The ARNOLD ARBORETUM of HARVARD UNIVERSITY

Annual Report 1941-1942

TO THE PRESIDENT OF THE UNIVERSITY:

SIR,

It was not anticipated that contributions to the Arnold Arboretum would be as extensive as in previous years, but the total of $9,376.25 is rather impressive when one considers existing economic conditions and the strains brought about by the present war. The receipts for the Gifts for Cultural Purposes Fund amounted to $3,061.25, in spite of the fact that no appeal for assistance was issued during the year. A bibliographic fund amounting to $2,500.00 was received from twenty-three supporters of the Arboretum which enabled us to provide for Dr. Verdoorn's immediate needs. The special travel fund was increased by anonymous gifts amounting to $535.00, while from the same anonymous donor $600.00 was received for the George B. Emerson Fellowship III. A grant of $1200.00 was received from the Committee for Inter-American Artistic and Intellectual Relations to provide for the salary of Dr. Lorenzo R. Parodi during the time he was in the United States. During the year the first awards of the James R. Jewett and the Vieno T. Johnson prizes were made in accordance with the terms of gift appertaining to the James R. Jewett fund. Also in accordance with the terms of gift the usual amounts were added to principal of the James Arnold and the Charles Sprague Sargent funds. Through the interest of Mr. and Mrs. Arthur G. Rotch of Boston, the Arboretum has received, on loan, an excellent oil painting of James Arnold and family, done in Italy about 1850, and this now graces the main reading room of our library.

The badly overcrowded condition of the herbarium and the somewhat overcrowding of certain sections of the library mentioned in the last annual report becomes more acute, but under existing conditions it is realized that we shall have to do the best that we can. A certain amount of important material can still be filed in the present herbarium, but any future large distribution is impossible until more floor space and additional steel cabinets can be provided. Through special funds provided for the purpose by numerous friends and supporters of the institution it was possible to appoint Dr. Frans Verdoorn as Bibliographer, who has initiated work on a large and important project briefly discussed below under bibliography. Dr. F. P. Metcalf was appointed Research Associate for a period of one year to work with me on our accumulated collections from southeastern China. Dr. Lorenzo Parodi of the University of Buenos Aires was appointed Research Associate during the period he was in the United States under the auspices of the Committee for Inter-American Artistic and Intellectual Relations, November 19, 1941 to March 18, 1942. Professor Alfred Rehder and Dr. J. H. Faull, both retired, continue to work daily on the problems in which they have so long been interested. It is

fortunate that our policy is such that a continuation of important research is possible in special cases when retirement, because of the age limit rule, becomes effective.

Various staff members have cooperated with the Division of Biology, through which the Arboretum is affiliated with Harvard University, in offering undergraduate and graduate courses and in supervising graduate students specializing in botany. During the year Dr. Raup gave a course on methods and problems in the study of vegetation, and has outlined a new course to be offered in the summer of 1942 on elementary field botany. Dr. Sax gave a course on cytogenetics, and in association with Dr. Mangelsdorf and Dr. Reed another one on advanced genetics. Dr. Bailey gave an advanced course on the comparative morphology and development of the vascular plants. Under our agreement with the Division of Biology, our staff members may offer a single half-unit course every other year. The work of nine graduate students was directed by various of our staff members.

Now that the detailed planting maps are finished, and the identifications of the growing plants checked, much attention has been given to the elimination of unnecessarily duplicated as well ascertain unsightly species of trees and shrubs that were represented elsewhere in the grounds by good specimens. Over 200 eliminations were made. Following the actual checking of named specimens in the already very large collection, some 6,500 different species and varieties being involved, new labels with corrected names are being installed as rapidly as possible. The work is very critical and progress is naturally slow. About 350 changes were made during the spring flowering season.

The Hemlock Hill area, badly devastated by the hurricane of 1938, suffered still further in that some sixty old trees left standing after the hurricane died during 1941. Their death was due to a variety of causes, including great damage to their root systems and twisting of their trunks by the storm, and perhaps to a certain degree by the undue drying out of the terrain following the destruction of the majority of the trees on this once densely forested area. These were removed with the assistance of the woods crew of the Harvard Forest.

