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Robert L. Taylor

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Narcissus, Foggy Dew

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*A general view of the terrain around Knechtsalakte, in the Van Rhynsdorp district where "flowering stones" abound. The genera *Argyroderma* and *Conophytum* are found on all the white quartz patches.*

Flowering Stones

W. H. HODGE

Stones that flower? Not really, of course, yet in many parts of arid South Africa grow certain kinds of stemless succulent plants in appearance so much like small stones that it is only when they produce their colorful pastel flowers that they momentarily cast off their disguise to show that they are plants and not just desert pebbles.

Most "flowering stones" claim kinship with a botanical sorority, the *Mesembryanthema* (literally "noon-day flowers"), famed along with the aloes and euphorbias as one of South Africa's noted groups of succulents. As such they are plants that have become adapted successfully to desert existence by means of fattened body structures which serve as reservoirs for

all-important water storage. Not all flowering stones are "mesembs," as the botanist familiarly calls them; most are, but a few other families of plants—and in particular the spurges (*EUPHORBIA*CEAE), milkweeds (*ASCLEPIA*DACEAE), stonecrops (*CRASSULA*CEAE), and lilies (*LILIA*CEAE)—have also managed to produce in South Africa a few vegetable pebbles of their own.

Whatever their family ties may be, all these strange plants share at least one thing in common, they are one hundred per cent South Africans and are inhabitants of regions in that country subject to prolonged drought. Their calling cards, when plants are grown away from home, carry exotic geographical names such as Bushman-

All illustrations accompanying this article were prepared from photographs made by the author.



land, the Namib, Little Namaqualand, Griqualand West, or the Little or Great Karroo. The country that bears these names encompasses much of the rain-starved lands which run throughout Southwest Africa, south almost to Capetown and thence easterly into the hinterland enclosed by the great curved escarpment that is South Africa's Drakensberg Range.

A day's travel by car east or north of Capetown brings one into the land of the flowering stones. Residents of our own southwest, were they to travel here, would feel quite at home; for arid districts, wherever they occur in the world, have a certain sameness in their aspect, a sameness evoked by the influence of similar environmental conditions. As in our southwest there is the same hot sun, the same shimmering sandy or gravelly wastes on plain or hill, the same sparse vegetation, the same dried-up watercourses lined with low-growing, deep-rooted, flash-flood-expectant trees. The spiny trees look like mesquite (*Prosopis*) but aren't; instead they are usually acacias, so typical of the African landscape. Nor are there cacti or centuryplants to be seen spotting the landscape, but taking their place stand their South African equivalents—succulent cactiform spurges and rosetted centuryplant-like aloes, so similar in form, as a result of similar environments, that the casual visitor would hardly note the difference between these striking examples of what biologists call convergent evolution.

As in most deserts, bare spots, relatively free of any vegetation, are not uncommon. Sometimes sandy, they are more likely to be stony, covered with gravel or boulders. Though seemingly free of vegetation, gravelly patches like these are the most frequented homesites of stone-like plants. Stop at one

of these gravel patches in Namaqualand. As it often happens it may consist of white quartz pebbles distributed solidly over perhaps an acre or more, though forming thin layers over the soil of no more than a few inches deep. Yet you would swear that nothing could grow on such a gravel heap. In fact nothing seems to be here. But what's this? Someone has dropped a plucked flower, a radiantly yellow daisy it seems. It is still fresh though—as a daisy one might add! You stop to look closer; then kneel down to examine the curiosity of a fallen flower on a stone pile, still fresh though lying under a blazing desert sun—only to find that the flower is seemingly attached to a stone. Better said it seems to be growing from a crevice or crack between two of the milky white pebbles. At least they look like pebbles. You touch them, then pinch them. Not stone-hard, they are turgid succulent leaves, a single, silvery-colored pair of them. What you have found is a "silverskin" (*Argyroderma*), one of the classic examples of South Africa's flowering stones.

Silverskins share many of the characteristics of their sister stone plants so perhaps it would pay to take a closer look at our find. Kneeling down to better examine the plant it comes to you suddenly that there are other silverskins about, dozens of them scattered here and there among the whitish pebbles. There may be several on each square yard. A few are in bloom but many lack flowers. Those without flowers are so perfectly camouflaged that you cannot fail to marvel at how seemingly well-protected they are out here in a desert no-man's-land. For in such sites succulent leaves are at a premium and any wandering animals—such as antelope, ostrich, or baboon—would be especially on the lookout



Top: A yellow-flowered "cone plant," *Conophytum calculus*, near Van Rhynsdorp, flowering in May. Bottom: *Conophytum calculus*, as it appears on its native quartz patch.

for a few extra mouthfuls of juicy silverskin salad.

Uprooted, a plant of *Argyroderma* is an insignificant thing—just a single pair of thick leaves each one more or less hemispherical and attached to a short stubby stem and root system. When young the leaf-pair stands tight together. But at the beginning of the first winter rains in June (lying below the equator—South Africa has a reversal of our seasons) a tiny pair of new leaves usually develop between the older ones and at their expense, the old leaves shrivelling up during the process. From the same central slit, buds push out to open into the showy yellow or magenta blossoms, which, for a brief period, serve as beacons to pollinating insects, thus breaking down for awhile the artful camouflage of stone. Stems are practically non-existent—as they should be on these plants, which for security's sake need to hug close to the ground in the shelter of the pebbles they mimic.

