



Annual Report 1956-1957

TO THE PROVOST OF THE UNIVERSITY:

SIR,

The following is the annual report of the Arnold Arboretum for the fiscal year ending June 30, 1957.

This year marks the eighty-fifth anniversary of the establishment of the Arnold Arboretum. To commemorate this event, special exhibits and open houses have focused attention on the outstanding living collections of trees and shrubs in the Arboretum's plantings both in Jamaica Plain and Weston, as well as the research collections in Jamaica Plain and Cambridge, which have been built up over the years, while news stories, magazine articles and other types of publicity have dealt with the contributions of the staff members of this organization since its founding in 1872.

From its inception, the Arnold Arboretum has played an important role in the introduction of plants new to American gardens from distant parts of the globe. In order to single out some of the plants which members of the Arboretum staff have introduced into cultivation in America, Mr. Heman Howard, the assistant horticulturist, prepared special yellow labels to be attached to the proper plants. A survey of the records was made to locate those plants or their descendants which were introduced into horticulture for the first time at Jamaica Plain and about 1,800 yellow tags were required to label those plants in immediate view from the roads and paths. Such plants proved of immense interest to the many visitors of the past season. They noticed that some of the most common and the most sought-after varieties were first introduced into American gardens by the Arnold Arboretum.

THE STAFF

At the fiftieth anniversary banquet of the Botanical Society of America the president of the Society presented Certificates of Merit to fifty distinguished botanists for their contributions to their fields. Two staff members of the Arnold Arboretum, Irving Widmer Bailey and [Karl Sax](#), were among those so honored. Their citations were: "Irving Widmer Bailey, Plant anatomist and inspiring teacher, for his outstanding contributions on the structure of the cell wall and the histology of the cambium, and for his application of anatomy and morphology to problems of evolution of angiosperms." "Karl Sax, for his classical studies on the chromosomes of wheat, his

continued interest in the chromosomes of ornamental woody plants and his extensive contributions about the effect of irradiation on chromosome breakage and chromosome structure."

The presentation was made at the University of Connecticut during the annual meeting of the American Institute of Biological Sciences. Two staff members, Drs. Sax and Howard, were invited to serve as American Institute of Biological Sciences lecturers to stimulate interest in a biological career among students in smaller liberal arts colleges. Dr. Sax was able to visit the College of Wooster in Ohio and Dickinson College at Carlisle, Pennsylvania, for this program during the year. This program places outstanding scientists, teachers and lecturers on the campus of the college for several days. The speaker has the opportunity of meeting with students, staff and the public formally in lectures and informally about the campus and in the dining halls. The association has proved to be stimulating and the program is being continued. The demand for Arboretum staff members as speakers exceeds our abilities to fill all requests.

During the year staff members attended conferences or gave lectures in seventeen states and in Canada. Dr. Sax took part in symposia on "Biological Effects of Ionizing Radiation" at Storrs, Connecticut, on "Population" at the University of Minnesota, on the hazards of ionizing radiation at the Canadian Atomic Energy Commissions meetings at Chalk River, Canada, and on Forest Tree Physiology at the Harvard Forest. Dr. Howard talked to many garden clubs and other groups on the Arnold Arboretum, emergency survival problems, his research in plant taxonomy and on the vegetation of the West Indies. On one trip he met with garden clubs, botany departments of local universities and Harvard Clubs in Tennessee, Georgia, Louisiana and Texas.

[Dr. Wyman](#) attended horticultural meetings in Delaware and Michigan and spoke at the Williamsburg symposium and at the Longwood Gardens. Mr. Coggeshall represented the Arboretum at the Propagators Convention in Cleveland and nearly all of the staff attended meetings of the American Institute of Biological Sciences at Storrs, Connecticut.

One annual appointment was made to the staff for work on the Flora of the Southeastern States and three for work on the herbarium integration and general curatorial duties. Dr. Charles W. James joined our staff after an appointment at the University of Tennessee and Dr. Frances M. Jarrett came to the Arboretum at the completion of her graduate work at Cambridge University, Cambridge, England. Dr. Jarrett is a specialist in the flora of the Pacific Islands and Asia. Mrs. Jeanne Claude Webber, who has been working on the flora of Europe at the Botanical Garden in Geneva, Switzerland, will assist in the herbarium integration. Dr. Howard L. Rock completed his graduate work at Duke University and, having specialized in the Compositae, will assist in the integration of that large family of flowering plants.

