

Stewartias - Small Trees and Shrubs for All Seasons

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Certainly some of the most interesting and unusual small trees and shrubs available for use in ornamental plantings are the deciduous species of the genus *Stewartia*. And although the horticultural merits of these plants have occasionally been extolled, we feel justified in bringing them to your attention again, particularly since a new species, already in cultivation at the Arnold Arboretum, has recently been discovered and named. Moreover, the methods given below of propagation of *Stewartias* from seed and cuttings will hopefully encourage growers to increase the numbers of these pest-free plants so that they can receive the widespread use and popularity we feel they deserve.

Stewartia is a member of the tea family, the Theaceae, and plants of the genus are easily recognized in our cultivated flora by their numerous creamy white flowers that are produced individually on short to long pedicels in the axils of the leaves. The small, sometimes bushy trees or shrubs have alternate, simple, dark green leaves that lack stipules; the leaf margins are serrated or toothed, and the under surfaces are often finely pubescent when young. In the Boston area *Stewartias* bloom during late June and early July, a period when most of the spring-flowering woody ornamentals have past. The flowers are produced on the current season's growth, and the flower buds, enveloped by the calyx and subtended by one or usually two floral bracts, are evident early in spring as the leaves expand.

The calyx is comprised of five sepals that are usually similar in size and shape to the floral bracts, and in some species both are conspicuously foliaceous. The five (or sometimes up to eight) petals of *Stewartia* flowers are essentially scallop-shaped in outline and form and are silky pubescent on their outer surfaces; in one species the petals are flushed with red on the outer surface near the base. The stamens are numerous, and the filaments are united to one another towards the base where they

are usually attached to the base of the petals as well. After flowering, the petals and stamens fall to the ground still attached to one another.

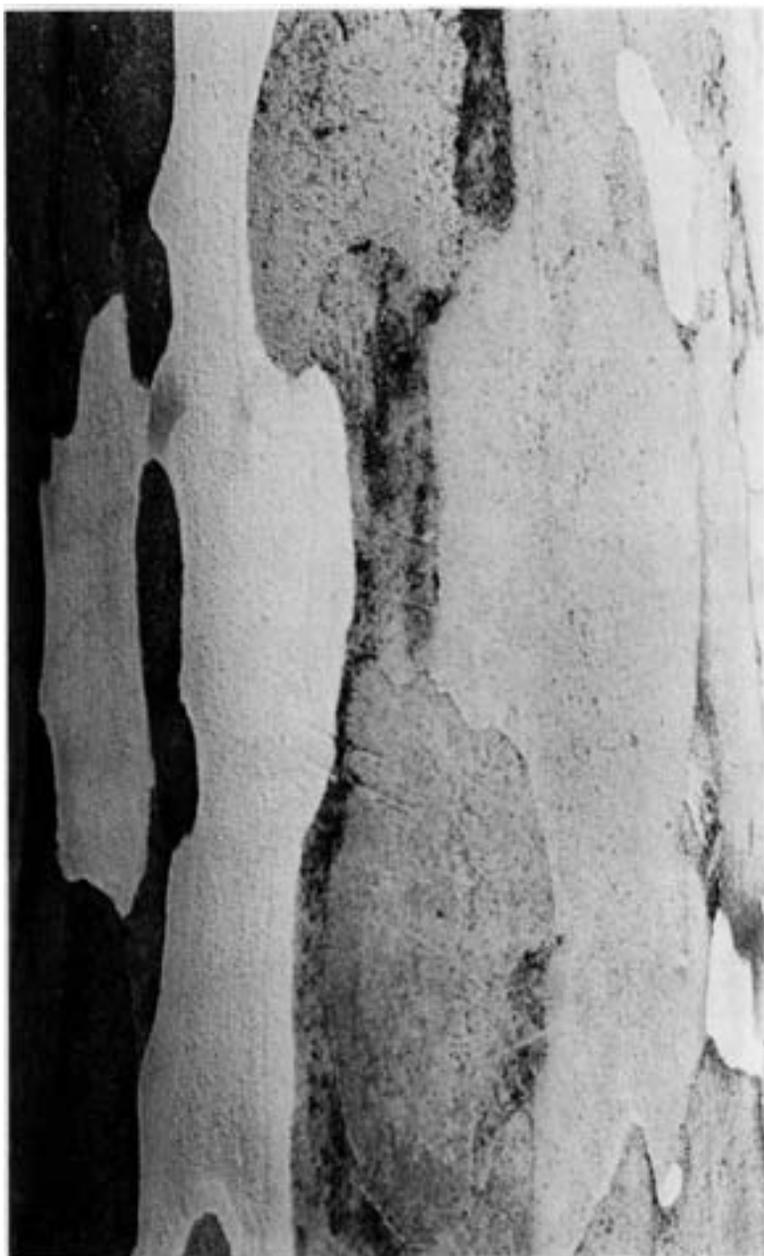
The flowers of *Stewartias* are similar in size, general structure, and appearance to a single *Camellia* flower. This fact is not surprising since these two genera, along with *Franklinia* and *Gordonia*, belong to the same subfamily of the Theaceae. A key to these genera and other genera of Theaceae in cultivation has been published previously in *Arnoldia* (17: 1–12, 1957) in an interesting and informative article by Dr. C. E. Wood, Jr.

