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Scratch-board drawings by D. Todd Gresham

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Forsythia 'Beatrix Farrand'

THE WAYSIDE GARDENS COMPANY

Forsythias

DONALD WYMAN*

There are few plants as bright and colorful in the early spring as the forsythias. Fortunately, they can be grown over a wide area of the United States and are true harbingers of spring wherever grown. They have been favorites in American gardens for a century because they are rugged shrubs, easily propagated, quickly grown, and because of their colorful display of yellow flowers every spring. Fifty- and even sixty-year-old plants are still flourishing in the Arnold Arboretum, Jamaica Plain, Massachusetts. In fact, their usefulness is not wearing thin, for numerous new varieties, hybrids, and clones have been introduced in the past few years to give a wider spread of color and habit forms.

The first species introduced into Europe was *Forsythia suspensa sieboldi*, a native in China but brought into Holland from a Japanese garden in 1833. About twenty years later this was introduced into England and shortly thereafter into the United States. The first plant in the Arnold Arboretum was obtained from the garden of Francis Parkman in Boston sometime during the year 1876, so it is obvious that this species was being grown in America several years before.

Over the years, new species have been introduced from Europe and the Orient and many new varieties and clones have originated and been propagated. The flowers of all are yellow; they vary, as far as their ornamental uses are concerned, chiefly in respect to their habits and the shade of yellow in their flowers.

There are too many varieties being offered now. It is often difficult for a plant hybridizer, who sees some of his own seedlings differing from standard varieties, to judge them with a jaundiced

eye. Often he feels that anything different is worth naming, and then the plantsmen are coaxed into the old circle of obtaining something just because it is "new," only to discard it later when its true qualities become better known.

At the turn of the century there were only about four forsythias being grown in the United States [*F. intermedia*, *F. suspensa*, *F. suspensa fortunei*, and *F. viridissima*]. By 1920 others had been introduced from China, Korea, and Europe [*F. europaea*, *F. ovata*, possibly *F. japonica*, *F. viridissima koreana*, *F. intermedia* vars. 'Densiflora,' 'Primulina,' 'Spectabilis,' and 'Vitellina,' and *F. suspensa* vars. *atrocaulis* and 'Decipiens']. It has been only during the last twenty years that some of the "best" forsythias have come into being, no doubt aided in their popularity by the use of color plates in nursery catalogues.

New forsythias have originated during the past twenty years as the result of chance and close observation, and as the result of planned breeding work. Since forsythias do not produce seeds freely and since they are very easily rooted from cuttings, most commercial growers are content to rely on asexual propagation. Several "sports" have originated, however, and these will be mentioned later.

The entire group is very easily grown. Actually they grow in almost any kind of soil, but do best in a deep, rich loam. They are practically free of disease and insect pests, never needing to be sprayed—an obvious advantage to spray-weary gardeners.

Nearly all are hardy in climatic zones where the average minimum temperature does not go below -10°F . *F. ovata* is the hardiest and will survive in the next colder zone; *F. suspensa atrocaulis* and *F. viridissima* will be flower-bud-hardy in the next warmer zone.

*Horticulturist, Arnold Arboretum of Harvard University, Jamaica Plain, Massachusetts

As for their sequence of bloom, *F. ovata* is always first in the Arnold Arboretum, followed a few days later by *F. giraldiana*. The remainder all bloom practically together—at the time the spice bush and the Korean azalea bloom in the vicinity of Boston, which is about mid-April; earlier, of course, further south. Since their flower buds are formed the previous year, they are at the mercy of the weather, sometimes opening many flowers during an especially warm Indian summer in October, sometimes keeping their flower buds tightly closed until very late in an unusually cold, retarded spring. They have bloomed with the lilacs at such a time, although usually they fade and are gone by lilac time.

An interesting thing happened last year. During a sudden warm spell they started flowering on time and because of the cool weather immediately thereafter, they remained effectively colorful for four weeks. Not many shrubs give effective color for this length of time.

Pruning is simple, but far too many individuals do not prune these plants properly. Forsythias are best when

grown as specimens or when grown *en masse*—they do not respond well to being jammed into the shrub border where other shrubs will encroach on their space. As a result, they must be pruned carefully, in such a way that their beauty of form is not damaged. Hence, pruning from the base, by removing the older branches and allowing the younger, more vigorous ones to take over, is by far the best method.

Many a time one sees these beautiful plants sheared, or pruned, by merely hacking off the tops. If such drastic action is needed, it would be better to cut them off a few inches above the ground in the very early spring or just after they have flowered and let them grow back into form gracefully. Because of this, they should never be planted unless there is sufficient space for normal growth and development. Those who have seen an individual plant, or several plants, grown by themselves so that they can take full advantage of space in developing their graceful, arching branches, will know what this means.

Vegetative Key to Forsythia Species

1. Leaf nodes in the middle of current year's shoots, mostly one inch (or less) apart except on vigorous shoots
 2. Leaves six times longer than wide; all simple; none lobed; plant extremely dwarf ————— *F. viridissima* 'Bronxensis'
 2. Leaves only three or four times longer than wide, sometimes lobed or trifoliate on vigorous shoots
 3. Plant often procumbent, branches readily rooting on the ground *F.* 'Arnold Dwarf'
 3. Plant a slow-growing shrub, not procumbent *F. intermedia* 'Nana'
1. Leaf nodes in the middle of current year's shoots, considerably more than one inch apart
 4. Pith hollow but leaves often deeply lobed or trifoliate, solid at the nodes *F. suspensa* and varieties
 4. Pith lamellate or chambered, leaves not lobed or trifoliate except occasionally in *F. × intermedia*
 5. Leaves entire *F. europaea*
 5. Leaves mostly serrate
 6. Leaves broad-ovate, mature branches yellowish *F. ovata*
 6. Leaves lanceolate, mature branches greenish, brownish or purplish
 7. Pith usually solid at the nodes, leaves sometimes divided into three parts on overly vigorous shoots *F. × intermedia*
(The cultivars 'Karl Sax,' 'Beatrix Farrand,' 'Lynwood Gold,' 'Spring Glory,' and 'Arnold Giant' will usually key out here, but none have leaves divided)
 7. Pith chambered throughout, leaves simple
 8. Leaves oblong-ovate; rather rugose, serrated at least three-fourths the length of the blade *F. japonica saxatilis*
 8. Leaves narrow-lanceolate
 9. Some leaves almost entire—at most only a few serrations above the middle *F. giraldiana*
 9. Leaves definitely serrate above the middle *F. viridissima*

Forsythia Species and Varieties

[An asterisk denoting the best for ornamental plantings.]

F. europaea: This six-foot shrub was introduced into the United States from England in 1900. It is a native of Albania and the original plant is still growing in the Arnold Arboretum. The flowers are usually borne singly so that it does not make a good showing when compared with the Asiatic species. Even though the flower buds are almost as hardy as those of *F. ovata*, there is no reason for growing it as an ornamental. It is usually distinguished from the other forsythias by its leaves, which are mostly entire, having only a few teeth at most. Its sole claim to fame is that it is the only truly European forsythia.

F. giraldiana: Another poor ornamental which should not be grown as such, was introduced from northern China in 1938 by the Arnold Arboretum. Closely related to \times *F. intermedia*; the flowers are slightly smaller. At Swarthmore, Pennsylvania, Dr. Wister notes that it usually blooms a few days before *F. ovata*, but our plant blooms a few days afterward.

\times *F. intermedia*: A cross between *F. suspensa* and *F. intermedia*, this originated in Europe before 1880. It grows up to nine feet tall and has arching branches and, being a hybrid of two species, gives evidence of both species in its leaves. Occasionally there is a small amount of purplish autumn color on the plants, a trait from *F. viridissima*. Because the plant is a hybrid and will vary, it is advisable to grow some of the varieties asexually and to omit the hybrid altogether from ornamental plantings.

\times *F. intermedia* 'Aurea': A very poor variety with yellow leaves which, when grown in the shade, is colorful. In the full sun, however, the leaves burn badly. Our five-year-old plants are only about three feet tall, have produced inferior flowers, and so this, too, might be omitted from ornamental plantings.

\times *F. intermedia* 'Densiflora': Introduced by the Spaeth Nurseries of Berlin, Germany, in 1899, this was popular for a time because it produced more flowers than any of the species and botanical varieties up to that time. Now, however, other clones are as good or better.

\times *F. intermedia* 'Mertensiana': Introduced a few years ago by the Swiss firm of Gebr. Mertens, Zurich. This is said to be more compact in habit than other *F. intermedia* varieties, grows up to about ten feet in diameter, but is not much different from other *F. intermedia* varieties and might well be overlooked.

F. intermedia 'Nana': Here probably belong several plants listed in the trade as *F. "dwarf," F. suspensa fortunei nana*, *F. 'Compacta Nana,'* etc. We have grown some for several years and they are all practically identical, with lamellate pith between the nodes, solid pith at the nodes and leaves simple, lobed, and sometimes compound. They are very slow in coming into bloom, sometimes taking seven years, and then the flowers are not profuse, but small and a poor, greenish-yellow. One twenty-year-old plant here was five feet tall by eight feet wide, but in all that time it was not what might be called a good flowering specimen.

\times *F. intermedia* 'Primulina': Originated as a chance seedling in the Arnold Arboretum a few years before 1915. It is valued for its light yellow primrose-colored flowers, but the newer sport of *F. intermedia* 'Spectabilis,' 'Lynwood Gold,' has more flowers and they are larger, also.

* \times *F. intermedia* 'Spectabilis': Commonly called the showy-border forsythia, this originated in the great Spaeth Nurseries of Berlin in 1906; it was introduced into America by the Arnold Arboretum in 1908. It is still one of the most popular of all, with flowers that are as vivid a yellow as the 'Beatrix Farrand,' only recently introduced. Being a *F. intermedia* variety, it is more upright and sturdy than *F. suspensa*, the flowers are larger (about an inch and three-quarters) and are produced in greater quantity and in clusters. Some consider the color display as almost a "brassy" yellow, yet there are many who prefer it for just this reason. It is a darker yellow than the *F. suspensa* varieties and, with 'Beatrix Farrand,' can be classed as having the darkest yellow flowers of the entire group.

\times *F. intermedia* 'Vitellina': Another of Spaeth's introductions in 1899, it has the smallest flowers of this group of hybrids, the reason it has not proved popular.

F. japonica: This species and its variety *saxatilis* bear their flowers singly and hence make poor display plants. The species is a native of Japan and the variety came to America from Korea in 1924.

F. ovata: This should not be considered as one of the best forsythias since the flowers are small and often are produced erratically. In slightly colder areas, however, where the flower buds of most other forsythias are known to be killed by winter cold, this might be tried, if a forsythia must be planted. Hence, its uses are limited greatly, but it is worth mentioning. In the collection at the Arnold Arboretum, it flowers about ten days before most of the other forsythias. Often erratic, it may bloom well one year and very poorly for one or two years thereafter. In extremely cold areas the flower buds will winterkill. There is a variety of this being grown by some Dutch nurserymen under the name 'Robusta,' but all plants of this which have been grown in the Arnold Arboretum seem to be more closely related to *F. europaea*. The original plant is still flourishing in the Arnold Arboretum.

F. (ovata × europaea): A cross made at the Arnold Arboretum shortly before 1935, but the resultant plants are in no way superior to the parent species.

F. suspensa: A native of China, growing about nine feet tall with widely arching branches. Although the species is graceful and interesting, there are several varieties that are better as ornamentals. The species and its varieties are usually identified by the hollow pith (solid at the nodes) in their stems and the leaves, often deeply lobed or divided into three separate leaflets. All have gracefully arching branches but they do not produce as many or as large flowers as do the *F. intermedia* varieties.

F. suspensa atrocaulis: This variety is not so hardy as the other varieties. The young stems are purplish. It was introduced in 1907, but is not commonly in cultivation.

F. suspensa 'Decipiens': Originating in Spaeth's Nursery in 1905, it has been growing in the Arnold Arboretum since 1908. The flowers are single and do not provide nearly as outstanding a display as the other varieties.

**F. suspensa fortunei*: Charles S. Sargent said that the Arnold Arboretum first introduced this to American gardens about 1878. This is the form with gracefully arching branches, more upright in habit than Siebold's forsythia, and because it has been so popular for so long, it is the form of *F. suspensa* which everyone has come to associate with this genus. The flowers are the same color as those of Siebold's, but slightly larger.

F. suspensa 'Pallida': This has the habit of the species, but the flowers are actually a washed-out yellow, so it is not one to grow as an ornamental.

F. suspensa pubescens: Introduced about 1908 from China, it differs little from the species and can be overlooked as an ornamental.

**F. suspensa sieboldi*: This is the first forsythia to be introduced into European and American gardens; in Holland in 1833, in England about twenty years later and in America probably shortly thereafter. It is the form with the long, graceful, often procumbent branches that is sometimes seen planted at the edge of a wall where the long stems have an opportunity to hang down vertically for several feet. The stems root easily wherever they touch moist soil. The flowers are a brilliant yellow.

F. suspensa 'Variegata': Forms of this arise occasionally with either yellow leaves or leaves variegated with yellow. None I have seen make meritorious ornamentals and some fail miserably when planted in full sunshine.

F. viridissima: This is another species from China, discovered by Robert Fortune and sent to England in 1844. It is offered by only a few American nurseries because it is not nearly so handsome as *F. suspensa fortunei*. Also, it is one of the least hardy. It is the only species to have rather distinct purplish-red autumn color, however. The flowers are only mediocre, the height can be as much as nine feet and rather stiffly upright in habit.

F. viridissima koreana: Introduced from Korea in 1917 where it is native in the vicinity of Seoul. This is more hardy than the species, but otherwise is about the same. Rehder says it has a more spreading habit and larger and more brightly colored flowers.



ARNOLD ARBORBTUM

Forsythia 'Karl Sax'

F. viridissima 'Bronxensis': Originating in the New York Botanical Garden about 1939, this is extremely dwarf and slow-growing in habit. Ten-year-old plants are only about one foot tall and two feet in diameter. Its often prostrate branches do not root easily and because of its slow growth and poor rooting ability, it is gradually being discontinued by most American nurserymen who originally stocked it when it was introduced to the trade in 1949. It does flower well, with flowers borne either singly or in clusters of three. The leaves are only about one to one and one-half inches long and half an inch wide.

**F.* 'Arnold Dwarf': Resulting as a cross between *F. intermedia* and *F. japonica* made by Karl Sax in the Arnold Arboretum in 1941, this should never be planted for its flowers which are small and greenish yellow and are produced sparsely. In fact, plants may be five or six years old before they produce any flowers at all. As a woody ground cover it is excellent, chiefly because of the fact that its procumbent branches root readily wherever they touch moist soil. A six-year-old plant may be only two to three feet tall but nearly seven feet across and as it grows older it may grow a few feet taller. If desired, however, this taller growth can be removed easily with brush scythe or pruning shears. Its ability to remain comparatively low and to spread regardless of the slope on which it is planted, are its chief merits.

F. 'Arnold Giant': This was produced by Dr. Sax as a result of experimental breeding work, but it is unfortunate that it was ever named and released. It is a colchicine-induced tetraploid not easily propagated from cuttings. In a group as easy to root as the forsythias, this is reason enough for discarding it. The flowers are large and deep yellow, but those of newer varieties are superior. Also, the habit is stiffly upright rather than gracefully arching, as with many of the better forsythias. It should not be grown.

**F.* 'Beatrix Farrand': This is a cross between a colchicine-induced tetraploid and *F. ovata*, being a triploid, originating in the Arnold Arboretum in 1939 as a result of the plant-breeding work of Dr. Sax. The flowers are often as much as two and one-half inches in diameter

and, in certain situations, are slightly darker than those of *F. intermedia* 'Spectabilis.' It is upright and dense in habit, produces heavy bloom and is becoming popular for its vivid yellow, conspicuous flowers.

**F.* 'Karl Sax': This is a new forsythia recently named by J. L. Thomas of the Arnold Arboretum in honor of Karl Sax, a former director, who is responsible for originating it. The flowers are a slightly darker golden yellow than those of 'Beatrix Farrand,' more profuse but slightly smaller, and the habit is neater and more graceful. Moreover, after trials of several years in the Midwest, it is reported to be hardier than most other forsythias. It is a tetraploid, with noticeably thickened and somewhat rigid leaves.

