acquisition of compactors for the building addition is included in this recently approved grant renewal.

The combined herbaria received as a gift forty-six volumes of approximately 4,600 specimens as exsiccate assembled by a firm of agricultural merchants in France in the late 1800s. These volumes of historical interest in identifying cultivated and economic plants of the period will not be accessioned, but will be considered as library volumes and deposited in Jamaica Plain for appropriate use.

The projects of individual staff members are various, and completed publications are listed in the staff bibliography. The work in progress ranges from studies of fossil to modern floras, and involves many geographic areas. Dr. Hu, although retired, is preparing a flora of Hong Kong and the New Territories. This work is supported by one grant from the Chinese University of Hong Kong and another to the Chinese University from the Division of Scientific Research and Higher Education of UNESCO. Dr. Hu's research also involves medicinal plants used by the Chinese people, with special interest in ginseng. In July 1977 she participated in conferences held in Lugano, Switzerland, and Munich, Germany, on the uses of ginseng. In April 1978 she flew to Hong Kong for a consultation meeting on medicinal plant research in southeast Asia, sponsored jointly by UNESCO, the Institute for Advanced Research in Asian Science and Medicine of New York, and the Chinese University of Hong Kong. Following the presentation of her paper on Botanical Resources of Medicinal Plant Research in Southeast Asia, Dr. Hu accepted an invitation from Academia Sinica in Peking, People's Republic of China, and spent five weeks at botanical institutions in Peking, Suchow, Nanking, Shanghai, Lushan, and Canton, presenting lectures to many groups. Dr. Hu also has been appointed to the editorial board of the American Journal of Chinese Medicine.

Dr. Howard continued his work on the Flora of the Lesser Antilles, and in two field trips visited fourteen islands for field studies and collection of plants poorly represented in herbaria, such as aquatic flowering plants, Araceae, Agavaceae, and Cactaceae. While on the island of St. Kitts he spoke on the local flora to students at the Behavioral Science Foundation, conducted several field trips, and helped identify plants apparently used as food by the local populations of monkeys. Under Dr. Howard's direction, Ms. Annette Aiello completed her doctoral dissertation on "The Genus Portlandia (Rubiaceae)" and received her degree in March.

Dr. Norton Miller continued cooperative studies with Professor Gary G. Thompson of Salem State College on the late-glacial plant fossils from a site in northern Vermont-New Hampshire. This rich
deposit contains fossils of numerous kinds of vascular plants and mosses, and has revealed some novel phytogeographic data. Dr. Monte Manuel visited the herbaria for several days to work with Dr. Miller in their revision of the moss genus *Trachyloma*. Mr. Peter Albert, under the direction of Dr. Miller, is investigating the ecological significance of poikilohydry and desiccation tolerance in desert mosses. His work has been supported by grants from the Atkins and Fernald funds, and by the Farlow Herbarium. Miss Cecilia Lenk is conducting field studies on the Gaspé Peninsula, Quebec. She is investigating the pattern of late- and postglacial vegetation development, and factors responsible for the present ranges of several ecologically important tree species that reach their distributional limits near the Gulf of St. Lawrence.

Dr. Lily M. Perry, officially retired but very active in daily work in the herbarium, finished her manuscript on "Medicinal Plants of East and Southeast Asia: attributed properties and uses." Ms. Brooke Thompson-Mills assisted Dr. Perry in seeing the manuscript retyped in photo-ready copy. The work has been accepted by the M.I.T. Press for publication and distribution.

Dr. Schubert is writing treatments of the genus *Desmodium* for the Flora of Ceylon, which is being prepared at the United States National Herbarium; for the Flora of Panama, being prepared at the Missouri Botanical Garden; and for a revision of the genus for all of Africa. She will present material on the Desmodieae (Leguminosae-Papilionoideae) at the International Legume Conference to be held in Kew, England, subsequently to be issued as part of the Proceedings of the Conference. Several weeks were spent in consultation with Dr. Rogers McVaugh in a joint effort on the genera *Desmodium* and *Dioscorea* (Dioscoreaceae) for his Flora of Nueva Galicia, Mexico.