Equally intriguing as the flowers, the relatively large fruits are rounded or conical, usually five-ribbed, woody capsules that are tapered at their upper ends into beaklike projections. The capsules develop from the superior, compound ovaries found at the center of the flowers. When in bloom, the ovaries of the flowers are usually hidden from view by the numerous stamens. Green at first and subtended by the persistent sepals and floral bracts, the capsules gradually assume a rich, light or dark brown color at maturity when they open to disclose the seeds in five internal locules or compartments. The capsules of most species remain on the branches during the winter months, providing an attractive accent to the delicate tracery of the branches.

But perhaps the most notable aspect of several species during the winter months is the fact that, once the colorful fall foliage drops, the bark of trunks and limbs is exposed to full view. Four of the deciduous species develop smooth, mottled bark, and on larger trunks and branches soft fawn, silvery or pinkish-brown, or buff colored areas alternate in irregular patterns with one another or with darker cinnamon or reddish-brown areas. The beautiful bark colors and patterns alone are reasons enough to plant these species of *Stewartia*.

As it is now understood, the genus *Stewartia* consists of both evergreen and deciduous species, although the latter are by far the most familiar horticultural subjects. Only one evergreen species, *Stewartia pteropetiolata* Cheng, is known to be cultivated in western gardens, and we have documentation of its cultivation in southern California and in England. While the exact number of evergreen species (sometimes grouped as comprising the separate genus *Hartia*) remains indefinite (probably

Fig. 1. Close-up photograph of the mottled bark pattern developed on the trunks of *Stewartia pseudocamellia*. Photo: P. Bruns



not exceeding eight or nine), seven deciduous species and one hybrid are currently recognized, and all have been introduced into cultivation (see G. P. DeWolf, Jr., The introduction of our hardy *Stewartias*. *Arnoldia* 29: 41-48. 1969). All of the evergreen species and five of the deciduous species are native to eastern Asia, but the two additional deciduous species occur naturally in the southeastern United States. Thus, *Stewartia* exhibits one of the fascinating distribution patterns that illustrates the floristic relationships between eastern North America and eastern Asia.

The first plants of *Stewartia* on record were found in Virginia by the Reverend Mr. John Clayton in about 1687. The plants Clayton described and distinguished from the dogwood (*Cornus florida* L.) were from a population near Williamsburg on Archer's Hope Creek; that population is still in existence today. Fifty-five years after the Reverend Mr. Clayton had discovered these plants, Mark Catesby, the English traveler and naturalist, received a new shrub for his garden at Fulham, England, from another John Clayton, an English naturalist in Virginia. The plants flowered in May of 1742, and it is suspected that Catesby, recognizing their ornamental value and botanical interest, gave plants of the new shrub to John Stuart, the third Earl of Bute, for the botanical garden he was helping to establish at Kew.

In addition to his gift of living plants to Catesby, the younger Clayton also sent dried herbarium specimens of the shrub to Gronovius, a Dutch botanist who forwarded one to Linnaeus. The name *Stewartia* (sometimes incorrectly spelled *Stuartia*), honoring John Stuart, was given to the new genus and first published by Linnaeus in 1746.

