



The
American
HORTICULTURAL
Magazine

spring 1970 / volume 49 / number 2



Journal of the American Horticultural Society, Inc.

2401 CALVERT STREET, N.W. / WASHINGTON, D. C. 20008



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THE AMERICAN HORTICULTURAL MAGAZINE is devoted to the dissemination of knowledge in the science and art of growing ornamental plants, fruits, vegetables, and related subjects. Original papers which increase knowledge of plant materials of economic and aesthetic importance are invited. For manuscript specifications, please address the chairman of the Editorial Committee.

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FRONT COVER ILLUSTRATION

Still life painting of peaches (*Prunus persica*) found at Pompeii, now in the National Museum, Naples.

BACK COVER ILLUSTRATION

Detail of mosaic from House of the Faun, at Pompeii, now in the National Museum, Naples. In this Egyptian scene the leaf, bud, blossom, and seed-pod of the Indian lotus (*Nelumbo nucifera*) are accurately portrayed. The mongoose, hippopotamus, Egyptian cobra, ducks, and songbirds are also pictured.

PHOTOS: STANLEY A. JASHEMSKI

The 25th American Horticultural Congress
of
The American Horticultural Society

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NOVEMBER 1-4, 1970
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Vanishing Green

The future of our cities and the part horticulture must play in their preservation is a subject of great import to all people today. Because of the timeliness of Dr. Gates' words, your Editorial Committee is pleased to include here the following editorial from the Missouri Botanical Garden Bulletin, Vol. 58, No. 1, 1970.



Most people are alarmed about the vanishing wilderness. I am of course concerned about our natural areas, but I am concerned also with our vanishing urban parks and greenbelts. St. Louis is a fortunate city with its many tree lined streets and beautiful parks. Not all cities are so green, and St. Louis is cooler because of the trees, and has more shade and less wind.

A healthy city is a green city. Plants filter the air and supply the oxygen we breathe. A city of only asphalt and pavement, of sewers and skyscrapers, of freeways and parking lots is a sick city. Man must learn to merge country and city and to integrate greenbelts with residence and business. European cities are tree lined and dotted with parks. By tradition the European understands the need for urban parks, for Tivoli, and for botanical gardens.

We need the right kinds of trees and shrubs for the city. Not all plants will grow in the summer heat reflected from parking lots and buildings. Not every tree will tolerate the masses of salt splashed from the streets in winter into the soil around their roots. Nor is it easy for plants to breathe the chemical laden urban air and remain healthy.

We need to plan the proper plants for the city and to cultivate them especially for this purpose. We need to integrate the country with the city and get some of nature back into the urban area. Birds and animals will live with us in the city if we give them the proper habitats, such as cover for quail in our parks, fruit trees for wax-wings in our yards, shrubs with seeds for cardinals, and insects for the warblers that migrate through in the spring and autumn.

David M. Gates

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Pompeian Gardens

Yield

Their Secrets

WILHEMINA F. JASHEMSKI

STANLEY A. JASHEMSKI PHOTOS

ONE AUGUST AFTERNOON ALMOST 1900 years ago a seventeen year old boy named Pliny looked across the Bay of Naples and saw a cloud of unusual size and appearance; shaped like an umbrella pine, it was sometimes white, sometimes dark and spotted. For two days Vesuvius spewed forth a mixture of ashes and pumice stone, followed by volcanic dust accompanied by successive earthquake shocks. Young Pliny was visiting his uncle, the famous elder Pliny, a well known commander of the Roman fleet stationed at Misenum across the Bay from Naples. Years later the Roman historian Tacitus wrote to Pliny the Younger asking for details regarding the death of his uncle who lost his life in attempting to rescue friends endangered by Vesuvius. Fortunately the two letters written in reply have been preserved giving us a vivid eyewitness report of the eruption in A.D. 79 which completely destroyed the towns of Pompeii and Herculaneum and the villas in the surrounding countryside.

Generations of schoolboys have thrilled to the story of the last days of Pompeii, but scholars have scarcely begun to use the wealth of material preserved at this unique archaeological site. At other sites in the Roman Empire fragmentary remains have survived by chance; in the area destroyed by Vesuvius living cities and villas were preserved just as they were at the moment of destruction. Only at Pompeii is it possible to walk up and down miles of streets and see the homes and gardens of thousands of inhabitants. These gardens hold the key to many unanswered questions.

Gardens had an important place in the life of the ancient Romans. At Pompeii the garden was an integral part of the house and a significant factor in its development. There was at least one garden in almost every house, while some houses had three or four. These gardens have much to tell us about the people who lived in them. Gardens also played an hitherto unsuspected role in restaurants, hotels, schools, and various types of shops. There were also gardens connected with many public buildings as well as the large vegetable gardens, orchards, vineyards, and commercial flower gardens. Because of the intimate relation of the garden to architecture, painting, aesthetic expression, religion, social life, horticulture, economics, and city planning the study of the hundreds of gardens pre-

Detail of garden painting in House of Venus Marina. Plantings that were too large for the actual garden are pictured behind a painted lattice fence. The two flowering oleanders (*Nerium oleander*) with characteristic leaves, a myrtle (*Myrtus communis*) with white flowers, and a stylized pine on which a song thrush is perched are easily identifiable, as is the gray heron. The large flowering tree is difficult to identify.



The House of Venus Marina. This house takes its name from the large painting of Venus floating on a sea-shell found on the center panel of the rear garden wall. This magnificent house was badly damaged by the earthquake of A. D. 62 and not yet completely restored when Vesuvius erupted seventeen years later. The owner must have been very fond of his garden for it was completed first.

served by Vesuvius yields new insights on many aspects of Roman life.

My study of these gardens involves the recovery and preservation of a large body of valuable but rapidly disappearing evidence. Early excavations, often inadequately reported, have been destroyed by brambles and weather; much was destroyed in World War II when the Allies dropped 161 bombs on Pompeii.

One of the most striking aspects of many gardens is the picture painted on the wall to create the illusion of a much larger garden. These paintings, which unfortunately deteriorate when excavated and exposed to the weather, are especially important because they picture the plants that grew in the gardens. They form a unique chapter in the history of botany and cultivated plants. Together with carbonized roots, seeds, bulbs, fruits, and nuts they furnish valuable information for the identification of Pompeian flora.

But the excavation of an ancient garden gives the only definitive evidence for its actual appearance and use in antiquity. Pompeii because of the way in which it was destroyed, is the only city where it

is possible to make subsoil excavations and determine if the land was planted. Elsewhere scholars can do little more than speculate on the probable uses of open land within the ancient city. The study of land use and city planning is of fundamental importance today, and any accurate study of urban planning necessitates a knowledge of the uses of open land.

I have excavated various types of open areas and have proved in each case that they were planted. One of the most interesting was attached to the *caupona* (restaurant) of Euxinus. The owner was first identified by the large election notice near the entrance. The Pompeians took their elections seriously, and frequently painted on their outside walls notices which included their own names and those of the candidates they recommended for office. When the interior of this restaurant was excavated three amphoras were found with painted inscriptions which gave the occupation, name, and address of the owner:

*To the copo, Euxinus, at Pompeii,
near the Amphitheater.*

Right: Garden sculpture in the House of the Vettii. Pompeians were fond of small white marble sculptures, which were very effective in their green gardens. The support of this one is beautifully sculptured with ivy leaves and blossoms.

Rabbit Fountain. Water played an important role in the garden. This charming little fountain statue is typical of many that have been taken to the National Museum in Naples. The Vettii had fourteen fountain statues in their garden; today the ancient pipes have been repaired and the fountains play again in the summer sun.

Below: Formal garden in the House of the Vettii. This beautiful peristyle garden surrounded by a covered portico shows the emphasis on design in the planting of Pompeian gardens. They were essentially green gardens, planted with ivy (*Hedera helix*), myrtle, acanthus (*Acanthus mollis*), and box (*Buxus sempervirens*). Small flowers such as violets, iris, daisies, poppies, roses, and lilies furnished color accents in season.



In addition to the counter-room, where passers-by could be served, there was a dining room; a few upstairs rooms provided lodging for overnight guests. From the counter-room two doors led to a large open area which appeared to be a garden, but only subsurface excavation could determine if it were planted. This I undertook in the summer of 1964, with the permission and encouragement of Professor Alfonso de Franciscis, Superintendent of Antiquities in Campania. After scraping down to the original level we were rewarded almost immediately by finding three circular areas (each about 3 in. in diameter) filled with lapilli. When the roots of ancient trees and plants decayed they left cavities, and the volcanic debris which covered the garden gradually trickled into these until they were filled. When the holes were completely emptied they appeared to be the cavities left where three deep roots had decayed. The next deposit of lapilli that we cleaned out was baffling; the irregular shape revealed was certainly not that of a root cavity. Soon a workman handed me a tooth, then bits of bone and then two more teeth. It suddenly dawned on us that we had found the

spot where a dog had buried his bone! (The teeth were later identified by the Smithsonian Institution as those of a pig.) The next cavity (almost 6 in. in diameter), with branching laterals, was shaped very much like a grapevine root. But the most exciting was the discovery of the cavity of a huge tree root, 23 in. in its largest dimension at ground level.

The next step was to fill the cavities with cement and make casts of the roots so that we might study their shapes and identify them. When the 34 cavities that we had found had been filled, the cement was allowed to harden for three days; then the soil was removed. It was clear that Euxinus had a vineyard, for there were thirty-two grapevine roots and the roots of two trees.

The garden apparently was used as an extension of the dining area. There is no evidence of a masonry triclinium on which customers might recline as they ate, as in some gardens, but no doubt crowds from the Amphitheater were willing to be served less elegantly at tables set up in the garden rooms and under the spreading branches of the two trees. A painting in another restaurant indicates that table service was not un-

Steps in the process of making the cast of a large tree root in the garden of Euxinus. Left: Cement is poured into the cavity after it had been reinforced with wire. Right: The surrounding soil is removed and reveals the cast of the tree root. The casts of two vine roots can be seen in the upper right.



known at Pompeii. The Roman poet Martial speaks disparagingly of this type of restaurant and taunts the boor who does not recline when eating. Graffiti on the west wall of the garden reflect the banter between serving girls and patrons:

*The blonde taught me to hate
brunettes. I will hate them if I am
able, if not, unwilling, I shall love
them.*

The *caupona* of Euxinus enables us to picture for the first time the rather rustic restaurant with rooms to let, that served food and drink at the counter and in the dining room, as well as in the garden, to the crowds that came to Pompeii for the spectacles in the Amphitheater. The presence of serving girls reminds us of the Syrian *copa*, or hostess, in the delightful little poem in the *Appendix Vergiliana*, who invites the traveler to stop and enjoy the various pleasures of her inn:

*Come then, and rest your weary self
beneath the shady vine. . .*

Many scholars have believed that this description, which so perfectly describes Euxinus' garden-restaurant inn, was lifted from Hellenistic life little realizing that such places existed in Italy.