HORTICULTURE

One of the functions of the Arnold Arboretum is the growing of all plants hardy in the vicinity of West Roxbury. The ultimate success of the trees and shrubs planted in Jamaica Plain seems to

be controlled by the weather. In past years hurricanes, summer heat or flooding, late frosts, ice storms or other vagaries of the climate have had their effect on the growth of the plants in our collection. This past winter was marked by a period of unusually cold weather. A four-night period of sub-zero weather climaxed by a low temperature of twelve degrees below zero was recorded at the greenhouses on January fifteenth and lower temperatures were probably experienced elsewhere on the grounds. At Weston the temperature dropped to thirty degrees below zero on the same day. Many of the plants considered marginally hardy were killed outright, killed to the ground or severely injured during this cold weather. These have been listed and the injuries discussed in two issues of *Arnoldia* during recent months.

The spring flowering was also affected by the cold weather, for flower-buds formed last summer apparently failed to receive adequate protection during the low temperatures. The effect of snow line or other forms of fortuitous or deliberate protection was evident in the flowering of many genera and species.

[The Park Department of the City of Boston](#), through the cooperation of Commissioner Frank Kelley and his assistants, Mr. O'Keefe and Mr. Byrne, continued its work of rehabilitation on the grounds of the Arboretum. During the year sections of the roads and sidewalks were patched, benches painted and repaired and, with the assistance of the Arboretum staff, all of the cobblestone gutters except those in the Peter's Hill tract have now been dug out and cleaned. The appearance of the paths and roads has been materially improved by this work.

The Arboretum staff has under way considerable work on the collections and the grounds which add to the appearance of the Arnold Arboretum plants and plantings. Twenty-five large truckloads of well-screened and composted leaf mould were distributed around the shrubs. The supply of spent hops which we have used as a mulch for a number of years was terminated and we have started to use ground cocoa shells on an experimental basis. Early reports of this material as a mulch have been published in *Arnoldia*. A section of native woodland adjacent to our collection of dwarf conifers was cleared during the winter and work has begun to transplant some of the smaller plants in this collection. We hope to expand the collection nearer to the road, thus giving individual plants more room and displaying them to greater establish a naturalized display a few years hence. Some of the collection bloomed well this spring. We have started a new planting of Rhododendron species in a cleared area on the steep slopes of Hemlock Hill near the Rhododendron collection. If the present test planting of forty specimens thrives, as we expect, additional areas will be cleared and developed into a new and attractive display area for the Arboretum.

Planting in the Jamaica Plain collections has been difficult due to the continued dry weather of late spring and early summer. In all, three hundred specimens of twenty-two species and varieties of evergreens and one hundred thirty-five deciduous species have been added to our collections during the fall and spring planting. These are either new plants or replacements for defective specimens. All have required continuous watering and care. We have introduced approximately one hundred seventy-five species and varieties from foreign

countries during the year. These plants are apparently not available from commercial sources or other gardens in this country. After they have been tested and observed at Weston, they will be planted in Jamaica Plain.

Requests for plant materials from the living collections of the Arboretum included pollen for breeding programs and reference collections, samples of leaves and stems for chemical analysis, soil samples from roots of specific trees for chemical and antibiotic tests, herbarium specimens and propagating material.

During the past fiscal year two hundred forty-nine shipments of propagating materials were sent out, representing eight hundred sixty species and varieties. The majority of these went to arboreta and botanic gardens within the United States and Canada. However, requests were filled which were received from twelve countries in Europe, Asia, Africa and Australia. Only thirty-seven shipments of one hundred fifty-two species and varieties were of seeds. This indicates the increasing demand for material for vegetative propagation in the horticultural interest.

