Summer 1983

arnoldia

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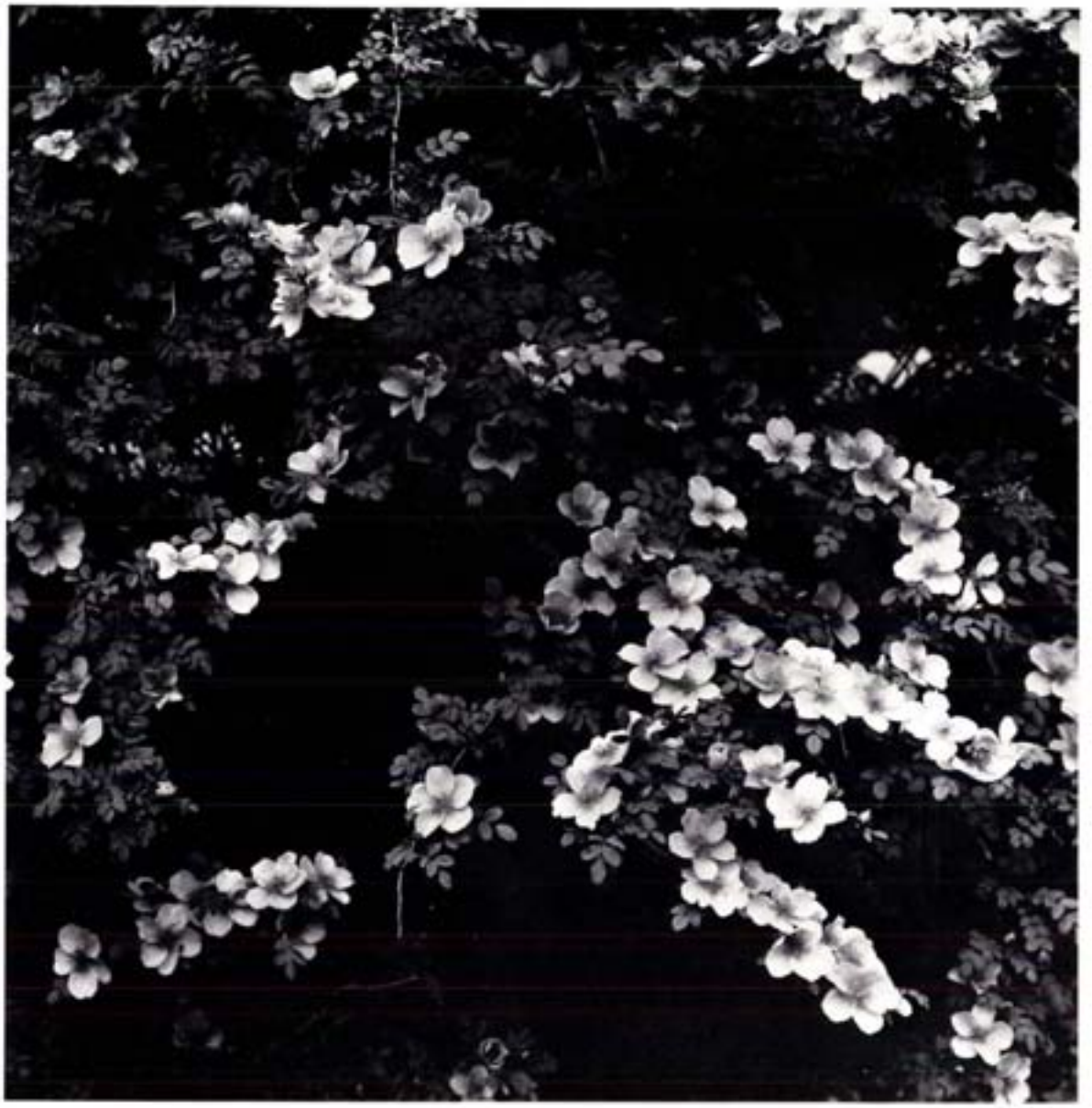

Rosa hugonis

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Front cover photo: An unusual form of the Austrian copper briar rose (*Rosa foetida* 'Bicolor') with sectored petals. Al Bussewitz, photo *Back cover photo:* Normal Austrian copper briar rose. Al Bussewitz photo.

Gardening with Species Roses

Jonathan Shaw

Each year as winter settles over New England the latest rose catalogues appear in my mailbox, featuring the newest and gaudiest hybrid teas and floribundas. Several of these grow in my own garden, but over the years I have replaced them with species roses and shrub roses. Species roses are the wild roses that grow naturally throughout most of the northern hemisphere, and shrub roses are for the most part primary hybrids or selections of species roses. Neither group is commonly grown in gardens but both should be, for in addition to bringing diversity and a refreshing natural grace to a garden, they need much less spraying and maintenance than most cultivated roses. Spraying roses is a chore that I have gradually come to dislike, a dislike mixed of equal parts of laziness and a fear of casually used chemicals. Summer pruning is also not part of my work ethic, and with wild roses I can forget summer pruning.

What have I lost in abandoning hybrid teas and floribundas? The roses I grow tend to be tall, five feet and up; most bloom only once; the color range, particularly in the reds, is limited; and most have single flowers. What have I gained? My species and shrub roses associate well with the other shrubs in my garden; they are easy to care for; and for sheer flower power they have few equals.

The rose family (Rosaceae), of which the rose genus is only a part, contains many garden-worthy plants. These include bush and tree fruits — apples, pears, and raspberries — as well as other woody plants, such as shadbush (*Amelanchier*) and flowering quinces (*Chaenomeles*); and herbaceous perennials, such as lady's mantle (*Alchemilla*) and meadowsweet (*Filipendula*).

Depending on which authority is recognized, the number of rose species is between 150 and 300. Like certain other genera, the genus *Rosa* poses a challenge to botanists. Many of the species are not distinct, because they hybridize easily both in the wild and in cultivation. Others have been so long associated with humans that their origins are no longer certain. This may explain why taxonomic problems abound and why the most recent monograph on roses (*Rosarum Monographia or A Botanical History of Roses* by John Lindley) is 163 years old.

The latest edition of Bean's *Trees and Shrubs* (1973–1980), prepared with the assistance of Graham Thomas, a horticultural authority on shrub roses, estimates the number of valid species at no more than 150 but lists only 82 primary entries. Alfred

Rosa helenae var. *flora plena*
Al Bussewitz photo

Rehder in his *Manual of Cultivated Trees and Shrubs* (1940) lists 38 species.

Wild roses are found only in the temperate zone of the northern hemisphere. None are found south of the equator. With few exceptions they bear single, five-petaled flowers, and the colors tend to be mauve, white, pink, or yellow, with just a few displaying flowers of brilliant red. There are no blues. Some are enormous, so-called climbing roses that can grow 20 feet in a year. Others are low shrubs, prostrate or up to a foot and a half high.

Landscape Uses

Species roses have far more potential landscape uses than hybrid tea roses or floribundas. Some are adapted to extremely harsh sites where few similar plants will grow. They are for the most part medium to tall shrubs and therefore can be placed in shrub borders or wherever a shrub will thrive. The suckering species will fill gaps between other shrubs, and the taller species will permit bulbs and smaller plants to thrive beneath their branches. The so-called climbing species can be trained into trees and draped over nearby shrubs or tip pruned to form shrubs. Species roses are graceful, easily placed near other shrubs, and do not require a formal setting. In traditional rose gardens species roses can provide diversity, stature, and grace.

A few species roses prefer wet sites; others require dry, almost arid positions; and some tolerate semishade. This adaptability has not been utilized extensively in gardens. The following are some of the landscape uses of species roses.

Groundcovers: Rosa wichuraiana is often used in this fashion, the trailing canes lying flat upon the ground.

Colonizers: Rosa pimpinellifolia, 3 to 5 feet high, will quickly spread to stabilize large areas or fill in spaces between other shrubs. *Rosa rugosa* will do the same but with larger canes and more "rugged" leaves. *Rosa nitida* is the lowest of the colonizers, a compact 18 inches.

Hedges and Windbreaks: Rosa rugosa will perform this function, as will *R. hugonis.* There are others, but few so tough.

Canopies and Archers: These are roses whose canopies spread widely but not densely and can be underplanted. *Rosa moyesii* is magnificent in this way, providing high shade for bulbs and low perennials beneath its own spectacle of brilliant geranium-red flowers and scarlet hips.

Summer and Fall Foliage: Throughout the growing season the leaves of *R. glauca* Pourr. (*R. rubrifolia*) are a pale reddish purple, a flower arranger's delight, and *R. alba* and several others have foliage of a lovely gray-green color. In the fall the leaves of most species roses are inconspicuous, but *R. nitida* exhibits shades of deep purple-red, as do several other American roses.

Flower Color and Size: For pure reds *R. moyesii,* for pure yellows *R. primula* or *R. hugonis.* The flowers of species roses are single and generally of medium size. For those who like their flowers small and abundant, there is no more graceful rose than *R. elegantula* 'Persetosa' (*R. farreri*), known as the threepenny bit rose, which is covered in early June with single pale pink flowers, each no more than a half-inch in diameter.

Fruit: Rose fruits, commonly known as hips, are among the greater assets of the species: one-inch red marbles on *R. rugosa,* two-inch orange-scarlet vases on *R. moyesii,*

Rosa elegantula 'Persetosa'
Drawings by Emily Osman

and half-inch black, shining drops on *R. pimpinellifolia.*

Fragrance: Flower fragrance is not strong in most species roses, because in roses the fragrance is emitted from the petals, and species roses rarely have more than five petals. Many species are especially outstanding for leaf fragrance, for example, *R. eglanteria* and *R. primula.* To pick flowers and leaves from these roses is to perfume one's hands and even the clippers. The scent is strong but not cloying.

The genus *Rosa* is divided into four subgenera: *Hulthemia, Hesperhodos* (roses of the west), *Platyrhodon* (flat roses), and *Rosa* (*Eurosa* or true roses). The first of these contains a single (or perhaps two) species. Although the flower is said to be striking, the plant is rarely found in botanical or private gardens because it is so lacking in vigor and so difficult to grow. The second subgenus, *Hesperhodos,* includes several species from the western United States. These, too, are rarely found in cultivation, primarily because their characteristics are unspectacular. The third subgenus, *Platyrhodon,* contains only one species, *R. roxburghii.* It is a marvelous tall shrub, and for convenience it has been included below with other roses of similar stature.