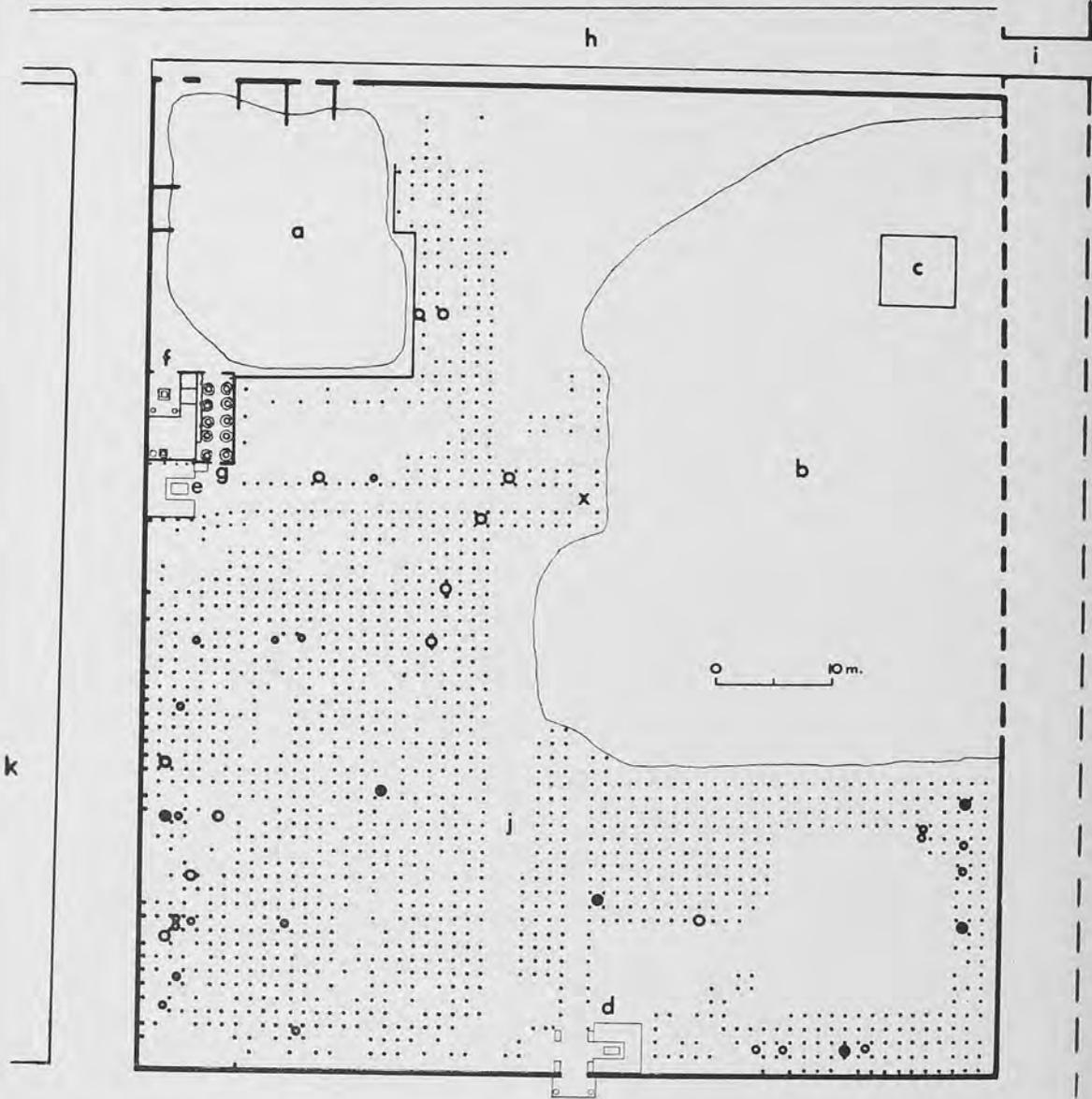
But perhaps the most important of our discoveries resulted from our preliminary excavations in the large *insula* (block) to the north of the Amphitheater. This *insula* is one of the most interesting in the city because of the speculation through the years as to its use. Few in the entire city are as large; even the Forum is only slightly larger. The first limited excavation in this area took place in 1755, and excavation has continued at intervals since that time. The *insula* was early identified as the *Foro Boario* or Cattle Market, the name that still appears on a plan of the city distributed to visitors. Some scholars have thought that the area contained the cages of animals used in the *venationes* (animal hunts) held in the nearby Amphitheater. Excavations in

1954-55 uncovered two rooms equipped for making wine which suggested that the area might have been planted. Only a subsoil examination of the entire area could definitely reveal its use. This I began in the summer of 1966. Modern roots often destroy all evidence of ancient roots but fortunately this *insula* had much less destructive vegetation than most, so I was hopeful that we might still be able to determine whether it had been planted. We made a trial excavation along the east wall where there was a substantial covering of the original volcanic debris. Digging down through more than four feet of lapilli we came to the original ground level. Almost immediately we found a tree root cavity about 12 in. in diameter at ground level. Encouraged by our initial success, we continued the trench along the east wall, but were disappointed to find that the undisturbed covering of lapilli soon ended. The excavators in 1955 had removed the volcanic material down to the original ground level, and later covered the area with backfill. We eventually found several small root cavities, but the backfill was deep and compacted, and the results discouraging.

We next explored the western half of the *insula*. Here we eventually found a tree root cavity near the west wall and a number of smaller root cavities. Others were found near another wall. If the *insula* had been planted elsewhere than along the walls we felt that we would find the evidence by digging trenches in the interior of the area. After considerable digging and many disappointments we found three small cavities, but could find no more. By this time there was a general feeling that the project was futile, and the expenditure of time and money too great for the few root cavities found. Roots along the wall proved nothing about the use of the area. Three roots in the center were encouraging, but did not disprove the identification of the site as the Cattle Market.

We decided to work in another garden which yielded important initial results, but the thought persisted that no garden was as important as the one we had

Plan of vineyard excavated by the University of Maryland at end of 1968 season. a,b) unexcavated areas; c) modern house; d,e) masonry triclinia; f) room with wine press; g) shed with ten large terra-cotta containers in which wine was fermented embedded in the ground; h) street; i) city gate; j) unexplored area left for passage of trucks; x) intersection of two paths; k) orchard of Julia Felix. Dots show grapevine roots; small circles, small tree roots 4 inches or less in longest diameter; large circles, medium tree roots; large black circles, large tree roots 12 inches or more in longest diameter. (Funds for the excavations were provided by the General Research Board of the University of Maryland. The work was carried on with the permission and encouragement of Professor Alfonso de Francisci, Superintendent of Antiquities in Campania, Italy.)





Vineyard excavated by University of Maryland (see plan).

abandoned. We returned and continued digging toward the center of the *insula*. Eventually our luck changed and we found a generous scattering of small root cavities all the way to the center of the *insula*. We also found a large tree root cavity; its longest dimension at ground level was 15 in. and the root was deep. It began to look as if there had been considerable planting in the Cattle Market!

We next continued the trench all the way across the *insula*. Almost immediately we found eight evenly spaced roots (1½ in. to 4 in. in diameter), and as we dug, row after row of ancient root cavities dramatically appeared, until we finally reached the east wall. We then proceeded to widen our trench on both sides. As we approached the gate, we understood why we had been unable to find one row of roots. This row had been left unplanted and formed a path leading directly to the entrance. Columella in his manual on agriculture, recommends that the vineyard might be divided by footpaths for the use of laborers in carrying stakes, repairs for frames, or fruit. He suggests that the vineyard might be

broken up into divisions of one-half a jugerum (or one-third acre), which is approximately the size of each quarter of our vineyard.

By the end of the 1966 season we had found five large tree root cavities, and over 200 vine root cavities. The University of Maryland excavations during the summer of 1968 brought the total number of trees to 38, and of vine roots to over 1,400. The number of vine roots would be almost doubled if the second cavity found in many locations was a root and not a stake. The mathematical precision with which the roots were located suggests that the ancient owner had planted with the manual of Columella in hand. He recommended a quick method of laying out a vineyard by using a line stitched with purple or other bright color at the same intervals that roots were to be planted. Pliny, the Elder, who was acquainted with this area, may well have been reflecting local practice when he advised that in a rich soil vines should be planted four feet apart. The distance between our vines is almost exactly four Roman feet! During the 1968 season we also uncovered the



Luxurious dining area in garden of wealthy Pompeian merchant. In antiquity, vines shaded guests as they reclined on the masonry triclinium which was covered with pillows. Today glass protects the Egyptian scenes which decorate the triclinium.

two triclinia in the vineyard, one just inside the entrance across from the Amphitheater, the other near the entrance to the building where the wine was made. Our unknown proprietor apparently did a thriving business serving visitors to the Amphitheater.

The planting pattern found in this vineyard is strikingly similar to that used in the vicinity of Pompeii today. Even the depressions, sometimes three, often four, that we found still perfectly preserved around the ancient roots, were recognized by our workmen as similar to the depressions that they put around their vines to hold water. Modern vineyards nearby probably look much as our vineyard did in antiquity. Trees planted at the edges of these vineyards, and at intervals inside, remind us of the 38 trees that we have found thus far in our vineyard. It is still not possible to say if the vines were staked, or if the second cavity found in many locations is that of another vine. It is hoped that the University of Maryland excavations in 1970 will answer this and other questions. Plans have been made to remove a portion of a high hill of undisturbed fill so that we can examine cavities that have not been injured by the passage of



Glass bowl with fruit. This wall painting found in the house of Julia Felix, now in the National Museum at Naples, probably pictures the kinds of fruit grown in the large orchard attached to this house. Among the luscious Campanian fruits shown are pears, apples, pomegranates, figs, and grapes. The dates were imported from North Africa. No doubt many of the tree roots found in the large vineyard described in this article were those of fruit trees. The vineyard is just across the street from the orchard of Julia Felix. (See plan)

trucks, or modern vegetation. We also hope that in this undisturbed area we will find more carbonized material, especially fruit and nuts.

The discovery of this vineyard is of special importance because it is the first one ever found which was laid out according to the precise recommendations in the Roman agricultural manuals.

Moreover the discovery of large cultivated areas inside the city walls, contrary to what has been written and generally believed regarding "the increase in population and shortage of land. . . in Italian cities in the early Empire," is of great significance for the study of land use in the ancient city.



Wilhelmina F. Jashemski, Professor of Ancient History at the University of Maryland, at Pompeii, where she has been working for fifteen years. She has been accompanied on these trips by her husband Stanley A. Jashemski, who has made a complete photographic record of the sites destroyed by Vesuvius. Dr. Jashemski is well known for her articles and lectures on ancient gardens. Her book, The Gardens of Pompeii, Herculaneum, and Stabiae, is nearing completion. Last year she received a Senior Fellowship from the National Endowment for the Humanities, and was given the Tatiana Warscher Award in Archaeology by the American Academy in Rome in recognition of her work at Pompeii. An important part of her book is the study of all the plants known from the wall paintings, sculpture, mosaics, carbonized remains, and graffiti in the area destroyed by Vesuvius. In her study of the plants of the Pompeian area she is collaborating with Dr. Frederick G. Meyer, Research Botanist at the U. S. National Arboretum, who is well known to readers of this magazine.

Text reprinted with permission from the *Graduate School Chronicle*, University of Maryland, Spring, 1969, with additional photos. Lay-out by Lillian and William Clark.

Creating a Seed Orchard for Superior Black Locust

FRANK S. SANTAMOUR, JR.

Black locust (*Robinia pseudoacacia* L.) is a tree of exceptional utility. It is the largest of the 10-20 species of this North American genus, and has been used extensively in shelterbelts, for planting mine spoil-banks, for erosion control, and as an ornamental. The use of the black locust in afforestation has been more widespread in Central Europe than in the United States. In Hungary alone, more than 200,000 acres have been planted. In common with other legumes, nitrogen-fixing bacteria are associated with nodules on the roots of locust. Because of these bacteria and the high nitrogen content of the leaf litter, black locust has also been used to improve soil fertility. The tough, durable, decay-resistant wood has long been prized for fence posts and items of construction subject to moisture or weathering. In addition, black locust is an important honey plant.

Unfortunately, the run-of-the-woods black locust is a poor-quality tree, with numerous crooks and forks. However, the discovery of a particularly straight, fast-growing type of locust on Long Island, New York, prompted intensive interest in black locust and led to a search for other desirable trees. The Long Island type has been referred to in the literature as var. *rectissima* or 'Shipmast'.

The history of the 'Shipmast' locust, as summarized by Detwiler (1937), indicated that it was brought to Long Island from an unknown part of the lower Chesapeake Bay region of Virginia by a Captain John Sands about the year 1700. Apparently, very few trees survived, and the best formed trees were propagated by the digging and replant-

ing of root sprouts. Thus, the characteristic "sterility" or scarcity of fruit on the 'Shipmast' trees may probably be regarded as a function of self-incompatibility of this widely planted clonal type.

The Soil Conservation Service of the U.S. Department of Agriculture initiated a selection program in 1938 and, by 1943, 100 clones had been selected and propagated. Over the next several years, the S.C.S. Section of Hillculture Research distributed planting stock of selected types to various institutions for testing.

The U.S. National Arboretum received 50 plants of each of five clones, including 'Shipmast', in April, 1954. These plants were 1 year old from root cuttings. One of the clones (BN 4191), had been designated as cv. 'Appalachia' and was selected near Blackwood, Virginia. The other three clones were selected from native stands in West Virginia. All clones were described as having a "pinnate" type of growth habit, with a well-defined stem, and major branches on the lower portion of the crown.