During the past year the Arnold Arboretum received one hundred ninety-one shipments representing six hundred ninety species advantage. Over twenty varieties of narcissus and daffodils have been planted along Bussey Brook near the rhododendron collection to and varieties as seeds, propagating material or plants. These were included in the 1,002 species and varieties handled by the propagation department during the year. Not all of the seeds proved viable, nor did all of the propagating material for rooting, budding or grafting prove useful. The development of proper techniques in propagating and handling the rare and unusual plants in the living collections is important to the extended acceptance and use of these plants. Many of the most interesting plants introduced by the Arboretum have never had wide use because of difficulties in propagating or transplanting the species. Much of the experimental work in the greenhouses by the propagator and other staff members concerns various aspects of this basic problem.

Some of the work which has been done in the last year concerned species of *Abies*, *Acer*, *Davidia*, *Fagus*, *Picea*, *Pinus*, *Stewartia* and *Tilia* and varieties of *Syringa vulgaris*. Experimental work was tried to overcome the double dormancy of seeds of *Davidia involucrata* by exposing the seeds to warm temperatures followed by cold temperatures prior to planting. Selected varieties of *Syringa vulgaris* were tested to compare the effect of different hormone concentrations on rooting and the resulting rates of growth between these rooted cuttings and grafted plants. Attempts were also made to graft varieties of *Syringa vulgaris* in the fall, storing such grafts through the winter to obtain more rapid growth during the following spring. Additional experimental work was done on the propagation of Asiatic maples.

Various species of *Tilia* were propagated from soft wood cuttings taken in August. Good rooting was obtained, but unexplained difficulty was encountered in overwintering such rooted

plants. Previously the same difficulty was experienced when *Stewartia* cuttings taken in August were rooted. Experiments are currently under way in an effort to solve this problem.

THE CASE ESTATES

Shortly after the Arboretum was given the property known as the Case Estates in Weston, the town felt the need for additional land for new school buildings. In 1946 a tract of forty-two acres was sold to the town of Weston from the Case Estates for a modest sum. As the town has grown, however, the need for additional school buildings and adjacent playground space has increased.

During the past year a study committee, termed the School Site Committee, returned a recommendation that the future growth of the school population be met by a decentralized school building program. The committee's report contained the negative vote of a single member and this report was supported by the selectmen and other town officials. Nevertheless, at a town meeting held in the fall the committee's report was not accepted and the town meeting voted to take by eminent domain the Case Estates land north and west of a Soo-foot line parallel to Wellesley Street. Although the town officials have taken no further action during the past fiscal year, a School Building Committee and a firm of surveyors have given consideration to building three additional schools on land to be taken from the Case Estates. Such action could involve seventy or more acres of the one hundred forty-five acres now in the Case Estates, leaving less than half of the land originally given to the Arboretum for horticultural purposes in Weston.

Much time has been spent with appraisers and surveyors during the past year and considerable staff planning has been necessary to determine what plants can be moved and what others should be propagated if the land-taking proceedings are carried out. The horticultural plantings at Weston, such as the ground cover demonstration plots, the small tree demonstration area and the shrub and perennial gardens are being visited by an ever-increasing number of people.

Garden clubs have requested special trips and tours of these plots and plantings. A new pruning demonstration tract has been established this year and will show results next spring. Comparison tests on the use of cocoa shell as a mulch are also being conducted at Weston. Repairs were completed on the Chandler house which was turned over to the Arboretum last year and which is now occupied by the Director.

EDUCATION PROGRAM

During the third year of the informal education program for adults conducted at the Arnold Arboretum, the spring and fall field trips with Dr. Wyman and the propagation classes with Mr. Coggeshall were continued and were well attended.

Again this year the applications for the classes in plant propagation exceeded the physical limits of the greenhouse and some people had to be disappointed. Dr. Wood offered a

class in identification of cultivated plants and Dr. Howard taught two new classes in economic botany entitled, "Botany in Boston I and II."

During the spring the staff combined to present a series of seminars on cultivated plants which were open to the public as one of the regularly scheduled classes. At each seminar Dr. Howard discussed the history and botanical classification of the group, Dr. Wyman the horticultural utilization and values, Dr. Sax the genetics and breeding programs, Mr. Williams the diseases and maintenance and Mr. Coggeshall the methods of propagation. Each seminar was scheduled to be held when the plant group under discussion was in flower on the grounds. The class members showed keen interest in this concentrated presentation of information regarding restricted groups of ornamental plants.