All remaining species roses are found in the subgenus *Rosa,* and because it contains 95 percent of the species roses, this subgenus has been further divided into 11 (or perhaps 10) sections. Species and hybrid roses from eight of these sections appear in my selected list beginning on page 6. Species in the other three sections (*Chinenses, Banksianae,* and *Bracteatae*) were not included because they are not hardy in the Northeast. The eight sections are:

Laevigatae, shiny-leaved roses: contains only one species, *R. laevigata,* with large, solitary flowers, shiny leaves, and a climbing growth habit. Plants with long, flexuous stems; flowers, large, white; branches with scattered, hooked prickles; sepals erect, entire, persistent; leaves usually with 3 leaflets, deciduous; stipules nearly free; styles free.

Synstylae, roses with united styles: contains most of the roses that are called climbers. This section is characterized by long canes and white flowers in clusters. Plants usually climbing or trailing, with many-flowered inflorescences; branches with hooked prickles; outer sepals pinnate or entire, deciduous; leaves with 5–9 leaflets, evergreen or deciduous; styles united into a slender column.

Pimpinellifoliae, anise-leaved roses: a most useful group with many graceful species bearing yellow and white flowers on vigorous bushes. Medium to low shrubs with solitary flowers; branches with straight prickles and bristles; sepals entire, erect, persistent; leaves with 7–9 small leaflets, deciduous; styles free.

Gymnocarpae, naked fruited roses: similar to the section *Pimpinellifoliae,* but in this section the apex of the flower axis (which contains the seeds) as well as the sepals drops when the fruit is ripe.

Cassiorhodon, cinnamon roses: hardy plants bearing pink or red flowers and distributed throughout the northern hemisphere. Upright shrubs; inflorescences usually many-flowered; branches with straight, infrastipular or scattered prickles; sepals entire, erect after flowering, persistent; leaves with 5–11 leaflets, deciduous; styles free.

Carolinae, Carolina roses: exclusively American roses that are noted for their adaptability and suckering habit. Upright, often strongly stoloniferous shrubs; inflorescences few-flowered; branches with straight, paired prickles; sepals entire or few-lobed, spreading after flowering, soon deciduous; leaves with 7–9 leaflets, deciduous; styles free.

Caninae, dog roses: contains most of the roses of Europe, including many hybrids, both wild and cultivated. At one time this section was thought to contain hundreds of species. Plants with upright or arching stems; inflorescences many-flowered; branches with numerous, stout, hooked prickles; outer sepals lobed, reflexed after flowering, deciduous (rarely erect and persistent); leaves usually with 5–7 leaflets, deciduous; styles free.

Gallicanae, French roses: contains only one species, *R. gallica,* and is recognized more as a horticultural than a botanical group, because of its numerous forms and cultivars and the long association of *R. gallica* with humanity. Upright shrubs, with few-flowered inflorescences; branches with hooked prickles mixed with bristles; sepals often lobed, reflexed after flowering; leaves with 3–5 leaflets, deciduous; styles free.

The species on the following list have been chosen to demonstrate the diversity and adaptability of species roses and their primary hybrids. All but a few I have grown in my own garden or observed in private or public rose collections. Many of the species can be seen in the Arboretum, and others are currently being introduced.

Species Roses Recommended for the Northeast

R. blanda Ait. Eastern & Central North America. Introduced into cultivation in 1773. Section *Cassiorhodon.* Flowers 1½–2 inches, solitary or in clusters. Blooms in early June.

This is a native American rose and for that reason alone deserves to be cultivated more often. It grows about five feet high and is almost entirely without thorns. Although it has been said to have no unusual garden merit, *R. blanda alba,* the pure white form, is lovely in early June, and for health and vigor it is unsurpassed. Like other native plants, it is hardy on the East Coast and disease resistant.

R. ecae Aitch. Afghanistan/Pakistan. Introduced in 1880. Section *Pimpinellifoliae.* Flowers ¾–1 inch, solitary. Blooms in early June.

With the exception of *R. foetida,* this has the brightest yellow flowers of any species rose. It is not vigorous, but one of its hybrids, 'Golden Chersonese' (1967), has preserved *R. ecae*'s color and dainty leaves while increasing its vigor. 'Golden Chersonese' is covered in late May with single bright yellow flowers. These bloom just above the delicate leaves, giving the whole bush an unusually dainty look.

Rosa ecae

R. eglanteria L. (*R. rubiginosa*). Eglantine rose. Europe. Cultivated prior to 1551. Section *Caninae.* Flowers 1½–2 inches, solitary or in clusters. Blooms in mid-June.

This is the sweetbriar or eglantine rose. The flowers are pale pink and abundant, and the shrub grows to six or eight feet high. Its greatest asset is its fragrant leaves, which release their fragrance when crushed. It grows wild in Great Britain, and references to its apple fragrance are common in English literature.

Hybrids: Numerous hybrids of this rose exist. One of the best, which preserves the fragrant leaves, is 'Gold Bush' (1954), a wide, arching shrub with amber semidouble flowers. Disease-free leaves make 'Gold Bush' a special asset in the garden.

R. foetida J. Herrm. Austrian briar rose. Asia. Introduced before 1590. Section Pimpinellifoliae. Flowers 2–3 inches, usually solitary. Blooms in early June.

The flowers of this rose are a deep yellow. Unfortunately, in the eastern United States the plant is susceptible to blackspot, but fungicides, such as benomyl, may be an effective treatment. In its native Iran the dry climate no doubt protects it from fungi attacks.

Hybrids: Because of its brilliant flowers, *R. foetida* has been hybridized frequently, and its genes have entered indirectly into most modern roses. An older hybrid is × *harisonii* ['Harison's Yellow' (1830)], an outstanding rose. It is vigorous, up to six feet high, and sometimes suckers slightly so that it renews itself by finding fresh soil. The flowers are semidouble and a bright yellow, a softer color than that of *R. foetida.* Its other parent is *R. pimpinellifolia.*

R. foetida 'Bicolor' is an outstanding cultivar known as the Austrian copper briar. What a rose! The petals are a brilliant orange on the inside and an equally brilliant yellow on the outside. (An unusual form of this cultivar, with sectored petals, is shown on the front cover.) When in flower this rose is visible at several hundred feet.

R. gallica L. Red rose. Europe/Asia. Cultivated prior to 1500. Section *Gallicanae.* Flowers 1½–2½ inches, solitary or in clusters. Blooms in mid-June.

This rose has been cultivated for so long that it is difficult to know which is the species and which the hybrids. The only member of its section, it is a suckering shrub up to four feet high and has unusually large (up to 3½ inches long) leaflets.

Hybrids: The selections and hybrids of

Rosa gallica

R. gallica are extraordinarily numerous. In the mid-19th century one nurseryman listed 400 varieties. In my own garden I have grown many hybrids of *R. gallica,* two of which I have found to be especially successful: 'Tuscany Superb' (1848) and 'Scarlet Fire' (1952). The former is a vigorous and disease-free shrub about four to five feet high with large maroon-crimson double flowers, set off by a center of bright yellow stamens. It is a stunning plant.

'Scarlet Fire' is a modern hybrid of *R. gallica,* and although it does not resemble its parent it is one of the most outstanding shrub roses. The petals are pure scarlet and the center of each rose is yellow. The flowers bend in great wands along arching branches reaching 8 or 9 feet in height and spreading as much as 10 to 12 feet. The leaves are somewhat susceptible to blackspot, but because of the plant's height and vigor the upper leaves are not affected. (Blackspot usually begins on the lower leaves and branches of most roses and then ascends.) This ability to "outgrow" fungus enemies is characteristic of several of the strongest shrub roses. This is a marvelous rose. In my garden I have three bushes two to three feet apart, forming a dense clump.

R. glauca Pourr. (*R. rubrifolia*). Europe. Introduced in 1814. Section *Cassiorhodon.* Flowers 1–1½ inches, in clusters. Blooms in early June.

This rose is valued for its foliage, a faintly dusky maroon, resembling in early summer the color of a ripening plum. This unique foliage color enhances its value in the landscape. Reaching six or seven feet in height, the plant branches gracefully and the pink flowers with small white centers unobtrusively complement the foliage.

Hybrids: Rosa glauca has one outstanding hybrid (with the species *R. rugosa*), 'Carminetta' (1923), which shares *R. glauca*'s rosy foliage. From *R. rugosa* it has inherited great vigor and larger flowers. It is a less delicate plant than *R. glauca* but unique nonetheless for its foliage.

R. helenae Rehd. & Wils. Helen's rose. China. Introduced in 1907. Section *Synstylae.* Flowers 1–1½ inches, in many-flowered corymbs. Blooms in mid-June.

Named by E. H. Wilson for his wife, and introduced by the Arnold Arboretum, this handsome rose is difficult to obtain. Like those of other roses in section *Synstylae,* the flowers are white and rather small but compensate for their size by their abundance. The hips, which are an attractive red, are conspicuous in the fall. Like many shrub roses, this one is sometimes classified as a climber. Since no rose is a true climber (roses have no tendrils and do not twine), all this means is that *R. helenae* makes long annual growths and will grow beyond six or

eight feet high if not pruned at the tip. A particularly lovely variety of this rose, *flora plena,* grows in the rose collection of the Arnold Arboretum.

R. hugonis Hemsl. Father Hugo's rose. China. Introduced in 1899. Section *Pimpinellifoliae.* Flowers 1½ inches, solitary. Blooms in late May.

This rose ought to be in every garden. It forms a graceful arching shrub six to eight feet high. The growth is dense and the foliage is delicate. The medium-yellow flowers appear in late May in the Northeast and in most years precede all other roses that I know. It is no wonder that this rose is obtainable from just about every nursery and is probably the most popular species rose grown in the United States.

Rosa wilmottiae

R. laevigata Michx. China. Cherokee rose. Introduced before 1780. Section *Laevigatae.* Flowers 2½–3 inches, solitary. Blooms in late May.

Although native to southern China, *R. laevigata* has become naturalized in the southern United States and has an American name, the Cherokee rose. The flowers are large, white, and fragrant. This very beautiful rose is not fully hardy north of the Carolinas.

Hybrids: For those who would like to capture the beauty of this rose in a hardier form, 'Silver Moon' (1910), a probable hybrid, would be the choice. The flowers are similar but larger, and the fragrance is very strong. The leaves are a dark, glossy green. The canes are long and thick, and 'Silver Moon' is best grown as a climber. Because of its origin, it is hardy in New England only along the coast.

R. moyesii Hemsl. & Wils. China. Introduced in 1894. Section *Cassiorhodon.* Flowers 1½–2 inches, solitary or in pairs. Blooms in early June.