**F.* 'Lynwood Gold': This was originally found as a branch sport of *F. intermedia* 'Spectabilis' in a garden in Cookstown, County Tyrone, Ireland, and was introduced by the Donard Nursery of Newcastle, County Down, Ireland. It was introduced into America in 1953 by the Gulf Stream Nursery of Wachapreague, Virginia, and is considered an improvement over *F. intermedia* 'Spectabilis' since its flowers are more open and seem to be better distributed along the stem; that is, the flowers are not so bunched. It, too, is a brilliant yellow, only minutely lighter in shade than *F. intermedia* 'Spectabilis,' is upright in habit, possibly a little stiff, but still most beautiful in flower.

F. 'Nyman's Variety': A. T. Johnson of Conway, North Wales, Great Britain, wrote a note about the history of this plant which was published in the *Gardeners Chronicle* in 1954. It was raised from a packet of Forrest's seeds. At first it was thought to be *F. suspensa atrocaulis*, but later was observed to be superior to it, with stiff, bronze-colored branches ten feet high and two-inch-wide flowers described as an "ivory yellow." It is not yet in American nurseries, but the Arnold Arboretum has been growing a plant imported from England in 1957 which has not yet bloomed. I do not know whether it will be any hardier than *F. suspensa atrocaulis*.

**F.* 'Spring Glory': A branch sport of another of the Arnold Arboretum's in-

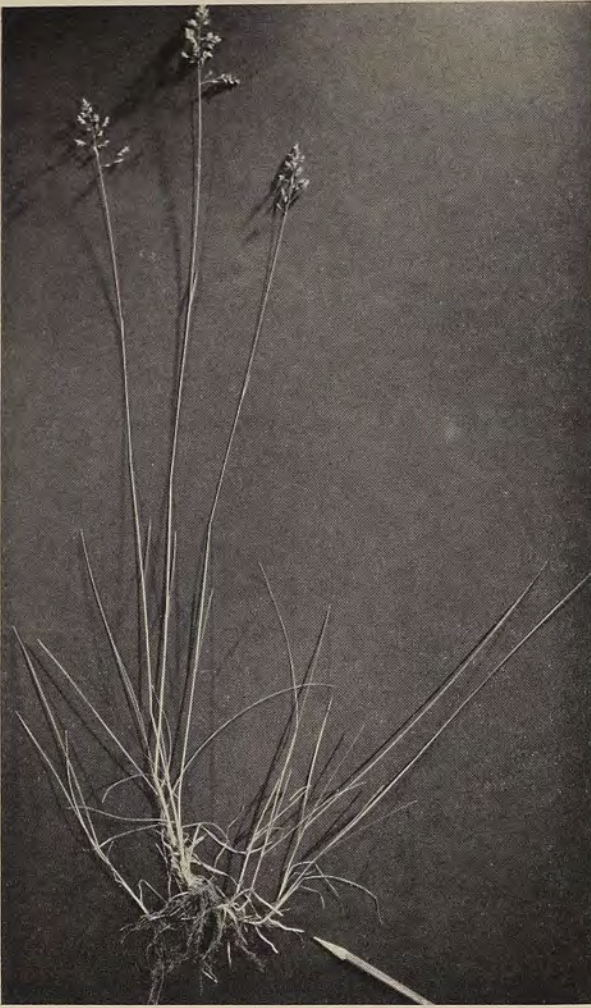
Comparison of Forsythia Flowers

Species or Variety	Petal width (Inches)	Flower Diameter (Inches)	Shade of Yellow, according to Royal Hort. Soc. Colour Chart	Nickerson Color Fan (Munsell Color Scale)
<i>europaea</i>	$\frac{5}{16}$	$1\frac{5}{8}$	3/1 aureolin	5Y 9.1/12 brilliant
<i>giraldiana</i>	$\frac{1}{4}$	$1\frac{1}{8}$	603 empire	5.5Y 9.1/12 "
<i>intermedia</i>	$\frac{5}{16}$	$1\frac{1}{4}$	4/1 lemon	4Y 9/12 "
'Densiflora'	$\frac{1}{4}$	$1\frac{1}{2}$	603 empire	5.5Y 9.1/12 "
'Nana'	$\frac{1}{4}$	$1\frac{1}{8}$	602/1 mimosa	7.54 9.1/8 brilliant greenish
'Primulina'	$\frac{5}{16}$	$1\frac{3}{4}$	603 empire	5.5Y 9.1/12 brilliant
*'Spectabilis'	$\frac{5}{8}$	$1\frac{3}{4}$	4 lemon	2.5Y 8.5/13 vivid
'Vitellina'	$\frac{1}{4}$	$1\frac{3}{8}$	3 aureolin	5Y 9/13 brilliant
<i>japonica</i>				
<i>saxatilis</i>	$\frac{1}{4}$	$1\frac{1}{4}$	3/1 aureolin	5Y 9.1/12 "
<i>ovata</i>	$\frac{1}{4}$	1	603 empire	5.5Y 9.1/12 "
(<i>ovata</i> × <i>europaea</i>)	$\frac{1}{4}$	$1\frac{3}{8}$	3/1 aureolin	5Y 9.1/12 "
<i>suspensa</i>				
<i>atrocaulis</i>	$\frac{1}{4}$	$1\frac{3}{8}$	3/1 aureolin	5Y 9.1/12 "
'Decipiens'	$\frac{1}{16}$	$1\frac{5}{8}$	4/1 lemon	4Y 9/12 "
*'fortunei'	$\frac{5}{16}$	$1\frac{1}{2}$	3 aureolin	5Y 9/13 "
'Pallida'	$\frac{5}{8}$	$1\frac{5}{8}$	603 empire	5.5Y 9.1/12 "
<i>pubescens</i>				
*'sieboldi'	$\frac{5}{8}$	$1\frac{1}{8}$	3 aureolin	5Y 3/13 "
<i>viridissima</i>				
'Bronxensis'	$\frac{3}{16}$	$\frac{3}{4}$	603 empire	5.5Y 9.1/12 "
<i>koreana</i>	$\frac{1}{4}$	$1\frac{1}{4}$	4/1 lemon	4Y 9/12 "
*'Arnold Dwarf'	$\frac{1}{4}$	$\frac{3}{4}$	64/2 dresden	9Y 9/8 bril. greenish
*'Arnold Giant'	$\frac{1}{2}$	$1\frac{7}{8}$	4 lemon	2.5Y 8.5/13 vivid
*'Beatrix Farrand'	$\frac{1}{2}$	$2\frac{1}{2}$	605 chrome	2.5Y 8.2/12 "
*'Lynwood Gold'	$\frac{1}{2}$	$1\frac{3}{4}$	4/1 lemon	4Y 9/12 brilliant
*'Spring Glory'	$\frac{1}{2}$	2	603 empire	5.5Y 9.1/12 "

*These are the "best" for ornamental plantings. To these could be added *F. ovata* for certain limited areas where flower buds of the others winterkill, and *F. viridissima* 'Bronxensis' where an extremely dwarf, slow-growing but flowering variety is wanted.

troductions (*F. intermedia* 'Primulina'), this was found in the garden of H. H. Horvath, Mentor, Ohio, about 1930 and was introduced by the Wayside Gardens of Mentor, Ohio, about 1942. This and its parent, the primrose forsythia, have flowers that are a lighter yellow than the others, without being the objectionable greenish yellow of 'Arnold Dwarf.' It is an improvement over the once-popular primrose forsythia because it has large flowers (about two inches in diameter) and more of them, thus making a much better display. It may well replace the primrose forsythia in general landscape use.

Thus, in this small group of yellow-flowering shrubs, it can be seen how plant breeders and observing horticulturists have been able to bring forth better ornamental plants. Of those recommended for ornamental planting, only four are native somewhere in the world, and six are the result of selection and hybridization—all introduced within the last two decades. In this connection it is only fair to point out, also, that the first variety introduced to America is still one of the best, definitely emphasizing the extremely important fact that sometimes the older varieties, when judged fairly *on their merits*, are still among the best.



Complete bluegrass plant at time of inflorescence formation, with abundant tillers branching from the base, and new rhizomes forming (at point of pencil). Since bluegrass is apomictic to a great degree, seed formed by the inflorescence provides offspring of heredity identical to the parent plant.

Ryegrass to the right, bluegrass to the left. The greater size of the ryegrass seed results in fewer potential plants per pound (about 250 thousand vs. 2 million for bluegrass), but greater seedling vigor. Along with the fast start from large, food-packed seeds, comes aggressive tendencies which result in clumpy grass such as is illustrated on Page 205.



Making and Maintaining a Lawn

ROBERT W. SCHERY*

Although ground covers, composed usually of grasses, have been an accoutrement of North American civilization for many decades, lawn grass was nonetheless only of casual and incidental gardening concern until recent years when the exodus to the suburbs suddenly made good lawns big business. Reasonably little experience in depth or directed research was available to draw upon; Old World conditions and scheme of living offered scant parallel, unlike many other facets of gardening. American lawn craft has not yet worked completely out of this impasse, and sound, scientifically-proven information is still badly needed. Much lawn tending remains guided by hearsay and "old wive's tales," even by downright misinformation. There is probably more waste motion in the lawn facet of gardening, than in practically any other sphere.

Yet the demands are perhaps greater than in other spheres. The home owner wants from his lawn not a single spectacular showing of seasonal nature (as may be the case with say chrysanthemums, roses, sweet peas, or such), but year-around attractiveness and an absolute "keeping out of the mud." This must be accomplished in spite of inevitable abuse not inflicted upon other garden areas. Lawns must endure hard usage for play and recreation; the unnaturalness of mowing, often too short for the good of the grass; demands for greenness both in the heat of summer and in frigid winter. It's a large order.

The commercial side of turfgrass drew upon whatever information was available, chiefly from the experiment stations, and the golfing microcosm (almost the only facet of turfgrass interest having undertaken appreciable research). Some of the information, valid for the golf course, does not extrapolate well to

home lawns. And agronomists, with whom much of the turfgrass research resided, are oriented, in their basic training, to agricultural crops. Most crop plants are annuals, or at least have a limited and proscribed season. With them there is a need for hereditary identicalness, and heavy emphasis is on improved varieties, high yields, ease in harvesting, and the economic advantages that come with one year productiveness of a uniform population of plants. Such is not quite the case in a lawn, where the mower becomes the great "uniformatizer" and where subtle variability may prove an advantage for perennial existence of mass grass populations.

Golf courses take for granted intensive maintenance, designed largely for the care of creeping bentgrasses (or selected strains of bermuda in the South). Because of the inheritance from golf course research, may we not be over-intensifying lawn care on many occasions; perhaps in many parts of the country lawnsmen make long-range trouble for themselves by adhering to "bentgrass edicts?" Are we sometimes "killing our lawns with kindness?"

And do we stress "timeliness" enough? Often the *what* may be less important than the *when*. This is especially true, it seems, in lawn fertilization. Fertilization is a wonderful tool to help control "mat," something hardly heard of before intensive lawn management. And is the "disease" that crops up everywhere really disease—or a physiological upset from ill-timed feeding? Are the selected varieties more susceptible? Is lawn grass getting "fat" and degenerate? Or do we merely make it seem so, by doing the right thing at the wrong time.

What about ever-increasing "needs" and voluminous "treatments," hurled at the lawnsman nowadays. It really isn't troublesome to have a good lawn. But are we wasting hours and dollars unnecessarily; there are instances where individuals have spent good money and time only to create problems?

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Personal preference is often overlooked in lawn tending advisories. There are degrees of lawn sparkle, just as there are Fords and Cadillacs, with their differing upkeep costs. Subjective impressions should be a major criterion, even though less exact than clipping weights, almost the only objective means agronomists have for measuring turfgrass response.

Everyone wants a good lawn, yes, but not at the cost of constant yard work or the expenditure needed to maintain a golf green. Attractiveness around the home, certainly; but may not some seasonal "deglamourization" be endured in the interest of a more economical "average" attractiveness for the year?

The Grasses

For a good lawn, suitable building blocks for the climate where this lawn is to be are needed. One can never make a first rate lawn out of coarse haygrasses or impermanent bunchgrasses. Any grass (or combination of turfgrasses) of quality should be fine textured, perennial for the climate in which used, and preferably able to spread by rhizome or stolon. Within the framework of these major attributes varietal choice is less important than maintenance practices; all good grasses can make an excellent turf if they are properly tended, but none can do it when maintenance is really poor. The Lawn Institute likes Kentucky bluegrass mixed with red fescue varieties such as come from Oregon, for lawns north from Tennessee; bermudas, Zoysias and centipede for the South, or St. Augustine in shade.

Kentucky Bluegrass (*Poa pratensis*) is the mainstay for lawns in the northern two-thirds of the country. All evidence suggests that bluegrass arrived in this hemisphere along with the first colonization of the East Coast. It spread westward as the forest was felled and the soil turned. Presumably first spread westward was down the St. Lawrence valley with the French, for some of the early explorers to Kentucky found bluegrass already growing there (although it was not popularly named for the state until about 1850).

The parent species, more recently termed "natural" Kentucky bluegrass in

the trade, adapted itself extremely well to the North American climate and soils, spreading widely. It has volunteered in land abandoned from cultivation, from Kentucky westward into the high plains and northward into Canada. The chief harvest centers today of natural Kentucky bluegrass are in northcentral Kentucky, northwestern Missouri, Iowa, South Dakota, and locally in Wisconsin, Minnesota, North Dakota and Canada. Nebraska and Kansas some years yield sizable crops also. The production system is such as to assure in the retail seed package, well diversified heredity subjected to much natural selection.

Adapting as it has to a wide range of ecological niches, natural Kentucky bluegrass brings an admixture of strains to market. In essence it is a natural blending of varieties, comparable to the mechanical mixing of agricultural or horticultural selections. This has appeal for lawn grass, for the same reason that seed mixtures rather than pure lines have advantage; it provides a range of candidate plants for the myriad microenvironments manifest in any lawn. While natural Kentucky bluegrass lacks the glamour associated with publicized selections, and hence is sometimes at a disadvantage in modern merchandising, it still seems an eminently suitable base for a lawn seed mixture. An exception might be in those rare instances where expert talent knows how to cope with the whims of pure-line varieties. The Lawn Institute suggests a hard core of natural Kentucky bluegrass for a quality seed mixture, into which may be blended other noteworthy varieties having special attributes or local adaptation.

Bluegrass is largely apomictic. Thus once selections of reasonable distinctiveness have been made, the new "varieties" can be perpetuated by seed with reasonably little roguing of the fields. Almost all of the improved varieties have come from simple selection of locally outstanding plants; there has been little planned hybridization, although some of the Carnegie work attempted interspecific crosses which yielded scant practical improvement. So far no one has beaten nature in providing a generous supply of Kentucky bluegrass variants for local adaptation.

Horticultural selections include such well known commercial varieties as Ar-

boretum, Merion, Newport, Park, and a few others. Some of these are little different from natural Kentucky bluegrass, but are preferred for such commercial reasons as high seed yield. Merion is perhaps the most distinctive of the lot, being low-growing and with a linked series of characteristics that may well define a subspecific taxon in Kentucky bluegrass. Along with the desirable features of low growth, resistance to leaf spot, and dark green color, come disadvantages such as slow seed germination, high susceptibility to rust, and reduced adaptedness to southern extremes of the bluegrass belt. Moreover, Merion is notoriously a heavy feeder; it will not look well unless at least twice the usual nitrogen ration is received that is normally recommended for natural Kentucky bluegrass (about 3 pounds of actual nitrogen per 1000 square feet per year).

Park is a combination resulting from several vigorous strains planted together, from selections made in Minnesota. It should have the same advantages of genetic flexibility that natural Kentucky bluegrass has. Indeed, its performance is little different, except that the large seed sprouts and establishes quickly. Newport is a Carnegie selection from the West Coast of Oregon. A choice strain from the original clone is the high-yielding C-1 selection, noted for strong autumn performance in the lawn. Delta is a Canadian selection, notable for high seed yields, but otherwise little different from natural Kentucky bluegrass. Arboretum is a selection from Missouri, originally chosen for adaptedness to hot summers that far south. While there is merit in any of these varieties, for general lawn mixtures perhaps a blend of several into natural Kentucky bluegrass provides the greatest assurance of suitability for the diversity of lawn locations and maintenance schemes.