During the three years of the education program which has been conducted at the Arboretum, four hundred eighty-eight people have attended one or more courses. All staff members were needed to assist when the Arboretum cooperated with the Massachusetts Horticultural Society in presenting their annual Field Day in Jamaica Plain. Eight buses were chartered for the two-hour trip around the grounds and the overflow was guided in their own cars. A staff member served as guide in each bus and attempted to answer the many questions which were asked. In addition to this regularly scheduled event, many garden clubs now schedule regular meetings at the Arboretum where staff members conduct the groups through the grounds. Special tours have been arranged for children's groups, older people and the handicapped.

EXHIBITS AND DISPLAYS

The Arboretum display at the Massachusetts Horticultural Society's Spring Flower Show held in Mechanics Building emphasized the eighty-fifth anniversary of the Arnold Arboretum by featuring a planting of ornamental trees and shrubs introduced by the Arboretum staff. The exhibit received a first prize from the Massachusetts Horticultural Society and was awarded the gold medal of the Pennsylvania Horticultural Society for "an exhibit of special merit which stimulates an interest in horticulture."

We were very much pleased to receive the latter, as it is one of the two top awards offered at this show. A Christmas show was held at the Administration Building in Jamaica Plain and featured the plant materials used in Christmas decorations, such as tree ornaments, wreath-making materials and broad-leafed evergreens used in floral arrangements.

A selection of fifteen plants from the [Larz Anderson Collection of Japanese Dwarf Plants](#), the bonzai trees, were sent to Detroit for display in the March Spring Flower Show in that city. Open houses were held on May 12 at the Case Estates in Weston, on May 19 at Jamaica Plain and on June 10 in Cambridge. Staff members, identified by badges, were on the grounds and in the buildings at each location to answer questions or explain work in progress.

LIBRARY

The librarian, Mrs. Lazella Schwarten and her staff continued the work on the integration of the libraries and the reconditioning of books in addition to the regular service of an active library. During the year the integration of the periodicals was completed and continued on the other volumes, so that the total task is now about half finished. Additional stacks were constructed for volumes dealing with the horticultural subjects in Jamaica Plain and a further reorganization is under way on the latter collection.

During the year 229 bound volumes were added to the library, bringing the total of bound volumes to 49,738. Two hundred and fifty pamphlets were received and added to the collection which now contains 16,218 items. Among the various catalogues maintained, 580 cards were added to the general card file, 4,000 to the Gray Herbarium Index and 2,250 to the Index to American Botanical Literature.

The requests for interlibrary loans from outside organizations continues to mount and of necessity certain procedures have been incorporated into our operations. Except in very special cases, books over one hundred years old or those currently available on the commercial market are not sent on loan. Even within these limits, the librarian may restrict the privilege of a loan depending on the condition, value and local need for the book. Wherever possible, we suggest microfilm, photocopy or a typed description of the material needed as substitute for a loan. Nevertheless, ninety-five books were sent out during the year on inter library loan. The use of the library by staff and students increased measurably during the year as work in other parts of the Arboretum increased.

HERBARIUM

The work concerned with the integration of the two major collections housed in the Harvard University Herbarium in Cambridge involved most of the efforts of the herbarium staff again this year. The plans for progress in this essential task have been discussed in previous reports. During the past year it was possible to appoint additional taxonomists to the staff to assist with this work. Special funds were made available by the Harvard Corporation for this project. Such funds have been used to employ full-time workers as well as some part-time help.

During the year the operation of placing in sequence all genera of the various families in the collections was completed. At this time the family sequence is complete and all of the genera are in proper order. Actual integration at the specific level has progressed so that one hundred sixty families, or about one-half of the herbarium, is in final arrangement. During the course of this work, which is under the direction of Dr. Kobuski, annotations are made according to the latest monographs available, geographical arrangements are coordinated, repairs to specimens are made where possible and types and other authentic specimens are indicated and placed in special folders. The completed portions of the herbarium stand as a model for future work. The fruit and seed collections received special care during the year and

this collection is now uniformly boxed, adequately spaced and completely rearranged. The sequence used follows that of the herbarium.