This is my personal favorite among wild roses, a huge shrub reaching 15 feet high after many years of growth. Its flowers are brilliant red, verging on geranium-scarlet in the selection 'Geranium' (1938). In the fall the arching branches are covered with unusual bottle- or vase-shaped hips that are bright red. Because this shrub forms a high canopy, bulbs and other shrubs can be planted underneath, making this rose ideal for the shrub border.

Hybrids: There are relatively few hybrids

of *R. moyesii.* Most of these have been created in England, but one of the best is 'Eddie's Crimson' (1956), hybridized by a West Coast nurseryman. It shares all of its parent's fine characteristics and, if anything, is slightly more vigorous. It has numerous hips that are somewhat less vase-shaped than those of *R. moyesii* itself.

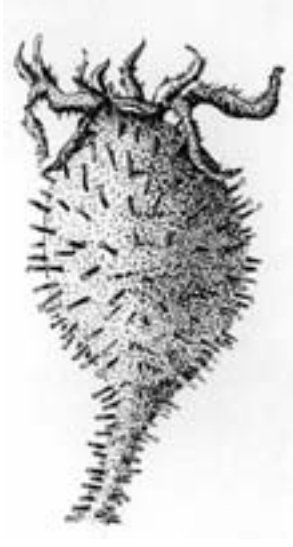
R. multiflora Thunb. Japan. Introduced before 1868. Section *Synstylae.* Flowers 1 inch or less, in many-flowered panicles. Blooms in mid-June.

This is a beautiful Japanese shrub with tiny white flowers in large clusters. By fall the flowers have been replaced by equally small red hips, which are excellent in arrangements. This plant has been touted as a turnpike barrier. It spreads very easily, as birds carry its small seeds a considerable distance. It has been much used in hybridizing, particularly in the polyanthas and the floribundas. Because of its phenomenal vigor and adaptability, this species is an understock for most roses in this country. Multifloras may reach a height and width of 10 feet, and many have in my garden. Approximately one-quarter of all the multifloras that have seeded themselves in my garden are thornless, a nice Mendelian ratio. The thorny remainder are larger and may have trunks one foot thick at the base. When removing one of these roses, I found it necessary to use a chain saw! The thornless forms are best. They are adaptable to all soils and situations and have attractive hips. The hips are the most beautiful feature of this plant. Many hybrids of this rose have been created, but few duplicate its extraordinary vigor.

R. nitida Willd. Eastern North America. Introduced in 1807. Section *Carolinae.* Flowers 1½ inches, usually solitary. Blooms in early June.

This is a dwarf rose with attractive autumn foliage color. Growing to approxi-

Hips of (left to right) *Rosa moyesii, R. roxburghii,* and *R. pimpinellifolia (R spinosissima)*



mately two feet high in the best forms, this shrub extends rapidly underground, forming a low thicket that is covered with deep pink flowers early in the rose season. It is an outstanding native rose suitable for both dry and damp sites along driveways and highway islands and near houses. It is my belief that this rose will eventually become very common in the cultivated landscape. At present it is rarely seen but deserves to be sought out for its special qualities.

R. palustris Marsh. Eastern North America. Introduced in 1726. Section *Carolinae.* Flowers 1½ inches, in corymbs or solitary. Blooms in mid-July.

This rose is unique in that it grows in wet places, even in sunlit swamps. It also will grow in ordinary garden soil. The flowers are light pink and the leaves are light green and shiny. It grows up to six feet high in thickets and increases by suckers. Like many other native plants, *palustris* is shamefully neglected by gardeners. Related species sometimes grown are *R. carolina* and *R. virginiana.* Like most roses, *R. palustris* needs full sun.

R. pimpinellifolia L. (*R. spinosissima*). Scotch rose. Europe/Asia. Cultivated prior to 1600. Section *Pimpinellifoliae.* Flowers 1½ inches, solitary. Blooms in late May or early June.

A vigorously suckering type of which there were at one time many dozens of selections, the Scotch rose can be found in shades of pale pink, white, and pale yellow, although the latter may be the result of hybridization. This rose is usually three to five feet high and is thoroughly hardy and adaptable. Because it suckers so easily, it must be planted where it will not overwhelm smaller plants. It grows best in full sun and is excellent in dry sites. A superbly adaptable rose, it should be planted wherever its special characteristics make it useful. All its varieties are outstanding; the one known as *altaica,* with cream yellow flowers, is especially handsome and grows up to six feet high.

Hybrids: R. pimpinellifolia has produced many outstanding offspring. Most bloom once only. One of the best is 'Golden Wings' (1956). This rose resembles a floribunda but has much greater vigor. Its medium-yellow flowers are large and single, covering the bush all summer long. It is somewhat susceptible to disease, and in my damp Cape Cod garden I find it necessary to spray it with a fungicide twice during the summer. Another very satisfactory hybrid is 'Stanwell Perpetual' (1838). All summer this produces medium-sized double pink blossoms on a four- to five-foot disease-resistant bush.

R. primula Boulenger. Central Asia. Introduced in 1910. Section *Pimpinellifoliae.* Flowers 1–1½ inches, solitary. Blooms in late May.

This is a lovely yellow rose, and it is the most fragrant-leaved of all roses. The scent permeates the air, particularly after rain. The leaves are small and delicate and disease resistant, making this a choice plant.

R. roxburghii Tratt. Chestnut rose. Japan/China. Introduced in 1880. Subgenus *Platyrhodon.* Flowers two inches, usually solitary. Blooms in early June.

This Chinese rose is a special favorite of mine. Named the chestnut rose because its hips are covered with chestnutlike prickles, it forms a stout, round bush 8 feet high and 10 feet wide. One specimen in the collection

Rosa roxburghii

of the Arnold Arboretum has a trunk 10 inches in diameter: this is the variety *hirtula.* An attractive feature of *R. roxburghii* is the peeling bark. The leaflets are large for a rose and their very regular pinnate arrangement is particularly conspicuous. The flowers of *R. roxburghii* are single and pink. This rose commands respect if only for its impressive armor.

Hybrids: Of the few hybrids of *R. roxburghii,* the most well-formed and most beautiful is 'Coryana' (1926). It produces large single pink flowers in great profusion, set against attractive foliage. In one garden I visited, a jacket had been draped to dry on the strong branches of 'Coryana'.

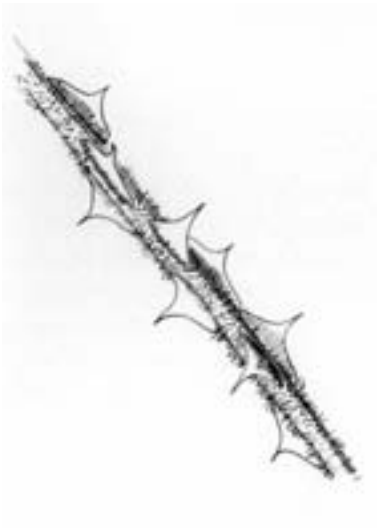
R. rugosa Thunb. Russia/Japan/China. Introduced in 1845. Section *Cassiorhodon.* Flowers 2½–3 inches, solitary or in few-flowered clusters. Blooms between early June and mid-June.

Naturalized all along the east coast of the United States on dunes to within a few feet of the high tide mark, this is a shrub rose without peer. It is extraordinarily hardy and adapts to every soil, from clay to sand. The wild forms bear single flowers of white, pink, or purple-red, while the hybrids broaden the color range and flower form without losing the vigor and adaptability of the parent. The canes are thick and covered with spiny thorns. Like those of many roses that sucker, the canes are almost consistent in diameter throughout their length. *Rosa rugosa* is unaffected by salt spray, and if the locations where it grows along the coast are an indication it can take some flooding from saltwater as well.

Hybrids: All the hybrids are good and because of *R. rugosa*'s vigor are almost always recognizable. Most do not sucker with the freedom of their parent, and because they are heavyset seem more like stevedores than like the ballerinas among roses such as 'Golden Chersonese'. The hybrids are numerous, and it is difficult to suggest selections. Two hybrids I have grown are particularly outstanding: 'Blanc Double De Coubert' (1892) and 'Jens Munk' (1974). The former is a fragrant double white from the turn of the century which blooms repeatedly throughout the summer. The latter is a recent hybrid with excellent pink blooms on a dense, disease-resistant shrub.

R. sericea f. *pteracantha* Franch. (*R. omeiensis*). China. Introduced in 1890. Section *Pimpinellifoliae.* Flowers 1½ inches, solitary. Blooms in late May.

Here is a wild rose whose most attractive feature is its thorns. A brilliant translucent red during the first year, they are poised along the branches like miniature delta-winged airplanes. The sight of this rose, with the sun shining through its thorns, is spectacular. During the second year the prickles darken to gray. The four petals, instead of



Thorns of *Rosa sericea* f. *pteracantha* (R. *omeiensis*)

the usual five, are a unique feature of this rose.

Hybrids: A hybrid that may be superior to its parent is 'Red Wing' (date of introduction unknown). This has been selected for its extraordinary thorns, a luminous red, and its vigor and resistance to disease.

R. wichuraiana Crép. Japan. Introduced in 1891. Section *Synstylae.* Flowers 1½ inches, in panicles. Blooms in mid-July.

Rosa wichuraiana is the best of the prostrate roses. It is vigorous and adaptable and sends out long canes, which sprawl a few inches above the ground. Like those of other roses in the *Synstylae* section, its flowers are white with a lovely boss of yellow stamens in the center. *Wichuraiana* is widely available from nurseries and is often extolled as a groundcover. It should be realized, however, that it does not make a thick carpet of leaves and should be planted on a mulched site so that weeds do not come up between the canes. This shrub is also disease resistant.

Hybrids: Numerous hybrids of *R. wichuraiana* have been created. These are ramblers, thick sprawling bushes three to five feet high that are even more vigorous than *R. wichuraiana.* The best known is 'Dorothy Perkins' (1901), which is now found growing in the harshest and most unlikely locations because it roots from the tips of the canes and is therefore easily transplanted. It blooms once in early summer with small pink double flowers. Although it is often afflicted by mildew, its vigor is not significantly diminished by the disease. Some years ago 'Dorothy Perkins' sported a more compact shrub, 'The Fairy' (1932). This is a wonderful plant that needs no attention at all and has pale pink flowers similar to 'Dorothy Perkins'.

R. willmottiae Hemsl. China. Introduced in 1904. Section *Gymnocarpae.* Flowers one inch, solitary. Blooms in early June.