Red Fescues (*Festuca rubra*, in variety) are another major ingredient of quality lawn seed mixtures. This species is especially durable on poor soils and in shade. Its growth habits and seasonal cycle are very similar to Kentucky bluegrass, so that red fescue makes an excellent companion in lawn seed mixtures. Not only does it extend the adaptability of the mixture, but the sizable red

fescue seed substitutes very nicely for "nurse grass," a modern bugaboo inherited from the past when it was thought desirable to have a quick-sprouting species to "protect" soil and stand until the permanent grass could become established. Of course modern research has proven repeatedly that nursegrasses usurp space, nutrients, and moisture, inhibiting establishment of the permanent grass.

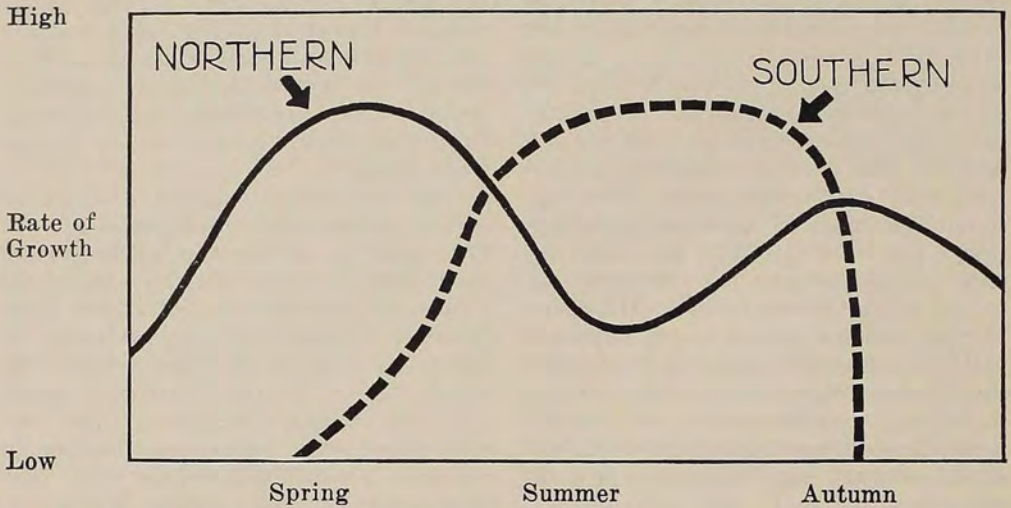
The red fescues have not volunteered widely throughout the eastern half of the country, as have the bluegrasses. Consequently there is no harvesting of "natural" varieties of red fescue comparable to midwestern production of bluegrass seed. Rather the industry has shifted to the Pacific Northwest, where the best selections are grown under precise agronomic operations, notably in Oregon. From Oregon come such elite varieties as Chewings, Illahee, Pennlawn, Rainier, etc. The seed is of high purity and germination, provides an excellent backing for bluegrass in "sunny" lawn mixtures, and is the predominant component for shady lawn blends.

Differences between the parent "creeping red" fescue and the several varieties named are not very apparent. Physiological superiorities may have been evident in choosing varieties, but as these grow in eastern lawns there is no generally superior variety. It might be suggested that, as with bluegrass, mixing a few named selections insures wide adaptability.

Other northern grasses. The chief additional northern lawn genus is *Bentgrass* (*Agrostis*). Colonial varieties (*A. tenuis*) are usually chosen for lawn usage, while the creeping bentgrasses (*A. palustris*) provide most golf green selections. Of the creeping bentgrasses only two are commonly available as seed, Seaside and Penncross. Penncross is an F-1 attempt at hybrid vigor, from natural crossing of several selections planted in inter-mixture. It has generally given superior performance to Seaside.

Most Colonial bentgrasses contain a certain amount of "creeping blood," fostering patch-forming in lawns. To avoid discordant lawn texture, experts generally view bentgrass as better used alone than in combination with other grasses. In any event bentgrass requirements are somewhat different than are

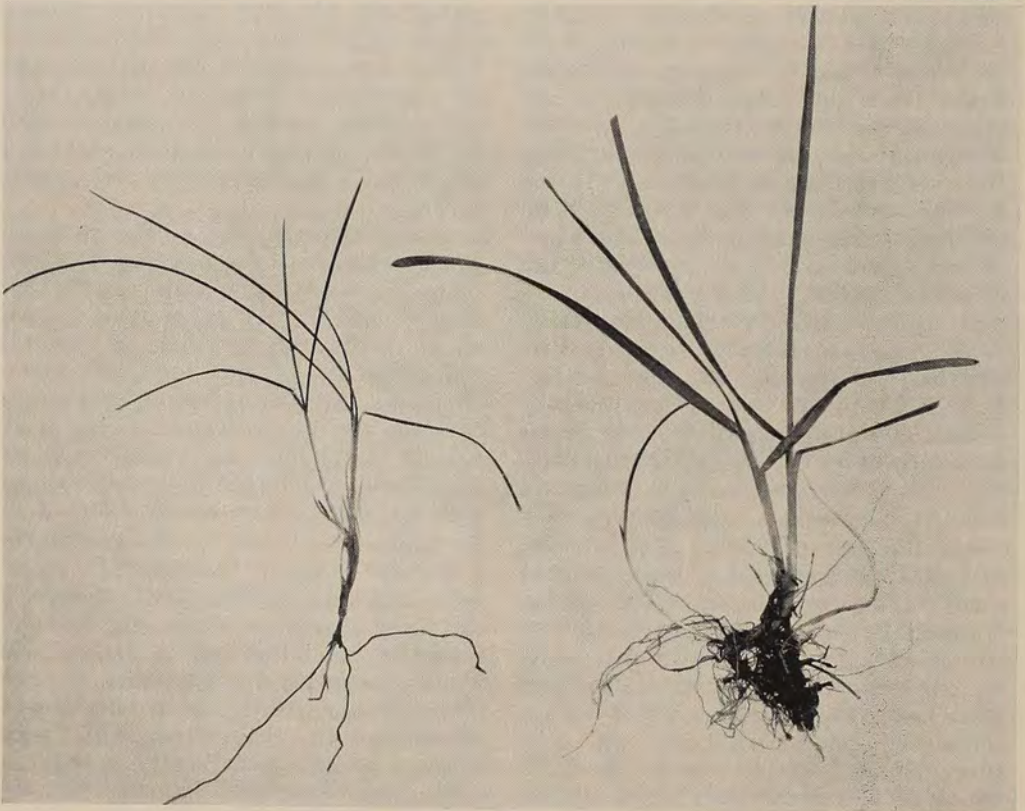
Lawn growth cycles. The solid line represents a typical northern lawn of Kentucky bluegrass; the broken line, southern lawns such as Bermuda or Zoysia. The southern line can also represent summer weeds in a northern lawn; the northern line, winter weeds in a southern lawn.



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Red fescue to the left, bluegrass to the right, the two mainstay grasses for the northern two-thirds of the nation. Both are fine textured, perennial, spread to a greater or lesser extent with rhizomes (notably to the right and left of the bluegrass plant).

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those of bluegrass and red fescue—close clipping, generous fertilization and watering, special efforts to control disease, thinning to prevent thatch—in short, more intensive management. Bents brown out more readily in summer, and may be lost in hot muggy weather.

Some of the named "Colonial" bentgrasses are Astoria, Colonial, Highland, and New Zealand Browntop. The "Rhode Island" selection seems the same as Astoria, and is considered somewhat freer from creeping tendencies than most other commercial varieties. Apparently in the bentgrass fields of western Oregon, source of most of the seed, there has been widespread volunteering and mixing of strains.

Rough Bluegrass (*Poa trivialis*), imported from north Europe, is a frequent ingredient of shade mixtures for cooler climates. It is shallow rooted, actually resembling bentgrass more than Kentucky bluegrass. It usually dies out in sunny locations, at least under hot, dry conditions. It is best adapted to moist shady locations, where little else will thrive.

Occasionally other fine-textured, perennial species are included in northern seed mixtures. *Canada Bluegrass* (*Poa palustris*), *Wood Bluegrass* (*Poa nemoralis*) and *Sheep's Fescue* (*Festuca ovina*) are examples. Unfortunately, very often included are some of the coarse bunch grasses, of which the *Tall Fescue* group (*Festuca arundinacea*) is probably the most troublesome. The designation "Kentucky-31" [tall] fescue on seed packages often confuses the inexperienced purchaser, who presumes this variety is somehow the equivalent of Kentucky bluegrass. Alta and Goars are other varieties of tall fescue, while *Meadow Fescue* (*Festuca elatior*) finds some usefulness in mixtures for the dry interior valleys of California. All of these fescues, in contrast to the fine fescues from Oregon, are too coarse to make an acceptable lawn. They become bunch grass clumps when not crowded into dwarfness by heavy seeding. We suggest the use of tall and meadow fescues only for out-of-the-way play areas, and then planted heavily enough to insure crowding and dwarfing.

The *Ryegrasses* (*Lolium*), both annual (*L. multiflorum*) and perennial (*L. perenne*) are inexpensive bulk for

"cheap" seed mixtures. Under certain circumstances, such as in the fog belt around San Francisco, perennial ryegrass may be enduring and attractive. But it is a bunchgrass, will not spread into a tight sod as does bluegrass. Annual ryegrass is coarser, and seldom long-lasting. For that matter, neither species endures well over most of the nation. They seem to intergrade, and much of the domestic seed includes both perennial and annual forms. The designation Italian ryegrass usually refers to the annual species alone, whereas Domestic ryegrass may include a mixture of both types. Both species are fast sprouters, hungry for space and nutriment. As a result they are extremely competitive when used in appreciable quantities in a lawn seed mixture. In those mixtures where it is felt desirable to have a modicum of nurse grass, we suggest that the ryegrass content be held to 10% or less. Actually, the best lawn seed mixture will contain no ryegrass, but will rely upon the reasonably fast starting of red fescue to establish quick cover.

Redtop (*Agrostis alba*) is a coarser bentgrass, adapted especially to poorer soils in middle latitudes. As such it has some utility for temporary cover. As a nurse grass in combination with bluegrass and fescue it is not quite so aggressive as is ryegrass or tall fescue, ordinarily disappears in the course of several years, allowing the desired grasses to "take over"; but it is coarser than a good turfgrass should be, and tends to become clumpy in age. As with other bentgrass species, redtop contains millions of seeds to the pound, so that even a slight percentage in a seed mixture can result in a preponderance of redtop. If used at all, we suggest less than 5% in the mixture.

Southern Grasses. Southern lawns have traditionally been vegetatively planted from sprigs or plugs rather than seeded. Exceptions to this are common *Bermudagrass* (*Cynodon dactylon*), annual autumn seedings of "winter grass" (usually ryegrass, but any of the northern species), and to a lesser extent *Centipede* (*Eremochloa ophiuroides*), *Bahia* (*Paspalum notatum*) and very rarely *Zoysia*. In contrast, the improved bermudas that form a thick sod must be propagated as are the golf green bentgrasses of the North, and so must be the

named varieties of *Zoysia* which don't come true from seed. Only recently has a seed supply of centipede become available. *St. Augustine* (*Stenotaphrum secundatum*) seed is not available.

Principles governing choice of lawn grass in the South are the same as for the North, even though the seasonal cycle is just reversed. As always, one must choose not only upon the basis of climate and grass, but upon the kind and extent of maintenance. Bermudas require frequent attention to look well, much like the bentgrasses of the North. On the other hand centipede is a "poor soil grass," but temperamental and becoming chlorotic easily. Most of the other species are intermediate. Bermuda cannot be grown in the shade, although *St. Augustine* is very tolerant of shade. *Carpetgrass* (*Axonopus* sp.) is especially adapted to wet acid soils where little else will grow. *St. Augustine* is severely attacked by chinch bug, and has in recent years suffered from a number of serious diseases which mitigate against its usefulness.

When To Plant

The seasonal cycle of a lawn grass suggests the appropriate planting season. Ordinarily grass should be planted just ahead of the most favorable growing period for that species, allowing it to become established quickly and dominate the weeds. For northern grasses which prefer the cooler months, an autumn seeding is generally favored. Seeding dates range from August in the most northerly states to September or even October in middle latitudes. Failing planting in autumn, it is still possible to sow in winter, so that seed is in the soil ready to sprout come the first favorable weather of spring. Seeds find niches on frost-pocked soil, become imbedded when the soil softens on thawing. It will not suffer from lying unsprouted in cold earth through winter.

Spring sowings with northern grasses are possible, too, over most of the bluegrass belt. The trick is to get started early enough. Late spring and early summer seedings are successful only in favorable climates where summers don't become hot and dry. Seldom is a late spring seeding successful in the "crab-

grass belt," from Washington, D. C., westward to St. Louis. Lawn grasses don't become sufficiently established before onset of debilitating hot weather and summer "disease," and the inevitable competition from crabgrass and other weeds.

In the South at least six weeks of growth should be allowed before the season of dormancy. Thus the best planting time for southern grasses, which flourish during the hot weather but are dormant during the cooler months, is from early spring through early summer.

Soil Preparation

A lot of unnecessary work goes into soil preparation, especially over-zealous cultivation that breaks down soil structure. As for the many recommended soil amendments, remember that grass is nature's outstanding soil builder. Some of the best stands come from seeding a rough, loose seedbed, which then does not so easily slake and pack. Mixing in phosphatic fertilizers to the depth of the the root zone is especially important with seedbeds on poorer soils.

Compaction of heavy soils is a frequent problem. Tillage of a heavy soil when wet may actually form brick-like clods. This is one disadvantage of waiting until spring for planting a new lawn; in autumn soils are just emerging from a deficit period of soil moisture, whereas in spring they are generally saturated and poorly workable. In order to cultivate a soil in spring conveniently, one may have to wait until the most favorable planting season has passed.

Soil tests can indicate pH, the need for lime. Most grasses are widely tolerant, flourish in a pH range of 5 to 7. Plains grasses such as buffalo, wheatgrass, lovegrasses and grammas are best adapted to alkaline soils. Centipede and carpetgrass, well adapted to the sandy, humid coastal plain, do best under acid soil conditions. Most of the remaining grasses prefer a pH range from neutral to slightly acid. Agricultural limestone, preferably dolomitic to supply magnesium as well, is safer to use than hydrated lime. Fifty pounds per 1000 square feet usually suffices to raise the pH nearly an unit. For chlorotic grass in alkaline soils, sulfur or gypsum and chemical sources



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Results from planting a poor quality seed mixture, high in hay grass content. Tall fescue, ryegrass, orchardgrass and similar species form coarse clumps which are almost impossible to eliminate from the lawn later. In seeding new lawns, use a quality seed mixture predominating in fine-textured grasses adapted to the climate. For average lawns in the North this is usually bluegrass and red fescue varieties such as are grown in Oregon; while in the South, bermudagrass is the chief seeded species with a number of others vegetatively planted.

of nitrogen all have an acidifying influence. Iron sulfate or iron chelate treatments may be needed as well.

Mixing fertilizer into the seedbed gives the best assurance that the new turf will start vigorously. As mentioned, it is especially important to introduce phosphorus into the root zone, since this element is "fixed" almost immediately by soil, leaches down only slowly from the surface.

Soil tests also suggest deficiencies in major nutrients. In the soils of humid zones both phosphorus and potassium are generally needed; from eastern Kansas westward potassium, at least, is seldom called for. All turf benefits from nitrogen fertilization. But since nitrogen will be applied as the preponderant ele-

ment of mixed fertilizer after the turf is growing, one needn't be too concerned whether it is mixed into the seedbed in high proportions.

The balance of nitrogen-phosphorus-potassium in grass foliage is roughly on the order of 3-1-2. Since there is generally some available potassium in the soil, most fertilizers designed specifically for turfgrass have a ratio of these elements on the order of 3-1-1 or 2-1-1. Familiar analyses include 20-10-5, 18-8-5, 16-8-8, 10-6-4, and so on. Any of these is appropriate for mixing into the seedbed, since the young grass will make good use of the nitrogen as well as phosphorus and potassium. Whenever soil temperatures are in the 50s or lower, nitrogen is trapped, will not be volatilized. Nitro-



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A mulch, such as straw, a few stems deep, holds moisture while protecting the seedbed, resulting in a fast, uniform germination. Here seedling bluegrass pokes through the mulch, a few weeks after planting. The straw can be left in place to decay, and a few weeds beginning to appear can be eliminated after the grass is more mature, by a weed spraying.

gen applied even to frozen soil is retained, will benefit the turf fully come March and April. It is a common misconception that fertilizer is readily lost by leaching (on some sandy soils this may be true).