Curatorial work on the herbarium of cultivated plants at Jamaica Plain was limited, but the task of checking the coverage continued. Additional collections of cultivated plants from the United States and Europe were inserted.

During the past year 6,874 specimens were mounted and inserted in the herbarium, bringing the total accession count to 694,681 specimens in the Arnold Arboretum. The herbarium received 17,157 specimens during the year. About 10,900 of these were in exchange, 5,900 were from collectors subsidized by the Arboretum and the remainder as gifts or for identification. The largest number of these came again this year from Malaysia. Of the total, 5,400 represented the floras of the New World, 1,900 the flora of Europe and the remainder those of Asia, Africa and Australia.

The largest and most important Asiatic collections were received from Canberra, Australia; the Rijksherbarium, Leiden, the Netherlands; the Royal Botanic Garden at Kew, England; and the Herbarium Bogoriense in Indonesia. The materials received by subsidy were largely photographs of type specimens in European herbaria made by the New York Botanical Garden.

During the year the Arnold Arboretum sent out 878 specimens to American institutions and 665 to foreign institutions in a regular continuation of exchange. In addition, a special shipment of 2,613 specimens were sent to the Forestry Department at Lae, New Guinea, representing a complete set of the plants collected by [L. J. Brass](#) on the [Fourth Archbold Expedition](#). Three hundred and eighty-six specimens of this same collection were sent to specialists for identification. Again the facilities of the herbarium were made available to many visitors and additional materials were sent on loan or services rendered in response to requests by mail or phone.

During the year 10,421 herbarium specimens were sent out from the combined herbaria on loan to qualified scholars. These represented seventy-eight separate loans to forty-five different institutions and averaged over one hundred thirty specimens per loan. Fifty of the loans were to twenty-eight American institutions, while twenty-eight loans went to seventeen different foreign herbaria. The size of these loans is indicative of the wealth of material in the Harvard herbaria and the need for these same materials for comprehensive research programs. In addition to these requests, the staff, where possible, answered questions concerning identifications, distributions or technical problems which could be handled more reasonably by our staff than by the shipment of specimens. Most of the research interests of the staff mentioned in the previous annual report continue at present.

COMPARATIVE MORPHOLOGY

Professor I. W. Bailey, Professor of Plant Anatomy, emeritus, has continued to serve as curator of the wood and pollen slide collections. Professor Bailey's services materially assist the herbarium staff and assure the maintenance of the collections in good condition. A small number of accessions of wood samples and slides were added to the collection during the year and the requests for specimens from these collections continued at a normal rate. Professor Bailey completed several papers on wood anatomy and the use of anatomical characters in other aspects of botanical study. His recent interests have turned to the anatomical structure of the stem in the Cactaceae.

CYTOGENETICS

[Dr. Karl Sax](#), his assistants and students have reported the following contributions in the field of cytogenetics: The cytogenetic work with *Malus sargentii* continues and now shows that this species is facultatively apomictic and that the species is tetraploid. *Malus sargentii* var. *rosea*, however, is triploid. When the species is crossed with diploids the sexual progeny are usually triploids. When the variety is crossed with diploids the progeny range from near diploid to approximately tetraploid. In most of the crosses made, facultative apomixis is inherited as a dominant trait.

New hybrids of *Malus*, *Forsythia* and *Magnolia* species are being propagated for further testing. Induced polyploidy and the induction of mutations by ionizing radiation continue to be used in an attempt to create new ornamental plants. The work on dwarfing techniques for fruit and ornamental trees and shrubs now shows that knots tied in the stems of apple seedlings curtail growth but do not cause earlier flowering, as they do in the case of vegetatively propagated varieties. Further experiments with bark inversions have shown that freshly exposed wood following bark removal can be induced to form new bark by covering the exposed surface with either polyethylene film or with a non-toxic grease such as lanolin. These techniques should be of value in treating injured trees.

