PLANT BREEDING AT THE ARNOLD ARBORETUM

FOR nearly 60 years the Arnold Arboretum has introduced plants of horticultural interest from all parts of the world. This has been done by cooperation with other botanic gardens and horticultural institutions and by field collections made by our own staff members or agents in North America, Europe and Asia. During this time nearly a thousand species and varieties have been introduced into cultivation in the United States by the Arnold Arboretum. Many of them have proved to be of great horticultural value. Among the outstanding introductions are the Sargent Cherry, the Dove tree, a hardy form of the Cedar of Lebanon, the Regal lily, *Malus hupehensis*, *Malus totingoides*, *Rhododendron obtusum kaempferi*, and *Kolkwitzia amabilis*.

It is possible that a few more new hardy ornamental trees and shrubs will be found in the fields and forests of the Orient, but plant collectors have explored most of the north temperate zone. New species or varieties must now be obtained largely by the selection of occasional “sports” or mutations, or by producing hybrids of various species and varieties. These methods have long been used with the more common species of ornamental plants, and the great array of horticultural varieties of roses, rhododendrons, lilacs, and other ornamentals are the results of the plant breeders art.

The Arnold Arboretum provides an unusual opportunity for the plant breeder. Here we have trees and shrubs from all parts of the world and crosses can be made between some of these species which in nature would never hybridize because of geographic isolation. Some of our most important ornamental trees and shrubs have been produced in the past by crosses between American and European or Asiatic species. For example, the London Plane tree which is so often used for street planting in Europe and the United States originated in England from a cross between our *Platanus occidentalis* and the Mediterranean *Platanus orientalis*. The hybrid is more vigorous and hardy than either parent. Some of our hardest
Rhododendrons have resulted from crosses between the American *Rhododendron catawbiense* and the European *Rhododendron ponticum* and other species. At the Arnold Arboretum we have crossed our native white pine, *Pinus strobus*, with the Himalayan white pine, *Pinus Grifithii*, and with the Japanese white pine, *Pinus parviflora*, to produce new types of possible economic and ornamental value.

Plant breeding work was started at the Arnold Arboretum nearly 20 years ago. The early work was confined largely to problems of species origins and relationships as a foundation for the breeding program. The breeding of trees and shrubs is a time consuming and expensive project. Many species can be crossed only with difficulty, if at all, so that large numbers of pollinations must be made. Any hybrids obtained must be grown to flowering size and the plants must have room to develop naturally, so that the growth habits can be observed. Often a second generation is necessary to obtain the proper combinations of parental characters. Promising hybrids should then be grown for another generation as cuttings or on standard root stocks in order to study their behavior following the usual methods of propagation. In some cases test plantings should be made in various locations to test the adaptability of a new variety. Thus the time required to develop a new variety by hybridization will vary from six or seven years in the case of forsythias to nearly 10 years for apples and much longer for maples and pines.

After the hybrids are selected and tested they are still not available for general distribution. Since the Arnold Arboretum cannot engage in a general nursery business, the new varieties must be propagated and distributed to cooperating nurserymen. They in turn will need several more years in which to propagate the nursery stock for release to the public.

A number of hybrid plants have now been selected and include several varieties of forsythia, a long-flowering cherry, and many new ornamental apples. The two forsythia varieties have been named, and cuttings have been sent to cooperating nurserymen. “Arnold Dwarf” is a segregate from a cross between *Forsythia intermedia* and *F. japonica*. The original plant in our nursery is about 2 feet tall, and has a spread of about 8 feet at the age of six years. The drooping branches root readily and produce a creeping mass of foliage. The leaves are small, about an inch long. Unfortunately this forsythia has not produced flowers and may never do so, but its vegetative habit is so attractive that it should be of value as a ground cover or border plant.

“Arnold Giant” is a tetraploid forsythia induced by treating a seedling of *Forsythia intermedia* with colchicine. This was done by one of our student assistants, George Skirm. Like most plants with a double chromosome number, the leaves are thicker and greener, and the flowers are larger and darker than the parental form. The leaves are ovate, three to four inches long, and with serrated margins. The plant is somewhat stiff when young, but forms a compact spreading bush when mature. This variety has flowered every year for the past four seasons, and is hardier than most species and varieties of forsythia although probably not as hardy as *F. ovata*. 
PLATE II

No. 8240 Arnold Cherry—This photograph taken in 1941, shows the flowering and growth habit of the hybrid cherry at the age of four years.
Among the cherry hybrids one of the most interesting is a form which appeared in the progeny of a hybrid between *Prunus subhirtella* and *P. yedoense*. The original plant flowered when it was two years old, and at six years it is about 7 feet tall. It bears a profusion of small semi-double white flowers, which show a tinge of pink as the flowers open. The flower buds develop irregularly, so that in a normal season there is a good bloom for 10 days to two weeks. This variety, as yet unnamed, will be distributed to nurserymen next year.

The apple hybrids have yielded a number of promising varieties, but the proportion of good types has been small—as those of you who aided this work by growing the seedlings can testify. As a partial compensation to our cooperative friends who carried on this testing work we hope to be able to supply you with some of the better varieties in a few years. Meanwhile if you have any outstanding trees from the hybrids which we distributed in 1940, please let us know so that we can propagate them.

Most lilac varieties have been produced from *Syringa vulgaris* by plant breeders in France, Germany, and Rochester Park in this country. An outstanding exception is the Chinese lilac, a hybrid between *S. vulgaris* and *S. laciniata* (formerly *S. persica* var.) which first originated as a natural hybrid in a European botanic garden in 1777. This hybrid has since been produced artificially, although in limited numbers. The cross is easily made, and the hybrids grow slowly for the first year or two, and then about 97 percent of the seedlings die. Most of those which survive lack vigor. We have been able to remedy this trouble by budding the young hybrids on tree lilac (*S. amurensis japonica*) root stocks. The tree lilac also makes a good stock for the common lilac varieties.

Other lilac species can be crossed, but not if they belong to different sections of the genus. Crosses between *S. laciniata* and *S. pinnatifolia* produce vigorous hybrids which may prove to be of value. We have also produced hybrids of *S. pinnatifolia* and *S. vulgaris*, but they produce poor flower clusters, and since they are completely sterile they can not be used in further breeding experiments. The small flowered species can be intercrossed to some extent, but they are too much alike to produce distinctly new types of lilacs.

The hybrids are grown in the nursery plots of the Bussey Institution, and a few of the selected hybrids are grown on the Bussey grounds to provide readily accessible propagating material. Formerly the hybrids were tested on the Walter Street tract, a piece of land owned by, but not incorporated into, the adjacent Arnold Arboretum. Our hybrids are now to be tested at the Case estates in Weston, recently given to the Arnold Arboretum, where ample land is available and where there is little or no danger of vandalism.

Although the greenhouses and nursery plots of the Bussey Institution are not open to the general public, amateur or professional horticulturists who are interested in plant breeding or propagation are always welcome.

Karl Sax