Trace elements are seldom deficient for lawn grasses, both because most lawn grasses are not prima donnas in this respect (centipede excepted), and because most lawn soils are not unbalanced from continuous cropping through the years. With the clippings left, the likelihood of trace deficiency is at a minimum. The exception is where iron is tied up under high pH.

Mulching

Mulch holds moisture at seed side, bringing about quick sprouting, thus blunting the chief excuse for nurse grasses. Mulches also protect the soil and seed from wash. Any locally available material loose enough to permit entrance of air and emergence of seedlings, makes a satisfactory mulch. Traditionally straw has been used in grain producing regions, and sphagnum moss in urban locations because of its ready availability. But there's no reason why wood chips, tobacco stems, pine needles, and woven nettings cannot be used. As a

matter of fact tailor-made mulches are receiving intensive research for seeding roadsides. There are wood pulp slurries (blown upon the seedbed), and various fibrous nets, mats, and asphalt or latex emulsions.

Moisture retention is the paramount feature a home owner needs from a mulch. Straw three or four straws deep is still hard to beat, economy considered. Some of the woven nettings and asphalt sprays are so thin that they do little to prevent drying of the soil. Establishment of stand can be delayed several weeks if the seedbed is not held moist.

Weed Control

Good grass and high mowing afford the best weed control. Mechanical measures (such as raking up crabgrass ahead of the mower) have been tried, but emphasis has shifted to chemical means. For annual weeds, grasses especially, there is an expanding new field of pre-emergence chemical control. Zytron, dipan, and dacthal are the new chemicals, chlordane and arsenates widely used in recent years. Post-emergence control for crabgrass is chiefly with arsonates. Perennial grass weeds still don't yield to selective elimination. For nimblewill and quackgrass spot treatment with dalapon, simazine, amitrol or other general herbicides may prove necessary, followed by reseeding.

Broad-leaf weeds have mostly been whipped with the 2,4-D family of chemicals; with silvex joining low-volatile forms of 2,4-D, Dicot weed control seems well in hand. Precautions must be taken, and young grass may suffer. Bluegrass and fescue are more resistant than is bentgrass. This suggests a way of eliminating bentgrass patches in a bluegrass-fescue lawn. For chickweed, neburon is a specialty herbicide, although silvex or 2,4-D combinations with arsonates are effective.

Fertilizing Turf

The major need for vigorous grass of good color is nitrogen. Where soil phosphorus and potassium are adequate, nitrogen alone might serve as a turfgrass fertilizer (at least one annual feeding with complete fertilizer is usually recommended).

The source of nitrogen makes little difference to the grass. During cooler weather nitrogen is trapped by the soil and is long-lasting. Chemical fertilizers, based upon ammonium nitrate, soluble urea, and ammonium sulphate, prove quite satisfactory then, but during warmer seasons nitrogen may be ammonified and partially lost. Thus frequent light applications are required through the warmer season, or else one chooses instead a "slow-release" source of nitrogen.

Organic fertilizers have long been employed for steady nutrient release as microbial breakdown proceeds. "Burn" such as soluble fertilizers might inflict upon a lawn is thus prevented. However, the newer pelleted or prilled forms of soluble fertilizers roll from the foliage of upright grasses, are in effect non-burning at any reasonable rate.

Most organic fertilizers are more costly per unit of nutrient than are chemical forms. They are rather bulky, derived as they are from low-analysis bean and seed meals, tankage, treated sewerage, and other organic wastes. More recently man has attempted to duplicate the advantages of the natural organic fertilizers, by synthesizing the ureaforms. Ureaform is a polymerized product of formaldehyde and urea; this breaks down slowly under microbial action the same as do the organics. Ureaforms, also, are generally more costly per unit of nitrogen than are chemical fertilizers.

Fertilizer analysis was reviewed in discussion of the seedbed. Rates for established turf will vary with the soil and rainfall, but an average lawn needs about three pounds of actual nitrogen per 1000 square feet annually to look well. For northern lawns at least half of this should be applied in autumn, with a light application after the main surge of spring growth has lessened mowing needs. Three pounds of actual nitrogen would come from 30 pounds of a 10-6-4 analysis, or 15 pounds of a 20-10-5 (nitrogen is always the first percentage listed in the analysis, followed by phosphorus and potassium).

Caution should be used in summer feeding of northern lawns. Little trouble occurs where summer weather remains cool with ample rainfall, but in hotter locations towards the southern limits of the bluegrass belt, grass forced in sum-

mer, soft and lush, is a sure invitation to "disease." Although demise is generally attributed to disease, it is obvious that disease does not have lethal consequences for other turf not heavily fertilized. Physiological unbalance seems the primary cause of trouble.

Watering

There is no more equivocal a practice than watering. At one extreme it is absolutely essential, for survival or for greenness during dry periods; at the other extreme it encourages weeds, causing more harm than it does good. Naturally, any watering schedule must be calibrated to the type of soil and climate. Sandy soils accept water readily, but hold a reasonably small quantity. Thus sandy soils need watering more frequently at light rates. Heavier, clay type soils are just the reverse.

In such arid climates as eastern Colorado, a lawn is obviously not possible without supplemental irrigation. Minimum needs for a green lawn are an inch of water per week, and this might be taken as the base requirement for lawns anywhere during periods of drought.

Quantity of water has a marked ecological effect. Even lawns "clean" of weeds from intensive weeding over a period of years, may suffer unwanted imbalances in dominant grass. Lawns kept continuously moist favor hydrophilic species such as bentgrass, *Poa annua* and *Poa trivialis*, at the expense of bluegrass and fescue. Annual summer weeds are also favored by frequent watering, with crabgrass perhaps the most notorious invader.

Watering only sufficiently to keep the grass green, letting the surface dry between irrigations, may help restrict annuals. A sound middle-of-the-road course for home owners who want a green lawn all summer is to water when the grass shows the first sign of wilting. This is generally detectable by a bluish-green cast, and loss of "resiliency" such that footprints show protractedly.

One danger from advocating lawn irrigation is that inexperienced home owners may assume that where a little is good, a lot is better. Excessive watering can waterlog the soil, force all root growth to near the surface. Then if the

lawn is left to endure drought, as during a vacation, there might be loss.

Keep in mind that proven turfgrasses can survive drought, even though completely brown. An experienced horticulturist at the University of Missouri stated that well-rooted Kentucky bluegrass has never been killed by a Missouri drought. If you can tolerate sere grass during parts of summer, certainly established bluegrass-fescue sod is not harmed, and may be benefited by both the summer dormancy and inhibition of competing weeds. The best seed years for bluegrass follow those summers which are hot and dry.

Mowing

Only a few generalities can be tackled here; not that mowing is unimportant, for there is no greater abuse to a lawn than to have it repeatedly scalped. Nor is it unimportant to the lawnsmen, since man-hours spent on the lawn are mostly in mowing. To make them as pleasant as possible, choose a well-constructed mower of adequate capacity to do the job quickly, uninterrupted by frustrating mechanical tinkering.

As to height of cut, erect grasses such as bluegrass and fescue profit more from a raised height than do trailing species such as bentgrass and bermuda. Penetration of roots below ground relates to height of clipping. Even allowing a few days added growth may improve depth of rooting. One study has shown that daily mowing represses root growth more than weekly mowing at the same height. Of course a happy medium must be struck; don't let grass grow so long between mowings that it is "shocked" by the next clipping. Root growth is inhibited any time more than about one-third of the green leafage is removed. And unless mowing is reasonably frequent, extra-long clippings will remain unsightly at the surface of the newly mowed lawn (shorter clippings would sift through to the soil, decompose more readily).

Since clippings have definite fertility value, letting them remain on the lawn might be suggested for erect grasses which don't mat (as do trailing bents and bermudas). Clipping removal can be compensated for by an extra fertiliza-

tion on those lawns where dry remains are thought unsightly or hazardous. Removal of clippings during a year is roughly equivalent to a complete fertilization. In addition clippings yield "gums" in decomposition that benefit soil aggregation and water penetration.

If the clippings are short enough to sift through to the soil where moisture is adequate for microbial decomposition, they will seldom build into a mat; but on the trailing grasses a thick layer of undecomposed vegetation can accumulate, especially with siliceous grasses such as *Zoysia*. This mat or thatch may become so thick as to actually shed water, and partially smother new growth. Also, some pathologists feel that matted grass is more subject to disease, because of moisture held by this debris. If a mat does develop, it can usually be reduced by raking, or with special power devices for thinning and aerifying.

Kind of grass and its preferred height of cut will influence choice of mower. Rotary mowers are economical and versatile, set easily and mow more satisfactorily at the higher cuts. Rotaries would seem appropriate for bluegrass-fescue lawns, especially in middle latitudes where mowing in summer should be as high as 3 inches. High mowing reduces crabgrass invasion, and helps retain grass in the shade of trees.

If rotary mowers be preferable for high cutting, conversely the reels do a neater job at the lower cuts appropriate for bentgrasses, bermudas and many *Zoysias*. At heights above 2½ inches reel mowers tend to "blow down" the grass blades ahead of the cutting edge.

Pests and Problems

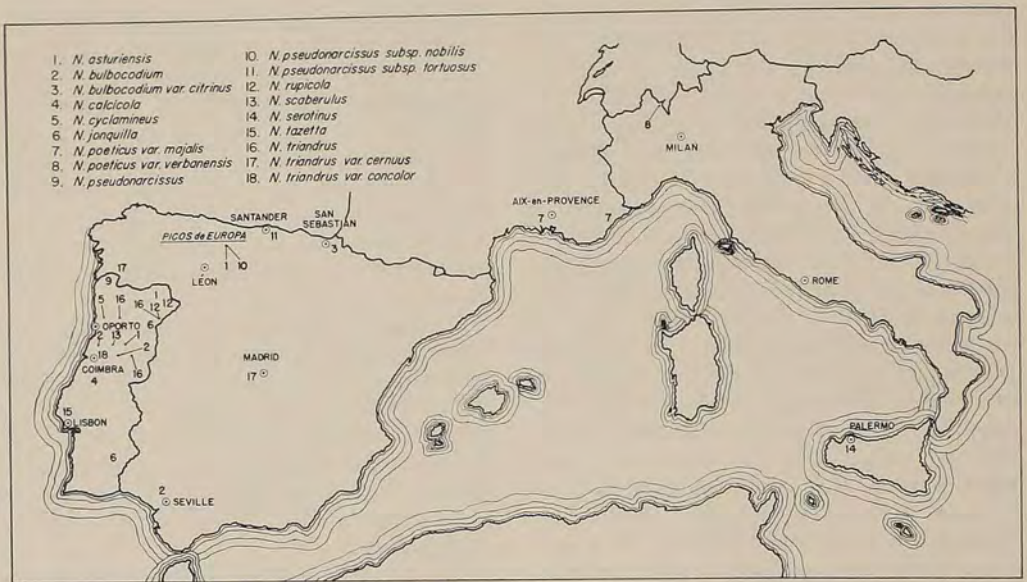
Fortunately lawn pests don't loom large in most lawnsmen's lives; proven turfgrasses have withstood onslaught through the years with little help. An intelligently managed lawn will snap back quickly from temporary affliction.

Now with convenient fungicides and insecticides at hand, it should be no great task to hold sparkle in seasons proving troublesome. High mowing, proper timing of fertilization and circumspect watering are in themselves most of the battle against disease. And with advent of the general-purpose insecticides, those occasional ravages as by chinch bug and sod webworm, can be brought under control.

Disease. There is current stress on lawn disease, but home owners seldom find it practical to check disease by timely spraying. Fortunately, change of weather usually does the trick. Many of the so-called diseases may be aftermath to an "upset stomach" of the lawn. Knowledge about turfgrass diseases is still meager.

Insects. The modern arsenal of insecticides makes insects in the lawn less a problem than might be expected. Almost any modern insecticide serves to control almost all lawn insects, but some insect troubles such as webworm seem on the increase, and there may be build-up of resistance to insecticides. Hazard to human health or pets is a problem of increasing consideration. In our incomplete knowledge, insecticides may sometimes kill off the predators of the insects we want to control, thus actually aggravate the trouble.

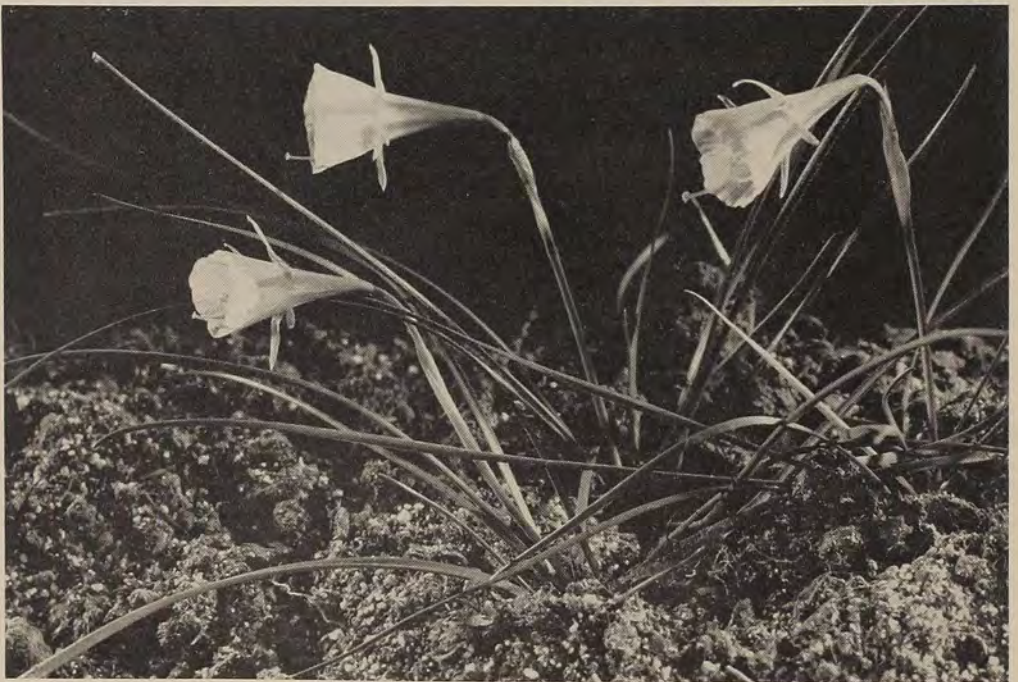
Miscellaneous. So far there has not been widespread usefulness from growth regulators or special soil treatments. The gibberellins increase height but not thickness. Growth repressants set back the grass, and require too meticulous handling for the amateur. Seed soakings are said to give quicker sprouting of slow-germinating grasses such as Merion bluegrass, but Lawn Institute tests indicate relatively little utility, and considerable extra work. Sweeping clippings is suggested for trailing, matting grasses, but should not be necessary on lawns of upright bluegrass-fescue, in which the clippings can settle through to the soil and decompose.



Location of the species of *Narcissus* collected on the U. S. Department of Agriculture-Longwood Gardens expedition to the Mediterranean in 1957.

Narcissus bulbocodium from a bog near Coimbra, Portugal.
Flowers are a deep orange-yellow.

LONGWOOD GARDENS, G. HAMPFLER



Exploring for Wild Narcissus

FREDERICK G. MEYER*

As harbingers of spring, few garden flowers in this country are more highly esteemed than the trumpet daffodil (*Narcissus pseudonarcissus*) and its numerous hybrids. The common name of the daffodil, we may note, stems from the word "daffodilly," or "daffodown-dilly," as this plant was sometimes called in 16th and 17th century England. The lent-lily in English country churchyards is this plant. In Europe, where it is a native species, the trumpet daffodil is one of the oldest of cultivated garden flowers.

In the course of a plant exploration trip to the Mediterranean region for ornamentals in 1957, twelve of the wild species of *Narcissus* were collected in Spain, Portugal, southern France, and Italy. This was a trip sponsored by the United States Department of Agriculture in cooperation with the Longwood Gardens of Longwood Foundation, Inc., Kennett Square, Pennsylvania.