Like the swollen stems of cacti the obese leaves of silverskins, with countless extra water-storing cells, form efficient reservoirs which enable the plants to live through the long periods of drought characteristic of their arid homeland. Not only this but the two leaves together make a near-spheroid form which, from an architectural standpoint, has not only the greatest possible storage capacity within for water but also possesses a minimum of evaporating surface. In the desert where conservation of life-giving moisture is of prime necessity these two features are "musts" if a plant is to survive.

The plump leaves of silverskins are far removed from the thin flat leaves of the majority of plants familiar to us. Two leaves represent a tremendous reduction from the state of having many

leaves, yet that was the original set-up among mesembs as is shown by the more conservative cousins of stone plants, where the possession of many leaves is the rule. One might add that such rock-ribbed conservatives, exemplified by the types with many leaves, live under more normal conditions of rainfall. Different though they may be yet the queer-shaped but efficient storage leaves of stone plants came into existence simply through gradual evolutionary change down through the centuries. What causes such striking adaptations to appear remains to be explained yet from many types of botanical evidence it can readily be proved that this evolution actually did take place. Moreover a biologist might suggest too, and plausibly, that the desert environment has been an important force in directing which of the many evolutionary changes that occur would best fit the desert mold and thus survive. Certainly thin and delicate leaves would fit no desert mold and hence would perish. The proof is that in no desert are thin leaf types ever found; they have been eliminated in the struggle for existence; on the other hand succulent leaves and desert conditions go hand in hand. In short, succulent leaves have made the grade when it came to the test of being able to survive in the desert.

Even more extremely adapted to arid conditions are the paired leaves of a cousin of the silverskins, the cone plants (*Conophytum*), whose species often spot the quartz patches with

Top: Pink flowered Conophytum minutum, a species forming small colonies on the quartz patches in Namaqualand. Bottom: Conophytum minutum, as it appears on its native quartz patch.



equal obscurity. Like Siamese twins the leaf-pair of a cone plant has become so closely fused together through evolutionary change as to look, when viewed from above, like a single insignificant pale green globe. Instead of the silverskin's slit this globe of the cone plant has only a tiny central fissure to indicate where two leaves were once separate. It is obvious that in this matter of leaf fusion the cone plant is one evolutionary step further advanced over cousin silverskin, for, as a more perfect sphere, it is more efficient as regards water storage and evaporation.

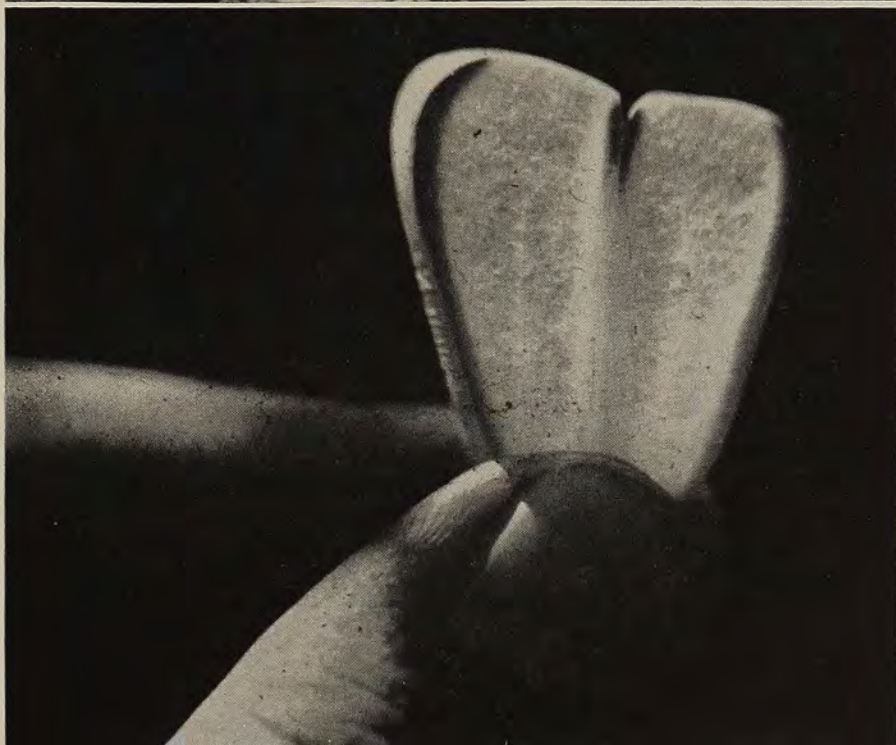
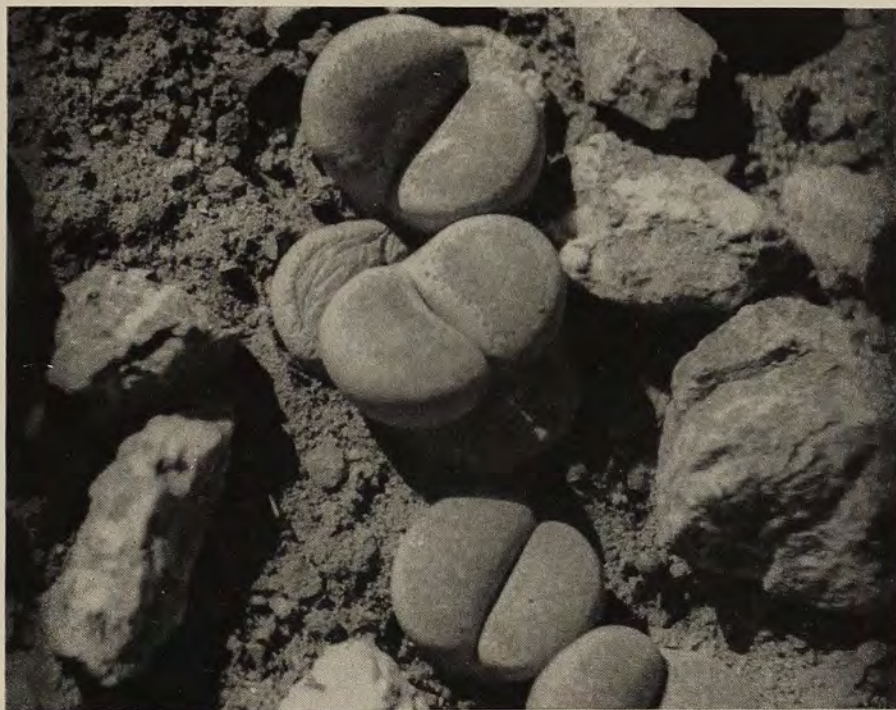
Besides serving as efficient reservoirs of water, the leaves of silverskins and cone plants—as well as those of many of their relatives among the succulent “mesembs”—are among the leading as well as original examples of “mimicry” in the plant world. For not only are they shaped like stones but they also have the very color of the stones among which they usually grow. Mimics such as these are the counterparts among plants of the numerous and perhaps more familiar examples that one finds in the animal world, especially among insects, where are to be found such oddities as bee-flies, walking sticks, “dead-leaf” butterflies, and the like.