Dr. Spongberg continues his work toward a manual of cultivated trees and shrubs with a series of family treatments being published separately. Ms. Robin Lefberg has prepared many of the illustrations for this new manual under Dr. Spongberg's direction. Grants from the Stanley Smith Horticultural Trust and the Charles E. Merrill Trust have aided the production of illustrations. Dr. Spongberg's treatment of the Crassulaceae for the Generic Flora of the Southeastern United States is in press.

Dr. Peter Stevens is nearing the completion of his large monograph of the genus *Calophyllum* (Guttiferae), and continues his general studies of the flora of Papua New Guinea.

Dr. Carroll Wood, in spite of a heavy teaching schedule, edited manuscript for the Generic Flora of the Southeastern United States, which is published as available in the *Journal of the Arnold Arboretum*. The success of the publication of plates, initially prepared for the Generic Flora, as *A Student's Atlas of Flowering Plants*, called for an expanded new edition covering more genera and families. Dr. Wood supervised the artistic work of Ms. Karen S. Velmure in the prepara-
tion of thirty plates of plants heretofore poorly or inadequately illustrated. Three students have been preparing doctoral dissertations under his direction. Mr. Walter Judd completed his thesis, properly entitled "A Monograph of Lyonia (Ericaceae)," and has accepted a position as assistant professor in the Department of Biology at the University of Florida. Mr. Christopher Campbell has under way a biosystematic study of the *Andropogon virginicus* complex in southeastern United States. A National Science Foundation student thesis grant to Dr. Wood has supported two seasons of field work, and Mr. Campbell presented his findings to the present at the meetings of the Botanical Society of America. Mr. Michael Donoghue is working on the genus *Viburnum* in Central America, where a concentration of species in Chiapas, Mexico, and in Guatemala required field study. Grants from the Atkins and Anderson funds have supported this field work.

**Library**

The approved plans for the addition to the Harvard University Herbaria building do include changes in the library, and the staff was involved in discussions with the building committee throughout the year. The reading area of the library will be increased by approximately 312 square feet. A new workroom, measuring about 504 square feet, will be available for supporting staff. To the rear of the library, and separated by a wire grille, is a section of the herbarium. This area will be added to the stack area of the library and represents a gain of 920 square feet. The herbarium will be moved into the new addition. A passageway from the rear elevator to the new addition will be a wide corridor with eighty linear feet available for lockable files and cabinets to be used for the storage of archival material. The photocopy machine currently on the first floor will be moved to a position outside the library reading room for greater convenience of the principal users.

An item for retrospective cataloguing, included in the National Science Foundation curatorial grant which ended during the fiscal year, was not renewed, and cataloguing activity in the library has been reduced significantly.

The lack of a second trained cataloguer on the staff of the combined libraries of the Arnold Arboretum and the Gray Herbarium is handicapping the routing to the shelves of new acquisitions and the treatment of uncatalogued materials. This process can be eased with (1) additional personnel; (2) the adoption of the Library of Congress classification, using such printed cards or those of CIP (cataloguing in publication); or (3) shelving new acquisitions in the Library of Congress system and recataloguing the remainder of the collection as time and funding permit. The conversion from the present in-house system of classification, developed and maintained for over one hundred years, would be a major effort, and would re-
quire funding by special grants sought for the purpose, as well as collaboration with closely associated botanical libraries in the community.

A new federal copyright law went into effect January 1, 1978, and requires good records of materials photocopied for research, class use, or interlibrary loan requests. The staff has been instructed on the provisions of this law, and its effects on library practices will be assessed at the end of the year.

During the year the librarian attended the annual meeting of the Council on Botanical and Horticultural Libraries, held in Denver, Colorado. Library assistants have attended workshops on MCSS and CONSER procedures.