The genus *Narcissus*, with about 30 to 35 species, is entirely of Old World origin. The greatest concentration of species occurs in Spain, Portugal, and North Africa. Narcissi also occur in France, Italy, and the mountains of central Europe. In parts of the Swiss alps the poet's narcissus (*N. poeticus* subsp. *radiiflorus*) occurs often in great abundance in alpine meadows. At least two species, *N. tazetta* and *N. serotinus*, occur around the perimeter of the Mediterranean. *N. tazetta* is the most widely distributed species, ranging from the Atlantic coast of Portugal to the Pacific shores of Japan. The paper-white narcissus (*N. tazetta* var. *papyraceus*) and the Chinese sacred-lily (*N. tazetta* var. *orientalis*) are widely cultivated. Several of the modern *N. tazetta* hybrids, especially those of the poetaz groups (*N. poeticus* × *N. tazetta*) are now widely grown in northern gardens. A half dozen species commonly cultivated include *N. bulbocodium*, *N. jonquilla*, *N. poeticus*, *N.*

pseudonarcissus, *N. tazetta*, and *N. triandrus*. Hybrids of these furnish the greatest proportion of narcissi grown today. In recent years, the miniature species, especially *N. cyclamineus*, *N. jonquilla*, and *N. triandrus*, have contributed to a host of new hybrids.

Almost all of the species are interfertile. Hybrids are easy to produce, even by the amateur. *N. serotinus* has thus far been an exception to this. Attempts to produce hybrids using this autumn flowering species as a parent have been unsuccessful, reportedly as a result of abnormalities in the pairing of the chromosomes. Improvements in cultivated narcissi should be expected by the use of additional germ plasm from wild sources resulting in: (1) the development of new characteristics in hybrid lines (breeders of exhibition daffodils could benefit from a reservoir of wild material); the development of new types more adaptable under the special climatic conditions of southeastern United States where it is now difficult to grow trumpet daffodils developed largely in Europe for northern gardens; wild material could be useful in the development of types for naturalizing; and (2) disease resistant types. The development of narcissi resistant to sclerotinia "smoulder" disease, ramularia leaf "scorch," basal rot, and a "decline disease" caused by a virus, conceivably might result from a reservoir of new *Narcissus* germ plasm introduced from wild sources.

A summary of observations recorded in the field indicates (1) the wide range in habitat preference of the species of *Narcissus*, and (2) a picture of natural variation which points out emphatically the need for further collecting in an effort to bring about a more profound understanding than we now have of the species and their relationships. Without a modern monograph of the species, it is not easy to know well even the material now in hand. The field notes as recorded below will be of particular interest to growers without a ready source of information of this kind. Data about

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*Grassy hillsides in the foothills of the Picos de Europa, Province Santander, northwestern Spain, are the home of *Narcissus pseudonarcissus* subsp. *tortuosus*. A close-up view of the wild plant is shown below.*



F. G. MEYER



Narcissus rupicola, a dwarf species, flowering in cultivation from wild material collected in Portugal. The rocky hills of northern Portugal (illustrated below) are the natural habitat of this dwarf and other upland species of narcissi.



F. G. MEYER

the habitats of wild *Narcissus* are almost wholly lacking in much of the readily available horticultural literature. Of value to know is that the phase commonest in gardens of the hoop-petticoat daffodil (*N. bulbocodium*) occurs in meadows often flooded with water several inches deep at flowering time, later dried out for several months over a long hot summer. Of interest is my experience with *N. pseudonarcissus* subsp. *nobilis*, a large-flowered phase with bicolored flowers, found in a meadow of western Spain so wet at flowering time it was necessary to recover the bulbs through mud and water a foot deep. In contrast, I scraped bulbs of *N. scaberulus*, an upland species, off tops of huge granitic boulders in pine-woods near Oporto, in Portugal. Mistakes in growing the rock-garden or upland species might be partly overcome if growers would be more careful to provide the sharp drainage requirements of these species with fastidious habitat requirements. On the other hand, it is not difficult to understand why it is more easy to grow *N. pseudonarcissus* and other meadowland species once these plants are observed growing in the wild.

Handling Bulbs of Wild Narcissi

The most practical time for digging wild narcissi covers a few weeks in early spring while the plants are still in flower. Bulbs dug at this time are not necessarily killed or even seriously retarded. In fact, most of the narcissi sent in March-April of 1957 flowered in the spring of 1958 at the U. S. Plant Introduction Station, Glenn Dale, Maryland. It is usual for freshly collected wild bulbs not to flower before the second season. They should be dug carefully to prevent injury, washed free of soil, packed in just barely moist sphagnum moss and immediately dispatched to the destination by air, appropriately covered by a plant import permit. Bulbs of wild narcissi dug at flowering time should not dry out. This is perhaps the chief consideration. Long drying in open air may kill or seriously injure the rock-garden or upland species, such as *N. rupicola*, *N. scaberulus*, *N. cyclamineus*, and *N. triandrus* with thin bulb-coats. Probably for this reason, the mortality in commercial bulbs of the rock-garden species is often relatively high. The small-bulbed narcissi should

be dug and transplanted while still in flower or when the leaves have begun to turn yellow and wither. Drying out of the bulbs in open-air should be prevented. Bulbs stored in soil, even in soil that dries out completely for several months, usually are uninjured. Bulbs of *N. pseudonarcissus*, *N. poeticus*, and other meadowland species, are much less affected by storage in open air; in fact, there is no real problem with this group or with the hybrids involving the rock-garden species. In the wild, narcissi receive an abundance of moisture during the growing months of spring, followed by a complete rest over the nearly rainless summer until growth of the roots begin with the first autumn rains.

Species of wild *Narcissus* collected on this trip may thus be divided into two major groups: (1) upland or rock-garden species, (2) meadowland species. Introductions numbered 33 collections representing 12 of the known species.

Group 1. Species of rocky uplands, usually in decomposed granitic (acidic) soils, often found growing in humus in rock pockets. In cultivation these species require better drainage than ordinarily provided for the species in group 2.

N. asturiensis

N. calcicola

N. rupicola

N. scaberulus

N. serotinus (usually near the sea)

N. tazetta (usually near the sea)

N. triandrus

Group 2. Species of open woodlands and grassy meadows (sometimes river banks) often flooded or very wet at flowering time but dry throughout the summer.

N. bulbocodium

N. cyclamineus

N. jonquilla

N. poeticus

N. pseudonarcissus

Wild Collections of 1957

Narcissus asturiensis

The smallest of the trumpet-flowered narcissi, 3 to 7 in. tall; flowers about 1 in. long, deep lemon-yellow. Native of a few areas in Portugal and adjacent western Spain. Origin of introductions:

- (1) Open grassy slopes near the summit of Puerto de San Gloria, Picos de Europa, alt. 4827 ft., Prov. Santander, Spain. In full flower, and abundant on edge of melting snow-fields, March 16. P.I. 238523. [P.I. refers to Plant Introduction number, U. S. Department of Agriculture]
- (2) Scrub-oak woodland growing in rich humus soil, Serra da Nogueira, alt. 3000 ft., near Bragança, Portugal. In flower March 23. P.I. 238699.
- (3) Open grassy slopes in granitic soil, near summit of Serra da Estrella, alt. 5100 ft., Portugal. In flower March 26. P.I. 238700.

Narcissus bulbocodium

The hoop-petticoat daffodil is one of the common narcissi of the Iberian peninsula where it is often abundant in meadows. It occurs also in southwestern France. Sometimes one must dig bulbs of this species in water nearly to his shoetop, the meadows are so wet during the season of flowering. Often it grows in great abundance, turning meadows aflame with the deep yellow flaring trumpets. Along the banks of the Rio Esla at Riaño in the Picos de Europa of northwestern Spain, several acres are carpeted with this species in March. Origin of introductions:

- (1) A very robust phase with flowering-scapes 25 in. tall in fruit (normally about 12 in.), from a bog (usually this species inhabits meadows), 25 mi. north of Coimbra along main road to Oporto, Portugal. Mostly past flowering on April 6. P.I. 238777.
- (2) Flowering-scapes nearly 1 ft. tall. In a wet meadow along Penacova-Luso road, 1½ mi. from Penacova, about 12 mi. northeast of Coimbra, Portugal. Seeds collected on April 3. P.I. 238877.
- (3) Flowering-scapes, 6 to 8 in. tall. From a wet swale on otherwise open hilly slopes dominated by *Cistus ladinifolius*, near Val de Flores, 35 mi. n. of Seville, Prov. Huelva, Spain. This local colony is indicative of the kind of habitat preferred by this phase of *N. bulbocodium*, namely a site ad-

acent to a water seep which dries up in late spring. Past flowering when gathered on April 12. P.I. 239061 (bulbs), 239062 (seeds).

- (4) Flowering-scapes 3 to 5 in. tall, with deep yellow flowers. Wet meadows along the Rio Elsa, Picos de Europa, alt. 3000 ft., Riaño, Spain. In flower March 17. P.I. 238524.

Narcissus bulbocodium var. *citrinus*

A distinct geographical variety of the species restricted to northwestern Spain and adjacent southwestern France with pale lemon-yellow flowers 1½ in. across; one of the largest flowered variants of this species. On steep grassy north-facing slopes in sandy acid soil growing among heather above the sea beyond Pesajes de San Juan, near San Sebastian, Prov. Guipuzcoa, Spain. In flower March 14. P.I. 238029.

Narcissus calcicola

Dwarf species related to *N. juncifolius* and *N. rupicola*, 5 to 6 in. tall, with yellow, scented flowers ½ in. across. In rock crevices in pockets of nearly pure humus, Serra do Sico, alt. 1200 ft., near Ramalhaes, west of Pombal, Portugal. Past flower on April 5. The species is restricted to a few localities in Portugal. P.I. 238778.

Narcissus cyclamineus

The earliest of the trumpet narcissi to flower, beginning at the end of January in Portugal. This species is restricted to a few localities in Portugal and adjacent areas of northwestern Spain and is now nearly extinct as a result of indiscriminate digging by collectors. Not a good grower and short-lived in cultivation in most parts of the United States, but the hybrids of this species are excellent growers, long-lived in cultivation and rank among the most distinctive of the new daffodil hybrids. The present introduction comes from a private garden in Oporto, Portugal where it naturalizes in abundance, the original stock of which came from moist banks of the Fareira River near Valonga, Portugal, the type locality of the species. P.I. 238701.



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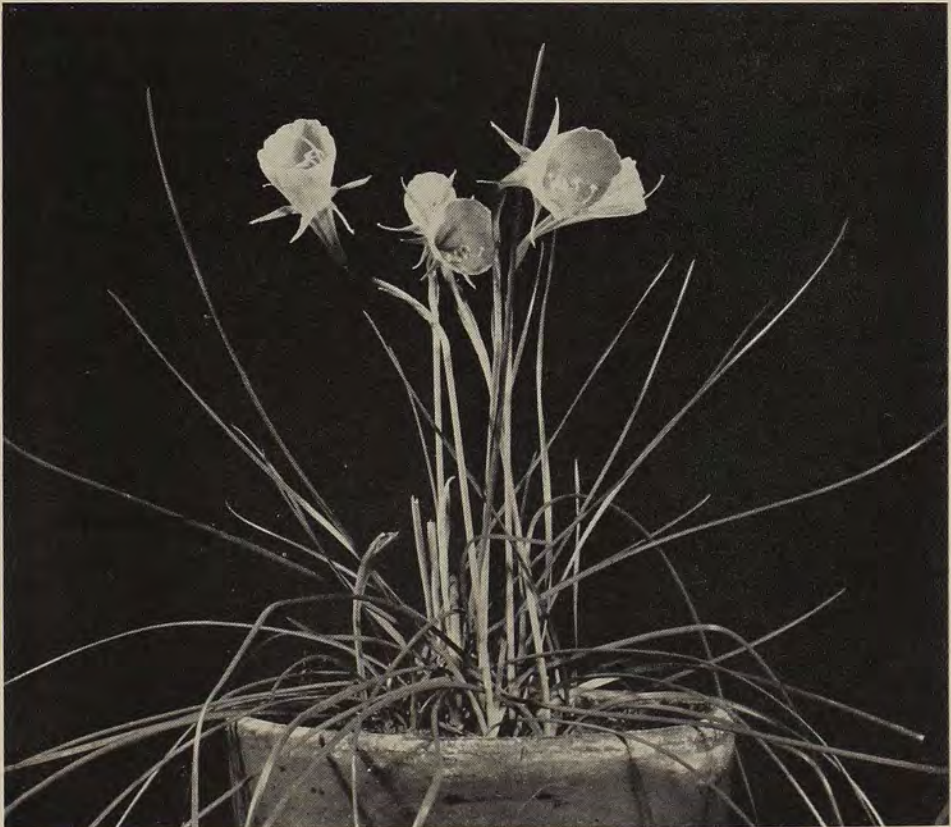
Narcissus triandrus var. *cernuus* shown in its natural habitat in pine woods of Province Orense, northwestern Spain.

Narcissus bulbocodium var. *citrinum* has lemon-yellow flowers an inch and a half across, larger than in the typical hoop-petticoat daffodil. Natural habitat: grassy slopes above the sea near San Sebastian, northwestern Spain.



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Narcissus poeticus var. *majalis*. The Poet's Narcissus' natural habitat is near St. Cannat, Aix-en-Provence in southern France.



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Narcissus jonquilla

The jonquil is restricted to Portugal and Spain where it occurs along river banks in stony-sandy soil. Often the bulbs are buried more than one foot by river sand, and to dig them is a laborious task. *N. jonquilla* as a wild plant exhibits variability mainly in leaf width, size of flowers and time of flowering. Origin of introductions:

- (1) Rocky sandy banks of the Douro River at Barca d'Alva, Portugal. Abundant; in flower March 25. P.I. 238702.
- (2) Banks of the Rio Guardiania near Serpa, road N. 260, Portugal. In flower April 10. P.I. 239063.

Narcissus poeticus var. *majalis*

The pheasant's eye or poet's narcissus occurs in southern and middle Europe in a narrow belt from northern Spain, across southern France to the Swiss alps, and the Balkan mountains south to Greece. The variety *majalis* is a large robust phase often 15 in. tall at flowering time with large flowers often 2 in. across. This is the common phase of the species in southern France where it is abundant in meadows, which at flowering time are often quite moist. Introductions originate from two localities:

- (1) Moist meadows near St. Cannat, Aix-en-Provence, France. In flower April 22. P.I. 239333.
- (2) Moist grassy meadows at Levans, Alpes-Maritime, France. In flower April 28. P.I. 239358.

Narcissus poeticus var. *verbanensis*

The variety *verbanensis* occurs in a restricted area of northern Italy above Lake Maggiore. The flowers are 1 to 1½ in. across, smaller than in var. *majalis*, and the plants are shorter with narrower leaves usually not more than one foot long at flowering time. Introduction from rocky meadows and open woods on mountain slopes above Lake Maggiore, near Pallanza, Italy. Abundant; in flower May 6. P.I. 239682.

Narcissus pseudonarcissus

The natural distribution of *P. pseudonarcissus* is France, Portugal, and Spain. Trumpet daffodils in the wild

may be divided into two principal types: (1) those with uniformly yellow, small flowers produced on a small plant with small bulbs, as typified by the lent-lily of northern France and England. In Great Britain this plant is thought of not as a wild species, although it has naturalized in meadows and in old English churchyards. In northern France bouquets of lent-lily are sold in early March along roadways near the forest of Fontainebleau, (2) those with bicolored flowers (trumpets deep yellow and perianth segments pale yellow), produced on a larger, more robust plant with larger bulbs and broader leaves, as typified by *N. pseudonarcissus* subsp. *nobilis* of Spain. On the Iberian peninsula the trumpet daffodil is nowhere common, although in parts of the Pyrenees it is said to occur in greater abundance. Introductions originate from:

- (1) Serra d'Arga, Prov. Minho, Portugal. P.I. 238738.
- (2) Phase with bicolored flowers, originally from northern Portugal. P.I. 238739.

Narcissus pseudonarcissus subsp. *nobilis*

The subspecies *nobilis* is a very robust, large-flowered geographical variant of the species growing to 15 in. tall with bicolored flowers and trumpets about 2 in. long. This is a rare phase of the species collected in very wet meadows near Riaño, alt. 3000 ft. in the Picos de Europa, Prov. Asturias, northwestern Spain. Should be tried as a parent in breeding new trumpet daffodils. In flower April 1. P.I. 238525.

Narcissus pseudonarcissus subsp.*tortuosus*

A phase of the trumpet daffodil with leaves often spirally twisted and flowers drooping with sulfur- to creamy-yellow trumpets. This rare subspecies is known in the wild only from one locality in northwestern Spain, where it occurs on north-facing steep-sloping meadows, near Unquera, Prov. Santander. In flower March 16. P.I. 238526.

Narcissus rupicola

A low-growing species related to *N. juncifolius* with grass-like leaves, 5 to



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Narcissus cyclamineus—the wild phase from northern Portugal.