An interesting and ironic historic note to the dual discovery of *Stewartia* by the two John Claytons lies in the fact that both men had discovered different species of the genus. All of the subsequently discovered species of *Stewartia* have been found in eastern Asia, and like several other ornamental genera with eastern Asiatic and eastern American distributions, certain Asiatic *Stewartias* are the most commonly cultivated ones in western gardens. However the following key, based primarily on floral and fruit characters, will serve to distinguish between all the deciduous species, American and Asiatic. Following the key are notes on the individual species and the one hybrid, an account of the rather unexpected discovery of *S. rostrata* from within the Arboretum's collection, and in conclusion, notes on the propagation of *Stewartias*.

KEY TO THE DECIDUOUS SPECIES OF STEWARTIA

1. Styles 5, distinct, petioles widely winged, enclosing the lateral and terminal buds, floral bract 1. *S. ovata*.
1. Styles united, terminating in 5 or 6 stigmatic crests or arms; petioles narrowly winged, not enclosing the lateral and terminal buds; floral bracts 2.
 2. Stamens with purplish filaments and bluish anthers, capsules dehiscent by the outward folding of the valve margins, the apices of the valves ± coherent; seeds angular. *S. malacodendron*.
 2. Stamens with whitish filaments and yellow or orange anthers; capsules apically dehiscent, the valves spreading apart from the apex, seeds planoconvex.
 3. Floral bracts about equalling or longer than the calyx; small or large trees or shrubs with smooth or fissured bark, young branches usually terete, not zigzagged. 4.
 4. Ovaries and/or capsules subglobose, completely glabrous or pubescent only at the very base.
 5. Ovaries and/or capsules completely glabrous; 2 ovules or seeds per locule; bark on older branches smooth and mottled. *S. serrata*.
 5. Ovaries and/or capsules pubescent only at the very base; 4 ovules or seeds per locule; bark on older branches finely fissured. *S. rostrata*.
 4. Ovaries and/or capsules conical, pilose or appressed pubescent over the entire surface. 6.
 6. Sepals oblong or ovate with acute apices. 7.
 7. Floral bracts ovate, subequal to the sepals; styles 6-8 mm. long; seeds 7-9 mm. long. *S. sinensis*.
 7. Floral bracts oblong, conspicuously longer than the sepals; styles 3-4 mm. long; seeds 5-6 mm. long. *S. monadelpha*.
 6. Sepals ovoid with rounded, ciliate apices. *S. × henryae*.
 3. Floral bracts conspicuously shorter than the calyx, small trees with smooth, mottled bark; young branches usually compressed and zigzagged, rarely terete. *S. pseudocamellia*.

Stewartia ovata (Cavanilles) Weatherby **Mountain Stewartia**
Stewartia pentagyna L'Heritier

Stewartia ovata occurs naturally in the mountains and on the adjacent Piedmont of North and South Carolina, Georgia, Alabama, Kentucky, and Tennessee. It is also known from two isolated stations on the Virginia Coastal Plain in the vicinity of Williamsburg, and it was at one of these localities that the species was first discovered by the Reverend Mr. John Clayton.