The libraries were aided in collection maintenance by the current curatorial grant, and 133 volumes were treated by deacidification of paper, rebinding, and repair of volumes. Two volunteers continued work in Jamaica Plain on refurbishing leather-bound volumes. To keep staff, students, and faculty informed of new accessions, title pages and content pages for books received each week have been photocopied and displayed in the reading room, with the designation "Received This Week."

With the addition of 471 volumes and pamphlets, the Arnold Arboretum Library contained 86,300 items at the end of the fiscal year. The use of the library in Cambridge, where records are kept of books shelved each day, increased by 5% during the year. No such records are kept in Jamaica Plain, and in neither library is a record kept of the volumes reshelved by the scientific staff after their use. Requests for interlibrary loans or photocopies decreased during the year, but the actual number of requests filled was more than double that of the previous year. In part this is associated with the special work and service involved in assisting the visitors preparing Taxonomic Literature II and Bibliographia Huntiana.
Volunteers

Some institutions call them aides, helpers, guides, or docents, but with appreciation we recognize as volunteers the willing people who donate their time, effort, and talents to the activities of the Arnold Arboretum. The use of volunteer help has continued to grow in the number of people participating, in the scope of their services, and in the total number of hours they have contributed. Nearly every activity of the Arnold Arboretum staff receives and benefits from their versatile assistance, and only through their efforts is the Arboretum staff able to conduct the programs scheduled. Some like to be out-of-doors and help with inventories of nurseries, mapping, or labeling of plants on the grounds, or the collection of seeds. Some like to talk and serve as guides for tours of the grounds, supervise visitors to the greenhouses, or teach special courses for the Friends. Some are artistic and supply educational displays, aid in special classes, or help in the preparation of flower show displays. We value the help received in the herbarium, the library, the greenhouses, and the grounds; on special projects, and on routine duties; in preparing book reviews, or in the contribution of articles for Arnoldia based on individual research initiative. One volunteer during the year visited a famous European botanical garden with a letter of introduction from the Arnold Arboretum and the request for permission to prepare herbarium specimens from plants on the grounds. The request was granted with the provision that a second set of specimens be prepared for the local herbarium. Institutions on both sides of the Atlantic gained from the efforts of this volunteer. The volunteers are indeed an asset to the Arboretum, and have our sincere thanks for their help.

Education

The educational contributions of the Arboretum staff are both formal and informal. Staff members with academic appointments have offered formal courses in the University in the Department of Biology (Biology 18, 103, 148), the Harvard Summer School (Biology
S-105), and the Harvard Extension Division (Biology E-146C). Many have students in graduate and undergraduate research courses or supervise advanced degree programs. Some serve on departmental committees as undergraduate advisors, or, at the graduate level, on thesis development or for qualifying examinations. Staff members have participated in courses offered primarily by other biologists as guest lecturers on topics of their specialty in the Department of Biology and the Graduate School of Design's Department of Landscape Architecture. Seminar series, both formal and informal, are many within the University, and members of the Arboretum staff have organized the series or offered lectures.

Less formal courses, lecture series, individual lectures, and demonstrations have been offered in Jamaica Plain and Weston. Through a cooperative agreement, the staff accepted three students as “interns” for special training in horticulture, with the students receiving academic credit through their own colleges. Two of these students undertook projects that will lead to publications, and required use of the herbarium, library, and living collections. A series of noon-hour lectures were offered biweekly in Jamaica Plain, and an invitation was extended to residents of Jamaica Plain through a listing in the local paper. When one notice was included in a calendar of events in a Boston paper, the audience filled the auditorium in the administration building. When Harvard University began a cable TV series within the University, the Arboretum staff was asked to participate on a regular basis, and did so with live and taped segments involving the living collections and the greenhouses. Staff members appeared as guests on TV programs of three stations, and on two radio talk shows where questions were answered on the air.