A strange fact, too, is that the stone-like plants actually appear to be limited in their distribution to the patches of white quartz. A person can wander away from the patches onto the darker soil and look “until blue in the face” for an *Argyroderma* or *Conophytum* but usually without luck. Back on another quartz patch and they again show up. The underlying soils, in which the plants are rooted, are the same whether bare or whether covered with a rubble of quartz yet the silverskins and their confrères seem to “select” only the

quartz-covered sites. What does this mean? Can plants “choose” where they want to grow? Certainly not! What happens is that seed of these stone mimics germinates wherever it falls or is carried. Seedlings germinating on darker soil, away from the patches, are conspicuous because of their light color and so are most likely to be eaten by animals, but most of those lucky enough to start germination on the quartz usually live on, reasonably well camouflaged, and living proof of the general efficacy of their mimicry. Other factors yet uninvestigated may also play an important part—for example dark soil may absorb more heat than white, highly-light-reflecting pebbles; seedling stone-plants may not be able to cope with the former condition.

At least one stone plant when transplanted out of its native arid environment, sheds its disguise and assures a form more like that of most normal plants. In so doing it is perhaps reverting to its ancient ancestral form that it had before South Africa had become so arid. This apparently “mutable” species is not a “mesemb” at all but a curious stonecrop, *Crassula columnaris*. South Africans call the plant, *koesnaatje*. Like other stone-like succulents this little *Crassula* inhabits the desert quartz patches but in the Little Karroo rather than in Namaqualand.

Of golf-ball size, little *koesnaatje* is similar in its spherical shape to other stone plants. But it has become adapted not, as in the stone-like mesembs, by losing all but one pair of swollen storage leaves, but rather by keeping all of its leaf-pairs. The latter, imbricated like shingles on a roof, are fitted together so tightly that they are hardly recognizable as leaves at all. Moreover they have a yellowish-brown cast which tends to match them the more



Top: *Lithops olivacea*, one of the classical "flowering stones." Bottom: A single plant sectioned longitudinally to show transparent central core of "window tissue," which is also utilized for water storage.

with the rust streaks of the quartz pebbles between which the plants are accustomed to grow.

A distinguished South African botanist had, at one time at his home in Capetown, a dozen *koesnaatjes* growing in a small box in some of their original soil. Visitors were invited to count the number of plants in the box but so well were they camouflaged that not one ever guessed the correct number at the first attempt! Even when in flower the plants blend with their surroundings, for the multitude of tiny flowers are white like the pebbles. But all this fine mimicry is lost when a plant of *Crassula columnaris* is moved out of its natural environment. Under abnormal humid conditions the typical ball form is modified through the elongation of the stem into a small but erect green column on which the leaves are no longer imbricated but rather loosely arranged. It was apparently a plant of this type, grown perhaps under humid greenhouse conditions away from its native arid Karroo, which caused botanists to give it the misleading name, *columnaris*.

All the stone plants described thus far would be wonder enough, but there are related genera which are even more amazing. For although silverskins, cone plants, and *koesnaatjes* mimic to a remarkable degree the color and shape of the quartz pebbles, some of their close cousins accomplish not only this but add the ability to mimic stone texture as well. Witness the genus *Lithops*, whose very name means "stone-like"; or the spotted stone plants of the genus *Pleiospilos*, whose leaves look like angular fragments of granite. The paired leaves of *Lithops* are flattened on the top, and, to better match the surroundings, they are irregularly wrinkled resembling the very texture of the surrounding rocks or

soil. Species of this genus are not limited to white quartz patches but grow in a variety of desert soils, which may vary a good deal in color. The strange thing is that whatever the soil color—whether yellowish sand, grayish shale, or ferruginous earth or stones—the wrinkled and flattened tops of the leaves of the several species of *Lithops* leaves always seem to match. Down through the years it would appear that the environment has been selecting only those variations which showed the best camouflage.