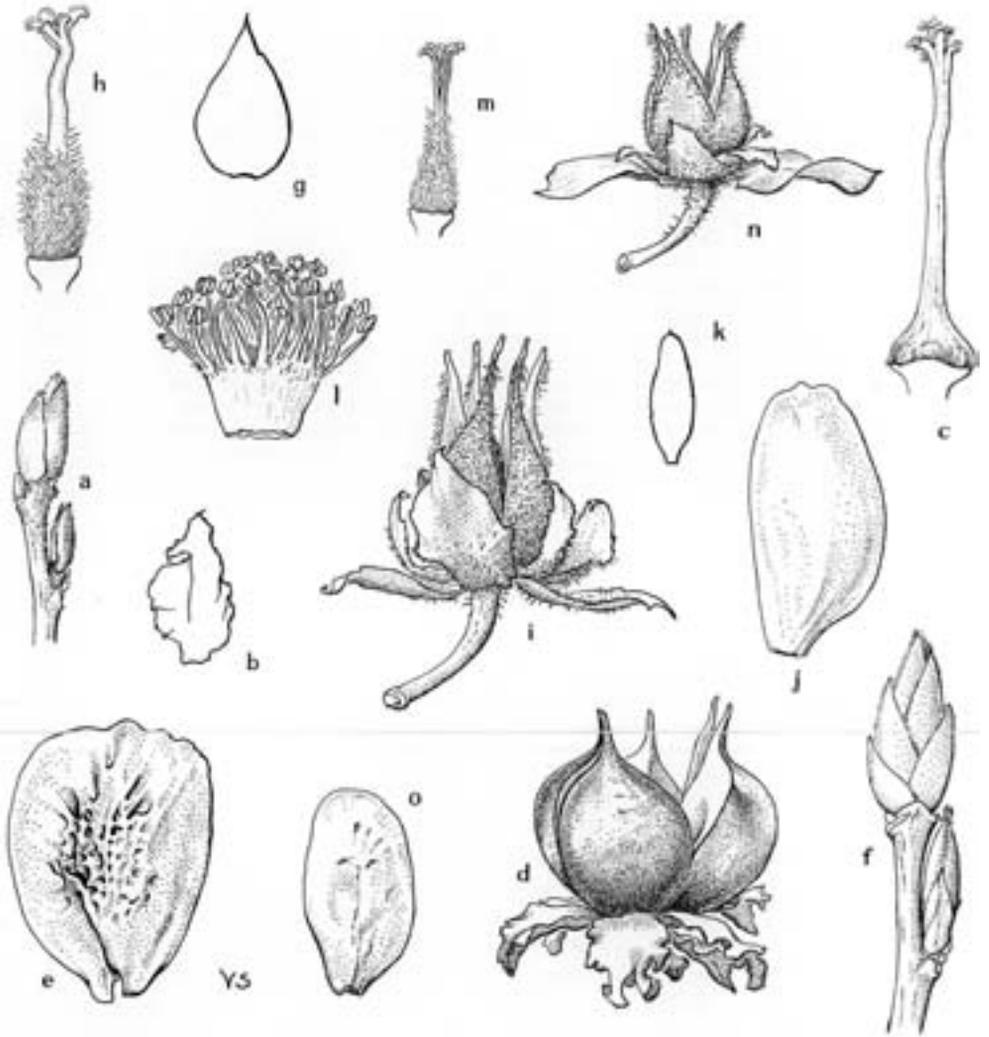


Fig. 2. *Stewartia*. a-e, *S. rostrata*: a, dormant winter buds, $\times 2$; b, floral bract, $\times 2$; c, ovary and style $\times 2$, note pubescence only at the base of the ovary; d, dehiscent capsule with persistent floral bracts and sepals $\times 1\frac{1}{2}$; e, seed, $\times 4$. f-j, *S. sinensis*: f, dormant winter bud, $\times 2$; g, floral bract, $\times 2$; h, pubescent ovary and style, $\times 2$; i, dehiscent capsule with persistent floral bracts and sepals, $\times 1\frac{1}{2}$; j, seed, $\times 4$. k-o, *S. monadelpha*: k, floral bract, $\times 2$; l, stamens, $\times 2$; m, pubescent ovary and style, $\times 2$; n, dehiscent capsule with persistent floral bracts and sepals, $\times 1\frac{1}{2}$; o, seed, $\times 4$. Illustrations by Virginia Savage.

This species is easily distinguished from other *Stewartias* by the single floral bract that subtends each of its flowers and by its five distinct styles. The flowers, about 2½ inches in diameter, are among the largest produced by any *Stewartia*, and f. *grandiflora* (Bean) Kobuski, a form that occurs sporadically throughout the natural range, is of particular horticultural interest due to its slightly larger flowers (up to 3½ inches across) with five to eight petals. In addition, the stamen filaments in f. *grandiflora* may be purplish rather than the usual white or yellowish color. At the Arnold Arboretum, one plant of f. *grandiflora*, which came originally from Highlands, North Carolina, produces flowers with both purplish and yellowish stamen filaments.

Although the bark of *Stewartia ovata* does not exfoliate to produce a smooth, mottled pattern, the plants develop into small bushy trees or shrubs to about 18 feet in height. And despite its natural southern range, the species and f. *grandiflora* are hardy as far north as the Boston region.