For balance of flower and leaf, there are few roses that equal this unaccountably neglected Chinese rose. Though long admired in England, it is rarely seen in the United States. The pale pink flowers have cream-colored stamens, and the foliage has a fernlike texture. The shrub grows to eight feet and is exceedingly graceful. I know of no source of this shrub in the United States at present. Discovered in western China near the Tibet border by E. H. Wilson, this rose merits widespread cultivation.

Diseases, Insects, and Other Disagreeable Matters

Conventional roses — hybrid teas and floribundas — are by necessity pampered plants. Often ravaged by disease, especially blackspot, most require spraying every 10 days to 3 weeks. Cynthia Westcott, Ph.D., a

longtime admirer of roses who made her living as a counselor to suburban rose enthusiasts near New York City, wrote that "possible enemies of the rose are legion. There are 500 insect pests and perhaps half as many bacteria, fungi, and various virus-caused diseases. Rodents are often a menace and pets occasionally." In her book, *Anyone Can Grow Roses* (1965), 65 pages out of a total of 199 were devoted to rose diseases and pests.

Conventional roses usually are not long-lived plants. Failure to spray these roses for a few months or failure to prune for a year produces scraggy and charmless plants. If they are without care for a longer period, they deteriorate to leafless stems, defoliated by blackspot. For the most part the species roses listed above are not severely affected by insects or diseases. Some are susceptible on occasion to blackspot or mildew but because of their vigor will outgrow or resist an attack. On the rare occasions when blackspot appears, I spray once or twice a summer with Benlate, a systemic fungicide. This is necessary for only a few specimens and even then is not necessary every summer. As for pets, the abundant thorns of most species discourage most of them.

Planting and Pruning

With few exceptions all roses require full or almost full sun. In choice of site, this is the first requirement. Ample room for roots is necessary for strong-growing shrub roses. Although a suckering species such as *R. nitida* would do well between the sidewalk and the street, the larger species would find the location too cramped. With regard to soil, the species roses and their hybrids are far more adaptable than most hybrid teas and floribundas, but if the soil is poor some manure placed below the roots and separated from them by a layer of soil is useful. A large hole obviously is better than a small one.

Throughout the world most commercial roses are grafted. In this country the understock is *R. multiflora.* Grafting is a commercial necessity, since it produces large plants in a short time and because it encourages growth in the many weak commercial roses that would die if they were dependent on their own roots. Although species roses obtained from nurseries are the result of grafts, they are capable of growing on their own roots. It is my practice when planting species roses and their hybrids to set the graft-point four inches below ground to encourage the rose to grow its own roots. This method leads in the long run to increased vigor, and if the plant should be damaged in the future it will send out new shoots from below ground. These new shoots will be part of the graft and not the understock.

In the field of horticulture nothing is more controversial than the pruning of roses. Pruning species roses is not difficult, however, if one point is kept in mind: these are hardy shrubs and should be treated accordingly. This means that after a number of years the very oldest stems should be cut to the ground in early spring in the same way that one might renew a lilac or a mock orange. No further pruning is necessary except to cut off dead branches. Since species roses require many years to develop their flowering capacity, yearly pruning can be severely damaging.

There are a few species roses that are climbers but can be grown as shrubs if desired. If the canes of these become too long, they can be pruned by cutting off the tips.

Author's Note: Other interesting hardy species roses, in the collection at the Arnold Arboretum, are:

R. acicularis
R. afzeliana
R. agrestis
R. amblyotis
R. amurensis
R. arkansana
R. arvensis
R. beggeriana
R belgrandensis
R. bella
R. brunonii
R. calocarpa
R. canina
R carolina
R. centifolia
R. cinnamomea
R. clinophylla
R. coriifolia
R. corymbifera
R. davurica
R. ditrichopoda
R. dumalis
R elasmacantha
R fedtschenkoana
R giraldii
R hibernica
R. highdownensis
R. horrida
R. huntii
R inodora
R. jundzillii
R kochiana
R. koreana
R longicuspis
R luciae
R. malyi
R. micrantha
R. nitidula
R. nutkana
R. omissa
R oxyodon
R pendulina
R. pisocarpa
R. pomifera
R prattii
R. pruhoniciana
R. pteragonis
R roopae
R rubiginosa
R. scharnkeana
R schwinkeana
R. sertata
R. setigera
R. setipoda
R. sino-wilsonii
R. spaldingii
R. spinulifolia
R. tomentosa
R. tuschetica
R. waitziana
R. webbiana
R. wintoniensis
R. woodsii
R zalana

Nursery Sources for Species and Shrub Roses

High Country Rosarium, 1717 Downing, Denver, CO 80218

Joseph J Kern Rose Nursery, Box 33, Mentor, OH 44060

Lowe's Own Root Nursery, 6 Sheffield Road, Nashua, NH 03062

Mike's Roses, 6807 Smithway Drive, Alexandria, VA 22307.

Pickering Nurseries, 670 Kingston Road, Pickering, Ontario L1V 1A6 Canada.

Roses of Yesterday and Today, 802 Brown's Valley Road, Watsonville, CA 95076.

Wyant Roses, Route 84, Johnny Cake Ridge, Mentor, OH 44060.

Not all roses listed in this article are available from the above sources. For further sources consult the current edition of *Combined Rose List* (roses in commerce and cultivation, rose registrations since *Modern Roses 8*, and hard-to-find roses and where to find them), compiled and available from Beverly R. Dobson, 215 Harriman Road, Irvington, NY 10533.

An English source, for which an importation permit is required (write Permit Unit, USDA, PPQ, Federal Building, Room 638, Hyattsville, MD 20782), is: Peter Beales Roses, Intwood Nurseries, Swardeston, Norwich NR14 8EA England.

For Further Reading

The following are the recent major publications on species and shrub roses:

Bean, W. J. 1973–80. 8th ed. *Trees and Shrubs Hardy in the British Isles* London: Murray. The fourth volume contains an updated listing of species roses as well as a section by Graham Thomas on the major hybrids.

Edwards, G. 1975. *Wild and Old Garden Roses* New York: Hafner. Like most of the other publications in this list, this is British in origin, and therefore much of the information needs to be adjusted to American climatic conditions.

Gault, S. M., and P. M. Synge. 1971. *The Dictionary of Roses in Color.* New York: Grosset and Dunlap. Outstanding color photographs of many species and shrub roses as well as hybrid teas and floribundas.

Gibson, M. 1973. *Shrub Roses for Every Garden.* London: Collins. A most comprehensive and readable account of shrub roses.

Kordes, W. 1964. *Roses* London: Studio Vista First published in Germany, this is a first-person account by the major breeder of shrub roses in the 20th century.

Krussman, Gerd. 1981. *The Complete Book of Roses* Portland, Oregon: Timber Press Inadequate editing and layout mar a remarkable book, which has an excellent section on species roses. The original German title, *Rosen, Rosen, Rosen,* better captures the spirit of the book.

Shepherd, R. 1978. Reprint. *History of the Rose.* New York: Coleman. This is the major American reference for those who wish to grow species roses and their hybrids. First published in 1954, it is not a history of the rose but rather a horticultural and botanical survey of the entire genus.

Thomas, G. S. 1956. *The Old Shrub Roses.* London: Phoenix House.
———. 1962. *Shrub Roses of Today.* London: Phoenix House.
———. 1965. *Climbing Roses Old and New.* London: Phoenix House Thomas is an authority on shrub roses and for accuracy and a graceful style has no equal. The three works above have been republished several times and contain the most comprehensive horticultural descriptions of species roses ever published.

Jonathan Shaw, the former director of the New England Wildflower Society, is now director of Bok Tower Gardens, in Lake Wales, Florida.

Castanea mollissima: A Chinese Chestnut for the Northeast

Edward Goodell

Will the chestnut's future equal its past? Since before recorded history, species in the chestnut genus *Castanea* have been prime sources of food and wood in vast areas of Asia, Europe, and North America. During the 20th century, however, the chestnut's contribution has been reduced drastically by disease and pestilence. In response to these setbacks, chestnut research has increased worldwide (Jaynes 1975). These efforts, combined with the great genetic variability within the chestnut genus, seem destined to reassert the chestnut's preeminence as a forest and orchard tree. Though commercial plantings are still a questionable enterprise in many areas, home production of chestnuts can be highly recommended for suitable sites (zones 5 and 6) in the northeastern United States.

The chestnut genus, which has 12 (Camus 1929) or 13 (Jaynes 1975) species, is in the same family (Fagaceae) as oaks and beeches. The genus originally evolved in the Orient, spreading west to Europe and east to North America via the Alaskan land bridge. The chestnut blight fungus (*Endothia parasitica*) comes from Asia, and *Castanea* species of that region have evolved various degrees of resistance, whereas European and American species are highly susceptible.

Four species of *Castanea* have been commercially successful: *C. mollissima* Blume, the Chinese chestnut; *C. crenata,* the Japanese chestnut; *C. sativa,* the European chestnut; and *C. dentata,* the American chestnut. The Chinese chestnut is cultivated in its native China and Korea. Centuries of seed selection have improved its resistance to chestnut blight and its production of nuts, but its wood remains very lightweight and weak and therefore has no commercial value. Of the north temperate species, it is the most resistant to blight.

The Japanese chestnut, which is also native to southern Korea, has been cultivated in Japan for at least 3000 years and perhaps as many as 7000. The planting of chestnuts in both Japan and Korea has increased in recent decades, yet total production has remained about the same because of increasing damage from a devastating new pest called the gall wasp. In addition to yielding great quantities of nuts (27,000 metric tons annually), the Japanese chestnut produces strong, durable wood that is used in fine woodwork, ships, and railroad ties.

For centuries the European chestnut has been a staple food and export commodity in the rural, hilly areas of southern Europe. Production has been reduced 85 percent since the turn of the century, both because of a decline of agrarianism in the region and

the combined effect of a root-rot disease and the chestnut blight. Even so, over 180,000 metric tons of European chestnuts are produced annually in France and Italy alone. More than 4500 metric tons are currently exported to the United States yearly. The nuts of the European chestnut are similar to those of the Japanese chestnut. Both are relatively starchy, and their sugars are less soluble than those of the other chestnut species.

In this country the American chestnut was the most important deciduous forest tree at the turn of the century. It was valued highly for its versatile decay-resistant wood, and its nut crops provided food for humans and substantial forage for livestock and wildlife. Then came the chestnut blight in 1904. In that year chestnut trees in New York City were found dying of an unknown cause. Investigations revealed a fungal, bark-canker disease that impeded the flow of sap. Large trees often died within two years of the first infection. The chestnut blight, as the disease was called, spread outward from New York City at the rate of 20 miles per year. Eventually, it completely decimated

Castanea mollissima nut emerging from bur
Al Bussewitz photo

the American chestnut as a commercial forest tree. This pestilence, which was probably introduced from the Orient on nursery stock around 1890, is one of the most devastating epidemics of a plant disease caused by a pathogen from a foreign country.