Stone mimicry was first noted in this genus some 130 years ago when William Burchell, well-known explorer-naturalist of his day, while journeying across the Karroo near the town of Prieska, noted a curiously shaped pebble on the desert and stopped to pick it up. To his surprise it proved to be as he later wrote:—"A plant—in colour and appearance (bearing) the closest resemblance to the stones between which it was growing—by (its) form and colour—this little *Mesembryanthemum* may generally escape the notice of cattle and wild animals." *Lithops turbiniformis* ("top-shaped stone appearance") is the name now given to the plant Burchell had discovered. Another traveller to the Karroo was accustomed to make periodic trips across the same stretch of desert gravel only to find during the course of one of these jaunts that, incredibly, hundreds of what he had believed to be pebbles had suddenly burst into blossom and were supporting colorful yellow flowers. Of course his "pebbles" were actually stone plants (*Lithops Lesliei*).

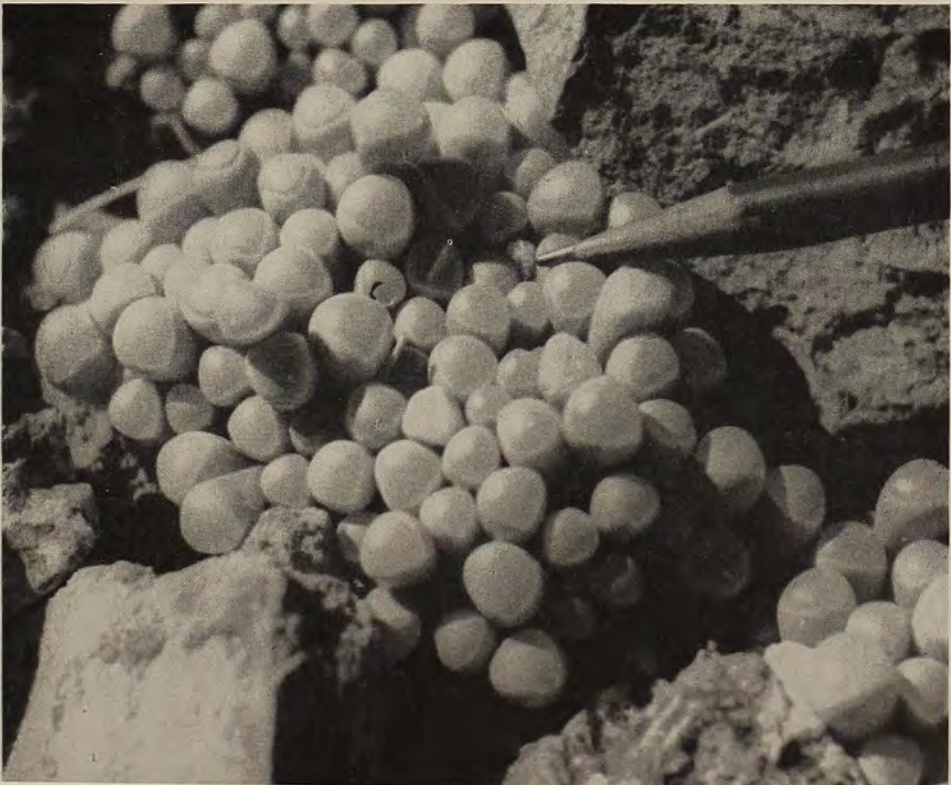
Species of *Lithops* as well as *koesnaatjes* tend to be buried in the soil, with the result that only the flat tops of their leaves show from above. Of course stone plants cannot dig actively and so bury themselves. Seedlings ger-



Close-up of some silverskins, *Argyroderma* aff. *brevittubum*, near Van Rhynsdorp. The yellow flowers open in midafternoon in May.

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Fenestraria rhopalophylla, showing the triangular central "windows."



minate on the surface of the ground but during the period of growth to maturity they undergo regular and severe droughts during which their slowly fattening leaves shrink somewhat in size through desiccation. At the same time the growth of the stem upwards, particularly at the time when the new leaves appear, is prevented by active contraction and shortening of the root. In this way the plants actually are drawn deeper into the surrounding soil until, after a period of years, only the top surfaces of the flat leaves are to be seen. This method of growth is not limited to mesembs like *Lithops* but is shared by other South African succulent groups, for example the liliaceous plant *Haworthia truncata* and certain dwarf spurges such as *Euphorbia Susannae* of the Karroo.

This subterranean habit does not merely help to keep the plant better hidden from the eyes of predators but it is also helpful in another way. By being buried the total evaporation surface of the leaves is reduced; and water, that might otherwise be lost if the leaves were entirely above ground, is thereby conserved. Unfortunately this adaptation has also a bad feature, for the leaves of plants—and including of course even the strange looking leaves of stone plants—are primarily living factories for synthesizing the food materials needed for growth, flowering, and the production of seed. All leaves must have sunlight. A partially buried leaf loses some of its photosynthetic surface even though such reduction of surface serves the purpose of conserving moisture. Strange as it may seem some stone plants have been able to get around the horns of this vegetable dilemma by an unusual improvisation. Evolutionary adaptation has resulted in the construction of a sort of "skylight" in their leaves. This

has not been as difficult as it sounds for the leaves of most succulent plants are made up of a thick core of transparent water-storage cells, completely covered by a thin, more or less opaque layer of the green photosynthetic tissue—the food manufacturing cells. All that had to be done was to eliminate the green layer from the flat tops of the leaves and the result would be a sort of built-in skylight to admit light. This is just what evolution has accomplished in most species of *Lithops*. Acting exactly like the windows of a house, through which passes daylight to diffuse into and lighten all corners of a room, so these unbelievable tiny windows, composed of thousands of transparent living cells, transmit life-giving solar energy down into the interior of the stone plant's fleshy leaves. There it is reflected not upon the outer but rather the inner surface of the green mantle of chlorophyll. A novel and yet highly efficient way to counteract what otherwise might have been a disastrous consequence of the subterranean habit.