6 inches long and bright yellow fragrant flowers about 1 in. across. The plants inhabit rocky declivities, especially on decomposed granite of northern Portugal and the mountains of adjacent western Spain. This beautiful little daffodil thrives best in cultivation when provided with sharp drainage in raised beds. It may also be grown in pots. Two introductions originate from:

(1) Amedo, Prov. Tráz-os-Montes, Portugal. P.I. 238507.

(2) Among large granitic boulders, alt. 1800 ft. between Lagoaça and Freixo de Espada à Cinta near the Rio Douro, Portugal. Nearly past flower March 24. P.I. 238704.

Narcissus scaberulus

Dwarf-growing species 5 to 6 in. tall, restricted to Portugal, with bicolored flowers $\frac{1}{2}$ to $\frac{3}{4}$ in. across, perhaps the smallest of the genus. The corona is nearly orange in contrast with a deep yellow perianth. In cultivation it

should be grown like *N. rupicola*. A single introduction originates from crevices of decomposed granite boulders in pine woodland, near Coimbra, Portugal. Past flowering March 26. P.I. 238705.

Narcissus serotinus

An attractive autumn-flowering species with white flowers, native of the coastal areas on both sides of the Mediterranean from North Africa, southern Portugal to Lebanon and Israel. Irregularities in chromosome pairing in crosses with other species have heretofore prevented successful hybridization using *N. serotinus* as a parent. Hybrids of *N. serotinus*, if they could be produced, would bring to gardens a new race of narcissi. Bulbs originate from the hills near Palermo, Sicily. In flower during October. P.I. 243837.

Narcissus tazetta

This well-known species occurs from the Atlantic side of Portugal, thence around the Mediterranean on both European and African shores to China and Japan. Flowering occurs from late December to March. The Chinese sacred-lily is *N. tazetta* var. *orientalis*. The paper-white narcissus (*N. tazetta* var. *papyraceus*) is the best known phase grown in the United States, although other varieties from time to time have been grown, especially in Europe. The wild phase in Portugal produces pure white flowers on scapes about 15" tall. A single introduction comes from Santarem, a locality not far from Lisbon, Portugal. P.I. 238740.

Narcissus triandrus

The Angel's Tears occurs widely over the Iberian peninsula, except in the southwestern part of Portugal and Spain. It is a common species of the hills of northern Portugal in acid soils where decomposed granite is the native rock. In driving east in a route above the Douro River near Oporto in March, it is often possible to see this plant in some abundance at various points along the roadside. It will be noted that populations exhibit considerable variability as to height of the plant, flower size, and in color of

the perianth, often cream-colored with a yellowish corona. A relic station for this plant exists on one of the French islands of Glenan, off the southern coast of Brittany. Introductions originate from the following localities:

- (1) Flowers creamy-white throughout. On well-drained pine-clad slopes in acid soil, dry in summer, Serra de Marão, Portugal. In flower March 22. P.I. 238706.
- (2) Among large granitic boulders between Lagoaça and Freixo de Espada à Cinta near the Rio Douro, Portugal. In flower March 24. P.I. 238707. Hybrid plants of *N. triandrus* and *N. bulbocodium* were found in this locality.
- (3) North-facing grassy slopes, alt. 1500 ft., near Covilhã on road toward Manteigas, foothills of Serra da Estrela, Portugal. In flower March 25. P.I. 238708.

Narcissus triandrus var. *cernuus*

Flowers bicolored, with the corona deeper yellow than the perianth segments. Occurs mostly in Portugal and northwestern Spain. Two introductions are:

- (1) Plants 6 to 8 in. tall, in moist, sheltered, pine-covered slopes in decomposed granitic soil, along road N. 120, border of Prov. Orense and Prov. Pontevedra, Spain. Abundant; in flower March 18. P.I. 238527.
- (2) Plants very short, 4 to 6 in. tall on north-facing slopes in decomposed granitic soil, near El Escorial and near the village of Robeldal, Prov. Madrid, Spain. In flower April 18. P.I. 239082.

Narcissus triandrus var. *concolor*

The yellow-flowered Angel's Tears, with the corona and perianth segments uniformly lemon-yellow. It occurs sporadically in parts of Spain and Portugal. A single gathering of seeds and bulbs originates from steep rocky slopes under olive trees, between Mizarela and Caneiro, about 6 mi. east of Coimbra on the Coimbra-Penacova road, Portugal. In fruit on April 3, in flower a month earlier. P.I. 238879 (seeds), 238880 (bulbs).

*White
peeling
papery
bark of
Melaleuca
leucadendron*



Ornamental Melaleucas for Subtropical Gardens

EDWIN A. MENNINGER

Australia's most useful contribution to subtropical horticulture are the hundred and fifty species of evergreen trees in the Myrtle Family called *Melaleuca*. Sometimes these are called tea trees or paperbarks, although nobody uses them to make tea and only a few of them have papery barks.

Their versatility lies first in the wide range of sizes, from rock garden ornamentals to big trees, some of timber dimensions. Second advantage lies in

their wide range of usefulness, from hedge plants to filler shrubs and ornamental specimens. Third advantage lies in the ability of various kinds to thrive under any possible kind of soil conditions, from wretched swamps to high dry land. And for the economic utilitarian, there is the fragrant, essential oil produced by the leaves of all species and distilled for the past century to fill many needs.

Yet with all these features, the *Melaleucas* are cultivated chiefly for the



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W. H. HODGE

Melaleuca leucadendron

- Melaleuca cordata*
- Melaleuca elliptica*
- Melaleuca hypericifolia*

splendor of their fluffy flowers. These include intense reds, pink, yellow, purple, and white. Their "bottlebrush" form reflects close relationship to the much smaller genus *Callistemon*. The only difference between them is that stamens of *Melaleuca* are always in bundles.

Most widely planted in South Florida is the so-called Punk tree or Cajeput, *Melaleuca leucadendron* L., which has re-seeded itself in many swamps and gone wild. In undrained land which most trees would scorn, the Cajeput reaches maximum vigor, a big bushy monarch sometimes to eighty feet, but brittle enough to be broken by hurricane winds. The tree first draws attention by its white, peeling papery bark which acts as insulation to make the tree highly resistant to damage from brush fires. (The name *Melaleuca*, derived from the Greek *melas*, black, and *leukos*, white, may refer to white trunks blackened by fire.) Several times a year this *Melaleuca* covers itself with great masses of honey-laden flowers, much loved by bees. Unfortunately, the honey they make is of such poor quality that the Central Florida Beekeepers Association is asking that new mass plantings of the tree be discontinued. Cajeput honey is reported to have such a disagreeable odor and flavor that five per cent in mixtures with other honeys lowers the grade to such an extent as to make it unsalable.

Southern California is too cold for this tree. Similarly in Australia, the coastal specimens in Victoria are anything but handsome, whereas in Queensland it is magnificent. Pink and cream-flowered varieties have been reported north of Brisbane.

Most widely planted in Southern California are the Pink Melaleuca (*M. nesophila*), the Prickly Paperbark (*M. styphelioides*), and the Drooping Melaleuca (*M. armillaris*).

"*Melaleuca nesophila* is one of the most beautiful of Australian ornamental trees," wrote E. E. Lord. "It has long been grown and valued in southern California as a park tree, yet in its native land it is rarely seen. It is covered in spring and early summer with numerous mauve-and-gold bottlebrush flowers that make good cuttings." Unlike most *Melaleuca* flowers, these are more ball-shaped

and are carried at the branch tips.

Melaleuca styphelioides is another handsome big tree with papery bark, twenty to sixty feet or more, and someone has called it the ideal street-planting tree, just spreading enough, uniform in growth, and willing to thrive in brackish or boggy soils or anywhere else. It has small, rather prickly, light green leaves, and in spring produces white bottlebrush flowers in great masses.

Melaleuca armillaris ranges from a tall, compact bush to a thirty-foot tree, depending on the wind protection it gets. It likes wet soils, has very fine cut foliage and in spring produces many white, two-inch bottlebrushes.

These three *Melaleuca* trees are grown only sparingly in Florida, where until recently the residents believed only one kind of *Melaleuca* existed—the Cajeput. But growers have now taken strongly to two other, newly-introduced species that hold even greater promise for landscape work. These are the big spreading "Snow in Summer" (*M. linariifolia*), sometimes called Flax-leaf or Narrow-leaf Paperbark, and a more tropical species from northeastern Queensland called "White Cloud" (*M. bracteata*, Syn. *M. genistifolia*).

Melaleuca linariifolia makes a tall tree to forty or fifty feet, well-shaped, with slender, spreading branches and bluish-green, linear leaves arranged oppositely on the twigs so that an end-view resembles a cross. It has heavy papery bark and just loves to be planted in swampy places in coastal areas. The wood of the tree is valued for piling in swampy places, because it resists rot. It is used in turnery and makes excellent fuel. Distillation of the leaves yields a pale yellow essential oil that has a pleasant terpenic and myristic odor.

The fragrant, white, dense bottlebrush flowers are produced in great abundance, always in pairs, and make the tree a spectacle at the peak of its bloom.

Melaleuca bracteata is a lovely tall tree to 40 feet or more with hard, blackish, rough bark, quite unlike the paperbarks. The scattered, rigid, acuminate or pungent-pointed, flat, half-inch, dark green leaves, give the tree the appearance of a conifer. But this resemblance vanishes when the copious small white bottlebrush flowers begin appearing all over

SAMUEL AYRES, JR.



GEORGE J. FARNHAM

*Melaleuca lateritia**Melaleuca thymoides*

the branches. They are in oblong spikes, sometimes at the branch tips but usually the axis grows out before the flowers expand, and many of the bracts develop into leaves.

Although the U. S. Department of Agriculture has introduced about fifty kinds of *Melaleuca* trees and shrubs, F. Franceschi grew these and many more, and other experimenters have tried their hands with the genus, the plants still do not have a wide distribution and the public is almost wholly ignorant of their possibilities, perhaps because none is available in nurseries. None of the shrubs is grown in Florida,

although in California the following are cultivated to some extent:

Robin Redbreast (*M. lateritia*). Red flowers. Six to eight feet.

Scarlet Honey Myrtle (*M. fulgens*). Red flowers. Five or six feet.

Crimson Honey Myrtle (*M. wilsoni*). Red flowers. From four to six feet.

Thyme Honey Myrtle (*M. thymifolia*). White flowers. Two or three feet.

Oval-leaf Honey Myrtle (*M. elliptica*). Carmine flowers. Ten feet.

Stiff Honey Myrtle (*M. cordata*). Red flowers. Three feet.

Dotted Melaleuce (*M. hypericifolia*). Red flowers. Eight to ten feet.

A Book or Two

Encyclopedia of Gardening

Stanley B. Whitehead. [Revised from Walter P. Wright.] Charles T. Branford Company, 75 Union Street, Newton Centre 59, Massachusetts. U. S. Edition 1960. 789 pages. Illustrated. \$5.00. (Library).

Walter P. Wright's *Everyman's Encyclopaedia of Gardening* was revised by Stanley B. Whitehead in 1952. The 1957 revised edition of this work now constitutes the 1960 U. S. printing.

Written for the British gardener, the book would seem to meet no great need for his American counterpart. Cultural methods for British gardens, for outdoor plants particularly, cannot apply in all climates in this country. There is, of course, no reference to hardiness zones for woody ornamentals, an important factor to the American gardener. Of lesser importance perhaps, is the inconsistency of giving the native habitat or area of origin for some plants but omitting it for many others.

VIOLET K. THOMAS

The Gardener's Directory

J. W. Stephenson. Doubleday and Company, Incorporated, 575 Madison Avenue, New York. 1960. 454 pages. \$3.95. (Library).

This is an important compilation of data, made initially because the author wanted to know himself. It contains, in brief annotated lists on: Horticultural Organizations in the United States (General, Specialty, Scientific and Trade, with data that is correct as for today but will alter as officers change and as facts are altered in passing time.); Places of Horticultural Interest in the United States; Calendar of Horticultural Events in the United States (another schedule that will soon be out of date); Sources for Horticultural Information and Services in the United States (again a section that will yield variable results); A selected list of Books and Periodicals; and a Section on International Horticulture, that should be invaluable particularly if one is a linguist!

This reviewer can think of no way of expressing his appreciation, other than to say that he is ordering his own copy at once.

B. Y. M.

Therapy Through Horticulture

Donald P. Watson and Alice W. Burlingame. The Macmillan Company, 60 Fifth Avenue, New York 11, New York. 1960. 134 pages. Illustrated. \$4.95. (Library).

The reader of this book will undoubtedly be surprised to note the few examples given of how horticulture has been used to overcome mental and physical handicaps. The writers are more concerned, and rightly so, with the use of the proper methods. The usefulness of horticulture has been well established and now it is time to delineate the methods so that each type of patient may be properly benefitted. Also, experience has brought to light certain limitations and the authors have fully covered this phase.

Chapter 9, "Therapeutic Evaluations" gives in diagram form a number of activities under the headings—Scope of Technique, Physical Effects, Mental Results, and Recommendations for Application. These activities illustrate the many items, some of which will be a surprise to the many who have not taken the time to study the effects of some of the simpler garden jobs on the gardener. The places where the major therapeutic programs might well be established as far as the physical program is concerned are illustrated. Sources of materials for such projects are also listed which should be helpful to any workers, for in most cases they are carried on by volunteer workers from sponsoring garden clubs.

W. H. Y.

Beekeeping

John E. Eckert and Frank R. Shaw. The Macmillan Company, 60 Fifth Avenue, New York 11, New York. 1960. 536 pages. Illustrated. \$12.50. (Library).

Since this review is to reach a group that contains probably few beekeepers but a great many who are in a position to take up beekeeping, either as a fascinating hobby or as an often profitable "extra string in the bow," this is written with these persons in mind.

There are still a great many people who think of bees only in terms of stings and visualize hives as straw "skeps" or log "gums." Hives of these types are rapidly disappearing and are now extremely rare in the United States. In fact, this writer, in the hope of making photo-

(Books available for loan to the Membership are designated: (Library). Those not so designated are in private collections and are not available for loan. Books available for sale to the Membership are designated with the special reduced price and are subject to the usual change of price without notice. Orders must be sent through the American Horticultural Society accompanied by the proper payment. Please allow two to three weeks for delivery. Those not designated for sale to the Membership at reduced prices can be purchased through the Society, however, at the retail prices given. In these instances the full profit is received by the Society to be used for increased services and benefits of the Membership.)

graphs of the old-fashioned log gums once so common in our South, made three trips through our southern mountains in the past two years without finding a single stand of such hives. They have been replaced by the modern movable frame hives.

The movable frame hive was invented over a hundred years ago by Lorenzo L. Langstroth, a Philadelphia clergyman, and is a marvel of simplicity. It enables the beekeeper to examine each individual comb in the hive at will. He can expand and contract the hive space as needed, make increases, find and treat disease or find the queen and replace her when desirable, or just satisfy his curiosity. Its use is now world wide.

In North America honeybees, too, are different. The former black bee from Northern Europe, which had such an unenviable but well deserved reputation as a stinger, has been replaced by modern, more gentle strains. The bee most generally used is known as the Italian, improved by cross breeding by American queen breeders. It is reasonably gentle, and is usually handled during hive manipulations without gloves or other protection except a head net.

Thus, any one wishing to take the initial step into beekeeping can, with the aid of one of the many good beginners' books, some obtainable free through the county agent, find himself embarked on a hobby that will give him years of pleasure and may often be expanded into a profitable part-time or full time occupation. Once over the first hurdle the new beekeeper will want to find the best authority he can find as to the hows and whys of his new occupation.

Beekeeping by Eckert and Shaw will fill such a need exceptionally well. It is written by two unquestioned authorities and is presented as a modernization of the long time standard book of the same name by Dr. E. F. Phillips. It contains an excellent chapter on "Making a Start in Beekeeping" and is ready with clear and authoritative information on all phases of beekeeping, even to marketing the packaged product, as the beekeeper requires it. The subjects covered include equipment, honey and pollen sources, colony organization, management in spring, during the honey flow, in preparation for winter, processing honey, and others.

The chapter on "Bee Behavior," containing as it does, a review of the research work of von Frisch and others on communication among bees by means of dances, is an exceptionally clear statement on this subject and should be good reading for almost anyone. Some extremely valuable research work has been done on the honeybee in recent years, and it is a pleasure to find this so well covered in the space available.