Stewartia malacodendron Linnaeus
Stewartia virginica Cavanilles

Silky Stewartia

Native to the Coastal Plain and Piedmont of the Southeastern United States from Virginia south to northern Florida and west to Arkansas and eastern Texas, *Stewartia malacodendron* is the species that John Clayton, the naturalist, discovered growing in Virginia. While the Silky Stewartia is rather infrequently encountered in cultivation, it produces, in our opinion, the most beautiful of all *Stewartia* flowers. The five large white petals form a contrasting, saucer-shaped background, 3 to 3½ inches across, for the erect boss of stamens that are entirely purplish-blue. The color of the stamens alone is sufficient to identify the species when they are in flower. Unlike the other species of the genus, the reddish-brown capsules of *S. malacodendron* open along the sides rather than from the apex. Furthermore, the seeds are a dark, shining, reddish-brown color and are unwinged and angular in outline. Other *Stewartias* produce more or less flat, narrowly winged, pale brown seeds.

Although we have attempted to grow *Stewartia malacodendron* several times at the Arnold Arboretum, it has not proved hardy. However, the plants, which develop into large, albeit rather spindly shrubs or small trees to about 20 feet, have been successfully grown as far north as Long Island.

Stewartia serrata MaximowiczIncluding *Stewartia epitricha* Nakai

With the exception of *Stewartia* \times *henryae*, *S. serrata* is perhaps the least frequently encountered *Stewartia* in American gardens. Native to Japan, where it inhabits mountainous regions of Honshu, Shikoku, and Kyushu Islands, it is represented in our herbarium of cultivated plants by only a few collections. It is, however, known to be hardy as far north as Connecticut.

A small tree with horizontal branches and smooth, reddish-brown, mottled bark, *Stewartia serrata* will be recognized by its petals that are flushed with red near the base on the outer surfaces, as well as by its completely glabrous ovaries. The capsules, like the ovaries, are completely devoid of hairs and are strongly five-ribbed; two seeds are produced in each locule. In England, where it is apparently more commonly cultivated, *S. serrata* is reported to begin flowering before the other species in early June.

Stewartia rostrata Spongberg

In 1939, the Arnold Arboretum received seed of a *Stewartia* from the Lu Shan Arboretum in Kiukiang, China, under the name *S. sinensis*, a species Alfred Rehder and E. H. Wilson had described in 1915. Subsequently, one plant grown from that seed-lot was planted in the *Stewartia* collection on Bussey Hill in the Arboretum. Only recently, however, did the name and identity of our plant come into question. As one of us was checking the identities of our living specimens, this plant did not seem to correspond to the published descriptions of *S. sinensis*.

On consulting Dr. G. P. DeWolf, Jr., and Mr. R. S. Hebb of the Arboretum staff, it was found that they, too, were aware that something was strange about our plant labeled *Stewartia sinensis*. Mr. Hebb's recollection of *S. sinensis* grown at Kew in England was of an upright tree with reddish-brown, exfoliating, smooth, mottled bark. Our Arboretum plant, now 38 years old, is a small bushy tree with several limbs from near the base and with tight, non-exfoliating, finely fissured gray bark.

As a result of these contradictions, further study was undertaken in the herbarium and library. Examination of the holotype specimen of *Stewartia sinensis*, a specimen collected in eastern Hunan Province, China, by Wilson in 1901, showed that Mr. Hebb's memory had served him well. The specimen represents a species with smooth, exfoliating bark; furthermore,



Fig. 3. Flowering branch of *S. rostrata*, the species recently described as new, growing in the Arboretum collections. Photo. P. Bruns

the ovaries in the center of the flowers are finely pubescent. The ovaries from flowers of the Arboretum tree have hairs only at the very base.

Other herbarium specimens that Rehder and Wilson had annotated as *Stewartia sinensis* included some plants that agreed in bark and flower characters with the holotype specimen. Additional specimens, however, appeared to represent the same species as the Arboretum tree on Bussey Hill. Further study revealed other differences between the two species, differences that are most readily observed when the plants are in fruit.

Once it was determined that the Bussey Hill plant was not *Stewartia sinensis*, the question remained whether it belonged to another species already described, or if it were, indeed, a new undescribed species. In an attempt to answer this question, the taxonomy of the entire genus was reviewed (see the *Journal of the Arnold Arboretum* 55: 182–214. 1974), and all of the published names and as many type specimens as possible were examined. During this process, *S. gemmata*, a name by which several of our living plants were known, also became suspect.