Skylight windows are not limited to the genus *Lithops* but are shared by about a half dozen genera among the *Mesembryanthema*. *Fenestraria*, of the sandy wastes of the Namib of Southwest Africa, takes its name from its fenestrated leaves, with their clear triangular "panes," making this one of the most famed of the so-called "windowed-plants."

For all their artifice and mimicry, stone plants, surprisingly enough, still fall prey to sharp-eyed (and probably even more important, keen-nosed) desert marauders. Their tasty succulence makes them eagerly sought out, often at night, by all sorts of animals preferring a vegetable diet. Troops of baboons have been seen stalking over the quartz patches inhabited by certain of

these plants. Antelopes, tortoises, hares, and especially ostriches—to say nothing of man's domesticated stock—are all proven enemies of South Africa's flowering stones. Man, too, must be counted an enemy. In the past Hottentots were known to relish the fresh-plucked plants, and even today the children of the Boers of the Karroo are not beyond nibbling on these little toes "toontjes"—as they call them—of the desert gravels.

But to man's credit is the fact that many flowering stones, in their position of cultivated ornamental plants, have been assured by him of perma-

nent protection against all enemies. The bizarre forms of these plants plus the beauty of their radiant flowers coupled with their petty space requirements—some of the species even thrive in the sunny rainless desert supplied by a three-inch flowerpot placed upon an ordinary south-facing windowsill—have made them the special pets of the connoisseur of succulents. It may be a far cry from Namaqualand or the South African Karroo to America but perhaps it will be on your own windowsill where you will first glimpse a "stone" in flower!

*A large quartz patch near Lemoenshoek in the Little Karroo. Note how the "Ostrich Toes," *Gibbaeum pubescens*, is limited to the patch. Also abundant on this patch, though invisible to most eyes, are *Crassula columnaris* and *Euphorbia susannae*.*





Top: *Crassula columnaris*, sterile plants as they appear growing on a quartz patch near Lemoenshoek in the Little Karroo. Bottom: *Crassula columnaris*, in flower, near Lemoenshoek in the Little Karroo.



Top: *Euphorbia susannae*, showing the rosettes formed by the branched tips. Near Lemoenshoek in the Little Karroo. Bottom: Plants of *Crassula columnaris* and *Euphorbia susannae* dug up to show proportion of subterranean parts. Little Karroo.



Top: *Piaranthus* aff. *mennellii*, a desert asclepiad with tuberculate leaves mimicking pebbles. Bottom: *Pleiospilos bolusii*, with leaves that resemble angular granitic stones.

Luxuriant Desert Exhibitions

LESTER ROWNTREE

Thanks to winter rains, last spring's wild flower display on the deserts of the southwest was as spectacular as any during the past thirty years. It was, as it always is, spotty, for desert rains are likely to be local. Between comparatively barren areas miles upon miles of solid colors overlaid the glistening sand-and-gravel floor enticing me along one narrow, dusty, but completely rewarding, side road after another to draw off onto flower-strewn opening and to wander through places of mysterious emptiness and sheer beauty.

Scents add enormously to desert joys. In no other flower field is the air so filled with aromas of foliage and blossom. The first drops of sudden rain release the invigorating odor from creosote, *Larrea tridentata* var. *glutinosa*, in the afternoon the white, green-flushed trumpets of Desert lily, *Hesperocallis undulata*, discharge their heady fragrance, a little later those sections where large-flowered white desert evening primrose, *Oenothera deltoides*, congregates with desert verbenas, Abronias, are flooded with perfume. One sundown my nose led me to an alluvial fan glowing with soft mauve of thistle sage, *Salvia carduacea*. The plants were over two feet tall and the ground between them was surfaced with equally redolent *Lupinus odorata*, lower growing, erect, deep rich purple and one of the desert's most endearing lupines. Another evening was spent in the sweet company of evening primroses and desert verbenas which packed the sand between feathery creosotes. The Abronias were pink *A. villosa* and the much paler, *A. pogonantha*.

One early morning which was out-

standing for its continued show of color harmonies yielded me a solid sheet of wee desert plants, some so smothered in bloom as to give the idea of entire foliage absence. Among them were *Gilia parryae*, in blue and in white; *Eriophyllum wallacei*, yellow and violet colored; and the bristly desert *Gilia*, *Gilia setosissima*. The poppy flowers capped erect seven-inch stems which rose from neat basal clusters of finely cut gray-blue leaves and over this glittering assemblage floated a lilac phlox-like canopy of tall *Gilia davayi*.