A glossary of beekeeping terms, which will be of especial value to the beginner, a very complete bibliography, and an index also are included. Altogether it is an excellent piece of book-making using large readable type, clear illustrations, good paper and binding. As continuous use of such a manual may extend over many years these features are important.

In view of the fact that honeybees are of such great value in cross pollination this book should be available in all libraries dealing with agricultural subjects—of course, it should also be on, and frequently off, the shelf of many beekeepers.

FRED W. SCHWOEBD

The Rockwells' New Complete Book of Flower Arrangement

F. F. Rockwell and Esther C. Grayson. Doubleday and Company, Incorporated, 575 Madison Avenue, New York 22, New York. 1960. 336 pages. Illustrated. \$5.95. (Library).

This book on flower arrangement has been written in an easy-to-read-and-understand manner which may be used by the beginner just starting to arrange or the experienced arranger. Surely the authors' experiences in writing previous books on flower arrangement have been of much help in this present book.

A series of chapters is written concerning the principles of design and color. Simple sketches well illustrate the points considered, such as balance, focal point, scale, accent; and, in many cases, an excellent arrangement in black and white illustrates the same point.

Those persons interested in flower arrangement of special types or periods will find the chapter on the types of arrangement useful. Design of oriental and occidental types are discussed together suggested types of containers and plant materials for each. A reading of these chapters will be of interest not only to the arranger who is called upon to make such a special kind but also to the viewer of period arrangements at the flower show.

This book is well illustrated (92 in color) which makes it an excellent one to be just read or to be studied as a text.

C. B. L.

The Southern Gardener

Mary B. Stewart. Robert L. Crager & Company, New Orleans, Louisiana. 1960. 436 pages. Illustrated. \$5.50. (Library).

Here is one more good try at writing a garden book for the South and this time for a very special portion of the South, the coastal plain area from North Carolina to northern Florida, then across that State to western Florida and along the Gulf Coast to Texas. Mrs. Stewart is very careful in explaining precisely what she means by the area for which she is writing, and how she will designate any comments for other portions of the South if such occur. By and large she succeeds very well. She also has a very detailed discussion of soil preparation, with relation to the soils in the area. The one thing she does not confess, is how much travelling she has done to see what can be done in other parts of the South than New Orleans, where she lives and works but still within the Coastal Plain areas of her field. One suspects that she has not done as much as she should, nor perhaps as much as she would like, for there remains in most of her text a background of New Orleans experience, that is of absolutely no use to those of us who live not too far away, but certainly not off the said Coastal Plain. This reviewer has already remarked more than once that the Gulf Coast part of that area, is full of tiny micro-climates and these do not come in for any attention at all save a few words of general warning.

There is an index and that shows a wide range of plant materials and some carelessnesses in trying to keep up with the latest scientific names, no disgrace but too bad, as she urges right names on all. The section on Potted plants for Patio use is interesting if one lives in an urban area, but there is little discussion of what one does with them, in other areas where winter temperatures mean emptying the patio. There are some astonishing inclusions among the bulbs listed and some given with too little reporting, e.g. *Leucocoryne xixioides* apparently reported on one planting that could not have been good, as the flowers are described as "so small" which they are not, if happy. No reporting on persistence. There is an interesting discussion on Nerines, and her treatment, but again there is nothing to show if after the success of the original planting, she continued to have successes. So one could continue almost indefinitely, not to be nasty about it, but to point out that the book should be redone, in far more detail and with more complete reporting on everything or else with omission of all such that are not known for a longish period.

The illustrations are line drawings, fairly accurate but not at all charming, and no credit line is given. They should be redone. Vines, trees, shrubs, bulbs, potted plants and the usual horror section of insects and diseases complete the story, plus a month by month calendar, that could well serve for many, even those like the reviewer, who live outside of the favored areas of the immediate shoreline.

B. Y. M.

Vegetable Diseases and Their Control

Charles Chupp and Arden F. Sherf. The Ronald Press Company, 15 East 26th Street, New York 10, New York. 1960. 693 pages. Illustrated. \$12.00. (Library).

This is a concise, well organized and well illustrated book of 22 chapters presenting pertinent information on about 40 major diseases of vegetables and their control. One chapter is devoted to the diseases of tropical and minor vegetable crops. Discussions are also included on general problems such as seed rot, diseases due to mineral deficiencies, and nematodes. A list of valuable references follows each disease discussion.

The book is exceptionally well written and will be most useful to commercial vegetable growers, home gardeners, as well as teachers and students in plant pathology.

Professor Chupp is considered a world authority on vegetable diseases. He taught more than 40 years at Cornell University, including 27 as Professor of Plant Pathology. Dr. Chupp became professor emeritus in 1954. Before coming to Cornell as Dr. Chupp's successor in 1954, Dr. Sherf had taught plant pathology and served as extension plant pathologist at the University of Nebraska and Iowa State University. He is

now leader of all phases of extension work pertaining to plant pathology in New York. Dr. Sherf specializes in vegetable diseases.

RAYMON E. WEBB

Corsage Craft

Glad Reusch and Mary Noble. D. Van Nostrand Company, Incorporated, 120 Alexander Street, Princeton, New Jersey. 1960. Second Edition. 189 pages. Illustrated. \$4.95. (Library).

To many gardeners, the enjoyment of flowers comes not only from the growing of them but also the using of them for many purposes. Wearing of flowers may add much to dress or outfit of the wearer. The fact that this is a second edition indicates the interest of home gardeners in using flowers as this kind of decoration. The book tells the principles of making a corsage and then illustrates the ways in which they are made. Sketches show how flowers are wired or tied to make many styles of corsages as well as arranging flowers to be used as jewelry and in the hair. *Corsage Craft* is an excellent guide to those wishing to make this form of arrangement.

C. B. L.

Other books added to the Library:

American Tomato Yearbook, 1960

John W. Carncross, Editor. American Tomato Yearbook, 8 Elm Street, Westfield, New Jersey. 1960. 44 pages. Illustrated. \$2.00.

Evergreens for Every State

Katharine M-P. Cloud. Chilton Company, Book Division, 56th and Chestnut Streets, Philadelphia 39, Pennsylvania. 1960. 227 pages. Illustrated. \$4.95.

Anatomy of Seed Plants

Katherine Esau. John Wiley and Sons, Incorporated, 440 Fourth Avenue, New York 16, New York. 1960. 376 pages. Illustrated. \$6.95.

Introduction to Quantitative Genetics

D. S. Falconer. The Ronald Press Company, 15 East 26th Street, New York 10, New York. 1960. 365 pages. Illustrated. \$6.00.

Principles of Genetics

Eldon J. Gardner. John Wiley and Sons, Incorporated, 440 Fourth Avenue, New York 16, New York. 366 pages. Illustrated. \$7.50.

The Gardeners' Pocketbook

Dahoon Holly

As a plant collector, I am rather severely handicapped by having to make a living by other means, but one manages.

One time while travelling down a highway at high speed, on a highway from Tampa, I spotted a twenty-foot evergreen tree on the edge of a low thicket, covered from top to bottom with red berries. After conservatively backing up the highway, and onto the shoulder of the road, I had a chance to examine a fine specimen of *Ilex cassine*. This was my introduction to the species so I began searching for others and taking cuttings.

Since that time, I have seen how variable in size and shape the leaves of the Dahoon can be. For example, the first tree seen had light green leaves, elliptical, about five inches long, but nearby I found a male tree with thick, dark green, almost obovate leaves, which reached eight or nine inches long on vigorous shoots.

Cuttings of these specimens rooted readily and I have been able to grow on a few of each in the form of trees and, by pinching shoots, in the form of shrubs. Today, these plants are growing on in moderately well drained soil in Coastal Alabama.

In Alabama I keep running almost exclusively into another form of *I. cassine* that has been given the varietal name of *angustifolia*. On this all the leaves are much smaller, perhaps two or three inches or less.

Here, *I. cassine* would seem to be a good holly for ornamental planting, save for one thing. In the spring, after shoot growth has made four to five inches, hordes of spittle bugs begin feeding on both shoots and leaves. These little black hoppers sit on the plant parts and begin puncturing cells, causing a severe curling and twisting of leaves and death of new shoots. I have not attempted any control in order to see what would happen. Usually, some time in August, the damage ceases abruptly and the plants resume new shoot growth.

Were it not for this particular attack, the Dahoon Holly would be superb in foliage, like its relatives. I do not know whether the species is the preferred host for the spittle bug, but in my observation it is much more severely damaged than nearby *I. opaca* varieties, *I. crenata*, *I. vomitoria*, *I. decidua* and *I. cornuta*. In fact, I could find no damage on the last four species.—E. J. HORDER, *Mobile, Alabama*.

Aquilegia jonesii, Rare Miniature Columbine

Many years ago we spent a most enjoyable summer in the Big Horn Mountains, in north central Wyoming, collecting the flowering plants of those enchanted mountains. One day we climbed Medicine Mountain to see the old Indian Medicine Wheel which covers a portion of the summit of the mountain, and to collect plants along the way.

The summit of Medicine Mountain is made up of a much fractured and jointed limestone with scree slopes below the summit and the ledges which surround a part of the mountain. A number of similar limestone-capped mountains can be seen at about the same elevation in the vicinity. These certainly are of the same geological formation. In the crevices of the limestone and in the scree slopes below the summit we found a miniature blue columbine which we had never seen previously in our collecting trips through the Rocky Mountains, and at that time we probably did not know that the species existed. We collected the columbine in several duplicates but came away with the impression that the plant was rare on that mountain. The species proved to be *Aquilegia Jonesii* which was first collected in and described from "northwest" Wyoming about sixty years before we found it.

In June of 1960 we deviated from the beaten tourist trail and took the north road up the west side of the Big Horns, to revisit Medicine Mountain. The snow still persisted where it had drifted dur-

ing winter months but the alpine flora was at its finest in most places. *Aquilegia Jonesii* was just beginning to show a few buds, rarely an open flower. We found the plant to be very abundant, especially on the scree slopes and just below the rounded summit of the mountain. Actually the individuals of this species must run into the millions on Medicine Mountain and on the other limestone-capped mountains of the vicinity.

The tufted leaves of *Aquilegia Jonesii* are usually from 3 to 7 cm. tall. The flower scapes, which bear a single flower, reach 8 or 9 cm. and when in fruit may reach to 15 cm. or more. The blue flowers are gigantic in relation to the plant which bears them. The photographs show that the inch-long flowers are almost as big as the plant from which they come.

The known range of *Aquilegia Jonesii* is not great, extending from Sheep Mountain in Alberta and Dawson and Gunsight passes in British Columbia southward along the Lewis Range to the Big Belt and Little Belt Mountains in Montana, then to "western" Wyoming and out to the isolated Big Horn Mountains in north central Wyoming. The species is to be expected on similar limestone formations in the Teton, Wind River and Green River ranges in Wyoming at elevations of about 10,000 feet.

The photographs will give a fair idea of the size of the plants in early spring and the kind of habitat in which they grow. Seeds should be present from late July through August for those who wish them. There is a passable road to the summit of Medicine Mountain now and a trip to see this fine little columbine and the Indian Medicine Wheel is well worth while for anyone going along the north road in the Big Horn Mountains. —LOUIS O. WILLIAMS AND RUA P. WILLIAMS, U. S. Department of Agriculture, Agricultural Research Service, Crops Research Division, Beltsville, Maryland.

Tree Peonies from Seed

Mrs. Jacobs' story of her success with tree peonies inspired me to write about our own.

In 1940, my husband bought some tree peony seed from Japan. They ger-

minated, some taking two years, but after four years my husband gave them all to me. I lined out about one hundred twenty in a square bed, and one morning on awakening, found that rabbits had eaten every one to the ground. They survived even that, and grew vigorously.

Dr. Wister, who visited us, told me it was a waste of time, as I would have "only dirty lavender" blooms.

None bloomed until they were seven years old and most of them took eight; from the one hundred twenty, I got one lavender and it was a beauty.

When they were ten years old, I sold sixty to my garden club members. They are all now twenty years old, the seedlings, not the club members! I have been able to follow practically every plant, and from the sixty remaining, I still have forty-five, after giving away the others. This spring (1960) I had over seven hundred blooms. Some are single, some double, some change from year to year, pink, white, red and white, and only one red.

I let a few seed mature on each plant. I immediately plant three in a small size pot (sand and good garden loam) and sink the pot in the lath house beds. Again, some come up the following spring and some the second spring, and so it goes on. I feed them superphosphate in March and bone meal in August. —ETHEL R. HANKELE, M.D., *Neshaminy, Penna.*

Azalea Shinnyo-no-tsuki in Northeastern Alabama

Several years ago, I stopped in Pass Christian, Mississippi, and telephoned B. Y. Morrison about this variety of azalea which intrigued me greatly from the descriptions. He gave me the address of a nursery source and urged me to try. I immediately ordered a dozen plants. The planting has been most successful and strangely enough I have never observed any damage to the blossoms which I could identify as being the result of cold. My trouble is that the blossoms instead of being six or seven inches in diameter are actually only

about three inches. Nothing I have tried seems to increase the size of these blossoms and I would certainly welcome any suggestion from you.

The fact that the January issue of the AMERICAN HORTICULTURAL MAGAZINE was devoted to palms has made me very happy. We have a native stand of *Sabal minor* in a swampy area within fifteen miles of the writer's home that I am positive is the northernmost stand of palms in Alabama. We grow *Cocos australis* (now *Butia capitata*) and I recently obtained from the Palm Society the address of a grower from whom I hope to obtain several other varieties including *Chamaerops*. — EVERETT LAY, *Gadsden, Alabama*.

Lycoris squamigera and Lime

The editor believes that a liberal addition of bone meal in his acid soil has helped this species that is not too well grown in the South, but his comments elicited the following note from Mrs. Jacobs, who gardens in limestone land in Kentucky and prepared her soil as indicated. Comments from others will be welcomed.

About *squamigera*'s fondness for lime, I have some doubts. I am in limestone country, as I am sure I have told you before, but I doubt the presence of much lime in my topsoil, as I have a layer of sandstone over the limestone. I started with five bulbs of *squamigera* perhaps twenty-five years ago. At that time the center of my activities was the pool for swimming. I planted the bulbs on a steep bank beyond the pool in clay so heavy that I was ashamed to put bulbs there. When I lifted the bulbs some years later to replant on the upper level of my place, I found each had become three. The bulbs originally sent me had been the size of a child's head. Most that I lifted and all that I have lifted since have been slightly larger than a good hyacinth bulb. Insofar as I can discover, there is no difference in the size of bloom between huge bulbs and smaller ones.

My replanting was where I wanted the flowers rather than where I thought they

might be especially happy, as I am given to considering my own pleasure rather than those of the plants.

The soil was well drained, very light loam. I had found that in Virginia, some good gardeners planted *lycoris* with the tip barely covered. I tried mine that way and covered with leaf mold, chiefly of beech leaves. I used rotting logs generously, also beech, around the patch with the thought of helping to hold moisture.

With leaf mold and rotting logs I doubt that the soil was even neutral, though I never did actually test it. The bulbs increased by leaps and bounds, have bloomed beautifully each summer, and were completely satisfactory. I began giving bulbs away and cannot guess how many have come from the original five.—MAUD R. JACOBS, *South Carrollton, Kentucky*.

Get Acquainted with Silenes

Gardeners unacquainted with the fascinating silenes are missing one of the dependables of plant life. Commonly called Catchfly and grouped in the Pink family, they consist of some 300 species scattered over North and South America and Asia. It is safe to say they are better known abroad than here. It is a rare occasion when more than the commonest sorts are observed in local gardens. We wonder why, as there are so many desirable features in their favor.

There are annuals, perennials, and biennials, easily propagated by division and cuttings. Seeds germinate readily when sown at proper time, and, as a rule, transplant well. I sow all *Silene* seed in the fall, except *S. regia*.

For most silenes, soil conditions are immaterial. A few prefer shade, others revel in full sun. They require no winter protection. Here *S. compacta* (sometimes referred to as *S. orientalis*) is a hardy annual, beginning to flower the latter part of April and from then until the freezes come one can find its rose-colored head somewhere in the garden. A light pink form of this variety appeared in our garden last year, proving a welcome diversion in color. Only once have we had the white sister of this species which was ethereal in its beauty.

S. pendula rosea is also a hardy annual, growing ten to twelve inches high. Blooming early, their pink, phlox-like blossoms combined with blue forget-me-nots and pansies create a pleasing picture. The double *S. Bijou* (from England), with salmon-pink flowers, growing four to six inches high, could easily be substituted for *Bellis* daisies.