A questionnaire was sent to eastern regional libraries regarding
their use of traveling exhibits. The response was more than favorable, and staff, with the aid of volunteers, prepared portable exhibit material to be displayed in cases or used as wall exhibits, which are now being seen in suburban libraries. Four exhibits were staged in the lecture room of the administration building. The exhibit on the plants mentioned in the writings of William Shakespeare was opened with a festive reception and a lecture by volunteer Mrs. Richard Warren, who was responsible for organizing the exhibit. Volunteers Mrs. Warren and Mrs. Frank Magullion cooperated in a holiday exhibit of dried and preserved plant materials. Water colors of botanical subjects by the late Edith Farrington Johnston were loaned to the Arboretum for an exhibit of native and tropical wild flowers. The fourth exhibit, during the spring flowering season, was assembled by staff members and described the nature and use of the herbarium. The Arboretum had an exhibit of Plants for Holiday Use at the winter show of the Massachusetts Horticultural Society; and in the spring show, a demonstration of wall and garden landscaping techniques. Both shows were staffed with the aid of volunteers to answer specific questions and to encourage support of the Arnold Arboretum through membership in our Friends organization.

Open house was held in Jamaica Plain and in Weston during the spring season, and many tours were conducted. A special workshop in the cataloguing of Kodachrome slides was held in the administration building, a bonsai workshop in the greenhouses, and a daylily workshop in Weston, to mention only a few of the special events.

An educational film entitled “Plant Propagation: From Seed to Tissue Culture,” was completed by Mr. Peter Chvany for the Arnold Arboretum. We are indebted to the Massachusetts Society for Promoting Agriculture, and to special Friends of the Arnold Arboretum, for the grant and gifts that supported the production of this film. The film was accepted by Macmillan Films, Inc., for duplication and distribution, for which the Arnold Arboretum will receive royalties. The film has been entered in competitions, and in the first entry won the Golden Eagle Award from the Council on International Nontheatrical Events. The second film of the three produced by Mr. Chvany, “Poisonous Plants,” won the bronze Chris Award in the Medical Service Category at the Columbus, Ohio, film festival. The original film on the Arnold Arboretum, produced for the Centennial Celebration in 1972, continues to draw approval from audiences as an explanation of the role of an arboretum. The film was shown twelve times during Dr. Howard’s visit to the People’s Republic of China, where the audiences were particularly interested in the specimens of native Chinese plants, such as *Cornus kousa*, *Davidia involucrata*, *Kolkwitzia amabilis*, and *Metasequoia glyptostroboides*, shown under cultivation. The herbarium storage and the mounting techniques were new to the Chinese audience, and the use of maps and labels was the subject of comments.
E. H. Wilson, when collecting for the Arnold Arboretum in China, took many photographs of plants, people, and places. An issue of *Arnoldia*, written in 1976 by Mr. Chvany, was a consideration of Wilson as a photographer, and had reproductions of a few of Wilson's photographs made from the glass negatives in the files of the Arnold Arboretum. In 1978 the Philadelphia Museum of Art was given permission to include several photographs in an exhibit entitled "Photography of China from 1850." The exhibit was also written up and the photographs were reproduced in the *New York Times Magazine*. Interest still remains in using the Wilson photographs in a general historical account of his travels or in a book on China. Many of the photographs of individual plants are of lasting interest, since they represent plants from which Wilson collected seed, or the type tree when the plants proved new to science. Copies of these photographs remain of scientific value, and sources of funds for another reproduction and distribution are being investigated.

**Travel and Exploration**

Arboretum staff members gain professionally in representing the institution at science and professional society meetings, both in the United States and abroad. Meetings provide an opportunity to visit a different area, to present papers, share experiences and gain information, take photographs for teaching or for use in publications, study collections, or collect specimens for personal research or for the Arnold Arboretum herbaria. Staff members may travel to fill requests for lectures to horticultural groups or university audiences. A period of distant travel may be part of a regular course, or the course itself may be conducted in a distant location. Special field work may be necessary for the development of research programs or for the benefit of the Arnold Arboretum collections. Travel by the staff is supported to a modest degree, through two special endowment travel funds, from the general unrestricted Arboretum budget, or from special grants for the purpose. Staff travel during the year, outside of Massachusetts, impressive in toto, met these characterizations.