The Centre Street tract presented to the Arboretum by Mr. John S. Ames last year has been placed in a reasonably presentable condition. Unwanted native plants have been eliminated, many vines and about twenty hybrid crab apples planted. It will take some years to bring this old quarry site into good condition, since because of the physical condition of the soil and preponderance of broken rocks, rapid tree growth can scarcely be expected. The past winter was mild and as a result there was very little winterkilling of flower buds, the net result being one of the most floriferous displays in April and May in the recent history of the Arboretum. During the spring of 1942, one hundred thirty eight new additions were made to the growing collections by transfer from the nursery. We have at present approximately 2,500 different items in the nursery, most of which will be added to the living collections when the plants are large enough to transfer to their permanent places in the grounds.

Because of the great popularity of the lilac collection and the very large number of species and varieties already established, it was decided to make a serious attempt to obtain all the varieties now being grown in America. During the year we acquired 61 additional varieties, bringing our total number of lilac species and varieties to 556.

There is naturally very great interest at present in plants of economic value. We have capitalized on this interest to the extent of acquiring thirty additional varieties of nut trees and seventeen varieties of blueberry shrubs. It was thought that it would be highly desirable to establish and maintain these for the benefit of the numerous individuals who seek information regarding them. There is another reason for building up our collection of select economic varieties. Not infrequently in the past, important forms have been located "in the wild" and these and horticulturally derived varieties not infrequently become lost for one reason or another, and drop out of sight. It is desirable that the specialists interested in such finds should realize that the Arnold Arboretum is an excellent place in which important variants may be grown permanently.

The total number of living plants received from various sources in the United States and Canada was 2,307. In the same period we received 51 packets of seeds and 187 lots of scions. We distributed 2,093 living plants, 257 packets of seeds, and 248 lots of scions.

The plant-breeding work of the past several years has produced a number of promising hybrids. About ten percent of the apple and cherry trees in the experimental nurseries have flowered and among these are several superior ornamental types. Crosses between Oriental and American species of *Malus*, and between diverse species of *Prunus*, have been made possible by utilizing the embryo culture technique. A new type of lilac has been obtained from the progeny of *Syringa persica*.

Professor Bailey and Dr. Nast have devoted considerable attention to the problems of determining the affinities of herbarium specimens that cannot be assigned with certainty to specific families by an examination of their external morphology. This type of work necessitates intensive investigations of the internal structure of all parts of an herbarium specimen, viz. stem, node, petiole, leaf, and floral organs if available. Considerable progress has been made during the last year in expanding the collection of slides of dicotyledonous woods to include anatomical preparations from herbarium specimens. Special emphasis was placed upon developing a reference collection of pollen slides, since such a collection should ultimately be of much utility not only to taxonomists, paleobotanists and morphologists, but also to those concerned in the analysis of peat and other organic deposits and in the study of hay fever. Through the assistance of Dr. Clyde F. Reed and of various graduate students, between 3,000 and 4,000 permanent pollen mounts representing approximately 1,800 genera in 160 families of the angiosperms were added to the slide collections. To the collection of microscopic slides of wood sections 382 were added, bringing the total to 24,764, representing 7,183 species. The wood collection was also increased from 5,278 to 5,569 species, the totals in the collections

now being 9,426 individual collections (preserved specimens) and 12,402 individual collections (dried specimens).

Official work in plant pathology largely ceased with the retirement of Dr. Faull. To meet a critical situation in genetics, provision had to be made to take care of this problem and we were unfortunately obliged to cancel a proposed appointment in plant pathology. Dr. Faull, however, continues to occupy his laboratory and is prosecuting investigations in his special field. He courteously takes care of our special problems as they arise, even although heat times has to sacrifice his own personal interests.