INSTRUCTION

Three staff members offered four regularly scheduled classes within the college and the graduate schools during the year. Dr. Johnston taught his course in the "Phylogeny and Classification of the Flowering Plants" and Dr. Sax gave "Plant Cytology with special reference to Genetics and Taxonomy." Dr. Howard offered two new courses. "Plant Materials" was offered as Landscape Architecture 7-1a in the fall semester and was taught at the Arboretum.

During the spring semester a second course, "Principles and Problems of Horticultural Taxonomy," open to undergraduates in the college, was offered through the Department of Biology. The latter course included lectures in Cambridge as well as field and laboratory work on the grounds of the Arboretum in Jamaica Plain as the spring season progressed. Dr. Howard and Dr. Sax continued to supervise the work of graduate students. Regularly scheduled

seminars on problems of plant taxonomy and plant geography were held in the Harvard University Herbarium during the year. Arboretum staff members took part in these programs open to undergraduate and graduate students.

TRAVEL AND EXPLORATION

Staff members of the Arboretum did not personally engage in any extensive program of field work during the past year. Small grants from special funds were made to support the work of collectors in foreign countries and to obtain material of value to the work of the Arboretum staff or specimens desired for our collections. Such grants enabled us to obtain seeds of additional ornamental woody plants from Japan, Scotland and Sweden. Herbarium specimens of authentically identified cultivated woody shrubs were obtained from several European gardens by extending nominal financial support.

Miss Lily Perry was granted a leave of absence during the spring to study at several European herbaria. This work was made possible by a grant made several years ago to [Dr. E.D. Merrill](#). This was known as the E. D. Merrill Discretionary Fund. It was Dr. Merrill's request that the residue of this fund at the time of his death be made available for Dr. Perry's use and that she use it to further the studies they had done cooperatively on the flora of New Guinea. Miss Perry has been able to study at the British Museum, Natural History Department, and the Royal Botanical Gardens at Kew. Later she will spend some time at Leiden and Utrecht in Holland.

GIFTS AND GRANTS

In this period of continuing inflation there is a great need for gifts for the general operation of the Arnold Arboretum. Happily, the Friends of the Arnold Arboretum have increased slightly in number and in many cases the gifts have also increased in size.

During the past fiscal year the Trustees of the Arnold Arboretum, the President and Fellows of Harvard College, increased the book value of the Arboretum endowment funds entrusted to their care. This resulted in an increase in the restricted and unrestricted income from endowment and in part met the general increase in wages as well as the increased cost of supplies and materials of the past year. A bequest from the estate of Mrs. Clement Houghton was also added to the endowment.

Gifts for cultural purposes from the Friends of the Arnold Arboretum during the year were used to employ summer labor for the care of the living collections on the grounds of the Arboretum in Jamaica Plain and Weston. These funds were also used to supply an assistant in the field of cytogenetics working with Dr. Sax and an assistant in the greenhouse to help the propagator, Mr. Coggeshall. The staff has been encouraged to apply to government agencies, private foundations and industry for grants to support research where applicable. A renewed grant from the Atomic Energy Commission was awarded to Dr. Sax for his work on the conduction of materials through the plant and for work on chromosome breakage patterns. Dr.

Howard received an award from the National Science Foundation for two years to support morphological work on the vascular pattern of petioles in flowering plants.

In both of these cases the awards enabled the recipients to employ technicians to do work which, if carried on otherwise, would have been supported by unrestricted funds from the Arboretum endowment. The necessity for such applications and grants will probably increase in the future. Currently only one Arboretum staff member has a research assistant paid from Arboretum funds.

Mr. George R. Cooley has renewed his support through gifts for taxonomic work under the joint direction of Dr. Rollins, Director of the Gray Herbarium, and Dr. Howard. This special fund has been used to further work on the wild and cultivated vegetation of the southeastern United States leading towards a generic flora of that area.

PUBLICATIONS

During the past fiscal year the regular twelve numbers of *Arnoldia* were published with [Dr. Wyman](#) as editor and four issues of the [Journal of the Arnold Arboretum](#) with Dr. Kobuski as editor. There were no special publications during the year. The research papers published by the staff numbered forty-four, a few more than the previous year.

RICHARD A. HOWARD, Director