Mr. John Alexander participated in a seminar on the storage of woody plants at the International Plant Propagators’ Society meetings in Columbus, Ohio, and attended the annual meeting of the Lilac Society at the Tyler Arboretum in Media, Pennsylvania.

Mrs. Ida Burch attended the annual meeting of the American Association of Botanical Gardens and Arboreta in Hamilton, Ontario, Canada.

Mrs. Lenore Dickinson took part in the Denver, Colorado, meeting of the Council of Botanical and Horticultural Libraries.

Dr. Howard attended the annual meeting of the American Horticultural Society in Pasadena, California. He completed two field trips collecting plants for his Flora of the Lesser Antilles. The islands of Puerto Rico, St. Thomas, St. Croix, St. Martin, Saba, St. Eustatius,
St. Kitts, Antigua, Barbuda, Guadeloupe, Les Saintes, La Désirade and Martinique were visited briefly in a search for specimens of cacti, aroids, agaves, and gingers, poorly represented in herbaria. In May Dr. Howard traveled to Hongkong en route to a twenty-eight-day tour of botanical institutions in eight cities in the People’s Republic of China.

Dr. Hu presented a paper at a special meeting in Switzerland on the medicinal uses of ginseng, and later at another in Hongkong before visiting the People’s Republic of China on an invitation from Academia Sinica.

Mr. Koller took part in horticultural meetings at the Morris Arboretum and the Swarthmore Horticultural Foundation in Pennsylvania, and attended the annual meeting of the AABGA in Hamilton, Ontario.

Ms. Donna Lynch also attended the annual AABGA meeting.

Dr. Miller conducted field work in northern Vermont; attended the AIBS meetings in East Lansing, Michigan, and the Botanical Society of America meetings in Blacksburg, Virginia. After each he participated in field forays associated with the meetings. He contributed a paper at the AAAS meetings, Pacific Division, held in Seattle, Washington, and stopped in San Francisco and St. Louis on the return trip for a study of the use of compactors in herbaria.

Mr. Pride participated in the annual meetings of the Hemerocallis Society in New Haven, Connecticut, and of the Gesneriad Society in New York.

Miss Margo Reynolds and Mr. Shaw attended the regional meeting of the AABGA held at the Brooklyn Botanic Garden.

Dr. Spongberg, along with Dr. Weaver, collected for the Arnold Arboretum in Japan and Korea in the fall. He later participated in the AABGA meetings in Hamilton, Ontario.

Dr. Stevens taught a course in Tropical Botany at the Fairchild Tropical Gardens in Miami in the summer of 1977, and again in 1978.

Dr. Weaver collected with Dr. Spongberg in Japan and Korea, and later reported on their trip at the regional meeting of the AABGA at the Brooklyn Botanic Garden.

Dr. Wood also taught in the summer school tropical botany course in Miami in 1977, and had the opportunity of preserving materials needed for his work on the Generic Flora of the Southeastern United States.

Gifts and Grants

The Arnold Arboretum derives its operational income primarily from the interest on invested gifts or bequests of past years. The income may be unrestricted and for general purposes, or restricted for specific uses or projects. We are fortunate to have the gifts from the Friends of the Arnold Arboretum, which are solicited by annual request for additional support. Occasional gifts are for specific purposes, but most are unrestricted and for immediate use. Memorial gifts are gratefully received and acknowledged. Gifts of materials
plants, books, or specimens are welcomed. Staff members also apply for grants in support of their own research or travel. Gift income is difficult to budget accurately, but amounts in excess of budget provision are held in special accounts to be used in subsequent years.