In the herbarium a total of 24,575 specimens was mounted, of which 23,101 were inserted into the herbarium, the remainder being herbaceous plants. In order to facilitate the keeping of records, it was decided to treat the mounted specimens which are understudy or which, because of lack of space, cannot be inserted into the general collection at present, as actually a part of the herbarium. In this category are 55,275 previously mounted specimens, largely Chinese and New Guinean plants still being studied by staff members. The addition of these plants to the herbarium total, together with specimens mounted and inserted this year, brings the total number of specimens in the herbarium to 592,256.

The number of specimens received by exchange, gift, subsidy, purchase, or for identification was 46,709. This number may be broken down geographically as follows: from North and South America, 25,212; from Papuasia, 7,359; from Polynesia, 6,860; from Indo-China, India, and Malaysia, 5,534; from Australia, 786; from the Philippines, China, Japan, and Africa, 958. The largest American collection received was a set of 5,432 specimens from the Universidad Nacional de Tucuman, Argentina; other important collections were about 6,000 specimens (including duplicates) collected in Fiji by Otto Degener (the concluding shipments of material obtained during the 1940-41 cruise of the "Cheng Ho," sponsored by Mrs. Anne Archbold), 6,088 specimens received in exchange from the Botanic Garden at Buitenzorg, Java, 1,271 specimens collected in New Guinea by M. S. Clemens, and 1,629 specimens purchased from the Boston Museum of Natural History, this last item including important historical material from Java and India collected by Zollinger and Wight.

The Arnold Arboretum distributed to other institutions a total of 19,412 duplicates, practically all of which went to American institutions; 17,627 of these specimens were sent as exchange, the remainder for identification by specialists. To the Gray Herbarium 11,075 specimens and 222 illustrations were transferred, to the Farlow Herbarium 271 specimens, and to the Ames Orchid Herbarium at the Botanical Museum 973 specimens. Books and microfilm to the equivalent value of 8,355 specimens were distributed under a special exchange arrangement. Thus the total number of specimens or their equivalent sent out was 27,989. A great quantity of material has been set aside for shipment to European herbaria when possible. Forty-one loans, with a total of 4,087 specimens, were sent out for study by specialists in 18 American institutions. For study by our own staff members, 106 loans consisting of 7,288 specimens were received from 23 institutions.

The card catalogue of references to new species and other important literature in the field of the taxonomy of woody plants now totals 131,695 cards, having been increased by

2,576 cards during the year. The collection of negatives representing types and other critical specimens was increased by 91 and now contains 4,138 negatives.

Routine work in the herbarium has been greatly handicapped by the fact that expansion space is at an end; no further distribution of specimens into the herbarium, except for small and especially needed groups, will be possible until additional floor space and cases are available. As a makeshift arrangement newly mounted specimens are being filed in generic order in cardboard cases on top of the steel cases in the Conifer Room, thus making consultation of the new material in each family possible, although very inconvenient. Due to war conditions, incoming material has been substantially less than in recent years, and this has permitted the mounting of many older collections which had been set aside in favor of more recent and more urgently needed collections. However, a vast amount of unmounted material still awaits attention. During the year we have continued to incorporate clippings, typed descriptions, and illustrations into the herbarium, and the work of breaking down the large genera into geographic series has been essentially completed. Staff members continued to work in their special fields, in addition to carrying out routine work of identification.

Professor Rehder made substantial progress with the bibliographical supplement to his *Manual of Cultivated Trees and Shrubs*. Dr. Smith completed his study of the Fijian collection made by Otto Degener and prepared a report for publication, also continuing his work on certain Papuasian families and undertaking, in collaboration with Professor Bailey, a study of the woody Ranales. Dr. Johnston has worked almost exclusively on the flora of the plateau region in northern Mexico, including a critical study of his own collections and those prepared by Mr. Robert Stewart. While his own and the Stewart collections were being mounted preparatory to study, he named and reported on three large collections from western Texas and northern Mexico. He has commenced work on his Catalogue of the flora of Coahuila and eastern Chihuahua. His work has been greatly facilitated through the acquisition of important collections from contiguous areas.