Because the blight fungus does not live below the ground level, stumps of diseased trees continue sending up healthy sprouts that eventually become infected and die, but in succession these sprouts keep the tree's root system alive for many years. As a result, chestnut saplings are a common sight in native forests. A few mature trees remain, especially beyond the northwestern extent of the American chestnut's range, where the infectious fungus spores are not so prevalent. For instance, over 6000 mature trees have been found in northern Michigan (Buisch 1978).

Oriental *Castanea* species have sufficient resistance to survive the disease. Although infected, the trees seldom die, even though entire limbs may die. For this reason Japanese and Chinese chestnuts have been imported to replace the American species, and breeders are now attempting to combine the blight resistance of the oriental species with the timber form of the American. Some hybrid seedlings among the thousands planted show promise. Richard Jaynes (1979), geneticist with the Connecticut Agricultural Experiment Station, summarized the prospects: "With time and substantial effort it should still be possible to develop clonal selections and even relatively true breeding lines of blight-resistant timber chestnuts for the eastern United States."

In Italy and France control of the blight has been achieved with a virus that infects the blight fungus and renders it incapable of continued attack. Control with this method is complicated, however, because the different strains of fungus existing in different geographic areas are often incapable of transmitting the virus to one another. Natural spread and long-term control have not been observed in the United States. Again, with further research the viral method could provide practical control in the future (Elliston and Jaynes 1977).

Description

The Chinese chestnut is a coarse-textured, medium-sized tree with a round top. The spreading main branches usually diverge in an irregular pattern near the ground. The growth rate of this species is considered moderate, but both rate and form vary among individual specimens. The glossy green foliage is handsome and disease resistant. Its color in autumn can be described as somewhere between the dull yellow of hickories and the bronze of beeches.

The Chinese chestnut is distinguished from other species by pubescence (presence of hairs) on the undersurface of leaves and on the young branch tips. The winter twigs are buff colored, sometimes with a red tinge on the upper surface, unlike the dark brown to purplish brown of other chestnut species. The leaves of the American chestnut are narrower, with a distinctly toothed margin. The Japanese chestnut leaves are distinguished by a bristle-tipped margin and by small glands appearing as tiny, pale dots on the undersides of young leaves. Crosses between these species have produced hybrid plants with a full range of intermediate characteristics.

The individual flowers are not impressive, but a Chinese chestnut tree in full bloom is

striking. An abundance of long, light yellow catkins offsets the glossy foliage. In Boston flowering occurs in late June and early July. The plants are monecious (having staminate [male] and pistillate [female] flowers on the same plant). The catkins, which are erect relative to the twig, are borne near the terminal end of the current season's growth. The long (eight-inch) catkins are comprised mainly of strongly scented staminate flowers. One to three pistillate flowers are located at the base of the catkins closest to the terminal end of the shoot. The staminate flowers are frequently visited by bees and other insects, including small beetles, but these agents are not necessary for pollination (Jaynes 1975). The pistillate flowers are inconspicuous, without scent, and have long styles.

Chinese chestnuts adapt to a wide range of well-drained sites, doing best on light-textured, acidic (pH 5.5) soils. They apparently are much more productive in warm soil than in cool, high humus bottomland soil. Vegetation characteristic of such sites is red oak, pine, sassafras, and bitternut hickory. It is commonly stated that Chinese chestnuts are hardy in zone 5, surviving at −20°F. However, the buds near the terminal end of the shoot may be injured by temperatures slightly warmer than that if a rapid decrease occurs (personal communication from Alfred Szego). Since most of the flowers are produced on terminal buds, significant decreases in yield may result in zone 5.

The Japanese chestnut is generally less hardy. However, many variations exist among individual plants. Frost pockets must be avoided because new growth in both species is susceptible to injury from late spring frosts. Partially shaded Chinese chestnut trees at the Arnold Arboretum regularly mature nuts, but a better crop and denser habit occur in full sunlight. Established trees withstand drought well. The site adaptability, handsome foliage, and the unusual flowering effect of this productive nut tree make it a highly desirable element in the landscape.

Fruit

The developing chestnuts are surrounded by a green, spiny involucre, commonly known as a bur. The spines are soft at first but become stiff and sharp as the nuts inside ripen. There are usually three nuts inside each bur, although one or two often fail to develop. When the nuts are ripe, the burs open and the nuts fall free. The size of nuts from unselected Chinese chestnut seedlings varies widely, but cultivated varieties have large, dark mahogany-colored nuts. The latter are similar in size to the commonly available European chestnut, about one inch in diameter, with 30 to 50 chestnuts comprising a pound. A dark brown leathery seedcoat about one millimeter thick forms the outer covering of the nut. Inside this, a papery thin fibrous brown pellicle (skin) adheres to the nut. The pellicle is more readily peeled from Chinese chestnuts than from European or Japanese chestnuts. Like that of other oriental chestnuts, the Chinese nutmeat has a rich yellow color. The nutmeat of American and European chestnuts is white. The edible portion of a fresh nut is 40 to 50 percent carbohydrate (mostly starch), 5 percent oil, 5 percent protein, and about 50 percent water. Chinese chestnuts are considered generally less sweet and flavorful than American chestnuts but much better tasting than European or Japanese chestnuts.

Chestnut trees in full sun can bear crops annually, in contrast to many other nut trees, which do so only biennially. The flowers appear on the current season's growth well after the danger of frost has passed. At least two seedlings or cultivars must be planted within 100 to 200 feet of each other to ensure cross-pollination and optimal fruit set. Seedlings commonly bear fruit in four to seven years, while grafted trees often bear within two years. Mature trees may yield 35 to 55 pounds of nuts each year.

In the United States commercial plantings of Chinese chestnut trees exist only in the southeastern states. However, observations at Vineland, Ontario, Canada suggest that commercial-size crops are possible in the northeastern United States (Society of Ontario Nut Growers). Seedling trees are widely available from commercial nurseries and state conservation agencies, but cultivars, which are not widely available, are far more valuable as nut producers. Several cultivars worthy of mention for the Northeast are described on page 26.

Propagation

The scarcity of Chinese chestnut cultivars results from the difficulty of propagating these plants vegetatively. Graft-union failures often occur after several years of vigorous growth. The suspected causes are a combination of factors, such as incompatibility between the stock and the scions, lack of stock hardiness, poor grafting technique, and blight fungus in the union. The greatest success is obtained by grafting a cultivar onto its own seedlings.

To do this dormant scions must be collected in late winter. The scion and root stock diameters should be equal. The scions should be stored with a slightly damp paper towel in a sealed plastic bag at normal refrigerator temperatures. Grafting must be performed after all danger of late spring frosts is past. Because only a single bud occurs per node, no reserved buds are available to break dormancy. The root stock will have leaves at the time of grafting, but all growth within 15 inches below the graft area should be removed. Grafts are most successful when located at least a foot above ground level.

Chestnuts respond well to bench grafting in a greenhouse. Root stocks must be dug as soon as possible in the spring, brought into the greenhouse, and grafted immediately. Successful grafts can grow 20 inches before being moved outdoors in early June.

A simple splice or whip graft is most effective with scions that have the same diameter size as the root stock. When grafting established trees, it is best to splice-graft small stems. Grafts on main scaffold branches usually fail. Summer budding is not successful with chestnuts, but grafting in spring using dormant buds on a growing root stock is common in Europe. Growth from grafted buds is apparently more vigorous than that from grafted scions. Desiccation of the graft union may be prevented by any means except using an asphalt-based compound, to which chestnuts are sensitive. The entire union may be wrapped in a plastic bag that has been sprayed with white paint. This helps retain moisture and keeps the union warmer for optimal healing.

Buds should be rubbed off the root stock at two-week intervals. After a month all materials except the budding rubber must be removed. Scion shoots should be growing at this time. Tying the new shoots to a support-

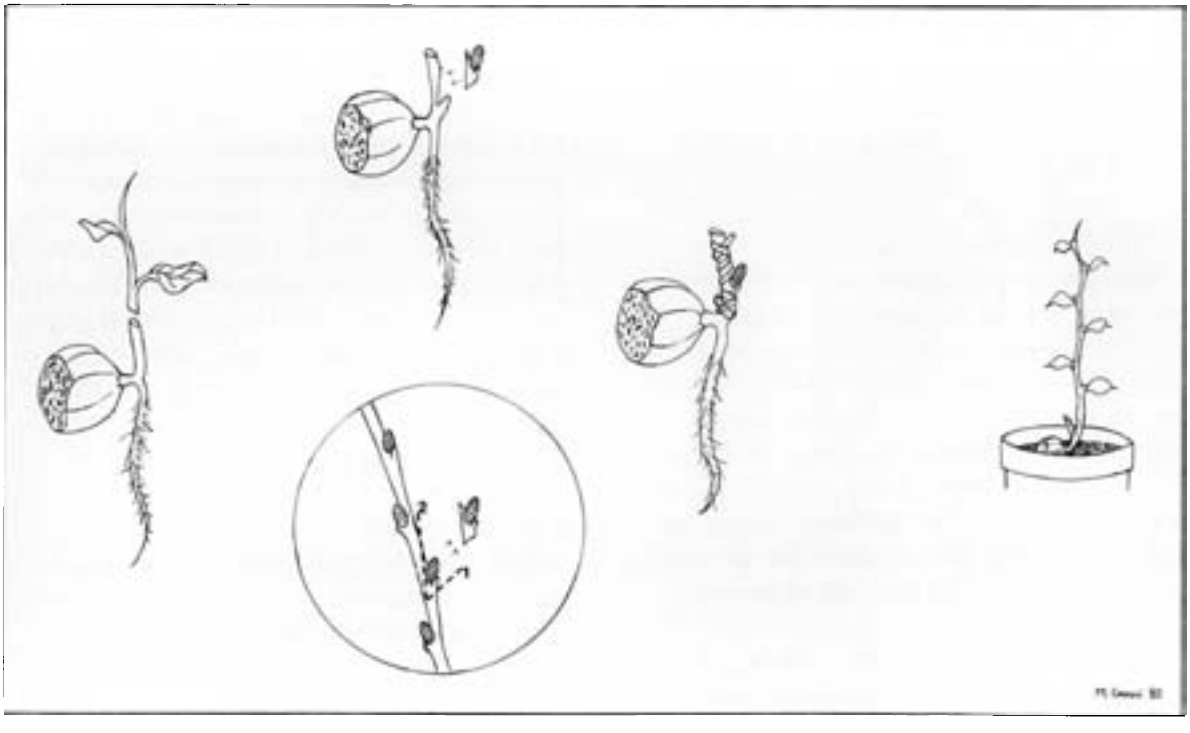
ing splint will protect them from wind damage.