Free of seed bags and collecting paraphernalia, I concentrated last spring and summer on plant communities and on the March and April deserts, took abundant notes on plant groups sharing the same rocky gulch or pieces of mesa, dry wash or mountain slope. To really know such a group it is necessary to live with it night and day, to watch the effect of dying and returning light on plant colors, to notice the movements of flowers and leaves, and the shifting moods that come to growing plants. It is necessary to observe the animals that visit the plants, note what humming birds and insects come to pollinate them by day and what moths hover over the blooms and suck their nectar at night. Nowhere does the play of light signify more than it does on the desert. In a few moments light movement can make distant mountains seem close or far, black or white, blue or pink or purple, and light can suddenly, or slowly, change the appearance of one's intimate plant companions.

A March desert community I returned to again and again was a nar-

row draw between two mountains of rock. These small mountains were painted to the top with violet, yellow-centered flowers of *Phacelia fremontia* and the large pure blue bells of *Phacelia campanularia*. Towering above these gay annuals were thorny, almost leafless, canes of ocotilla, *Fouquieria splendens*. Each cane ended in a red tongue of waxy bloom though few of the tongues were yet fully in flower. The water which, during winter storms, had streamed down the floor of this draw, in some places only one foot across at the base, had long since disappeared. At its mouth, where the sides drew away and increased breadth let in the full blast of eastern sun, I counted twenty species of native plants.

The tallest of these was two foot apricot mallow, *Sphaeralcea ambigua*, which has a wide range of color forms running from white through pale yellow, and redder shades to the usual brilliant scarlet. Below the mallow blossomed a nine inch plant of ground-cherry in that rich but pale and soft tone of yellow so useful as a peacemaker among vivid colors and so thankfully greeted by the field worker a little bored by a preponderance of strong hard yellows. The color of this *Physalis crassifolia* is a delightful corn yellow lying between what the second volume of the Royal Horticultural Colour Chart calls chrome and nasturtium orange. A beaver-tail cactus, *Opuntia basilaris*, sprawled in front of a rock on the bottom of this infant cañon and the brilliant cerise of its large flowers dominated its immediate neighborhood.

Above this rock the long slender stems of California chicory had worked its way up through the silvery mound of an incienso, *Encelia farinosa*, bush and their beautiful pointed buds and white dandelion-like bloom had joined *Encelia's* single yellow daisies. From

the side leaned large, glistening, yellow-centered heads of white tidytips, *Layia platyglossa*, with white rays, handsomely notched. Snuggling between two rocks below these grew a fourth daisy, *Perityle emoryi*, its small yellow-eyed blossoms almost hiding the vivid green leaves. Breaking in on this clique of composites were the flashing flower stems of desert paintbrush, *Castilleja angustifolia*, and with them they brought the bold yellow of *Coreopsis bigelovii*. The whole community was shot through with the sky blue spires of *Delphinium parishii*, a desert flower which last spring was unusually plentiful. When minted together with the intense blue of annual chia, *Salvia columbariae*, and the large flowers of desert aster, *Aster abatus*, in pale blue-mauve, lilac-mauve or dark bright purple-blue, this larkspur is a striking thing. All the pebbly spots not peopled by taller folks were filled with small fry. Among these an impish annual monkey-flower, *Mimulus bigelovii*, was the most pushing and myriads of its flat solferino purple faces grinned up at me as I moved about trying to do the impossible—step without treading on blossoms.

After a preview of this glowing colony it became apparent that the real beauty of the gathering was the sand blazing star, *Mentzelia involucrata*. Last spring most plants of this blazing star were two feet across and eighteen inches tall. Their beauty was bewilder-

All illustrations accompanying this article were prepared from photographs made by the author.

Top: Mohavea confertiflora, Ghost-flower. Bottom: Mentzelie involucrata, sand blazing star.



ing for they possess an ethereal quality few other flowers have, though the desert, often considered harsh and graceless, is strong on refinements of a very delicate nature. The ghost flower, *Mohavea confertiflora*, an annual, has something of sand blazing star's unique and silky charm but it can not match this *Mentzelia* for exquisite polish. There is a pinkish tinge in the smooth silver stem of *M. involucrata*, and this glossy sheen is repeated even more perfectly in the peerless flower which is a large cup neither white, nor cream, nor pink, but suggested all of these colors. Finely penciled lines of vermilion run up from the center of the blossom and the base of the deep cup is filled with creamy filaments holding pink anthers.

Like the yellow flowers of *Mentzelia lindleyi* of hot foothill slopes, an annual sometimes going by the name of *Bartonia*, and a common ingredient in popular mixtures of California wild flowers, those of *M. involucrata* stay open for most of the day and partly close toward night. The two blazing stars of eastern states are *Liatris scariosa*, a plant of dry roadsides and fields, producing tall wands of magenta-lilac or violet flowers, and *Chamoelirium luteum*, of swampy grounds. This one has stems crowded with small white fragrant flowers and yellow stamens. These two plants are quite unrelated to *Mentzelia* of the west, all of which belong to the Loasa Family. Do not be misled by confusion arising from common names. Last spring brought all *Mentzelia spp.* in the west out in full force. Some of the lovely smaller-flowered species swept along miles of sandy washes and enchanting Venus blazing star, *M. nitens*, dyed acre upon acre of desert foothills with tangerine flowers atop gleaming white stems.