The purplish variety *S. pendula bonnetti* is an old favorite, occasionally seen in gardens and hard to locate. Of all the *Silenes*, *S. frivaldskyana*, with blue foliage, long upright steps set with buff cream, and deeply lacinated flowers, is our most prized member of the family. This long-lived species has much in its favor. It will bloom continuously from May to November if the seed pods are clipped. Having a long tap root, it must be transplanted while small.

Another free flowering form is *S. acaulis kodiak*, from the Kodiak Islands. It is rarely listed, but well worth searching for. Still another fine member of the *Acaulis* group is *S. acaulis penduncularis*. Growing one to three inches high, it is fine for low edgings. The mossy foliage and long blooming rose-colored flowers were a decided feature. This one requires gritty soil. I fell in love with *S. alpestris flore-pleno* at first sight. This dwarf produces a profusion of pure white, small double flowers in May-June. It was short-lived with us.

Another dwarf gem is *S. maritima plena*, with large double white flowers and trailing habits. Along in May, we begin to watch for the opening of *S. wherryi*. The cushiony mats and large phlox-like blossoms of clearest pink are very effective in the border. While not as long-blooming as some varieties, it makes up for it in floriferousness. For a long season of bloom we like *S. schafta*. We have had this variety bloom continuously from July until frost. The silvery rose blossoms bring gaiety and color to a waning garden.

For late spring brilliance, nothing surpasses the Fire-pink *Silene*, *S. virginica*, having large flowers with deep cleft petals in vivid shades of velvety scarlet. This is our wild species and a hillside covered with their bright blossoms is an arresting sight.

A coral-pink sport of *S. virginica* has been discovered in our mountains and should prove a decided color break in

this species. *S. stellata*, a three-foot perennial with deeply fringed white flowers arranged in panicles, grows with reckless abandon in our garden.

The Royal Catchfly, *S. regia*, grows 30 inches tall. It is a showy, long-lived species for midsummer and autumn color in the garden. The well-branched, upright plants produce large flowers of brightest red. This is suitable for the hardy border. Seed should be sown in spring for best results. Last year, we grew *S. fortunei* in white and pink for the first time and were well pleased with it. The large, deeply fringed flowers were very attractive. Some species close in mid-day if placed in full sun, but this variety remained open the entire day.

S. hookeri is a super-treasure for the rock garden. The fringed bloom is bright coral-pink about one inch across. It grows in the sun or shade with equal results, blooming in May-June. Shortly after hot weather comes the foliage dies down. This one is difficult to transplant as the tap root goes deep into the ground. It comes freely from seed that must be sown in the fall.

The soft, gray leaves and inflated white flowers of *S. maritima* are a joy for weeks. For compact plants, place in poor soil. It is at home in sun or shade.

Considering its meagre possibilities and ranging from four to six inches in height, the wild pink *S. pennsylvanica* offers a bit of lively color in the rock crevices where it flourishes. The beautiful pink flowers are gathered in a flat-topped terminal cluster. There is no reason why this charming *silene* should not be in our gardens. For several years we have grown and enjoyed *S. alexis*, a delightful Hungarian native. This two-foot perennial has a three months flowering season. The delicate pink blossoms are very pleasing. — MRS. J. ROBERT CHRISMON, Greensboro, North Carolina.

Pinckneya pubens

Caroline Dormon said she wished I could be at Briarwood when the *Pinckneya* bloomed by the pond. "No use to give you one," she said, "for it comes from swamps and would not grow in your dry garden."

But it does grow in my dry garden and has grown there for ten years and has bloomed for eight of them. My Pinckneya is one of two small plants that Mr. Crayton let me have when I happened to visit him after one of his collecting trips. The other plant died, but this cannot be a difficult thing to grow, for the roots were bare, and after travelling from Florida to Biltmore, they came on down to Charlotte, to be set out in the heat of early summer.

Several trunks are usual, but mine has only one, and it would be a shapely small tree by now, if it had not met with an accident in early youth. The leader was cut off eighteen inches from the ground. The plant recovered slowly and has now reached a height of about ten feet. In the swamps it reaches twenty-five.

Pinckneya comes into bloom the last week in May or the first week in June, and is in its glory for a month or more. The clusters of tubular flowers, that look as if they were cut from fine, cream-colored felt, are set off by an occasional enlargement of the calyx-lobe, that looks like a leaf and turns a clear, bright pink, that is a tint of spectrum red, and very near the carmine 21/2 of the Royal Horticultural Society Colour Chart.

The flowers are followed by rather decorative green-gold fruits, to three quarters of an inch in diameter. These hang on for a year before they split and drop their winged seeds. The large oval, light green leaves take on warm apricot tones in October.

Mr. Hohman told me several years ago that at Kingsville, Maryland, he had one four year old Pinckneya that had never bloomed. This, mine, and Caroline Dormon's are the only cultivated plants that I have known about. It seems to me too bad that we are not making use of one of our most beautiful native trees, especially as it seems to be easily propagated. Cuttings of mature wood are said to strike in sand under a hand-glass. Seedlings need rich moist soil and shade, and the trees need some shade. Mine did much better before I lost a sheltering pine.

In spite of its restricted range, along the coast from southern South Carolina to Florida, Pinckneya is well enough known to have several common names, such as Maiden's Blushes, Calico Bush,

and Georgia Bark. It is also called Bitter-bark and Fever Tree because the bark has been used as a substitute for quinine.—ELIZABETH LAWRENCE, *Charlotte, North Carolina.*

California Redwood in Mississippi

In the autumn of 1946 I sent to California for a dozen redwood seedlings, about ten inches high. I planted ten of them in a temporary, makeshift lath house, while we were living on the beach front in Gulfport, Mississippi. I gave two plants to my brother in Long Beach. During the 1947 hurricane, when salt water flooded our yard, all ten of mine were lost, but my brother, Ben Simmons, succeeded in growing one of his and it is now (1960) eight feet high.—MRS. B. F. LINDSEY, *Long Beach, Mississippi.*

Gordonia lasianthus

Thanks to the publicity given it, the Franklinia has had its name and fame well before the public, and from that same public one hears many a complaint about failures, with not enough data offered for any diagnosis.

If it is difficult, certainly there is no difficulty with potted plants of its cousin, *Gordonia lasianthus*, which seems to accept moving as easily as any common thing.

Obtaining a plant of this has been among the many procrastinations of the editor's garden, but this late April a stop was made in Atlanta and a plant picked up at old Fruitlands Nursery. It was growing in a tin, not too happily, if one counted the bare stem and the top tuft of leaves, but within a week after being put into a spot where it would have regular watering, and a soil that would delight any camellia, it started out to grow, with fine new leaves and in late July, one glorious bloom quite as fine as any Franklinia, known here. Scented too.

It is too soon to know how evergreen it will be here, and this fact is queried only because of the bare stem in the original can. Dr. Hume says, in his

Camellias in America (page 89), that "Its pure white flowers, each lasting for only a day, are attractive and sweet scented. Individual trees continue to bloom over a period of two or three weeks. There is another species, *G. axillaris*, in southern China." He reports it as evergreen also.

We have here another *Gordonia*, possibly not the species noted last, but from China, that is evergreen, grows mostly in a bush form with many stems from the base, and blooms that appear so late in the autumn that most are caught by our light frosts.

Our plant of *G. lasianthus* is too young to be a source of cuttings, but our Chinese plant comes easily from cuttings that grow off well in ordinary media. How long it may take to make a bush remains to be discovered. As far as this reporter could tell, there was only a faint scent from the blooms of the Chinese plant. Possibly in some garden just a little more sheltered, it would have no difficulty in blooming well and competing with the earlier camellias.—B. Y. M., *Pass Christian, Miss.*

Hardiness of *Fatsia japonica*

The only discovery of interest that I have made here, is that *Fatsia japonica* will grow well.

In southern California this was our favorite foliage plant for tropical effect. After coming to Georgia, I was surprised to read somewhere that *japonica* was hardy to New Jersey. Local gardeners and nurserymen assured me that this meant, *along the coast only*. (Actually, our garden is located in a microclimate that is one sub-zone more severe than that of Atlanta generally.) We had to find out for ourselves, so we planted a small specimen of *japonica*. It has thrived and survived the ice and snow storms of last March and a two degree F. spell of weather two years ago. It receives no special winter protection. Its leaves are large and healthy appearing, but it does not grow during the winter and is, therefore, slower than the California-grown plants.—GRAHAM HEID, *Atlanta, Georgia.*

Lycoris in Shreveport

Actually, I live in a pine grove which, according to the authorities, denotes an acid soil. Some of the lycoris are planted in drifts among the trees and some in the borders of the azalea beds where the soil is maintained at pH 5. I permit the needles to fall from the pines and accumulate as a mulch for the winter, but remove the covering in spring to discourage insects from taking up residence, and to allow sun and air to reach the soil. Ample moisture is provided throughout the year.

Bulbs are planted in September but the flowers are small the first season. Any planted in October seldom appear above ground until the following season. I have never transplanted any, but suppose that when the plants are dormant, would be the best time, just as the leaves are ripening off. Foliage is kept in top condition as long as possible and when dead, is cut, not pulled, at soil level.

To make as great a display as possible, to do for the garden in the autumn what azaleas do in the spring, I feed my bulbs. After the blooms have faded, and as the foliage emerges, I apply a generous quantity of superphosphate, over and around the planted area. I simply scatter handfuls until the ground is white. Then it is watered in. About two or three weeks later, another feeding is given, a light sprinkling of well rotted dairy manure.

Under this treatment, it is common to find scapes with nine to ten flowers, and this season, 1960, there were, for a first time, heads of eleven flowers on some of the plants bought as *Lycoris aurea*.

One buys lycoris as one finds them, some here, some there. In my garden I have *radiata*, *aurea*, *albiflora*, *albiflora carnea*, *squamigera* and a cream colored form with flowers like those of *radiata* for which I have no name. All of this cream colored form came in a shipment of *aurea* several years ago. *Aurea* varies in color from pale yellow to bright orange, and blooming periods are spaced from the last week in August to mid-October. Whether or not these are all *aurea* I do not know, but they were bought under that name. Multiplication is not as rapid as books suggest and one must wait several years to get a full dis-

play, one well worth waiting for. As purchased, *albiflora* and *albiflora carnea* appear identical, all blush pink, nary a white one. *Squamigera* is very slow to multiply and temperamental, some years giving good bloom, some years not.

I started planting *Lycoris* in 1932 and have added what I can find from year to year; this year, adding "*cinnabarina*" and *squamigera purpurea*, if they ever arrive.—LOIS FLAXMAN, *Shreveport, Louisiana*.

Rhododendron prunifolium

We are very fortunate in having *R. prunifolium* native in our own country, and are using it extensively in the Gardens on the Callaway Estate. We hope that, in years to come, it will be one of the main features of the Gardens during the summer season. Of course, the plant is found also in other areas in the State, and some in Alabama as well, but it is possibly the rarest of all native species. We have also a good source of seeds of the plant from the Callaway Estate, since Mr. Callaway's preservation of this species was what won him the Garden Club of America award. Since that time, we have been doing all the propagation here in the Gardens, and have several thousand plants already in permanent locations, and are planning to add many thousands more in years to come.

This plant was collected from a number of sources, usually around streams or in moist soil areas, and is much more exacting in its demands for location than any other native species we handle. It should never be put out on dry sites, and should be given partial shade, in the best location possible. We have better results with collected plants if we cut them back to the ground, and place them in a heeling-in bed of well rotted sawdust and peat moss for one year before putting them out in permanent location. This has reduced mortality on collected azaleas, so that we now follow the practice on all collected species. Many of these azaleas, after one year in the heeling-in ground, are back to a height of twelve to eighteen inches and others, such as *R. canescens* and the

Oconee Azalea, will have set flower buds that first season, whereas *R. prunifolium* does not.

We are growing most of our *R. prunifolium* azaleas from seed, collecting seed from the different colored forms that we have. We find, after the first several years of seeing our seedlings, that this is the best procedure, as most of the resulting seedlings are coming through with very good red color, and not too many of the orange hues.

We have also done some limited work on growing this plant (and others) from root cuttings and think that this also has possibilities and further work will be needed on this.

R. prunifolium starts flowering with us the first of July, spasmodically through August and September in individual plants. We have flowering at this same time a late-flowering form of *R. arborescens*, having made crosses between it and *R. prunifolium*, and have some very interesting hybrids from them.

The first group of these hybrids flowered last year, with many of the pink and salmon shades among them, and most of them with fragrance from *R. arborescens*. Of course, the large part of the group of these hybrids has not yet flowered and there are many other younger hybrid seedlings that we will be looking forward to seeing in the next few years.

We have other crosses, using *R. prunifolium* and other native azaleas, with seedlings now coming on from *R. prunifolium* × *R. cumberlandense*, and many others as well. Most of these are two or three years old and it will be at least two or three more years before we can see the results.—FRED C. GALLE, *Chipley, Georgia*.

For Hardiness, Grow Your Own Amaryllis

Since the Dutch hybrid amaryllis are not hardy out of doors here, I have been making crosses, between one of the van Meeuwen hybrids, Queen Superiora, and American hybrids. The Queen Superiora is a magnificent, blood red, with full flat flower form. The American hybrids were chosen at random from what I

liked best of both Howard and Meade strains. The resulting seedlings are almost as handsome as the Dutch, and are hardy outside here in Sheffield, where our winter temperatures may go as low as -5 and rarely -10 degrees Fahrenheit.

Ordinarily I do not use any protective mulches and as always follow the rules to plant the bulbs in depths so that the neck shows.

The seeds are sown as soon as ripe, and are scattered on top of a bench in my greenhouse, between the pots of other things and forgotten. Germination is very good. Once large enough to handle, the seedlings are transplanted into wooden boxes and placed under a bench and grown on. They are given no rest and kept in growth the year around. Quite fertile soil is used and no further feeding is done until at size $\frac{1}{2}$ to $\frac{3}{4}$ inch bulbs are lifted and set around the edges of the greenhouse benches out of the way and grown there till the first blooms occur. With no rest, these bulbs usually bloom in one and one half to two years from sowing of seed. The most outstanding bulbs are planted outside in the early autumn and usually bloom the next spring.

The biggest trouble I have with the growing of amaryllis bulbs is that slugs eat out the hearts of the bulbs during the warm nights of winter. To combat this, I cover the plantings with aluminum screen wire, covered at the edges with soil.—D. D. MORRISON, *Sheffield, Alabama.*

Bellingrath Camellia Garden

There is a new camellia garden in Bellingrath, known as The Bellingrath Gardens Camellia Arboretum, unique in that it is at once an arboretum with a comprehensive collection of camellias and a garden that is beautiful throughout the year.

The camellia garden is a little less than four years old and already has five hundred varieties of *Camellia japonica* and about thirty species and species hybrids thriving on the original four acres.

With the exception of about two hundred, ten to fifteen year old plants moved in the first year for quick effect, all the plants are three and four year old grafts on one and two inch Prof. Sargent root stocks and have grown unusually well because of the heavy root systems, the well-drained, moderately acid, sandy soil and the light shade of pine trees. The terrain is gently rolling, affording perfect surface drainage, but does not erode because of the year round mulch of pine needles.

Each variety is permanently identified by a three inch x six inch brown plastic label with white lettering, riveted on an aluminum stake.

From the landscape point of view, the Camellia Arboretum embraces an area roughly four hundred feet square having a densely wooded ravine beginning near the center, and emptying into a bayou along one side; a stand of slash pine averaging about thirty feet apart; a winding, looping twelve foot trail surfaced with carpet grass and edged with ophiopogon; and a complete planting of five hundred different varieties, spaced at roughly twelve feet apart, staggered.

Beginning with the Daikaguras, September Morn, Arejishi and a few others that begin to bloom here in late September, the over-all blooming season is about six months, and such blooms! On many of the pines are climbers such as coral vine, trumpet vines, Banksia and other roses. Reseeding themselves to make their way up through the pine needles each year are such well known annuals as vinca, torenia, gaillardia, cleome and phlox. Nearly all the annuals and these vines are at their best when the camellias are not in bloom, all of which proves that there was no truth in the statement that a camellia arboretum here could not have year-round beauty.

During 1961, the arboretum will be expanded to seven acres, and new kinds planted to increase the total to eight hundred clones. One, two, and three year old grafts are on hand for this planting.—M. B. GREENE, *Theodore, Alabama.*



Sarracenia flava