Steps in Propagating Chestnuts by the Chip-Bud Method. 1. Harvest nuts in fall and place in moist, cold storage (32°F to 40°F) for 90 days. 2. Place nuts in moist, warm (70°F to 75°F) germinating medium. 3. When shoots emerge and leaves begin unfolding, remove sprouts from germinating medium and cut off leafy portion of shoot. 4. Cut shield-shaped chip from remaining portion of shoot. 5. On plant to be grafted, cut chip of same size and shape around bud on basal two-thirds of previous year's growth. 6. Bind bud and shoot together in position of maximum cambial contact. 7. Place graft in container deep enough to accommodate tap root. 8. Place container in humidity case at 70°F to 75°F. 9. When graft union has healed and bud is leafing out, begin to reduce heat gradually. 10. Plant outdoors in June. *Drawing by Michael Grassi*

Chip-budding sprouted chestnut seed is a recently developed propagation method with promise for both amateur and professional horticulturists (Jaynes 1980). Using this technique, I successfully grafted 29 plants out of a total of 48. It eases the grafting process somewhat and greatly reduces the amount of time required to produce from seed a grafted plant ready for transplanting (see diagram below).

Despite improvements, vegetative propagation is still considered difficult, and justly so. In contrast, growing plants from seed is relatively simple. Consequently, virtually all of the chestnuts sold or grown in orchards in this country come from seedlings.

Seed should be collected from parent trees that are known for blight resistance, heavy yields, high quality nuts, and good form. The



nuts dehydrate rapidly after releasing from the bur, losing their ability to germinate unless promptly sown or stored at high humidity between 32°F and 40°F. A good method is to mix freshly harvested nuts with an equal amount of peat moss. This mixture should be sealed in a sturdy plastic bag and stored in the crisper in a refrigerator until ready to plant. A few drops of water may be substituted for the peat moss. Condensation on the inside of the bag indicates an over damp condition. Nuts may germinate in storage but if carefully handled may be successfully grown.

The tendency of chestnuts to sprout prematurely makes fall a good time to sow seeds. Even at near-freezing temperatures during late winter and early spring, the nut will germinate and establish its rudimentary root system. There are some pest problems with fall sowing, however. Weevil larvae in the nuts can enter the soil, pupate, and pose a threat to subsequent crops. Another pest is the squirrel. Regardless of the planting time, rodent protection must be provided until the seedlings are about a foot high. Otherwise, the kernel may be dug up and the entire plant killed or stunted. Covering the seeds with woven wire during storage and after the seedlings have germinated will also protect the plants against rodents.

To sow seeds, place nuts on their sides about two inches below the surface of fertile, well-drained soil. A thick insulative mulch will protect the seeds from damage (chestnut seeds are damaged by temperatures below −24°F), but the seeds' location must be carefully marked so the mulch can be pulled back in the spring. About 95 percent of sound chestnut seed can be expected to germinate. It is best to plant as early in spring as possible.

The culture of Chinese chestnuts is similar to that of peaches. Frost pockets must be avoided to protect the easily injured young foliage from late frosts. Light, slightly acidic soils are best, although heavier, calcareous soils are satisfactory if drainage is sufficient. Young chestnut trees are affected by drought conditions. This is unlikely to be a problem in the northeastern United States except during the first growing season.

Dormant chestnut trees transplant successfully. It is important to spread the roots evenly and provide adequate water until they are established. Mulching (after the soil has warmed up) will reduce weeds, conserve soil moisture, and add organic matter to the soil. Spring is the best time for fertilizing, although fertilizing is not necessary in the first year. Since fertilizers may burn the bark, they must not be allowed to come in contact with it.

Mature chestnut trees need approximately a 25-foot space between them. Seedling chestnuts can be planted much closer together until their fruiting characteristics can be evaluated, but the poor producers must then be eliminated. As little as a five- to eight-foot space is sufficient for the first two fruiting years (Jaynes 1979). Seeds can be sown closer, because sick and stunted plants can be eliminated each year as they approach fruiting age. Depending on the parent trees and the grower's standards, up to 10 percent of the offspring will be worth keeping. The pollen parent is equally important for producing superior offspring.

Pruning should be kept to a minimum. In young trees it delays the onset of bearing, and in older trees it can reduce yields. Pruning in early summer will help direct the tree's energy into fruit production rather than stimulate vegetative growth (Society of

Ontario Nut Growers 1980). However, open wounds are more susceptible to infection at this time than during the dormant season (Bey 1979). The best overall tree shape is conical with a central leader and horizontal scaffold branches. This shape serves two functions. First, it allows the most sunlight to reach the fruiting ends of the branches, and second, it provides the most shade to the trunk, which is susceptible to sunscald. Unshaded horizontal or drooping branches retain more carbohydrates and produce more fruit than do ascending branches. The Chinese chestnut's natural tendency for spreading branches may make a central-leader shape impossible to maintain without excessive pruning, however.

Pests

The blight is the most prevalent pest problem of chestnuts in the northeastern United States (Payne and Johnson 1979), but the oriental chestnuts have coevolved with the blight fungus and have developed resistance to it. The Chinese chestnut species is more resistant than the Japanese chestnut, but the resistance of individual plants varies within each species and with site conditions. Chinese chestnuts may become infected but usually heal quickly and are not severely affected.

The chestnut weevil (*Curculio* sp.) can pose a serious problem. Immediate removal of fallen fruit from beneath trees prevents the weevil larvae from pupating in the soil and keeps the population at tolerable levels.

Chestnuts must have adequate zinc, but this should not be a problem in the Northeast. A deficiency will show up as yellow, mottled leaves.

High populations of gypsy moth larvae, and to a lesser extent Japanese beetles, can cause severe defoliation. Mites can build up to harmful levels if Sevin has been used to control leaf eaters. The southern and western regions of the United States have troublesome pests, and a couple of these — oak wilt and blossom end rot — have been reported as far northeast as Pennsylvania and New York.

The symptoms of blight infection begin with the appearance of bark cankers on stems three or more years old. Cankers on young, smooth bark are orangy brown in contrast to the gray-green normal bark. Tan spore-containing processes extend from these during wet weather. The spores are washed away by rain or carried long distances by birds and insects. Cankers do not show up immediately on older thick bark but appear as abnormal splits and bulges in the bark as the infection advances. Removing the dead bark will usually reveal a fan-shaped pattern of threadlike, fungal growth.

Minimizing bark damage and treating wounds can help reduce infections. The blight rarely reaches more than a centimeter below the soil surface, and many soil organisms (tentatively identified as fungal *Trichoclerma* sp.) are believed to be antagonistic to the blight fungus. Some cankers have been successfully treated with soil compresses (Weidlich 1978). The treatment involves covering the canker with soil and wrapping it in plastic for several months during the growing season. The canker undergoes a complete remission and is sealed off with a healthy callus. Admittedly, this technique is labor intensive and suitable only for a small number of trees.

The chestnut crop ripens in late September and October. Until then the spiny burs remain tightly closed around the nuts.

At this stage gloves are an absolute necessity in handling the burs. As the nuts ripen, the mature nutshells change from white to brown, and the burs begin to split open, allowing the nuts to drop to the ground.

The nuts must not be allowed to lie on the ground, because heat will cause the seeds inside to deteriorate rapidly, and squirrels and other wildlife will quickly carry the chestnuts away. The nuts can be collected without repeated visits to the tree if, when the first burs begin to open, as many as possible are harvested by shaking the limbs and gathering the burs from the ground. A hat, jacket, and gloves are needed to ward off the spiny burs as they fall. The burs should be stored in a cool, humid location, where they will continue to ripen and release their nuts within about a week. The nuts can then be easily separated from the bur chaff.

Uses

The traditional method of preparing chestnuts for eating is roasting in a skillet or oven. The resultant sweet snack has a grilled, tangy flavor. Chestnuts may also be eaten raw after drying the fresh nuts in a cool, airy place for a few days until they feel spongy. This slight drying increases the sugar content, producing a sweet, milky flavor. If they are allowed to, chestnuts will continue to dry until hard. At this stage their primary value is for grinding into flour, which can be used in baked goods, although it may be possible to rehydrate the nuts by steaming them for a half hour (Westwood 1978).

Cold storage at a high humidity level will keep the nuts fresh for at least eight weeks and often much longer, even until the next harvest. These conditions can be achieved with a plastic bag stored in the crisper in a refrigerator, but no free moisture should be present. The nuts should be checked occasionally and molded ones discarded.

Peeling the leathery seed coat of chestnuts is the first step in any preparation except roasting. The easiest way to do this is to make a slit across the scar side (opposite the point) and then bake the nuts in a preheated oven at 250°F for 10 minutes. The seed coat will dehydrate and shrink, causing the nut to protrude through the opening. A gentle squeeze on the pointed end will pop the nuts free.

Chestnuts may be eaten in many forms. Poultry stuffing is perhaps their most common use. The nuts may be stir fried, boiled and mashed like potatoes, and used raw or cooked in casseroles, salads, soups, and hot breakfast cereals. They may be cooked in syrup to create a glacé dessert. Boiled chestnuts may be frozen for long-term storage.

Cultivars

Except where noted, the following descriptions are adapted from *Nut Tree Culture in North America* (1979) by Richard Jaynes. 'Nanking' is the most widely distributed Chinese chestnut cultivar. It customarily bears heavy annual crops of large nuts, but these are not highly regarded for their flavor or storage qualities. 'Nanking' ripens nuts at the Arboretum in mid-October, about the time of the early autumn frosts.

'Eaton' is the selection with which to compare others in the Northeast. An attractive tree with large, waxy leaves, it averages 40 pounds of large nuts per year, and these mature two weeks earlier than those of

'Nanking' (Jaynes 1970). 'Eaton' probably has Chinese, Japanese, and American parentage, but it bears the closest resemblance to the Chinese species. 'Eaton' nuts compare favorably in taste with most American chestnuts.