The planting site chosen at the National Arboretum for these trees was near Hickey Hill, where the soil type was a heavy clay. The trees were planted, without replication, in clonal blocks (generally 5 rows of 10 trees each) with a 12-foot strip between contiguous clones. The spacing was 6 feet between trees and rows within a clone. The trees were measured in February 1968, when they were 14 years old. Total

Research Geneticist, U.S. National Arboretum, Crops Division, Agricultural Research Service, U.S. Department of Agriculture, Washington, D. C. 20002.



Fig. 1. 'Shipmast' locust, showing characteristic poor form, at the National Arboretum.



Fig. 2. A superior selected locust clone H.C. 4149 (NA 4916) at the National Arboretum.

height was measured to the nearest foot with a Spiegel-Relaskop optical device.¹ Diameter at breast height (DBH) was measured to the nearest tenth of an inch with a steel diameter tape. Each tree was also checked for borer damage on the lower 6 feet of the trunk.

'Shipmast' was the poorest clone, with an average height of 31 feet and diameter of 3.5 inches. Furthermore, trees of this clone were generally quite crooked and had numerous forks. The failure of 'Shipmast' to live up to expectations has been demonstrated in several tests throughout the country. The other four clones were quite similar, with excellent form and a combined average height of 40 feet and diameter of 4.5 inches. Border trees of these clones, growing with less intense competition, averaged 48 feet in height and 6.6 inches in diame-

ter. 'Shipmast' and other clones are pictured in Figs. 1 and 2. For a more complete analysis of these clones in another area, see Santamour (1960).

Only 12 trees in the entire planting showed evidence of attack by the locust borer, and the death of only two trees could be attributed to borer damage. Almost all the trees that had been attacked were suppressed specimens growing in the interior of the plots. Thus it would appear that four of the clones show definite superiority in form, growth rate, and borer resistance. In situations where it might be desirable to plant black locust, vegetative propagations from these and other selected clones would provide stock. However, such propagation might be too expensive for large-scale planting. Obviously, it would be advantageous to be able to grow such stock from seed.

The planting scheme of the Arboretum plantation, while definitely lacking in statistical value, has provided us with

¹"Mention of a trademark or proprietary product does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture, and does not imply its approval to the exclusion of other products that may also be suitable."

an opportunity to create a seed orchard for the production of potentially superior seed and seedlings. Locust is insect-pollinated and research in Hungary has shown that it is highly self-incompatible. Thus any seed produced in the orchard will result from hybridization between two of the selected clones.

Ideally, this planting should have been thinned 4 to 7 years ago in order to promote the development of longer, seed-bearing crowns. We plan to develop this orchard in two stages. In the first stage, all 'Shipmast' trees will be removed and the remaining clones thinned to about nine stems per clone. The remaining trees should provide a moderate amount of seed for several years. The second stage will be the development of

full-crowned trees from selected stump sprouts. After the sprouts have begun to bear seed (3 to 5 years) the overstory trees will be removed.

The measure of seed superiority must, of course, be determined by a progeny test. In the fall of 1968, seed was collected from this seed orchard and from native stands. The comparative performance of plants derived from these two sources will determine the feasibility of utilizing this orchard as a source of superior seed.

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Air Pollution Damage to Plants at Longwood Gardens

RUSSELL J. SEIBERT

When I became the director of Longwood Gardens in 1955, I left the Los Angeles area where I had spent 5 years as the director of the Los Angeles State and County Arboretum, developing an arboretum under conditions of rapidly increasing concentrations of noxious air pollution.

During that period, the Los Angeles County Air Pollution Control District was working out techniques for pinpointing sources of air pollution by means of using highly sensitive indicator plants. These techniques satisfactorily proved to the courts countless sources of industrial pollutants. Through effective control laws and the use of susceptible indicator plants along with the recognition of specific types of injury caused to various plant materials by different specific kinds of air pollutants, it was possible to bring the many sources of industrial pollution down to a minimum. Today, 85 percent of the Los Angeles County air pollution is caused by the automobile, or more specifically, the reciprocating gasoline and diesel engines. Only 15 percent is caused by industry.

As a contrast, the average proportions of pollution sources of other large cities throughout the U.S.A. are currently reported at 40 percent from industry and 60 percent from automobiles.

Our first years at Longwood Gardens were a delight since there was no perceptible air pollution present and no indication of air pollution injury on our plant materials. On several occasions, this fact was confirmed by such people as Dr. F. W. Went, then from the California Institute of Technology, who was expert in recognizing symptoms of air pollution injury on living plant materials.

Director, Longwood Gardens, Kennett Square, Pennsylvania 19348.

During the summer of 1961, June 11 and 12, to be specific, we observed the first occurrence of "eye smarting" air pollution at Longwood.

The number of days of perceptible air pollution steadily increased each successive summer and early autumn until the summer of 1965 when we first observed its effects in the form of damaging injury on *Petunia* 'White Cascade' at Longwood.

During the summer of 1967, Longwood suffered serious and quite perceptible injury from SO₂ and from the photochemical oxidants, including both ozone and PAN, Peroxacetyl-nitrate, as determined by the types of injury on the various plants.

It was during the summer of 1967 that the perceptible presence of plant damaging pollutants was observed to be noticeably present during atmospheric periods of "Bermuda Highs" lying off the East Coast for periods of two days to a week or so. During these periods, there was a gradual build-up of pollutants. During these periods of "Bermuda Highs" or atmospheric inversions it was also noted that there was a slowly moving air mass which travelled from south to north. My son, who at the time was taking flying lessons at the New Castle County Airport, reported that a concentrated source of visible pollutants was moving north-northwest from the power plant and refinery at the Tidewater Complex near Delaware City which reached even beyond the Longwood Gardens area.

Plants with suspect injury during the summer of 1967 included spinach, beets, *Cornus florida*, lilac *Browallia speciosa*, *Celosia argentea* 'Golden Feather', *Ipomoea fistulosa*, *Musa* × *paradisiaca* 'Aeae', *Greyia sutherlandii*, *Protea cynaroides*, *Protea neriifolia*, *Passiflora ligularis*, *Petunia* 'White Cascade', and

Ajuga reptans 'Blue', to name but a few.

Some of these plants were sent to the U.S. Department of Agriculture Air Pollution Laboratory at Beltsville, Maryland, where controlled experimental testing took place. Growing some plants of each species under activated carbon filtered air, then comparing them with plants of the same species and cultivars grown under various types of polluted air confirmed their susceptibility to the photochemical oxidant types of pollutants.*

The summer of 1968 proved to have a minimum of air pollution in our area and this, coupled with the fact that there were no "Bermuda Highs" of lasting duration, allowed the pollutants to be carried away from our area by the prevailing northwest to southeast flowing air mass.

Until the summer of 1969 we had experienced a minimum of plant damage, apparently because of the scrubbing action of the frequent rains throughout this spring and summer. However, the latter part of August and through September, we had repeated cycles of air pollution build-up. The most serious occurred Tuesday and Wednesday, September 23 and 24, 1969.

By Wednesday afternoon, during the Wilmington Air Pollution Alert, we were able to observe the characteristic hydrocarbon oxidant injury taking place on our more susceptible indicator plants at Longwood's Experimental Greenhouse; namely, on 'Bel-W 3' tobacco and on *Cineraria*.

Indeed, I am most concerned about the damage air pollutants are causing to our display plants at Longwood Gardens. We continue to find more plants which are being damaged. I have previously reported photochemical oxidant injury

*For the latest reliable illustrated reference work which covers the various types of air pollutants and the injury caused on different species of plant materials, I would like to refer you to: *Handbook of Effects Assessment Vegetation Damage*, edited by Norman L. Lacasse and William J. Moroz, Center for Air Environment Studies, The Pennsylvania State University, University Park Station, Pa. 16802. \$6.00.

to *Ginkgo* in Los Angeles, St. Louis, and Philadelphia. I am sorry to say I now see the first symptoms of local injury to *Ginkgo* at Longwood, a tree near the Longwood interchange and entrance where it is subjected to rather heavy incidence of auto fumes, the greatest contributor to the photochemical oxidant types of air pollution.

I am especially concerned by the rapid build-up of increasing concentrations of hydrocarbon photochemical oxidants which are reaching out to our area from the industrial and population centers along the Delaware River. I have seen this very same type of rapid build-up take place on the West Coast (Los Angeles) as I am now seeing here on the East Coast.

If this pollution build-up continues unchecked, it will effectively prevent us (and similar gardens and arboreta throughout the United States) from carrying out our objectives after 1974. The reason is simple: Air pollution threatens our main objective—prime horticultural display for the benefit, enjoyment, and education of the public. The alternative is to grow our plants under activated charcoal or other effectively *filtered air*—a very expensive, back-handed way to counteract the effects of air pollution. *The intelligent course is to control it at its source!*

Following is a partial list of Longwood plants on which there is photochemical oxidant injury traced to the high air pollution incidence during September 1969:

- Rhododendron schlippenbachii*
- Ajuga reptans* 'Blue'
- Leucospermum conocarpum*
- Protea cynaroides*
- Nicotiana* 'Bel-W3'—tobacco
- Greyia sutherlandii*
- Browallia speciosa*
- Petunia* 'White Cascade'
- Carica papaya*—papaya
- Erythrina* spp.
- Chrysanthemum* (trial seedling)
- Celosia plumosa* 'Fireglow'
- Cucumis sativus* 'Challenger'
- Beta vulgaris* 'Burpee Fordhook'—chard

Beta vulgaris 'Crosby's Egyptian'—beet
Allium cepa—Jap bunching onion
Phaseolus limensis 'King of the Garden'—lima bean
Lactuca sativa 'Summer Bibb'
Nicotiana tabacum 'Hill Island'
Gossypium hirsutum—cotton
Apium graveolens 'Burpee's Golden'
Hibiscus esculentus 'Clemson Spineless'—okra
Iris germanica var. *florentina*
Armoracia laphifolia—horseradish
Syringa—2-3 of our cultivars
Actinidia arguta
Heliconia caribbaea (yellow flowering)
Anacardium occidentale—cashewnut
Cineraria cvs.

It is urgent that local, state, and national authorities enact and enforce laws which will control effectively this rapidly increasing threat from pollutants—SO₂, fluorides, oxides of nitrogen, and especially the photochemical oxidant types—all of which we are finding to be poisonous to various types of plant life.

Meantime, I want to urge here what I have stressed before, that here are three

things we can do to make further use of nature in pollution control:

First, bring together lists of plants which demonstrate tolerance to man-made pollutants. This should be done for different climatic zones throughout the temperate-to-tropical world.

Second, determine which plants are the most efficient "smog eaters" and which can utilize and eliminate the other ingredients of man-made pollution in the air.

Third, plant at every opportunity those plants that not only enhance the setting but also tolerate the most adverse metropolitan conditions.

Every tree and plant we can grow will bring us that much closer to keeping the air breathable. Our survival depends on our breathing environment. It seems to me that we have every reason to insist on plantings and their maintenance in and around our towns, villages, cities, and industrial centers.

The pollution problem is now international. In my opinion, the urgency of our need to find solutions cannot be over-emphasized.

1969 Awards and Citations Of The American Horticultural Society

The Society's annual awards for excellence in advancing the cause of horticulture were made at the Awards Dinner, a high point of the 24th American Horticultural Congress at Philadelphia, Pa. September 19, 1969. Committee Chairman Francis de Vos presided at the dinner.

In recognizing the outstanding work

of these distinguished leaders in the horticultural field, the Society emphasizes standards of excellence for all horticulture.

Making up the 1969 Awards and Citations Committee were Gretchen Harshbarger, Fred B. Widmoyer, Earl E. Vallo, Anne Wertsner Wood, and Chairman Francis de Vos.

The Liberty Hyde Bailey Medal to Dr. George H. M. Lawrence

An inspiring teacher and distinguished Director of the Bailey Hortorium and Hunt Botanical Library. He helped a generation of horticulturists and gardeners to understand and appreciate the taxonomy and literature of cultivated plants.



Dr. Lawrence earned his undergraduate degree at the University of Rhode Island and the Ph.D. at Cornell University, specializing in botany and related

fields. He was an assistant to and student of Liberty Hyde Bailey for six years, director of the Bailey Hortorium for nine years and edited *Baileya*, a quarterly journal of horticultural taxonomy.

He is currently director of the Hunt Botanical Library at the Carnegie-Mellon University, and editor of *Huntia*, a yearbook of botanical and horticultural bibliography.

He has written two books, *Taxonomy of Vascular Plants*, and *Introduction to Plant Taxonomy*, and scores of papers in scientific journals.