Now that I seem to be committed to

the *Mentzelia*, I might as well go a little further afield, to the hot shaley slopes and the intriguing banks of mountain rivers, and include the imposing giant of the genus. If you want to find this bonanza at its best roam these spicy places at dawn or early in the evening, or, better still, in the bright light of a full moon, for the flowers are half closed during the day. They remind me of single water lilies with pointed petals in soft lemon yellow. They are filled with long silky stamens of yellow and are carried aloft frosty four-foot stems. Last summer I measured one bush of this, the only biennial of California's dozen of species, and it was five feet tall and seven feet across. Fully spread, most of the blossoms were seven inches wide. When picked and kept in water, the buds on *Mentzelia* stalks keep coming out and as cut flowers they have an unusual appeal.

It is autumn now and I am going back to the desert. All that I shall find left of *Mentzelia*, larkspur, diminutive jewels and all the annual and herbaceous plant life belonging to that dazzling galaxy will be dried stalks in shades of corn and tan. In my baby cañon the mallow stems will look drab indeed and only the blue-gray plates of *Opuntia* will be intact; they will have taken on a still bluer tone. The brave fellowship shed its seed months ago but early next year, rains will coax the seedlings out of the gravel and liberate aromatic scents from the waving branches of creosote.

Top: *Gilia setosissima*, the bristly *gilia*. Bottom: *Aster abatus*, desert aster.





The Confusing *Chorisia* Trees

EDWIN A. MENNINGER

From Florida to Texas to California and elsewhere in warm regions throughout the world is cultivated a Brazilian ornamental flowering tree that blooms usually from October to December. Despite its spectacular beauty it is comparatively rare because it is much too large for most yards. In this country it rarely sets seed, and it does not propagate readily by other means. But the amazing thing, which upsets all the textbook foundations, is that no two of these trees are exactly alike.

Scientifically the tree is known as *Chorisia speciosa* St. Hil., but that is just a name. Every owner of a *Chorisia* tree is sure that his is the real "*speciosa*," and the entirely different tree in the neighbor's parkway must be something else. But until some taxonomist sits down and starts all over again on this genus at the beginning, both these trees and many others equally dissimilar are going to be "*speciosa*" which, fittingly, means beautiful. All *Chorisia* trees described in this article belong to the "*speciosa*" group with this exception:

There are a very few *Chorisia* trees in the United States that have yellow flowers and are not beautiful. They are an Argentine immigrant named *C. insignis* and are described near the end of this article.

Florida parks and gardens boast a good many *Chorisia* trees, but the largest of them all, and one of the most beautiful, is on the Coachman place near Clearwater. It is probably 50 years old, stands more than 50 feet high and is as much across the crown. Here indeed is a bouquet for a giant. But the flowers of this tree are so different, not only in color, but in shape, size, formation and general appearance, from the flowers of other *Chorisia* trees, that the author undertook to determine which was which. Consulting reference books only increased the confusion; not enough authors had ever seen more than one *Chorisia* tree. The first definite progress was made when photographs of three quite different *Chorisia* blossoms were submitted to the New York Botanical Garden for helpful comment. These photographs

Top: Showy *Chorisia*, *Chorisia speciosa*, Type I(a). Center of flower white with yellow markings. Petals streaked with red and pink. Outward tips of petals bright, glowing pink. Staminal column white, with top crown dark and drooping. This tip corresponds to Schumann, but the petal shape, flare and arrangement do not. This photograph is of Mrs. H. L. Byers' tree, St. Petersburg, Florida, seedling from the Coachman tree near Clearwater, Florida, the old Byrd McMullen place. Pasco Roberts Photo.

Bottom: White Lily *Chorisia*, *Chorisia speciosa*, Type II. The flowers much resemble a lily, as they are pure white with dark pink streaks toward the center. The petals are shorter than in Type I, and they tip forward rather than flare backwards as in the other. The staminal column is broken at the head, but is solid for most of its length. This photograph is of a tree in the Christian Science churchyard at Stuart, Florida. The flowers are identical with those of very large trees in the court house yard at Fort Myers, Florida, of which this is a scion.

The petals in this photograph resemble those in Schumann's drawing.
Coutant Photo.

are reproduced in connection with this article. Mr. Joseph V. Monachino of the Garden staff offered these observations:

"The three photographs look like those of three structurally different flowers, the Swinglehurst tree and the Christian Science Church tree of a similar type, although not identical, and the Montgomery estate tree of a much different kind.

"The flowers of the specimens filed in our herbarium under *C. speciosa* also display marked divergencies. Your specimens could be placed here if the variation is accepted to be of a single species. However, the identity of some of our material is questioned, and the group appears to be in confusion. The deeply split filament tube of the pink-purple flower (Swinglehurst tree) suggests *Ceiba* rather than *Chorisia*, but the filament tube of the pink flower (Christian Science Church tree) is also partly split. The size, shape and color of the petals also seem to vary.

"The photograph of the Swinglehurst tree you sent resembles the photograph of *Chorisia pubiflora* appearing on Plate 1 of Dawson's article (G. Dawson: 'Las especies del genero *Chorisia* cultivadas para adorno en la republica Argentina.' *Revista Argentina de Agronomia* 2:1-10. 1944), but the petals look narrower, their margins are more wavy and the stamens are more erect. The united staminal tube shown in your photo of the Montgomery estate tree is as it should be in *C. speciosa*, according to description. The flower of the Christian Science Church tree is not in complete agreement with either of the other two but is closer to the Swinglehurst tree. This divergence does not, however, necessarily prove specific differences. What it does indicate, I do not know.

"Dawson suggests that *C. pubiflora*

is very close to *C. speciosa* and may possibly be a case of mutation.