On checking type herbarium specimens of this name it was discovered that Chien and Cheng, the Chinese botanists who had published *S. gemmata*, had redescribed *S. sinensis*. Chien and Cheng had obviously realized that two species were passing under the name *S. sinensis*, but in an attempt to remedy this situation they chose to give the name *S. gemmata* to the species Rehder and Wilson had described and named in 1915. This aspect of the confusion, incidentally, points out the great value of type herbarium specimens in determining the correct application of botanical names. Had Chien and Cheng studied the type of *S. sinensis*, they, too, would have realized that the species that lacked a name was the tree with non-exfoliating bark and flowers with the ovaries pubescent only at the very base. The name *S. rostrata* has been proposed for this new species because of its distinctive rostrate or beaked, five-ribbed capsules that remain on the branches over winter and sometimes into a second or third growing season.

It is of note that *Stewartia rostrata* is the only deciduous Asiatic species that, like the two American species, has tight, non-exfoliating fissured bark. And herbarium data indicate that it is apparently confined in nature to mountainous regions of Chekiang, Kiangsi, and eastern Hunan Provinces in China. In cultivation, it is included in the collections of the Barnes and Morris Arboreta and at Longwood Gardens, as well as at the Arnold Arboretum.

Stewartia sinensis Rehder and Wilson

Stewartia gemmata Chien & Cheng

Once it was realized that the Arboretum's plant labeled as *Stewartia sinensis* was not that species, we were momentarily disappointed that our collection lacked a plant of this Chinese *Stewartia*. It had been discovered by E. H. Wilson, and Alfred Rehder and Wilson had named and described it as new. However, during the taxonomic studies that were initiated because of the unknown identity of *S. rostrata*, it was recognized that plants on Bussey Hill labeled as *S. monadelphica*, a species native to Japan, were actually plants of *S. sinensis*. These plants had been grown from seed obtained in 1934 from the Sun Yat Sen Memorial Park in Nanking, China, and despite the mobility of ornamental plants, it had seemed strange that we had received a Japanese species from a Chinese source.

An erect tree or ascending shrub to about 60 feet, *Stewartia sinensis* is characterized by its attractive, smooth, exfoliating,

mottled bark, its pubescent ovaries, and its foliaceous floral bracts that are about as long as, or slightly longer than, the similar appearing sepals. The capsules are conical and densely pubescent, and two seeds are produced in each locule. The flowers, while smaller than those of some other species (about 2 inches across), are produced in great numbers. In nature this species occurs in mountainous regions of eastern central China, and its closest ally, with which our plants were originally confused, appears to be the Japanese *S. monadelphica*.

***Stewartia monadelphica* Siebold & Zuccarini**

Including *Stewartia sericea* Nakai

Known to attain a height of 50 feet in Japan, *Stewartia monadelphica* is native to mountainous areas of southern Honshu, Kyushu, and Shikoku Islands. In American gardens, however, it is usually a smaller tree that is noted for its beautiful reddish-brown bark on both the trunk and delicate horizontal branches. Its flowers are the smallest produced by any deciduous *Stewartia* (a little over an inch in diameter), and it is easily identified in bud, flower, and fruit by the oblong, persistent floral bracts that are conspicuously longer than the five sepals.

***Stewartia pseudocamellia* Maximowicz**

Including *Stewartia koreana* Rehder

Readily distinguished from other members of the genus by its small, kidney-shaped or rounded floral bracts that are considerably smaller than the densely silky-pubescent sepals, and by its branchlets that are usually compressed or flattened and zigzagged, *Stewartia pseudocamellia* is the most widely cultivated species of the genus. The flower buds, rounded before opening, and the flowers which are up to 3½ inches in diameter, are borne on long pedicels. The boss of stamens with orange anthers suggest those of a single *Camellia* flower. The ground beneath the small trees or shrubs becomes carpeted with the fallen corollas and the attached stamens as the flowering season progresses.

Native to Japan, where it is also cultivated, *Stewartia pseudocamellia* is also known to occur naturally in southern Korea, and the Korean plants grown at the Arnold Arboretum were germinated from seed collected by E. H. Wilson in 1917. Originally regarded as a distinct species (*S. koreana* Rehder), and then as a variety of *S. pseudocamellia* (var. *koreana* (Rehder) Sealy),

the Korean plants do not appear to be morphologically distinct from the plants of Japanese origin. Korean plants at the Arnold Arboretum do, however, differ from Japanese plants in their more saucer-shaped flowers, their extended blooming period, and in the coloration of the leaves in fall. The foliage of the Japanese plants becomes a deep burgundy-red in fall, while leaves of the Korean plants turn a bright yellow- or reddish-orange. As a result of these behavioral differences, differences that are significant to nurserymen and horticulturists, we propose here that the Korean plants henceforth be designated as a cultivar, and we suggest the cultivar name 'Korean Splendor'.