Dr. Lawrence has been a trustee of Fairchild Tropical Garden, Coconut Grove, Fla., and of the Robert H. Montgomery Foundation, New York City; is an honorary life member of the Botanical Society of Edinburgh and the Horticultural Society of New York; was director of the American Horticultural Council 1947-58; a member of the Governing Board of the American Institute of Biological Sciences, 1966; chairman of the AHS Nomenclature Committee, 1956-66; and is a member of the American Institute of Graphic Arts.

Dr. Lawrence is a resident of Pittsburgh, Pennsylvania.

**Professional Citation Awarded
to**

Dr. Henry T. Skinner

For his outstanding service to American horticulture. His contributions to an understanding of rhododendron and azalea culture, the development of the National Arboretum, and to the American Horticultural Society have been truly significant.



Dr. Skinner was educated at the Wisley School of the Royal Horticultural Society, Cornell University, and the University of Pennsylvania. He served as curator of the Morris Arboretum in Philadelphia before his appointment as director of the United States National Arboretum in 1952.

A regular or honorary member of many professional, horticultural, and botanical societies, he is a past president of the American Association of Botanical Gardens and Arboreta, past president of the American Horticultural Society, and a member of the Commission on Nomenclature and Registration of the International Society for Horticultural Science. Currently he serves as a member of the Executive Committee of the Council of the International Society for Horticultural Science.

He has been a recipient of the Jackson Dawson Medal of the Massachusetts Horticultural Society for research contributions in plant propagation, The American Home Achievement Medal, the Arthur Hoyt Scott Horticultural

Award for work and writings on horticultural and botanical subjects, and the Gold Medal of the American Rhododendron Society for studies, especially, of American native azaleas.

In 1968 he received the Norman Jay Colman Award of the American Association of Nurserymen for contributions in the field of horticultural research.

Dr. Skinner lives in Bowie, Maryland.

**Garden Writer Citation
to
Nelson Coon**

For contributions to the literature of gardening. Through his books and articles, he shared his love of plants and knowledge of horticulture and gardening with amateur gardeners, commercial florists, and nurserymen.



Nelson Coon grew up in the violet-growing town of Rhinebeck, N. Y. where his father owned a florist business. During the great depression, Coon became superintendent of the arboretum-like grounds of the Perkins School for the Blind near Boston—a position he held until retirement in 1960.

He began his horticultural writing as a correspondent for *Florists's Exchange* in 1916. Since that time he has authored six books, several monographs, and numerous magazine articles about plants, and is currently garden columnist for the *Boston Sunday Herald* and *AHS's News and Views*.

Recording secretary of the Garden Writers Association of America, Nelson

Coon is also a member and past president of the New England Botanical Club, member of the International Society for Horticultural Science, member and past president of the Dukes County Historical Society, tour conductor of the Berke Garden Tours, and a frequent garden club lecturer.

He lives in Vineyard Haven, Mass.

**Citation in Amateur Horticulture
to
Dorothy F. Platt**

For her skill as a gardener, for over 60 years of dedicated service and leadership in a wide range of horticultural activities, and for her contributions as a flower illustrator.



Dividing her interest between painting and horticulture, Dorothy Platt has created in water colors many tropical plants and flowers, mostly of Guatemala and Hawaii and always with the emphasis on botanical accuracy. A collection of her work was published by Triton Press. She also illustrated *The Travellers Guide to Roadside Wild Flowers, Shrubs and Trees of the United States*, by Mrs. Lucien Taylor, and has had exhibitions at the New York Botanical Garden, the Philadelphia Museum of Art, and the Albany, N. Y. Art Institute, among others.

Mrs. Platt attended the first meeting of the Garden Club of America in 1913 and has been a member of the Garden Club of Philadelphia for 63 years. From

the former organization she earned the Achievement Medal and the Jane Righter Medal (for roses grown and painted) and from the latter, the Medal of Merit. Other medals have been awarded her by the Ambler School of Horticulture for Women and the Pennsylvania Horticultural Society.

Mrs. Platt is a resident of Philadelphia, Pennsylvania.

**Teaching Citation
to
Dr. Alfred N. Roberts**

For over 25 years of distinguished service as a teacher and research worker in ornamental horticulture at Oregon State University, Corvallis, Oregon.



Dr. Roberts received his academic training at Oregon State University and Michigan State University, earning his Ph.D. from the latter school. With the exception of his World War II naval service, he has taught at Oregon State University since 1940.

A past president of the American Society for Horticultural Science and on the Board of Directors of the International Plant Propagator's Society, he holds membership in several other scientific and horticultural societies. He is also a member of several honorary societies and has received two special awards from the American Society for Horticultural Science.

His published papers, his own or co-authored, number almost 100 and rep-

resent an unusually broad range of topics in the horticultural field.

Dr. Roberts is a resident of Corvallis, Oregon.

**Commercial Citation
to
Tom Dodd, Jr.**

For developing a great commercial nursery. His many plant introductions and participation in government plant testing and evaluation programs have helped to enrich our ornamental flora.



Tom Dodd is president of the Tom Dodd Nursery, Inc. of Semmes, Alabama, founded in 1920 by his father. An avid plantsman all his life, Dodd has been with the nursery since he was a boy. In his nursery, now over 300 acres, he grows native shrubs and trees of the South in an attempt to popularize them for garden use. A holly enthusiast, Dodd has introduced and named a number of new varieties from his nursery. He is also interested in magnolias and maintains an excellent collection in the nursery.

Dodd is a member of numerous horticultural societies including the Plant Propagators Society, the American Holly Society, the American Magnolia Society, the American Rhododendron Society, Royal Horticultural Society, the Louisiana Society for Horticultural Research and several trade organizations.

Mr. Dodd is a resident of Semmes, Alabama.

**Service to Horticulture Citation
to
Elizabeth C. Hall**

For three decades of distinguished service as Librarian and Associate Curator of Education at the New York Botanical Garden. She helped thousands looking for answers to their botanical and horticultural problems.



Elizabeth C. Hall received her undergraduate diploma from Radcliffe College and from the Ambler School of Horticulture and her library degree from Columbia University. She studied practical gardening for two years at the New York Botanical Garden. As a librarian she has had many titles, vast experience, and impressive responsibility at both The Horticultural Society of New York beginning in 1930 and The New York Botanical Garden beginning in 1937. She is currently Senior Librarian for the Horticultural Society (for whom she is compiling a 3500-title book catalog), and is Associate Curator of Education, *Emeritus*, of the New York Botanical Garden.

She is a member of the Woman's National Farm and Garden Association, the Torrey Botanical Club, and the New York Botanical Camera Club, and is an honorary member of the Herb Society of America and the Garden Club of Orange and Dutchess Counties.

Miss Hall has received awards from the New York Botanical Garden, the Men's Garden Club of New York, and Temple University. She is a lecturer on

a variety of horticultural topics and contributes to several professional and horticultural publications.

She lives in New York City.

Service to Horticulture Citation
to
Dorothy S. Manks



For 38 years of distinguished service as Librarian of the Massachusetts Horticultural Society and especially for her "Dictionary Catalog of the Library of the Massachusetts Horticultural Society."

Dorothy S. Manks was educated at Radcliffe College and Simmons College School of Library Science. After service with the Brookline, Mass., Public Library, she became Librarian of the Massachusetts Horticultural Society, serving until her retirement in 1963.

Her publications, in addition to the dictionary catalog, include *A Classification Scheme for Horticulture* and contributions to *Horticulture Magazine*, *Flower Grower*, *Library Journal*, *The New York Herald-Tribune*, *Huntia*, and others. She has appeared as lecturer before the Pennsylvania Horticultural Society, Old Sturbridge Village, Sturbridge, Mass., and various garden clubs. In retirement she is devoting her time to writing, travelling, and music.

Miss Manks is a resident of Cambridge, Massachusetts.

Exciting Developments in F₁ Hybrid Flowers

The outstanding advancement in the development and production of annual flowers in recent years is due primarily to the tremendous increase in the use of the F₁ hybrid breeding method. This breeding method has given large yield increases in corn and sorghum, increased egg and meat production in chickens and has been responsible for many of the improvements in vegetables. It has also given us many of the new annual flower cultivars. If you take a quick look through one of the recent seed catalogs you will find F₁ hybrid seed of *Ageratum*, *Begonia*, *Calceolaria*, *Cyclamen*, geranium (*Pelargonium*), gloxinia (*Sinningia*), Iceland poppy (*Papaver*), *Impatiens*, marigold (*Tagetes*), pansy (*Viola*), *Petunia*, *Saintpaulia*, *Salpiglossis*, snapdragon (*Antirrhinum*), and *Zinnia*.

What is a Hybrid?

The word "hybrid" has been used in different ways and is the subject of much misunderstanding. Botanically "hybrid" is used to describe the resultant populations that originated by intercrossing two or more species.

"Hybrid" was used in the annual flower seed industry to describe many new cultivars that were developed from later generations of intercrosses of other varieties. Thus, we have Unwin Hybrid Dahlias, Burpee Hybrid Zinnias, Pacific Hybrid Delphinium. In recent years "hybrid" has become synonymous with F₁ hybrid and is used to describe the first generation that is the result of crossing two different inbred lines.

How is a Hybrid Produced?

Most annual flowers have both male and female flower parts in the same flower. Therefore the inbred line chosen as the female or seed parent must be

protected from pollination by its own pollen. The pollen from the other inbred line (male or pollen parent) must be transferred to the stigma of the seed parent line. The simplest method of achieving this is to physically remove the anthers or pollen bearing structures from the seed parent before the pollen is shed and manually pollinate with the pollen from the pollen parent. Flower hybrids are often hand produced in this manner because of the small amount of seed needed. This method is prohibitively expensive for most vegetable and field crops, however.

Plant breeders use every possible means to avoid the expense of hand emasculation and pollination. They do this by finding seed parent lines that have defective pollen (male sterility); lines that have pollen but for some reason the pollen will not fertilize its own line (self incompatibility); lines that actually have pollen that can induce self pollination but because of placement or structure of the anthers, pollen does not reach the stigma (functional male sterility); or lines such as are found in the composite family that are fully double and bear no pollen.

Advantages of Hybrids

Hybrids in all plant species are generally more uniform, more vigorous, with larger flowers, and blooming over a longer period than their open-pollinated counterparts. Also, flower colors, flower types and plant habits can be developed in hybrids that are the result of the intermediate development of characters that cannot be "trued up" in inbred varieties. For example a nice rich cream colored zinnia can only be obtained by making a cross between yellow and ivory. Fully double petunias and African marigolds (*Tagetes erecta*) can only be commercially produced by the hybrid method.

Developments in Some Important Genera

Petunia: The F_1 hybrid petunia is by far the most important bedding plant in the United States today. Approximately 40% of the annual bedding plants sold are petunias. Over most of the country the petunia gives a continual mass of color from early summer to frost. The contrast between the old, small-flowered, open-branching, mauve or other dull colored petunias and the modern hybrids with their large flowers, compact habit and large, heavy, fringed flowers of bright or pleasing pastel colors is truly amazing. It makes one wonder just what is waiting to be uncovered in many of our other garden plants.

The double flower forms and the large-flowered or grandiflora types of petunia are completely dependent upon the hybrid method for production. The double character is dominant to the single form and is essentially female sterile, producing only an occasional functional pistil. The tendency to produce this occasional pistil permits breeding work to proceed, but would be a limiting factor for seed production by open-pollinated means. The F_1 hybrid double-flowered petunias are produced by using a single-flowered line for the seed parent and a homozygous (true breeding) double clone for the pollen parent.

The double-flowered lines produce variable amounts of pollen depending upon the individual inbred line, and are maintained by cuttings. Likewise, the popular large-flowered or grandiflora class of petunias can only be successfully produced by the hybrid method. Like the double character, the grandiflora flower type is dominant to the small or multiflora flower type. The grandiflora character is a semi-lethal in the homozygous condition, producing a very weak plant. Commercial F_1 hybrid grandiflora petunia seed is produced by crossing multiflora and grandiflora lines, usually using the multiflora line as the seed parent.

Recent breeding work has largely been that of making refinements in char-



PHOTOS GOLDSMITH SEEDS, INC.

Snapdragon F_1 hybrid 'Madame Butterfly'

acters such as flower color, increased flower size, freedom of bloom, compactness of habit, and earliness of bloom.