Two donors who wish to be anonymous gave gifts for capitalization during the year for the care of the collections of the Arnold Arboretum. A grant from The Stanley Smith Horticultural Trust, still in effect, supplies artistic aid to the research of Dr. Spongberg. A similar grant from the Charles E. Merrill Trust has been used to prepare for publication the manuscript of Dr. Perry, and for work on the manual of cultivated trees and shrubs.

Dr. Howard received a grant from the American Philosophical Society for support of field work completed during the year in the Lesser Antilles. Dr. Miller received a grant from the Milton Fund of Harvard University for investigations of fossil deposits in the upper Connecticut River valley. Dr. Schubert received a grant from the Tozier Fund for the purchase of projectors for the herbaria.

Publications

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 Journal of the Arnold Arboretum* is edited and managed by Ms. Elizabeth Schmidt under the direction of Dr. Schubert, who serves with Drs. Spongberg, Stevens and Wood on the editorial committee. These and other staff members assist in the review of manuscripts. The four issues of the *Journal* published during the year comprised 468 pages, with twenty-two articles by twenty-six authors. A new cover illustration for the 1978 volume, representing leguminous fruits growing in the Arnold Arboretum, was prepared by Ms. Velmure, and takes note of the International Legume Conference being held at Kew during the summer. The price of the *Journal* was raised to $25 per volume without noticeable effect on the regular distribution list of 715 copies. Kraus Reprint Company in New York, which handles orders for back numbers, has indicated that volumes 1-55 (through 1974) are available in original or reprint copies. Subsequent volumes are not complete but will be reprinted in the future.

The six annual issues of *Arnoldia* are edited by Mrs. Jeanne Wadleigh with assistance from Miss Reynolds. Numbers issued during the year comprised 251 pages, with a total of twenty-three articles by twenty-five authors. The book reviews were written by ten members of the staff and volunteers. The special issue of *Arnoldia* on Poisonous Plants is nearly depleted. A small interim reprinting is planned pending a review and revision of the contents. The reprint which sold for $1.00 has proved to be useful as a home reference, and the multiple copies that were purchased by several organizations for distribution have exhausted the supply.

Richard A. Howard
Bibliography of Published Writings of the Staff and Associates July 1, 1977 — June 30, 1978


Photo: E. Gray.


Row 2: R. Howard, W. Kittredge, M. Canoso, C. Wood, J. Alexander, R. Weaver,


Absent: H. Fleming, P. Stevens, N. Miller. 

Photo: P. Chvany.
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  
James Alvah Burrows, B.S., Assistant Plant Propagator  
Michael Anthony Canoso, M.S., Manager of the Systematic Collections *  
Constance Tortorici Derderian, A.B., Honorary Curator of the Bonsai Collection  
Lenore Mikalauskas Dickinson, M.S., Librarian *  
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., Senior Curatorial Assistant *  
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 (Retired June 30, 1978)  
Margo Wittland Reynolds, B.A., Staff Assistant  
Elizabeth Belding Schmidt, M.A., Assistant Editor of the Journal of the Arnold Arboretum  
Bernice Giduz Schubert, Ph.D., Curator and Senior Lecturer on Biology  
Kenneth Dwight Shaw, B.S., Assistant Supervisor of the Living Collections (Resigned June 30, 1978)  
Stephen Alan Spongberg, Ph.D., Horticultural Taxonomist  
Peter Francis Stevens, Ph.D., Assistant Curator and Assistant Professor of Biology  
Karen Stoutsenberger Velmure, B.A., Botanical Illustrator  
Jeanne Stockbarger Wadleigh, B.S., Editor of Arnoldia  
Richard Edwin Weaver, Jr., Ph.D., Horticultural Taxonomist  
Robert Gerow Williams, B.S., Superintendent  
Carroll Emory Wood, Jr., Ph.D., Curator and Professor of Biology  

* Appointed jointly with the Gray Herbarium  

Arboretum service area and Dana Greenhouses. Photos: E. Gray.