Observations made here at the Arboretum indicate that individual flowers of 'Korean Splendor' persist on the plants for slightly longer than 24 hours once the buds have opened fully. The prolonged blooming season (as compared with the Japanese plants) is not the result of the persistence of individual flowers, but is apparently the result of a greater production of flowers coupled with the less synchronous maturation of the buds. We



Fig. 4. The camellia-like flowers of S. pseudocamellia 'Korean Splendor' are accented by the rich green foliage. Note the rounded, silky buds yet to open. Photo: P. Bruns

have also noted that small bumblebees are attracted to, and force their way into, the unopened buds of *S. pseudocamellia* and 'Korean Splendor', apparently in search of pollen. The value of *S. pseudocamellia* and 'Korean Splendor' as summer-flowering trees is extended and enhanced by their equal beauty in winter when the mottled bark is viewed against snow-covered ground.

***Stewartia* × *henryae* Li**

Stewartia pseudocamellia 'Korean Splendor' × *S. monadelphica*

This putative hybrid between the two above listed *Stewartias* originated spontaneously in the collections of the Henry Foundation for Botanical Research in Gladwyne, Pennsylvania. It differs only slightly from *S. pseudocamellia*, but can be distinguished from that species by its oblong floral bracts that resemble those of *S. monadelphica*, its slightly smaller flower size, and the presence of two seeds per capsule locule. *Stewartia pseudocamellia* produces four seeds per locule, although two are often abortive. From *S. monadelphica* the hybrid can be distinguished by its ovoid sepals with rounded, ciliate apices, and by its larger flower size.

This small tree is known from several specimens at the Henry Foundation where both of the presumed parental species grow in close association with the hybrid, and it is also known in cultivation at Barnard's Inn Farm on Martha's Vineyard. Cuttings obtained from the latter source have been rooted in the Arboretum greenhouses, and young plants of *S. × henryae* will soon be added to the Arboretum collection; to our knowledge, it does not occur elsewhere in American gardens.

PROPAGATION OF STEWARTIAS BY SEED

Stewartia seeds are produced within the five-locular, woody capsules, and each locule, depending upon the species, contains two or four seeds. In some instances fewer seeds are produced in each locule due to the abortion of one or more of the ovules; abortion results because the egg within the ovule either was not fertilized, or the egg failed to develop after fertilization. Natural dispersal of the narrowly-winged, flattened seeds of most species is by wind, and in the latitude of Boston the capsules open and the seeds are available for dispersal (or collection) during late September and early October.

A careful watch must be maintained if one intends to collect the seeds from the dehisced capsules on the plants, since tightly closed capsules can open unexpectedly, and the seeds may be scattered quickly. As a result, it is best to collect capsules before they have dehisced. Maturity of seeds is indicated by a change in the appearance of the capsules; about mid-September they begin turning from green to brown, and at this stage the seeds are fully developed and viable, and the capsules can be gathered. Separation of the seeds from the capsules is easy if the fruits are placed in a paper bag, tray, or other container that is then placed in a dry location. In a few days the closed capsules will have opened, and when the container is shaken the seeds will fall out. Separation of the seeds from the capsules can then be accomplished by emptying the contents into a screen of suitable mesh size to retain the capsules but to permit the passage and final collection of the seeds.

Difficulty in the separation of seeds from capsules may be experienced with the fruits of *Stewartia malacodendron*. As mentioned previously, the capsules and seeds of this species differ from those of other species. The angular seeds are often held tightly within the locules, and their removal may require the forceable opening of the capsule by hand. Since the hard woody capsules of this species dehisce naturally along the sides, a blow on the top of the capsule with a small hammer may be necessary to release the seeds.