Snapdragon (*Antirrhinum*): F_1 hybrid snapdragons of the greenhouse forcing type were one of the first F_1 flowers. The tall strong 'Rocket' varieties introduced in 1960 were the first outdoor types developed using this method. Since then a number of F_1 hybrid varieties of different habits have been introduced, ranging from the very dwarf 'Floral Carpet' varieties to semi-dwarf and half-tall varieties, to varieties generally similar to the 'Rockets'. All of these have been big improvements over the comparable open-pollinated sorts, generally having stronger growth with more and longer spikes of flowers blooming over a longer season. F_1 hybrids have also been developed in the double-flowered form.

The newest development has been the new open-faced or butterfly type. 'Bright Butterflies', an F_1 hybrid mixture of



Petunia F₁ hybrid 'Red & White Delight'

colors was introduced in 1966. Parent lines for this variety were developed from crosses between the 'Juliwa' variety (developed by Dr. Edgar Knapp of the Max-Planck Institute, Heidelberg, Germany) and strong, normal flowered American types. This season a double

flowered open-faced type has been introduced with the name 'Madame Butterfly'. It is an All-America and All Britain award winner.

Like petunia, most of the hybrid snapdragon seed is produced in Central America and Japan by hand emasculation and pollination.

Marigold (*Tagetes*): F₁ hybrids in the African or American marigold (*Tagetes erecta*) have been available for about 10 years. The first were the 'Climax' varieties. These were of the tall type as are the more recently introduced 'Gold Coin' series. Both offer an abundance of large full-double flowers.

Recently the 'Jubilee' varieties have been introduced. They are a semi-tall, hedge type with excellent large full-double flowers.

Last season, 'First Lady', a semi-dwarf, clear, bright-yellow variety, was added to the list of F₁ hybrid marigolds.

For some time a variety named 'Red & Gold Hybrids', an F₁ hybrid between *Tagetes erecta*, the African or American marigold, and *Tagetes patula*, the French marigold, has been available. Recently a great deal of interest has been shown in varieties produced by crossing these species. The resulting hybrids are generally similar to *T. patula* but with many advantages over the



F₁ hybrid petunia seed production in Guatemala.



Petunia F₁ hybrid 'Astro'

French marigold. The flowers are larger, the plants bloom more heavily and over a much longer season.

F₁ hybrid marigolds are produced in field plots using alternate rows of seed and pollen lines. Two distinct forms of male sterility are used so that the seed line does not pollinate itself.

Although they are not F₁ hybrids, there have been some exceptionally good new French marigolds (*Tagetes patula*) developed the last few years. The first of these was 'Sparky' developed by Mr. Darrell Decker of Chula Vista, California. The later introduction of the 'Brocade' series and 'Bolero', an All-America award winning variety, are of this same general type. All of these combine large flower size, bright colors, earliness and dwarf, free-blooming habit to make outstanding garden annuals.

Zinnia: Great strides have been made in zinnia with the recent introduction of F₁ hybrids. At the present time hybrids are available only in the medium tall habit and cactus-flower form. The hybrid varieties are much superior, with stronger growth, a larger number of larger flowers with better doubleness.

The semi-dwarf button type and the very dwarf 'Thumbelina' have given a new dimension to the zinnia. Many companies are working hard on zinnia hybrids of the dwarf and semi-dwarf habit

with relatively large flowers. Some of these are very outstanding and will undoubtedly become extremely popular.

Pansy (Viola tricolor): As are so many of the recent improvements, the new pansy varieties are F₁ hybrids. One characteristic of these varieties is the ability to tolerate much more hot weather than the open-pollinated sorts. 'Majestic Giants' mixture, a 1966 All-America award winner, is outstanding for heat tolerance, as well as being free blooming and having very large flowers.

Geranium (Pelargonium zonale): Until about six years ago when the variety 'Nittany Lion' was introduced, garden geraniums were only grown from cuttings. Hybrids were introduced in 1967 and 1968. The 'New Era' and 'Carefree' series have greatly increased the use of the geranium as a garden plant. The seedling geranium offers many advantages, the plants are stronger and better branched producing a much better garden effect. Several breeding programs are in progress that will yield important additional improvements such as earlier blooming, more dwarf habit and freer blooming plants. For the first time double-flowered hybrids are being offered this current season.

Impatiens: Flowers that will grow and bloom well in the shade are badly needed and none fill the bill better than *Impatiens*. Hybrids again have been used to greatly improve this crop. The 'Imp' varieties are strong growing with many large flowers. The more recently introduced 'Elfin' varieties are very dwarf and extremely free flowering, although with smaller flowers. Both varieties are big improvements over the older types.

These are only the highlights of the recent developments in the main annual flower species. As I go over my own breeding plots and visit other flower plant breeders I see many interesting, exciting varieties ahead for the larger flowers with better doubleness.

dener.

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Plan Ahead for Effective Weed Control

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Last minute decisions are poor substitutes for well-laid plans for controlling weeds in vegetable and ornamental plantings around the home. Make your plans now to reduce the manual wear and tear of garden maintenance this year by using modern weed control technology.

Plan to use one of the strip mulches. These include black polyethylene film, aluminum foil, burlap mats and cloth, and paper mats. All of these strip-mulches control many germinating weeds and moderately suppress the growth of some perennial weeds in the immediate area. Bermudagrass, mugwort, morningglory, and several other perennial weeds, however, emerge from the edges of the mulches and require continuous hand chopping to control them. The pointed shoots of nutsedge grow up through the mulch and emerge like knife points. Garden areas badly infested with these, or other perennial weeds, should be treated with a soil

fumigant such as sodium methylthiocarbamate [metham], sold as Vapam, before any mulch is laid. Use of methyl bromide as a soil fumigant is now restricted to non-food crop areas with the exception of vegetable transplant beds and fields to be planted to tomato crops or strawberries.

You can easily lay these mulch strips on soil prepared for planting; cut holes through them; and set in such transplants as tomato, pepper, cabbage, sweet potato, and other plants (Figure 1). Hills of cucumbers, melons, beans, sweet corn, and other direct-seeded vegetables can be planted through appropriately spaced openings in the mulch. New plantings of strawberries made on 6-inch spacings through the mulch produce high yields of top quality fruit.

Where the gardening space is very small, a trellis-like culture of tomatoes combined with mulching is highly efficient. In this method, squares of the mulch are used around single plants grown in wire cylinders for support (Figures 2, 3). We have used the 'Big Boy' and 'Belgian' tomato cultivars. Yields have averaged about one bushel per plant. A number of other similar varieties adapted to local conditions are equally productive in this method of

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Fig. 1. Tomato plants growing on (A) unmulched row; (B) on row mulched with aluminum foil; and (C) on row mulched with burlap mat.



Fig. 2. Tomato plant supported by wire cylinder placed on a sheet of black polyethylene film.

culture. Six plants will provide all of the fruit used by an average family. The wire cylinders have a diameter of 30 inches and a height of 6 feet. Each one is set on a mulch strip 3 x 3 feet. Six plants will thrive on a space 15 feet wide and 20 feet long. A liberal application, one-half teacup, of 5-10-5 or 5-10-10 fertilizer is thoroughly mixed with each 16 square feet of soil before the mulch is laid.

Weeds in the unmulched areas between the rows are easily controlled by a carefully directed spray of Stoddard solvent cleaning fluid that thoroughly wets the weed foliage but avoids contact with crop plants.

The same wire support and mulching system can be used to grow cucumbers, climbing beans, peas, or other similar crops.

In addition to controlling certain weeds, the mulches reduce evaporative water loss from the soil, thus stabilizing moisture supply to the crop roots and enhancing growth. Soil temperature ex-



Fig. 3. Mature wire-supported tomato plant showing ripening fruits.

temperatures are minimized by mulches and reduce stress on the plant. Incidence of fruit rots of melons, cucumbers and tomatoes are minimized on mulches.

Mulches and fumigants can be used with equal effect in beds for planting annual ornamentals. In many instances, cutting and fitting mulches around established perennial ornamentals can minimize weed control problems and help to conserve moisture.

Mention of a trademark or proprietary product does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture, and does not imply its approval to the exclusion of other products that may also be suitable.

All agricultural chemicals recommended for use in this report have been registered by the U.S. Department of Agriculture. They should be applied in accordance with the directions on the manufacturer's label as registered under the Federal Insecticide, Fungicide, and Rodenticide Act.

***Triolena pustulata*—Correct name for "*Bertolonia pubescens*"**

PHOTO COURTESY A. B. GRAF



A greenhouse melastome has long been cultivated under the name of "*Bertolonia pubescens*." Herbarium specimens of "*Bertolonia pubescens*" Hort. at The New York Botanical Garden and at the U.S. National Arboretum in Washington, D.C. are now correctly identified as *Triolena pustulata* Triana. This is a lowland species from Ecuador originally collected over a century ago by Richard Spruce near Ventanas in Ecuador. It is now found in the Provinces of Cañar, Pichincha, Cotopaxi, and Los Rios, also in Ecuador.

Habit photographs of *Triolena pustulata* have been published under the name of "*Bertolonia pubescens*" by Madicke in 1911 and in *Exotica* 3 by Graf; the cultivated plants have also been mentioned by Preston in the *Dictionary of Gardening* (Second Edition) and by Encke in *Pareys Blumengärtnerei* (Second Edition). The characteristic dimorphic stamens, with three filiform

ventral appendages at the connective base in the large ones, were well illustrated by Ziegler.

Triana published the original description of *T. pustulata* in 1871. In his monograph of the Melastomataceae in 1891, Cognieux did not mention "*Bertolonia pubescens*." Hopefully, the horticultural name is later and the epithet would not displace that of Triana in *Triolena*.

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***Ilex Decidua* 'Byers Golden'—A New Yellow Fruited Possum-Haw**

Some of the cultivated species of holly, such as *Ilex aquifolium*, *I. cornuta*, *I. glabra*, *I. crenata*, *I. vomitoria*, and *I. verticillata*, possess yellow-, orange-, or white-fruited types. When occurring in the wild, individuals with atypically colored fruit may be given a botanical name, such as *I. opaca* forma *xanthocarpa*. Numerous clones selected in the wild for unusual fruit color have been brought into cultivation and given cultivar names, such as *I. vomitoria* 'Wiggins Yellow'. Also, individuals from among nursery grown seedlings—either as a result of open or deliberate selective pollination—have been selected and given cultivar status. The last example may be



***Ilex decidua* 'Byers Golden'. Fruit globose or broader than long, up to $\frac{1}{2}$ inch wide and $\frac{1}{3}$ inch long, Yellow Group 13A-13B to Yellow-Orange Group 14A-14B (Royal Horticultural Society Colour Chart, 1966).**

illustrated by *I. cornuta* 'Avery Island' and *I. cornuta* 'D'Or'.

The first documented clone of *I. decidua*, the possum-haw, with yellow fruits, was discovered about 1959 by Marcus D. Byers of the Byers Nursery, Huntsville, Ala. The single original plant, a mature shrub with golden yellow fruit, was growing in a fence row in the town of Deposit, about 7 miles northeast of Huntsville in Madison County, Ala. The plant was moved from the fence row to Byers Nursery where it was propagated vegetatively. Mr. Byers reports that the plant is apparently free of disease and most insect pests, and has maintained the golden yellow fruit color every year for the past 10 years under observation. He also states that he has never before seen a yellow-fruited possum-haw anywhere. It is also the first

record in botanical or horticultural literature of a yellow-fruited *I. decidua*. This very beautiful clone is given the cultivar name of 'Byers Golden'.

Description of *Ilex decidua* Walter 'Byers Golden' n, cv.

This clone is a vigorous, heavy fruiting, several stemmed and basally branched deciduous shrub with smooth, light gray bark. Specimens in the nursery row have attained a height of more than 12 feet, with an upright stiff habit and ascending, open, and graceful branching. The leaves are narrowly obovate to elliptic, dull dark green, membranous, ascending and tufted at the ends of the branchlets, $2\text{-}3\frac{1}{8}$ ($\text{-}4\ \frac{7}{8}$) inches long, $\frac{3}{8}\text{-}\frac{7}{8}$ inches wide above the middle, with acute and mucronate apices, attenuate-cuneate at base into slender petioles, 2-4 ($\text{-}6$) inches long.