'Orrin' grows slowly in a compact upright habit, yet it is a prolific producer of large, dark nuts. The tree is reportedly hardy to −34°F (Campbell 1979). The nuts ripen a few days earlier than those of 'Nanking' and store better than most. The glossy, dark green foliage of 'Orrin' is relatively pest free, making this a productive ornamental tree for small spaces. The only disadvantage of 'Orrin' is that its upright branch crotches may be susceptible to breakage under load. In general, 'Orrin' seedlings are regarded as superior.

'Sleeping Giant', as the name implies, is a large tree. This cultivar is a seedling of a Chinese chestnut that was pollinated by a Japanese and American hybrid. Its leaves are large and very glossy, and the original tree, located in Connecticut, consistently yields large nuts that have a flavor comparable to that of 'Nanking'. 'Sleeping Giant' is reportedly difficult to graft, although I have had success using the chip-bud technique.

'Henry VIII', from New Jersey, is a seedling of 'Crane' × 'Orrin'. It produces top-quality nuts and has dark, pest-resistant foliage. Its shape is pleasantly round.

Earl Douglass, who lives east of Rochester, New York, has hybrid seeds and seedlings of an oriental chestnut crossed with a native American chestnut. Some of these hybrids reportedly have timber form, are cold-hardy, and ripen nuts in September. They also have a relatively high resistance to blight compared to most American chestnuts, but Douglass says that they, too, eventually will succumb unless sprayed with fungicides.

'Au Cropper', 'Au Homestead', and 'Au Leader' were all selected and recently released by the Auburn Experiment Station in Auburn, Alabama, but I have no data regarding their suitability for the Northeast.

Chinese chestnuts are a valuable food-producing tree for home landscapes in the Northeast and may someday be a commercial crop. With the natural variability of the *Castanea* genus, great genetic potential exists for producing trees with superior nuts, timber, and pest resistance. The realization of that potential is proceeding through the efforts of both professional geneticists and amateur growers. Fortunately, several superior cultivars and seeds are currently available.

Author's Note:

I would like to acknowledge the invaluable comments and support of the following persons, whose contributions immeasurably added to the depth and scope of this article: Stephen Breyer, Earl Douglass, Henry Hartman, Richard Jaynes, Elwyn Meader, and Alfred Szego.

Sources for Chestnut Seeds and Seedlings

The following is a list of nurseries specializing in tree crops. Many are run as small part-time businesses. Orders should be placed well in advance, because supplies are often limited. Most have catalogues available upon request.

Auburn Nursery, 1930 South College Street, Auburn, AL 36830.

Campberry Farms, c/o Mr R. D Campbell, R R 1, Niagara-on-the-Lake, Ontario, Canada L0S 1J0. Improved strains of nuts.

Earl Douglass, Red Creek, NY 13143. Seeds and seedlings of Chinese and American chestnut hybrids.

John H. Gordon, Jr., 1385 Campbell Boulevard, North Tonawanda, NY 14120. Seeds, seedlings, and root stocks.

Grimo Nut Nursery, R R 3, Lakeshore Road, Niagara-on-the-Lake, Ontario, Canada L0S 1J0. Good selection of cultivars and seedlings. Custom propagation available.

International Tree Crops Institute, Appalachian Regional Office, Route 1, Gravel Switch, KY 40328. Seedlings and cultivars.

Jersey Chestnut Farm, 58 Van Duyne Avenue, Wayne, NJ 07470. Selected seedlings.

Leslie Wilmoth Nursery, Route 2, Box 469, Elizabethtown, KY 42701. Seedlings and cultivars.

Louis Gerardi Nursery, R R 1, O'Fallon, IL 62269. Seeds, seedlings, and cultivars.

Nebraska Nut and Fruit Tree Seed Program, Nebraska Nut Growers Association, Box 4644, Lincoln, NE 68504. Seed packets of native trees.

Ray Guidi Nursery, 193 Curtis Avenue, Dalton, MA 01226. Seedlings.

St. Lawrence Nursery, R D 2, Route 56A, Potsdam, NY 13676. Exceptionally hardy nuts.

Robert G. Seip, R D 1, Box 683, Alburtis, PA 18011. Cultivars and seedlings.

Stark Brothers Nursery, Louisiana, MO 63353. Seedlings and cultivars.

Talbott Nursery, R R 3, Box 212, Linton, IN 47441. Seedlings.

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Edward Goodell is the author of "Two Promising Fruit Plants for Northern Landscapes," which appeared in the fall 1982 issue of Arnoldia.

A. saccharum 'Newton Sentry' (foreground) in the Maple collection at the Arnold Arboretum

Acer saccharum 'Newton Sentry': Setting the Record Straight

Michael Dathe

It stands in an overgrown shrub border on a slope just to the left of the main entrance to Newton Cemetery. Scrub growth of Norway maples, buckthorn, and weeds grow around its base, and yews have closed in on three sides, leaving only a portion of the trunk visible. "Not one person in ten thousand takes note of it or realizes that it is unique," Newton resident A. H. Fewkes wrote in 1924. In the years since, it has received little more recognition.

The tree is the original of its type, a mutant of *Acer saccharum*, the common sugar maple, and has the narrowest canopy of any sugar maple known. F. L. Temple, the Cambridge, Massachusetts, nurseryman who introduced it into cultivation, described the tree as "exhibiting towering shafts of foliage" in startling contrast to the spreading branches of the common species. Temple's 1885–86 catalogue for Shady Hill Nurseries contains the following description:

Acer saccharinum columnare
This is a most remarkable form of the Sugar Maple, which grows in a compact, columnar shape. . . . The original tree of this sort is 30' high, and only 2½' in diameter at the top. The leaves are thick and leathery, and of a very dark color, which gives it a rich appearance. This tree . . . will be the parent of a new type of lawn and landscape tree. . . .

(Until 1900 the sugar maple was widely known as *Acer saccharinum*, which is now the correct name of the silver maple.)

Two years after introducing the Newton Cemetery tree into cultivation, Temple also introduced another upright maple, which he called *Acer saccharinum monumentale*. Although the two trees are readily distinguishable, their names quickly became confused in horticultural literature, and that confusion still exists today. Bernard Harkness, a taxonomist for the city of Rochester, New York, attempted to clarify the issue in 1954 and proposed the names *Acer saccharum* 'Newton Sentry' for the Newton Cemetery tree and *Acer saccharum* 'Temple's Upright' for the other in an article in *Baileya* (volume 2, number 3, page 99). In that article Harkness correctly identified the two trees with regard to the central leader, but in listing their distinguishing characteristics attributed the stubby lateral branches of 'Newton Sentry' to 'Temple's Upright'. A drawing that accompanied the article perpetuated the confusion, for the artist had drawn the 'Newton Sentry' with a central leader and the 'Temple's Upright' without. The latter mistake was carried into Donald Wyman's *Trees for American Gardens* (1965) and *Hortus Third* as well as numerous other publications. *Arnoldia* played its part in perpetuat-

ing the confusion in an article (volume 36, number 4, pages 168–69) by Richard E. Weaver, in which photographs of the two trees appeared with the names reversed.

The key identifying features of the mature 'Newton Sentry' are:

- Lack of a single central trunk above six feet from the ground
- Major and minor branches vertical
- Short, stubby lateral branchlets on secondary branches

The key identifying characteristics of the mature 'Temple's Upright' are:

- Strong central leader well into the crown
- Major and minor branches gradually ascending
- Absence of short, stubby lateral branchlets (secondary branches similar to those of the typical sugar maple)

The original 'Newton Sentry' in Newton Cemetry is now 50 feet high with a 16-inch diameter and a 14-foot spread. As 'Newton Sentry' matures, it develops several major leaders. Branches coming off these leaders closely follow them upward, giving the tree its extremely columnar form. The lateral branches on the secondary branches are generally one to six inches long and often resemble the flowering spurs on fruit trees.

'Temple's Upright' has an elliptical silhouette, with a single main central trunk and major branches bowing out before gently curving upward. It is a superb graceful, branching landscape tree. No data exist on how or where Mr. Temple acquired his first cuttings or whether the parent tree is still standing.

Fewkes observed the tree in its original location, on the grounds of the Claflin Grammar School in Newton, Massachusetts, in

Acer saccharum

1871, when he was a student at the school. It was later (between 1875 and 1880) moved to Newton Cemetery when the school was being enlarged. By 1954 it had grown to 40 feet high, with a 12-inch diameter at approximately breast height.

In 1885 the Arnold Arboretum received cuttings of the Newton Cemetery tree from Henry Ross, the cemetery's supervisor of grounds, and the resultant tree (number 2119), in the maple collection, is now 60 feet high, with a 16-inch diameter and a 17-foot spread. That tree for years was mislabeled because of the confusion with 'Temple's Upright' but now is labeled correctly. Two other trees propagated from number 2119

A. saccharum 'Temple's Upright'

also grow in the Arboretum; one, in the Weld-Walter Tract, is 27 years old, 25 feet high, 4 inches in diameter, and 7 feet in spread; and the other, on Peter's Hill, is 50 years old, 20 feet high, 3 inches in diameter, and 4 feet in spread. The latter cannot be considered indicative of the growth rate of 'Newton Sentry' as it has resprouted from the base following destruction by vandals.

For all Temple's hope for his new introduction, 'Newton Sentry' has never become a popular landscape plant. The usual design limitations of columnar trees and its own sticklike appearance in winter for the first 25 years are possible reasons for its lack of popularity. Another reason may be its lack of the low branches needed for screening purposes. Its fall coloration is earlier but otherwise similar to that of the common sugar maple. This early defoliation can be used to lengthen the fall foliage season when used in tandem with later defoliating trees. 'Newton Sentry' also has potential as a street tree, having been used in a strip planting in the center of the town of Sheffield, Massachusetts, with good results. In my opinion the tree's best use in the designed landscape is as a focal point, where its distinctly different growth pattern would be most visible.

Michael Dathe is a landscape designer and a resident of Newton, Massachusetts.

NEWS

New Hardy Forsythia for the Northern Plains

The Department of Horticulture and Forestry, Agricultural Experiment Station, North Dakota State University, Fargo, and the Department of Horticulture and Forestry, Agricultural Experiment Station, South Dakota State University, Brookings, in collaboration with the Arnold Arboretum, Jamaica Plain, Massachusetts, recently announced the pending naming and release in 1985 of a new hybrid forsythia selection that is hardy in the northern plains, where forsythias were previously nonadapted.