Dr. Raup has prosecuted some special field work in New England, but has devoted most of his time to a study of collections made by himself and others in northern Canada. He has reported on approximately 1000 numbers sent to him by correspondents for identification. Two new projects have been developed, one preparing detailed range maps showing the Canadian, Alaskan and northern United States distribution of the Mackenzie Mountains species; the other on trends in the development of geographic botany. Dr. Kobuski has prepared regional studies of certain genera of Theaceae in America and is continuing his studies of this family. Mr. Palmer in addition to extending his collections of cultivated plants in the Arboretum has given special attention to the genera Quercus and Crataegus. Dr. Allen has continued her work on the Lauraceae of eastern Asia, has completed a study of this family in Papuasia, and is undertaking preliminary work on the American representatives. Dr. Perry has devoted most of her time to continued study of the extensive Papuasian material collected by the Archbold Expeditions, Mrs. Clemens, and other collectors. Dr. Croizat has extended his work on the Euphorbiaceae and has undertaken studies of certain groups in the Cactaceae. Dr. Li completed his

monographic study of the Chinese Araliaceae and began identification work in selected families of the large Chinese collections received by the Arboretum in recent years. Miss Luetta Chen has completed her work on the genus Sabia. Dr. F. P. Metcalf of Lingnan University, who had spent the previous year at the Arboretum on the basis of a Guggenheim Foundation Fellowship, was appointed Research Associate for the year 1941-42, to work with me on the basis of a Milton Fund grant on our accumulated collections of Chinese material. He resigned to accept a commission in the Army Intelligence Service on April 15.

My own work has been largely on various problems appertaining to the floras of China, Indo-china, the Philippines, New Guinea and the Solomon Islands, on Polynesian bibliographic problems, and towards the end of the year the initiation of a very extensive investigation of the botanical problems raised by the erratic work of Rafinesque between the years 1804 and 1840. This will involve a searching examination of all the very numerous botanical papers that he published, many of them exceedingly rare, the preparation of a very extensive card index, and the eventual preparation of an *Index Rafinesquianus* in which it is proposed to list all of his thousands of new generic and specific names; a preliminary estimate seems to show that this will result in the probable addition in excess of 1,200 entries to *Index Kewensis*. Because of the homonym rule it is highly desirable that all these legitimately published names be listed, forever 100 years has elapsed since they appeared. This is one of the very few places in which such a task could be consummated, for fortunately the library of the Arnold Arboretum contains an almost complete set of Rafinesque's very numerous publications on botany.

Because of war conditions naturally all of our cooperative fieldwork has ceased in China, Siam, Burma, India, the Philippines, and Malaysia. We have been able to accomplish some important work in Cuba, operating through the Atkins Institution by employing a Cuban collector who had served two seasons as an assistant to, Dr. Richard A. Howard. A similar attempt in Mexico was reasonably successful, but after a fair trial was discontinued. We were able to finance an assistant to Dr. Richard Schultes, Mr. C. Earle Smith, for several months' field work in Colombia, but critical shipping conditions have as yet not made the delivery of the Cuban or the Colombian collections possible; the material prepared is however in safe storage in Cienfuegos and Bogota. A modest grant was made to the Instituto Miguel Lillo at Tucuman to finance an exploration of a little known area in northern Argentina. Dr. Johnston, partly financed by the Carnegie Institution, spent ten weeks from August 1, 1941, prosecuting field work in Coahuila and Chihuahua, Mexico, in the cooperative project between the Arboretum and the Carnegie Institution, involving an ecological and systematic survey of the Mexican desert floras. His season was particularly successful, as it was considered to be the wettest one in about twenty-five years. The vegetation naturally responded to the unusual precipitation, and what is even better, he was able to visit remote areas that in normal years are closed to travel because of the scarcity and uncertainty of the water supply. Regions previously unvisited by any botanist were explored. He collected about 2,000 numbers represented by approximately 10,000 specimens. Dr. Johnston, on his previous trip to this region, interested Mr. Robert Stewart, a local resident, in botanical field work, and through modest grants made

to him from Arboretum funds to cover the expenses of field work, we have acquired approximately 1800 numbers with ample duplicates from this same general region. Some local field work in New England was prosecuted by Dr. Raup and Mr. Palmer.