The leaf margins are sparsely and irregularly serrulate. The very large black-tipped fruits, generally borne in fascicles of 4-8 on short spurs, are globose to oblate (broader than long), $\frac{3}{8}\text{-}\frac{1}{2}$ inches in diameter, $\frac{1}{4}\text{-}\frac{5}{16}$ ($\text{-}\frac{3}{8}$) inches long, with 4 pyrenes. The golden yellow fruit is defined as 13A and 13B of the Yellow Group at first ripening, then maturing to a 14A and 14B of the Yellow-Orange Group (Royal Horticultural Society Colour Chart, 1966).

The consistent profusion of golden yellow fruits and the good growth form will make *I. decidua* 'Byers Golden' a favorite of holly growers and fanciers of novelty yellow-fruited plants.

Authentic voucher herbarium specimens and photographs of 'Byers Golden' have been deposited in the U.S. National Arboretum Herbarium. The cultivar name 'Byers Golden' has been registered with the Holly Society of America, the International Registration Authority for *Ilex*.

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Woolly Blue Curls—*Trichostema lanatum*

Among the bold and spectacular plants of the California countryside are several shrubby mints, and one of these is woolly blue curls, *Trichostema lanatum*. Early explorers called it romero because its appearance and odor was similar to their aromatic rosemary (*Rosmarinus*), of the Mediterranean region. The common name comes from the plant's striking inflorescence—tubular flowers with exserted, curled stamens against the rosy purple wool which covers the upper branches. These tall spikes overtop the main plant and bear many blue-purple flowers coming from inflated, silky buds which are almost as decorative as the open blossoms. The height of this colorful display comes during May and June, after which the spikes may be removed and a second flowering can be expected in mid-autumn.

Woolly blue curls is a robust, shrubby plant, two to four feet tall, with many leafy branches from a single trunked base. Evergreen foliage is narrow, yellow-green, disposed in little bundles along the branches. This attractive mint is native to dry slopes of foothills and low mountains from central California to San Diego County. Its natural companions include many typical drought tolerant species, such as yucca, *Penstemon*, *Rhus*, buckwheat relatives of the genus *Eriogonum*, bladder pod, *Isomeris arborea*, and many others.

Garden information on woolly blue curls is not extensive, but from my own experience, I know it to be long lived—having persisted in my dry border for about 15 years. Propagation from seed may be spotty and cold stratification for three months at 32 degrees F. is recommended. Young plants may be potted or planted directly into permanent garden quarters where plants often flower the



PHOTOS, RANCHO SANTA ANA BOTANIC GARDEN

Fig. 1. Plant of woolly blue curls, *Trichostema lanatum*, a shrub two to four feet in height.



Fig. 2. Close-up showing the blue-purple flowers set against the rosy purple wool which covers the upper branches.

first year. Heel cuttings may be rooted in sharp sand, and this is the best method in cases where superior color forms occur. In my dry garden several drought tolerant native plants accompanied woolly blue curls, including the tall, spectacular St. Catherine's lace, *Eriogonum giganteum*, *Fremontia napensis*, *Ceanothus impressus*, *Ceanothus* 'Sierra Blue', *Brodiaea* spp., *Mimulus*, *Arctostaphylos*, and *Penstemon*. *Brodiaea californica* with its large umbels of lilac-purple bells is a late flowering species, and especially harmonious in this company of colorful, indigenous plants. Water is given to this section of my garden only if the spring season has been overly warm and without rains. Full sun, lean soil, and perfect drainage are requirements which suit all of these.

Although it is not yet extensively cultivated, horticulturists of the several botanic gardens consider woolly blue curls to be a most desirable ornamental. In mild climates it is reported to have an exceptionally long flowering period. From such highly colored and free flowering native plants gardeners can have plantings with a western style and flavor not to be found anywhere else in the world.

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A Bizarre Tree Huckleberry

One recent cool morning, I visited a granite outcrop in northeast Newton County, Ga., in search of a stunted tree for a garden. The area is characteristic of the rolling hill country of the lower Piedmont band across north-central



Fig. 1. Tree huckleberry, *Vaccinium arboreum*. Branches in flower and in fruit with floral details. From C. S. Sargent, *Silva of North America*. Vol. 5, plate 230. 1893.



PHOTO WM. I. ALLGOOD

Fig. 2. Tree huckleberry, showing contorted and twisted branches of specimen growing in northeastern Newton County, Georgia.

Georgia. Two surprises awaited me—six deer sunning on the east side of a pine thicket and a medusa-like shrub unlike anything I had seen in 50 years of tramping through the Piedmont.

The bizarre specimen has been identified as a tree huckleberry, farkleberry, or sparkleberry, *Vaccinium arboreum*. While the blossoms, summer foliage, and fruit are characteristic of this species, the growth characteristics beg the issue. Not one of my friends who normally notice unusual trees has ever seen a tree huckleberry even remotely similar to this one. Normally, the tree huckleberry develops a spreading crown, but rarely does it assume the contorted aspect of this specimen with branches that closely resemble Harry Lauder's walking stick, *Corylus avellana* 'Contorta'.

Dr. Claude Brown of the University of Georgia, Department of Forestry, reports that he has never seen a tree huckleberry quite as large nor anything like it in growth characteristics, the

limbs of which put Gorgon sisters to shame with its serpentine branches.

In a preliminary attempt to determine the age of the tree, Dr. Brown suggested it to be younger than its size and characters would indicate, perhaps under 100 years. In attempting to account for the peculiar growth habit, Dr. Brown explains that the tree huckleberry normally develops a crown even when young. One branch will then dominate and grow essentially upright and develop another higher crown. This growth pattern may be repeated several times during the life of the plant.

As the photograph shows, no main branch dominates the tree's meandering growth. A core boring of the trunk betrays the tree's dual characteristics; evidently two shoots entwined at or below ground level to part ways again at about 28 inches above ground. We believe a cross section of the main trunk would reveal a figure eight growth with two centers and an early joining of the cam-

bium tissue of each shoot. The shrub is about 12 feet high and irregularly spreading, 22 feet in one direction and 18 feet in the other direction. The tree measures 28 inches in girth at the base. Tips of the branches fall to the ground and some are literally covered in humus from its own leaves.

The tree is growing in a depression of the granite outcrop, evidently in extremely rich soil, as witnessed by the rapid growth of several slash pines, *Pinus elliottii*. The depression also catches water during limited rainfall periods but water does not stand for lengthy periods. There appears to be a colony of tree huckleberries with a similar habit in the immediate vicinity, either from seeds or root sprouts from the large specimen. Tree huckleberry plants with normal growth habit are common in the vicinity of the unusual specimen.

In the wild, tree huckleberry occurs in sandy or rocky, usually dry woodlands of the coastal plain and piedmont from southern Virginia to Georgia and Florida, through the Gulf states, and from southern Illinois and Missouri through eastern Texas. In the south, the tree huckleberry is often up to thirty feet tall with a crooked trunk, occasionally eight or ten inches in diameter, and slender, more or less contorted branches which form an irregular round head. In the north, it is a shrub with many divergent stems. The bark is a beautiful reddish brown. The flowers are white. The hard, black berries, produced in abundance in late summer, are inedible.

The tree huckleberry or farkleberry is a native plant we have neglected in gardens. It is all but unknown in cultivation, except to a limited extent in areas where it is native. However, it was grown in English gardens in the 18th century. Although the specimen described here is an extreme form of the plant, the normal wild form has much to recommend it for gardens. The beauty of the plant comes from the distinctive habit, the beautiful reddish brown bark, and the lustrous bright green, nearly round leaves. Garden architects ought to know about it for the irregular,

often contorted growth form of old plants.

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***Fritillaria imperialis* — Proper Cold Treatment Vital For Forcing**

Fritillaria imperialis cv. *Lutea*, a member of the lily family, is a hardy bulbous plant which normally blooms in the spring. The yellow lily-like flowers are borne on a stem 2 to 3 feet high, with linear leaves 5 to 6 inches long extending two-thirds of the way up the stem. The many flowers hang pendantly in a terminal umbel among 8 to 20 erect linear leaves which are 2 inches or more in length.

To force *F. imperialis*, a cold treatment is recommended. However, this report indicates it is very important that the cold treatment be at a sufficiently low temperature.

In the past, Longwood Gardens has had considerable difficulty in properly forcing *F. imperialis* cv. *Lutea*. Blasting of the flower buds had been the chief difficulty, but non-uniform height and a variable blooming time were also problems.

Normally, bulbs were purchased in the fall and potted up in early October in a rich potting mixture to which were added 6 ounces of lime and 3 ounces of superphosphate per bushel. These were then given a cold treatment in a greenhouse held at 40-45° F minimum, the temperature going higher if the minimum could not be maintained because of higher outside temperatures. This was continued until around the first of March when the temperature was raised to 50° F at night and 65-70° F during the day. The plants resulting from this method of forcing were not satisfactory.

It was therefore decided to run a cultural study on *Fritillaria* at the Longwood Gardens Experimental Greenhouse to see if the situation could



PHOTO LONGWOOD GARDENS

***Fritillaria imperialis* cv. Lutea growing at Longwood Gardens, Kennett Square, Pennsylvania.**

be improved. The variables decided upon were the temperature of the cold treatment and the potting mixture.

The cold treatments were: I. The normal or control treatment consisting of placing the potted bulbs in a greenhouse where light could reach them and the temperature would be held at a 40-45° F minimum. The temperature, of course, went higher than this if the outside temperature did not permit the maintaining of the minimum temperature; II. Treatment by placing the potted bulbs in a dark refrigerator where the temperature could be held at a consistent 36-38° F; and III. Treatment by placing the potted bulbs outside in a pit covered with soil and straw where the minimum temperature would drop to below 32° F.

The two potting mixtures were: A. A relatively heavy soil mixture consisting of two parts loamy soil, one part sand and one part peatmoss; B. A light soil mixture which consisted of one part

TABLE 1. Average Bud Counts and Average Height (in inches) of *Fritillaria imperialis* cv. Lutea

Cold Treatment	Potting Mixture A (heavy)		Potting Mixture B (light)	Average for both Mixtures
	Bud Count	Height	Height	
I Greenhouse (40-45° min.)	Normal	3.2	3.2	3.2
	Blasted	4.3	4.3	4.3
	Total	7.5	7.5	7.5
	Height	21.7	18.8	20.2
II Refrigerator (constant 36-38° min.)	Normal	7.7	7.5	7.6
	Blasted	0.2	0.2	0.2
	Total	7.9	7.7	7.8
	Height	33.8	34.2	34.0
III Buried outside (min. less than 32°)	Normal	7.7	7.3	7.5
	Blasted	0.0	0.0	0.0
	Total	7.7	7.3	7.5
	Height	32.3	32.2	32.2
Average over-all cold treatments	Normal	6.2	6.0	
	Blasted	1.5	1.5	
	Total	7.7	7.5	
	Height	29.3	28.4	

loamy soil, one part sand, and two parts peatmoss. To both of these were added the normal 6 ounces of lime and 3 ounces of superphosphate per bushel.

The cold treatments and potting mixtures were used in all possible combinations, resulting in six treatments. Six bulbs per treatment were used, making a total of 36 plants in the experiment. The bulbs were planted in seven-inch pots so that the top of the bulb was just below the surface of the soil.

All treatments were begun on October 10, 1967 and at the end of the cold treatment the bulbs were placed in a house kept at 50° F at night, 65-70° F during the day. Those bulbs placed in the greenhouse for the cold treatment and those placed in the dark refrigerator (Cold Treatments I and II) were transferred to the warm house on February 28, 1968. The transfer for those buried in the pit (Cold Treatment III) was not done until March 4, 1968, because of frozen ground.

When the plants were moved to the warmer greenhouse, they were fertilized with a half-strength solution (1/2 tablespoon per gallon of water) of a 20-20-20 soluble fertilizer at one and three weeks after they were removed from the cold treatment.

On March 20, 1969, those plants given the cold treatment in the refrigerator and those held in the 40-45° F greenhouse for the cool treatment (Treatments I and II) were in full bloom. The bulbs that were buried outside (Treatment III) did not come into full bloom until March 30, 1969. The reasons for the later blooming of those buried outside can be attributed partly to the delay in bringing them in to the warmer greenhouse and partly to the fact that the colder temperatures kept the plants from developing as rapidly as those in the refrigerator and those in the greenhouse.

Just before the plants bloomed, bud counts were made, with the number of normal and blasted buds recorded for each plant. Heights of the plants were also recorded at this time. The averages

of the bud counts for each treatment and the average height of each treatment are listed in Table 1.