In the northern plains most commercially available forsythia species and cultivars flower reliably only on branches below the snowline. When flowers are produced above the snowline, their numbers are usually so sparse that the inherent floriferous qualities of forsythia species and cultivars are largely lost. The new forsythia is a shrub with superior flower-bud hardiness and showy spring flowers. Flower buds have shown hardiness at temperatures of −35°F, and the plant is therefore recommended throughout zone 3 of both the USDA or Arnold Arboretum plant-hardiness maps. The selection merits trial farther north in zone 2b as well.

The plant originated via the breeding work of Karl Sax, Ph.D., and cytologist Haig Derman at the Arnold Arboretum. It resulted from a cross of *Forsythia ovata* (early forsythia) and *F. europaea* (Albanian forsythia). Harrison Flint, Ph.D., while working at the Arnold Arboretum, observed a plant from this population in full bloom after the unusually cold 1966–67 winter, while a mass planting of *F.* × *intermedia* 'Spectabilis' surrounding the new hybrid was nearly devoid of flowers. Similar performance has been noted in trials in the northern plains.

The forsythia will be officially registered and named in early 1984, and first sale or general distribution to the public will begin in spring 1985. Dormant hardwood cuttings and one-year liners will be available to commercial propagators from January to April 1984. At that time written requests for materials can be sent to Dale E. Herman, Ph.D., Department of Horticulture and Forestry, North Dakota State University, Fargo, ND 58105.

American Conifer Society

A new, nonprofit society has been created for the development, preservation, and propagation of conifers, education of the public, and clarification of conifer nomenclature, with an emphasis on conifers that are dwarf and unusual. A quarterly publication will be circulated, and an annual meeting of the general membership will be held.

For membership information contact the secretary, Jean Iseli, 15241 SE Tickle Creek Road, Boring, OR 97009, or the president, Robert Fincham, 425 N 5th Street, Lehighton, PA 18235.

Notice to Readers

It has been reported to us by Joseph A. Witt, research professor at the Center for Urban Horticulture at the University of Washington, that the Clearwater River stand of *Cornus nuttallii* in northern Idaho, described

by Robert Nicholson in the fall 1982 issue of *Arnoldia,* was badly infested with a *Cornus* anthracnose when Witt visited the site in 1980.

The disease appears to be a new fungus taxon, and preliminary reports indicate that it is widespread throughout the range of *Cornus nuttallii.* It can be transmitted by both seedlings and seed, and it or a similar species of anthracnose may also infect *C. florida* and *C. kousa.*

Anyone in receipt of seedlings or seed of the Clearwater stand should be aware of the disease potential and dispose of infested plants by burning. Presence of the disease is indicated by brown necrotic areas centering around leaf veins, and occasionally on the petioles, causing partial or complete defoliation.

BOOKS

The New York Botanical Garden Illustrated Encyclopedia of Horticulture, by Thomas H. Everett. New York and London: Garland Publishing. 10 vols. $525.

RICHARD A. HOWARD

The first volume of this splendid work appeared in 1980, and the 10th and last in 1982. Three million words, 3596 numbered pages, 10,000 photographs — about 800 in color — 20,000 species, 3600 genera, and 2500 cross-referenced items comprise the work, for which the deserved superlatives have been used in other reviews. Each volume contains the same foreword by the late John M. Fogg, Jr., a preface, acknowledgments, data on how to use the work, and a "General Subjects" heading. These are worthy of close examination, for the author's stated philosophy in compiling the book is closely followed throughout the volumes. All entries, from "Aaron's Beard" (*Hypericum calycinum*) to *Zygopetalum* (with six species and one hybrid described) are arranged alphabetically. Most entries deal with genera. Bigeneric hybrids and chimeras are treated as binomials; thus there are seven bi- or trigeneric named hybrids involving *Brassavola,* and *Crataegomespilus* is differentiated from *Crataemespilus.*

For the plant families listed, data are included on their distribution, size, and characteristics, as well as a list of the genera included in this work, inviting further delving. A comparable list of species may accompany some generic treatments, e.g., *Rhododendron,* but one must also check

"Azaleas," where two alphabetical lists and treatments are found for native and exotic species. The author indicates that "vegetables, fruits, herbs and ornamentals," the common as well as some unusual ones, are treated. Thus, cabbage and cauliflower are discussed fully under their common names but are also mentioned, often with additional and different information, under *Brassica.* Cherry and peach have individual entries, with supplementary information under *Prunus.* Regrettably, such entries are not cross referenced.

The "General Subjects" category, pages xvii to xx in each volume, is a list of words representing entries grouped as "plant anatomy and terms used in plant descriptions;" "gardening terms and information;" "fertilizers and other substances related to gardening;" "technical terms;" "types of gardening;" "pests, diseases and other troubles;" and "groupings of plants." These in essence represent a topical index or table of contents by subject. The cross references (of which there are 2,500), are exemplified by "Boojam Tree is *Idria columnaris*" (*which see* is implied) or "*Adhatoda.* See *Justicia.*"

The entries for genera are both technical and practical. A guide to the pronunciation and derivation of the name is given, as well as common names, general characteristics, the number of species, the origin, geographic distribution, and often some history of uses. The species names may be accompanied by a few synonyms. The meaning of the species epithet may be found in a 15-page listing of "plant names." The species considered in each generic treatment may be located by the bold italic printing of the accepted name. The arrangement, however, may be according to their botanical classification (in *Quercus* by subgenus, section, and subsection), alphabetical (*Rosa*), according to a horticultural classification (roses), or seemingly at random (*Begonia,* perhaps the largest entry in the work). The reader may have to search once or several times to determine if the species, hybrid, or cultivar sought is included. The practical information for each genus is found in subentries clearly marked "Gardening and Landscape Uses," "Cultivation," and "Pests and Diseases." The first two are invariably excellent and the last often weak or inadequate (e.g., Dutch elm disease is not mentioned under any title words but only casually under *Ulmus,* with a frequently repeated suggestion to consult a local extension specialist).

The individual entries are remarkably easy to read or to scan, as the writing is superior; and happily the book is truly an American encyclopedia.

How good is the coverage? Of multivolume works in English, L. H. Bailey's *Standard Cyclopedia of Horticulture* (reprinted often without changes from 1928) and Chittenden's *RHS Dictionary of Gardening* (with supplements) are still available. Bailey's is out of date for the plants considered and for the nomenclature, but the gardening instructions never age. The RHS dictionary may be more recent but is European in its emphasis on available plants and techniques. Both works have some aids to identification in the form of keys, which the encyclopedia lacks. Perhaps the more appropriate comparision of plants discussed should be with *Hortus III,* recognizing the necessary brevity of entries in a one-volume work. Compare two small families, the Gesneriaceae and the Primulaceae. For the former the encyclopedia treats 45 genera, 4 of which are not in *Hortus III;* for the latter,

Hortus III has 47 genera, 5 of which are not in the encyclopedia.

For the Primulaceae the encyclopedia treats 14 genera (including *Dionysia,* a segregate of *Primula*), while *Hortus III* has an equal number of genera but includes the rare *Ardisiandra,* which is not in the encyclopedia. Within the genus *Primula* the encyclopedia treats 51 species or hybrid-species, 40 percent of the number of entries in *Hortus III.* The encyclopedia does list two additional species that are not in *Hortus III.* Again, *Primula* is an example of a collectors' genus, and *Hortus* attempts to list all taxa (singular *taxon,* a useful botanical term for any unit of classification but not included in the encyclopedia) reported in cultivation.

Comparing the treatment of larger families, the encyclopedia treats 77 genera of the Rosaceae, while *Hortus III* lists but 71. In the Leguminosae the encyclopedia considers 171 genera, 19 of which are not in *Hortus III,* while *Hortus III* lists 195 genera, 41 of which are not in the encyclopedia. However, all genera of both families represented in the collections of the Arnold Arboretum are listed in both works, while the Fairchild Tropical Garden inventory contains 13 genera not in the encyclopedia and 6 not in *Hortus III.* Neither publication attempts to include the holdings of all the botanical gardens of the United States, but each does remarkably well.

Mr. Everett states in the preface, "The vexing matter of plant nomenclature inevitably presents itself when an encyclopedia of horticulture is contemplated." Fortunately, he chose to adopt the nomenclature of *Hortus III,* with the exception of the cactuses and the ferns. Unfortunately, in the Cactaceae he has chosen to follow Backeburg, a "splitter" who, however, did publish a complete treatment of the family, while the "lumpers" have not. As to the English nomenclature represented by "cactuses," Everett states, "Surprising perhaps to readers accustomed to the use of cacti as the plural of cactus, cactuses is the correct English form. There is nothing wrong with using the Latin cacti, but then neither is there with the use of croci as the plural of crocus, yet most people prefer crocuses." Thanks to the guidance of Dr. John Mickel of the New York Botanical Garden for the treatment of the ferns, the resulting nomenclature is more in accord with the modern classification of these plants than is the treatment in *Hortus III.* Everett also states, "The decision usually not to differentiate between natural varieties and cultivars (horticultural varieties) in this Encyclopedia will be deplored by some," but then in the groups for which standards have been worked out, he does indeed use "cv" or the single quotation marks and the standard procedure of fancy names (mostly) in English.

If there is a shortfall to this work, it may be that not enough terms are defined. For example, regarding the inflorescence Everett states, "No satisfactory classification of the types of inflorescences has been devised by botanists, and by gardeners, terms describing them are usually loosely applied. . . . In this Encyclopedia very specialized terms for particular types of inflorescences are avoided and those commonly used by gardeners substituted, often with some flexibility of application." In the "General Subject Listing" of terms used in plant descriptions only, "head," "panicle," and "catkin" refer to the inflorescence type and are defined in the text, while "raceme," "spike," and "umbel" are used but not defined. The one or more free blank pages in the back of each volume

might well have been used for illustration and identification of leaf shapes or inflorescence types.

The colored plates are of necessity not always closely associated with the related text and are not referenced. At the end of volume 10, perhaps to correct this oversight, there is an index of the colored illustrations of the 10 volumes. The color work is superb. There are remarkably few errors of typography for a work of this magnitude; two pages of corrections have been issued for all 10 volumes and are available from the editor. The corrections will be made in subsequent printings.

This is the best volume or volumes of its kind ever compiled and published. The only problem with the work is a personal one: the work is addictive; I cannot stop browsing. We are all indebted to Thomas Everett for this illustrated encyclopedia of horticulture!

Richard A Howard, the former director of the Arnold Arboretum, is a professor of dendrology at Harvard University

Castanea mollissima catkins

The Arnold Arboretum of Harvard University, a non-profit institution, is a center for international botanical research. The living collections are maintained as part of the Boston park system. The Arboretum is supported by income from its own endowment and by its members, the Friends of the Arnold Arboretum.