When kept in dry storage, *Stewartia* seeds lose their viability quickly. As a result they should be sown or placed in pretreatment without delay after they have been harvested. All of the species grown and tested at the Arnold Arboretum (*S. ovata*, *S. pseudocamellia* and 'Korean Splendor', *S. rostrata*, and *S. sinensis*) produce seeds that are doubly dormant, and in their natural habitats the seeds would require two years to germinate. In other words, seeds dispersed in October of 1974 would be physiologically prepared to germinate by natural seasonal changes in the spring of 1976. However, by placing the seeds in a stratifying medium and providing artificial seasons, the seeds can be induced to germinate in about seven months. This pretreatment must be done in two stages, and the container for the seeds and stratifying medium during the process should be a polyethylene bag. Polyethylene film has the property of being air permeable yet vaporproof. Twisting the top of the bag and binding it with a rubber band makes the stratifying unit vaporproof for the entire treatment, and it should not be opened until the treatment has been completed.

At the Arboretum greenhouses, a stratifying medium composed of equal parts sand and peatmoss has worked well with *Stewartia* seeds. This mixture is dampened (moist but not wet) and, in proportion, the medium should be two or three times the volume of the seeds. This factor is important since at sowing time the seeds are not separated from the medium and the entire contents of the polyethylene bag are sown.

Using seeds of those species in cultivation at the Arnold Arboretum, it has been determined that a period of warm stratification for four months followed by cold stratification for three months satisfies the requirements for germination. Seeds placed in warm stratification in early October are transferred to cold pretreatment in early February, and the seeds are ready for sowing in the greenhouse or out-of-doors in early May. This timetable is excellent, since the seedlings will respond favorably to the warm and lengthening days of spring.

Warm stratification can be accomplished by placing the sealed bags in a location where the temperature is subject to normal day and night fluctuations. We place our bags in bins on a greenhouse bench where the temperature has ranged between 60° and 100°F. Any location where the day and night temperatures vary would be satisfactory; full sun, however, should be avoided since it might lead to high temperatures within the bags that would be detrimental to the seeds. When the period of warm stratification has been completed, the bag is simply transferred to a refrigerator to satisfy the need for cold treatment. At the Arboretum, cold pretreatment is accomplished at about 40°F.; however this temperature is arbitrary, and the temperature maintained in the storage compartment of any refrigerator should suffice for the cold treatment.

PROPAGATION OF STEWARTIAS BY CUTTINGS

As an alternative method of propagation, soft-wood cuttings may be taken from *Stewartias* to be rooted, and depending upon the availability of donor plants, large numbers of new plants can be asexually initiated. At the Arboretum, cuttings of *Stewartias* have been taken as early as June 23 and as late as August 20. Although rooting has been partially successful in all our attempts over this time period, the greatest number of cuttings was successfully rooted when the cuttings were taken and treated between June 23 and mid-July.

Although a wide variety of root-inducing chemicals have been used with success with *Stewartia* cuttings, we have found that Indolebutyric acid (IBA) has proven to be the best rooting stimulant. Normally, the cut ends of the cuttings are dusted with a 0.8% treatment of IBA in talc with the fungicide 'Thiram' added at the rate of 15 percent. High percentages of rooting have also occurred employing quick-dip treatments using a combination of IBA plus NAA (Naphthalene acetic acid) at the rate of 2500 parts per million of each in water. Quick-dip treatment involves immersing the bases of prepared cuttings in the liquid preparation for five seconds.

Rooted cuttings of *Stewartia*, particularly those made late in the growing season, have presented a survival problem during the subsequent winter. When potted or flatted after rooting, the plants have gone into dormancy and never recovered. This loss can be averted, however, if the cuttings are not disturbed after they have rooted. The procedure we use is to fill plastic flats with a rooting medium of half 'Perlite' and half sand by volume. The cuttings are made, treated, and inserted in the flats which are then placed under intermittent mist. When rooting has occurred, the cuttings are left in the flats and hardened off. In November they are transferred to our cold storage unit where the temperature is maintained at approximately 34°F. In February or March the flats are returned to a warm greenhouse, and when new growth begins to appear, the plants are transferred to containers. When handled in this manner, the rooted cuttings can be expected to survive and grow.

When a *Stewartia* is planted in the garden, it is advisable to place the plant in its permanent location where it will be exposed to full sun or high, only partial, shade. The plants appear to grow best in moist, acid soils, and it has been reported that larger plants transplant poorly. However we have had no difficulty transplanting plants upwards of 7 or 8 feet if a sufficient ball of soil is taken. Ideally, the plants should be grown as specimen trees and shrubs so that the full beauty of form, flowers, and bark can be enjoyed from all aspects and at all seasons of the year.