As can be seen by looking at the data, bud blasting was nearly eliminated by the cold treatment in the refrigerator and was eliminated entirely on those buried outside. Total bud count was not affected by the various cold treatments.

Average height was considerably less for those plants treated in the greenhouse than for those in the other treatments.

Potting mixture had no effect on either bud count or plant height.

The conclusion is that a cold treatment in a refrigerator or coldroom held at 36-38° F for about four months, and then removal to a greenhouse held at 50° at night and 65-70° during the day for about three weeks before display plants are desired, will produce high quality blooming plants of *Fritillaria imperialis* cv. *Lutea*, with a minimum of bud blasting. This treatment has been and is being used at Longwood Gardens, with excellent results in forcing these bulbs for display purposes.

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***Stewartia ovata* on the Coastal Plain of Virginia**

Two populations of *Stewartia ovata* are known on the Coastal Plain of Virginia: near Williamsburg, James City County (E. J. Grimes, 1922, *Rhodora* 24); at Merry Point, Lancaster County (Winifred J. Harley, 1961, *Rhodora* 63). Actually, as we now know, the Reverend John Clayton, rector of James Town Parish from 1684-1686, wrote about the first of these populations to Robert Boyle in a 1687 letter (J. T. Baldwin, Jr., In Press, *Rhodora*). This species, chiefly in the mountains from Virginia (?) and Kentucky to Georgia and Alabama, is called mountain camellia, though on the Coastal Plain—where it flowers in June—it has the common name of summer dogwood.



PHOTOS BY J. T. BALDWIN, JR.

Stewartia ovata with white filaments.



Stewartia ovata var. *grandiflora* with purple filaments.

The only other American species, *S. malachodendron*, is primarily on the Coastal Plain and in the Piedmont from Virginia to Louisiana, with an outlying station in Arkansas (Carroll E. Wood, Jr., 1957, *Arnoldia* 17). It is called silky camellia, from the downiness of the lower leaf-surface. This plant has purple filaments, whereas *Stewartia ovata* generally has white (yellow) filaments. But the James City County population, consisting of hundreds of individ-

uals over a larger area, has filaments on different plants of three colors: white (yellow), rose (lavender), purple.

Does this James City County population of *Stewartia ovata* result from introgressive hybridization of the two species in the early years of Colonial Virginia? We do not know. Frederick W. Coe (1959, *National Horticultural Magazine* 38) thought not. He found there certain individuals with both white-filamented flowers and dark-filamented ones: this I have not observed. Wood (1957) reported a comparable situation for a specimen of *Stewartia ovata* from Highlands, North Carolina, cultivated at the Arnold Arboretum. And somatic mutations affecting flower color are frequent in some cultivars of *camellia*. But we do know that the area where the James City County population grows was early put to agricultural use, so intermediate habitats might well have been created and populations of some plants eliminated. No stand of *S. malachodendron* is now known on the peninsula of Virginia, and those closest to Williamsburg are in Norfolk and Nansemond counties where the trees flower in May—several weeks before *S. ovata* flowers in James City and Lancaster counties. Both species occur in Cullman County, Alabama, and in Macon County, North Carolina (Clarence E. Kobuski, 1951, *Journal of the Arnold Arboretum*); it would be of interest to know whether plants with filaments differently colored are in those areas.

Certain of the purple-filamented representatives of *Stewartia ovata* constitute var. *grandiflora*; the variety was described from plants grown in Great Britain. The likelihood is strong that those plants derived from the James City County population, perhaps by way of John Clayton (1686-1737) or John Mitchell (1676-1768). Both men botanized in Virginia, and both were involved with *Stewartia*. For this variety Rehder states in his Manual: "Fls. 8-10 cm. across, stamens purple; petals sometimes up to 8. . . Ga. Cult. 1914." One would like to revisit the area of the origin of this introduction.

I have deposited specimens from the James City County population in the Gray Herbarium and in the Herbarium of the National Arboretum (*Baldwin* 14951). Julie Hotchkiss photographed a flower with white filaments and one with purple filaments on June 25, 1969. The

latter flower measured four inches across.

J. T. BALDWIN, JR.
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1970 All-America Selections

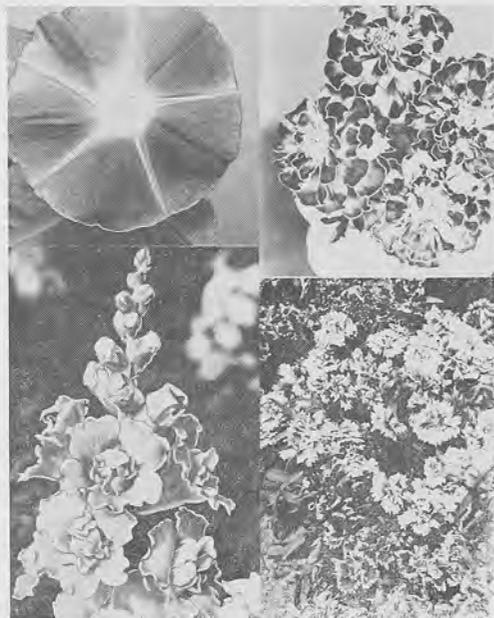
For some 38 years the All-America Selections have annually brought to the gardening public the world's leading new introductions in vegetable and flower seeds. Presented here are the 1970 All-America Selections—four flowers and two vegetables—which should be of special interest to society members.

These selections result from open trial

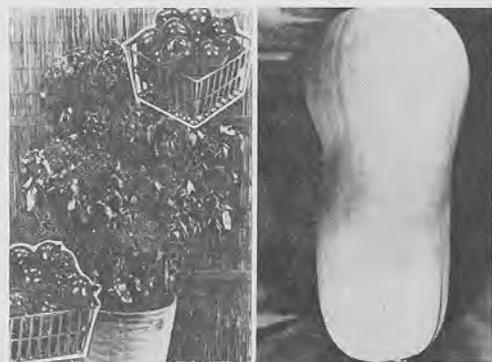
grounds competition in Canada, the United States, and Mexico. The AAS program is the only authentic pre-introductory testing and comparative rating of new flower and vegetable seed varieties for North America. Entries come from private, commercial, and public institution plant breeders from around the world.

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For more information write W. Ray Hastings, Executive Secretary, All-America Selections, P.O. Box 1341, Harrisburg, Pennsylvania 17105



New 1970 All-America selections: early giant morning glory 'Early Call Rose', dwarf French marigold 'Bolerero', hybrid snapdragon 'Madame Butterfly', and dianthus 'China Doll'.



Hybrid cherry tomato 'Small Fry' and winter squash 'Waltham Butternut.'

Where have all the Wild Flowers gone?

THOMAS HARNEY

Bogs, wet and spongy areas where unique forms of plant life flourish, are disappearing in the areas around major cities, dooming some of nature's loveliest and most unusual wild flowers.

What makes the bogs vanish more often than not is man's heedlessness as he bulldozes more and more land areas for housing developments.

The death of what may have been the last true bog in the Washington area, near Suitland, Md., was reported recently by Smithsonian botanist Stanwyn Shetler.

A half century ago Suitland bog was one of a dozen or more magnolia bogs in the area, so called because of the magnolia or sweet bay that grew in them. Botanists knew them as the most striking wild plant habitat in the vicinity and delighted in visiting them to see sphagnum moss and such wild flowers as pitcher plants, sundews, butterworts, and bladderworts, plants rarely seen except in bogs.

But over the last few decades as the population has grown, bogs like the Suitland bog have been destroyed one by one.

"A single new ditch or truckload of fill can alter centuries-old drainage patterns sufficiently to dry up a little bog or wet sandy flat and doom an ancient population of sundews, pitcher-plants, or butterworts to certain extinction," Shetler says.

These hardy wild flower species are at home in bogs because they have adapted to cold, soggy, spongy ground that lacks nitrogen.

Bogs are nitrogen deficient because they are built on a foundation of peat



Venus Flytrap

that is formed by plant matter decaying under cold water. The water-logged, acid peat creates conditions that limit the available nitrogen and other nutrients essential to plant growth.

Pitcher plants, sundews, and butterworts have found a way to compensate for this nitrogen scarcity. They "eat" insects, a habit that makes them one of the wonders of the plant world.

The pitcher plant, so called because of its cluster of pitcher-like leaves streaked with red veins, is attractive to insects because of its nectar. As the insects feed, they are inclined to stray into the mouth of the "pitcher." The pitcher's lip has stiff, downward pointing hairs, and once the insect begins to move down over these hairs there is usually no return. It soon reaches a steep, slippery wall that toboggans it down into a pool of water at the bottom of the pitcher.

The plant releases enzymes into the water. These and bacteria, which thrive in the digestive brine, immediately be-

Smithsonian Institution.

gin decomposing the insect. When the insects are digested the plant is able to absorb the nitrogen compounds for internal use.

Pitcher plants are found in sphagnum bogs across eastern and central North America from as far north as Great Bear Lake, near the Arctic Circle in north-west Canada, southward to Georgia.

A second bog resident in the same geographic range is the sundew, whose glistening leaves appear harmless, but when an unwary insect lands on them he finds himself entangled and trapped in tentacles that hold droplets of a sticky fluid. The plant then secretes digestive enzymes.

The Venus flytrap is another insectivorous plant found only in the bogs of the Coastal Plain of North and South Carolina. Its spiked leaves are a trapping mechanism that can snap shut on

an unfortunate fly and then secrete enzymes to digest it.

Both the pitcher plant and the sundews could be seen at Suitland, but when Shetler visited the area recently he found that bulldozers had graded for a nearby housing development and caused gravel to wash down a slope into the heart of the small habitat, destroying most of the pitcher plants and apparently all of the sundews.

"This is a symbolic tragedy. How do you convey the value of these unique plants that are lost and the fact that no one will ever be able to see pitcher plants bloom again in the Washington area?" Shetler said.

"Much more tragic than the loss of one small bog is the carelessness that permits man to blindly alter the landscape without regard for its flowers and other beauties."

The Story of The Royal Horticultural Society, 1804 - 1968

H. R. Fletcher. Oxford University Press, 200 Madison Ave., New York, N.Y. 10016. 1969. 564 pages. Illustrated. \$14.75 (Library)

On March 7, 1804, seven men met in London and formed an organization which later became The Royal Horticultural Society. This meeting had been preceded by months of correspondence and discussions, encouraged by John Wedgewood, son of Josiah Wedgewood of pottery fame. These seven men, all vitally interested in plants and in horticulture, included three amateur gardeners—John Wedgewood, Charles Greville, and R. A. Salisbury; a botanist, Sir Joseph Banks; two professional gardeners—William Forsyth and William T. Aiton, both gardeners to King George III; and a nurseryman-seedsman, James Dickson. At the next several meetings additional members were added who also became active and known in horticultural affairs. A pattern developed for their regular meetings, with talks on plants and gardening by members, shows and exhibits of newer and unusual plants. The Society also sponsored expeditions for the introduction of new plants. Later a publication was begun. The society grew so that by 1822 there were 2500 members. At first, only men attended the meetings, women being later included as guests at certain events, and in 1830, admitted to membership. Women soon became active in the Society, its meetings, and shows.

One of the early projects of the Society was to establish a garden for the growing of as many kinds of plants as possible. This garden was relocated several times until the present Royal Horticultural Society garden was established at Wisley in 1903.

The RHS established a horticultural examination program for student gardeners at Chiswick Garden, and one of the first certificates was presented on September 26, 1836, to Robert Fortune who was later to become well known as a plant explorer. He was one of several men who at one time or another went on plant exploration trips for the Society. David Douglas was one who was sent

to North America and who sent back to England many plants native to our western coast.

Beginning with its early meetings, the papers presented were later published. These publications took several forms, with the present one, the "New Series" of the *Journal of the Royal Horticultural Society*, begun in 1866.

Shows and exhibitions have been an important function of the RHS. They have ranged from exhibits for members—of special plants or groups of plants—to the large shows in special exhibit buildings and the present shows at Chelsea.

Perhaps one of the most significant meetings sponsored by the RHS was the International Conference on Hybridization and Plant Breeding in 1899, at which papers were presented by W. Bateson, C. C. Hurst and Hugo de Vries. These papers, which collectively contained information first published by Gregor Mendel in 1865, had essentially been lost to the scientific world, having been published in a relatively little-known journal. Hugh de Vries was one of three scientists who had rediscovered Mendel's work. The importance of this was recognized and the Society published a translation of Mendel's report in the *Journal* in 1901.