Dr. Verdoorn has made excellent progress on his major project initiated at the beginning of the year. This is projected as an "*Index Botanicorum*" or a biographical dictionary of plant scientists. A standard printed form, to be filed for reference, has been prepared for each entry, and to these forms a great mass of data appertaining to individual botanists is being transferred from a variety of sources. The files at present contain about 20,000 names and it is believed that ultimately this may be increased to about 50,000. This task is projected to cover the subject for the entire world from the earliest times to the present. Supplementary to this project he is also compiling corresponding data on the history of botanical gardens. He has found the library of the Arnold Arboretum to be a unique source of published works needed for consultation in connection with researches on botanical history.

During the past fiscal year accessions to the library amounted to 310 bound volumes, 226 pamphlets, 188 photographs and 105 negatives, and approximately 100 nursery catalogues. The total number of bound volumes is now 45,122, of pamphlets 13,183, and of photographs 18,850. Mrs. S. D. McKelvey made a generous gift of 156 photographs and 105 negatives, many taken in the Arboretum, and other interesting close-ups of lilac and magnolia buds. Some 1,720 cards were added to the main catalogue, 1,216 of them containing bibliographical data, and 427 slips were added to the subject catalogue which continues the printed subject catalogue of the library. Many books have been sent out on interlibrary loan, most of them to other departments of the University, while numerous volumes have been borrowed for use here. The number of periodicals received by exchange and subscription was materially reduced because of mailing conditions. Requests for microfilms and photostats continued to be numerous.

The two regular serials, the technical *Journal of the Arnold Arboretum* and the popular *Arnoldia* (a continuation of the *Bulletin of Popular Information*), have been maintained at their usual standard of excellence. No special publications were issued during the year. Plans have been perfected to discontinue the *Contributions from the Arnold Arboretum*, the last number of which was issued in 1938, and to replace it by a somewhat more economical format under the title of *SARGENTIA*. This will be issued at irregular intervals and will provide a place for the publication of important technical papers by staff members that are too long for Journal articles. The name selected commemorates Dr. Charles Sprague Sargent, who organized the Arnold Arboretum and served as its director for the first fifty-five years of its existence. A detailed bibliography of about eighty items published by staff members, appears in the *Journal of the Arnold Arboretum* 23: 519-521. 1942.

ATKINS INSTITUTION

This unit now operates under its own charter having been registered with the local provincial authorities as a non-profit scientific institution at the beginning of the fiscal year. The net results have been satisfactory, as certain restrictions imposed through industrial and commercial laws are eliminated. In the garden itself the activities have been largely of a routine nature, but additional plantings have been made in the palm section, in the succulent garden, and the native woodland section has been further improved by eliminations of some of the more rapidly growing trees that overshaded more desirable and slower growing hard wood species. Arrangements have been made to establish a variety nursery for Ceara rubber selections *(Hevea braziliensis*) in cooperation with the United States Department of Agriculture, the objective being to provide a place from which disease free bud-wood may be secured for plantation developments elsewhere in tropical America. The garden nursery has also been increased in size to take care of accessions awaiting transfer to their permanent sites. The construction of the extensions to the greenhouse and lath house and the completion of the connecting shelter house for visitors, provided for through an anonymous gift in the preceding year, was consummated. Casual visitors have been fewer but ten or a dozen individuals spent varying periods of time at Harvard House in connection with investigations in which they were interested.

One hundred eighty packets of seeds, 147 plants, and 113 cuttings were distributed, and 241 packets of seeds and 160 plants were received. The publication of the Frere Marie Victorin-Frere Leon "*Itineraires botaniques dans l'le de Cuba*" by the University of Montreal in the early part of 1942 was made possible by generous donations through the Atkins Institution from Mrs. Atkins and Dr. Barbour, an excellent illustration of inter-institutional and international cooperation.

E. D. MERRILL, Director