The reader will recognize in this history many names associated with plants and horticulture, persons who are remembered for their writings, their contributions to our knowledge of plants, and many who in turn have been honored by having their names used in the scientific naming of plants. Not only have gardeners and professional horticulturists been involved in the Society, but the Royal family, governmental leaders, business and professional people, as well. It has brought together people who represent a wide range of plant interest.

This is a fascinating history of an important segment of horticulture. It is a detailed, well documented story and makes enjoyable reading. The author was director of the Wisley Gardens from 1951 to 1954 and is now Regius Keeper of the Royal Botanic Garden, Edinburgh, Scotland. This is an important contribution to the history of horticulture.

CONRAD B. LINK

Informal Gardening

B. Cary Kilvert Jr., The Macmillan Company, N. Y. and, Collier-Macmillan Ltd., London, England, 1969, 286 pages, illustrated, \$5.95.

Informal Gardening is written especially for the new homeowner with the desire and ambition of designing and developing his own landscape. The author successfully combines horticultural principles and practices with his own experiences to establish a sequence of steps which should be followed in developing a landscape site.

He begins with the first considerations of home ownership—including the often overlooked topics of preserving the inherent features of the site, the land, and the plant care during construction. The author's own experience with builders and contractors adds amusement while emphasizing the importance of preplanning and "on the site" supervision by the homeowner. As the landscape is being developed, Kilvert also recommends naturalistic plantings which eliminate the need for future maintenance. A major theme of the text is the development of the landscape plan toward livability and enjoyment.

Another feature of this book is its emphasis on conservation of the land's natural resources and the economics of landscaping. Many suggestions are made for the use of native plant materials and construction surplus in the landscape. Although the individual is encouraged to perform a major portion of his own work, the author admits that conditions often arise which necessitate professional consultation.

While the book contains much descriptive text, it lacks diagrams which would have been beneficial to the inexperienced gardener. An appendix includes a list of recommended trees and shrubs—but it is limited and the author suggests consultation with local sources of garden information.

THOMAS J. McCUBBIN

Design With Nature

Ian L. McHarg, The Natural History Press for the American Museum of Natural History, Garden City, N.Y., 1969, \$19.95.

The author has given us an excellent book to serve as a guide for the 70's on the importance of ecology—the science of man's relationship to his environment.

McHarg, a renowned landscape architect,

ecologist, urban planner, writer and lecturer, portrays his adequate understanding of the land including an appreciation of its intrinsic value and knowledge of how it can best serve mankind. He takes a strong stand against man's disregard of his natural environment and demonstrates how new knowledge and techniques must be applied to the environment.

The author's practical approach, combining scientific insight and constructive environmental design, provides a procedure to identify each area of our environment for its most suitable use.

Design with Nature is a resource book not to be read hastily, but to be absorbed slowly to develop a foundation of ecological knowledge which may be affectively applied to our disappearing and disintegrating environment.

F. C. GALLE

Handbook of Rocky Mountain Plants

Ruth Ashton Nelson. Dale Stuart King, Publisher, Tucson, Arizona 85704. 1969, 331 pages, illustrated, \$6.95 (thin paper cover, \$4.95) (Library)

A book of the native plants of the Rocky Mountains written for those who wish to learn and know the plant he sees, *Handbook of Rocky Mountain Plants* is written in a non-technical manner by one familiar with the plants of the region. The simple keys for identification are based on the most familiar or obvious characters, with many line drawings to help.

The first section of the book describes the general mountain climate, soils, and landscape as they relate to and influence plant growth. A short description explaining the several zones of vegetation follows, beginning with the Foothills which "extend from where the plains break at the foot of the mountains up to the region where large trees are dominant," to the Montane zone or forested region, to the Subalpine zone and finally to the Alpine or Tundra zone—above timberline. Each of these vegetation zones have distinctive plants found in them, whether in the Rockies of Montana or in Arizona—a response largely to the elevation and temperature.

More than 975 plants are described, including details of size, color, and habit of growth, often with related items of historical interest, of Indian lore, and biographic information.

CONRAD B. LINK

Living With Your Land—A Guide to Conservation for the City's Fringe

John Vosburgh. Bulletin 53, Cranbrook Institute of Science, Bloomfield Hills, Michigan, 1968. 150 pages. Illustrated. \$1.00. (Library)

Members of the Garden Club of Michigan provided funds for the preparation of this paperback volume which was designed "to serve as a guide for persons freshly exposed to life at the city's fringe." However, as the foreword states, "it will have little to offer the person who lives in a subdivision in which there are six houses per acre."

There is much practical advice on the concerns of the rural or suburban property-owner: erosion, undesirable plants and animals, attracting desirable wildlife, highways, billboards, and so on. Chapter and appendix subjects may give the best idea of the scope: From Wilderness to Subdivision; The Site and the Soil; Water; Vegetation; Neighbors in Furs; Bird Life; Reptiles and Fish; Lower Animals; Community Affairs; Where to Find Advice, Help and Material.

This book will serve as an introduction to the ecology of areas in the northeast which are near urban centers but still afford some diversity of flora and fauna.

ROBERT L. BAKER

Rose Growing for Everyone

E. B. LeGrice. Faber and Faber, Ltd., 24 Russell Square, London, 1969. 151 pages. Illustrated. \$3.00. (Library)

One might describe this book for the beginner as a step-by-step recipe—starting literally from the ground up—for growing roses for personal enjoyment. The author divides the book into three basic parts, explaining clearly the functions of and culture associated with "the root, the shoots, the flower and the bush."

He emphasizes that the proper location and preparation of the bed is basic to successful rose growing. Careful detail, with clear, easy-to-follow diagrams, is found in this important section.

The one on pruning is clear, concise, and well illustrated. One of the important merits of the book, I believe, is that the author never merely states what must be done, he always follows his recommendations with reasons.

Attention is given to the basic disease and insect pests of the rose. These are pictorially illustrated for the benefit of the beginner.

Recommendations for control of the pests are made, with the method and timing of the control explained.

The last chapters are devoted to the description of specific varieties within four groups: ramblers and climbers; old-fashioned roses, species, and shrubs; the floribundas; and the hybrid teas. The author states that "the omission of a variety does not mean it is unworthy of a place in the garden"—a statement which implies that they are worth a place in the garden, at least the English garden.

Blanket recommendations are intended to serve only as a guide. Before purchasing a variety, a beginner in this country would do well to consult with other rose growers or trial gardens to determine what is best in his locality.

The author keeps the text interesting by his humorous use of well-placed, well-timed analogies. This is a worthwhile book for the beginner.

ALTON J. PERTUIT

Nightshades, The Paradoxical Plants

Charles B. Heiser Jr. W. H. Freeman and Co., 660 Market St., San Francisco, Calif. 94104, 1969, 200 pages, Illustrated, \$5.95. (Library)

This is a fascinating account of a family of plants that are familiar to all. Some are among our most common vegetables; others, decorative garden plants; still others have alkaloids of medicinal value while a few are poisonous and of questionable value.

The family *Solanaceae*, the nightshades, includes the potato, tomato, egg plant and pepper; the flowering kinds—*Petunia*, *Browallia*, *Schizanthus*, *Salpiglossis*, ornamental *Capsicum*; those with medicinal value—the henbane and belladonna; and some of inconsequential value such as the husk tomato, the wonderberry and tobacco, "the Filthy Weed" or "Divine Plant."

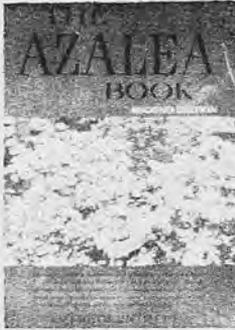
The book is written in a conversational manner that will be of interest to the plantsman, gardener, professional plant scientist, and interested reader. He includes something of the origin and history of each plant, stories of its development, ancient and modern uses, and some of the folklore that has surrounded certain of the nightshades.

The author has made a particular study of these plants and is thoroughly acquainted with the group as a professional botanist. He tells the story in an interesting, non-technical manner.

CONRAD B. LINK

The American Horticultural Society

THE AZALEA BOOK



The Second Edition of *The Azalea Handbook* is a delight to gardeners because of its comprehensive and authoritative coverage of the world of azaleas. From the basic how-to's of selecting, planting, fertilizing, and pruning azaleas for amateur azalea-philos to more exact scientific information for experts, *The Azalea Handbook* is a complete botanical and historical guide to this outstanding plant family. It is based on the combined knowledge of plant explorers, government specialists, foreign collectors, and the author, the late Frederic P. Lee. In addition to a section on the basic horticulture of the plant—its structure, growth factors, soils, nutrition and hybridizing procedures, the book also offers an extensive listing of azalea groups—their classification, description and history—including a revised listing of some of the American and Japanese species and the Satsuki group. Frederic P. Lee was a leading azalea authority and outstanding amateur grower in this country. A retired lawyer, Lee was a former officer of The American Horticultural Society, a long-time member of its Editorial Committee and an officer of many horticultural groups here and abroad. Included in his long list of horticultural honors, is the Gold Medal and Awards Citation of The American Horticultural Society. 408 pages, 6 $\frac{3}{4}$ x 9 $\frac{3}{4}$. 65 illustrations, 5 in color. Cloth-bound \$12.90 (\$8.90 to AHS members). Prices include postage, insurance, and handling charges.

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The American Horticultural Society

THE DAYLILY HANDBOOK

With more than 12,000 named daylilies now available and some 800 new cultivars appearing each year, *The Daylily Handbook* is a 'must' for lovers of *Hemerocallis*. Published jointly by the American Horticultural Society and the American Hemerocallis Society, this volume is the most comprehensive book ever produced on the daylily. Thirty authorities on *Hemerocallis* contributed its 19 chapters and 5 appendices. Subjects covered are history of the daylily, the species, cultivars, developmental anatomy and physiology, breeding of diploid daylilies and miniatures, tetraploid daylilies, selecting and evaluating, introducing and registering, propagation, culture and diseases, and many others. The appendices list hybridizers, growers, breeders of tetraploid daylilies, recommended cultivars by climatic regions, and the all-time great daylilies. Edited by Dr. George M. Darrow, fruit specialist for the U. S. Department of Agriculture for 40 years, now a distinguished breeder of *Hemerocallis* and other award-winning ornamentals, and Dr. Frederick G. Meyer, research botanist in charge of the herbarium of the U. S. National Arboretum and editor of the Society's *American Horticultural Magazine*. 232 pages. 32 pages of color photographs. 60 black and white photographs and drawings. Paperback (only) \$4.40.



THE DAFFODIL HANDBOOK

Delightfully informative for the amateur gardener and an acknowledged necessity for the professional, *The Daffodil Handbook* is comprehensive in treatment and international in scope. The list of its 27 authors is a veritable Who's Who of the daffodil world. In 25 interesting chapters they present complete know-how for growing outstanding daffodils—and enjoying it. Included are garden guides, instructions on planting, structural and growth factors, soils, nutrition, hybridizing, cultural practice, pest and disease control, facts on hardiness, groups of unique daffodils, lists of breeders and trade sources, and a wealth of botanical and historical information on this well-loved garden star. The editor is George S. Lee, Jr., former president of the American Daffodil Society and recipient of its Meritorious Service Medal. 240 pages. 56 black and white photographs and drawings. Paperback—\$3.40. Cloth-bound—\$4.90.



THE PEONIES

Written expressly from the point of view of, and for the use of, horticulturists and gardeners, *The Peonies* handbook introduces the reader to a multitude of beautiful plants. Both the herbaceous peonies (Section I), and the tree peonies (Section II) are covered in depth by a committee of distinguished authors, each writing from a lifetime of experience in growing these superb plants about which so little is generally known. Its scope includes chapters on description, culture, propagation, checklists of varieties, lists of growers, botanical classifications, pests, diseases, breeding, history, and a comprehensive bibliography. It provides authoritative and enjoyable reading for the amateur, the professional grower and the scientist alike. Its editor is Dr. John C. Wister, *director emeritus* of the Arthur Hoyt Scott Horticultural Foundation, Swarthmore College and internationally known for his brilliant work with lilacs, peonies and other ornamentals. 220 pages. 60 excellent black and white photographs and drawings. Paperback—\$3.90. Cloth-bound—\$5.40.