"The group must be carefully studied or revised to permit any conclusion, in my opinion. This would necessitate better herbarium material than what we now have. Not in a position to borrow specimens from other herbaria and do special study in *Chorisia* myself, I scouted around to see whether any one else would care to work with the genus. Neither my colleagues, nor the visiting botanists I have spoken to, care for the job at the present time.

"You have previously sent individual flowers, and now the three photos. If you will collect for us, good herbarium material of the three trees, that is, complete specimens, attached flowers and leafy branchlets ample enough to fairly cover a 15.5 by 11.5 inch sheet, this material could be deposited in our herbarium. It will constitute a permanent record of the problem we have encountered, and may help suggest to some botanist revisionary studies with the genus. Then, there will be some return, at least for the time and effort I and others who have attempted to aid us, have devoted to the subject."

Growing out of this correspondence, the author has spent two years collecting information and photographs of *Chorisia* trees in various parts of the world, and these are here presented as the basis of a better general understanding of the genus, and a more detailed study of its peculiarities in the future.

The author has arbitrarily separated *Chorisia* trees by the flowers into "showy, white lily, and pink lily" types which correspond to the Montgomery, Christian Science Church and Swinglehurst trees discussed by Mr. Monachino, in that order. Also presented is the "purple *Chorisia*." Because none of these four corresponds with any de-



Nixon Smiley Photo

Showy Chorisia, *Chorisia speciosa*, Type I(b). Like Type I(a) except disc at base of staminal column is mottled and inconspicuous instead of bold and pure white; staminal column is colored but crown is pure white, flared and not drooping. This picture was taken on the Robert H. Montgomery place at Coconut Grove, Florida.

gree of accuracy with K. Schumann's illustration of *C. speciosa* in the original study of the species, that artist's conception is also reproduced.

In the descriptive matter which follows, emphasis is placed primarily on

the differences encountered, because it is these which are the cause of the existing widespread confusion.

Chorisia speciosa St. Hil., sometimes called the FLOSS-SILK TREE, is indigenous to Brazil and the Misiones



G. E. Maul

Shozey Chorisia, *Chorisia speciosa*, Type I(c). Like both I(a) and I(b) except base of staminal column is heavily colored and petals do not overlap.



Top: Pink Lily Chorisia, *Chorisia speciosa*, Type III. Like Type II except that the staminal column is broken half its length, the petals narrower, more pointed, less undulate, and the outside half of the petal is bright pink. The streaks are red or dark pink. This flower is from the H. B. Swinglehurst tree at Stuart, Florida. Coutant Photo. (Ruler should denote top of illustration. Ed.)

Bottom: Purple Chorisia, *Chorisia speciosa*, Type IV. Like the preceding except the filaments are completely free, and the petals are bright pinkish-purple, fading to light pink and white in the center. This picture is of flowers on a tree at the McCutcheon nursery, at the Goosepond, St. Petersburg, Florida.

Pasco Roberts Photo.



region in Argentina, and is widely cultivated in both countries. Its spectacular crimson or pink or white five-petaled flowers are bigger, the palmate leaves are larger, and the trunk is fatter than in other species of *Chorisia*. Most trunks are heavily studded with stout, sharp thorns as the accompanying illustration indicates; these may disappear with age, Hoehne says, in some trees; in others they are entirely absent from the start. Among the hundred or more *Chorisia* trees the author has seen the only completely thornless specimen is in the Goodwin Memorial Park at Fort Pierce, Florida. It was severely damaged in the August 1949 hurricane but is recovering.

There is a wide variation in the color, size, shape and arrangement of the flowers. Note the confusion of color among these authorities:

Engler & Prantl: "Flowers are red violet, on yellow background with dark streaks."

Britton: Puerto Rico: "Flowers violet red."

Bailey's *Hortus Secund*: "Flowers yellowish, striped with brown at base."

Jose Augustin Maldonado, University of Tucumán, Argentina. "The flowers are crimson, but there are wide variations in the rosy color of the petals, and in the flutings at the base of the flower."

Dr. Teodoro Meyer, University of Tucumán: "Rosy flowers."

Michael Grabham in "*Flowers Seen in Madeira*," p. 51: "Petals oblong, all shades of purple, brown spotted at the base."

G. E. Maul, Museu Municipal do Funchal, Madeira: "Colors vary from very pale mauve, almost creamy-white, to fairly dark purplish-red with yellowish inner halves."

Observer in India: "Deep pink with yellowish and brown stripes at the

base."

Observer in Texas: "Dark rose pink turning to white at the base."

Observer in California: "Flowers are pink, brown and yellow."

The flowers were described by Karl Schumann, in *Martius. Fl. Bras.* 12³: 206-207. 1886, as follows:

CALYX campanulate, 1.5-2 cm. long, glabrous outside, 3-5 lobes.

PETALS 4 or 5 times as long as calyx, 7-9 x 2.2-3 cm., obovate-spatulate, undulate in lower part, white-tomentose outside, violet or red inside, and near base punctate and striped with black, emarginate.

STAMEN TUBE almost equalling petals, 7-8.5 cm. long, yellow; staminodia 5-7 mm. long.

One specimen in the herbarium of the New York Botanical Garden is marked: "Deep rose pink, basal part white, blotched with narrow oblong purple spots."

In an effort to separate these confused descriptions into general types, the author suggests this preliminary outline:

SHOWY CHORISIA: TYPE I—All those with backward flaring, bright pink petals.

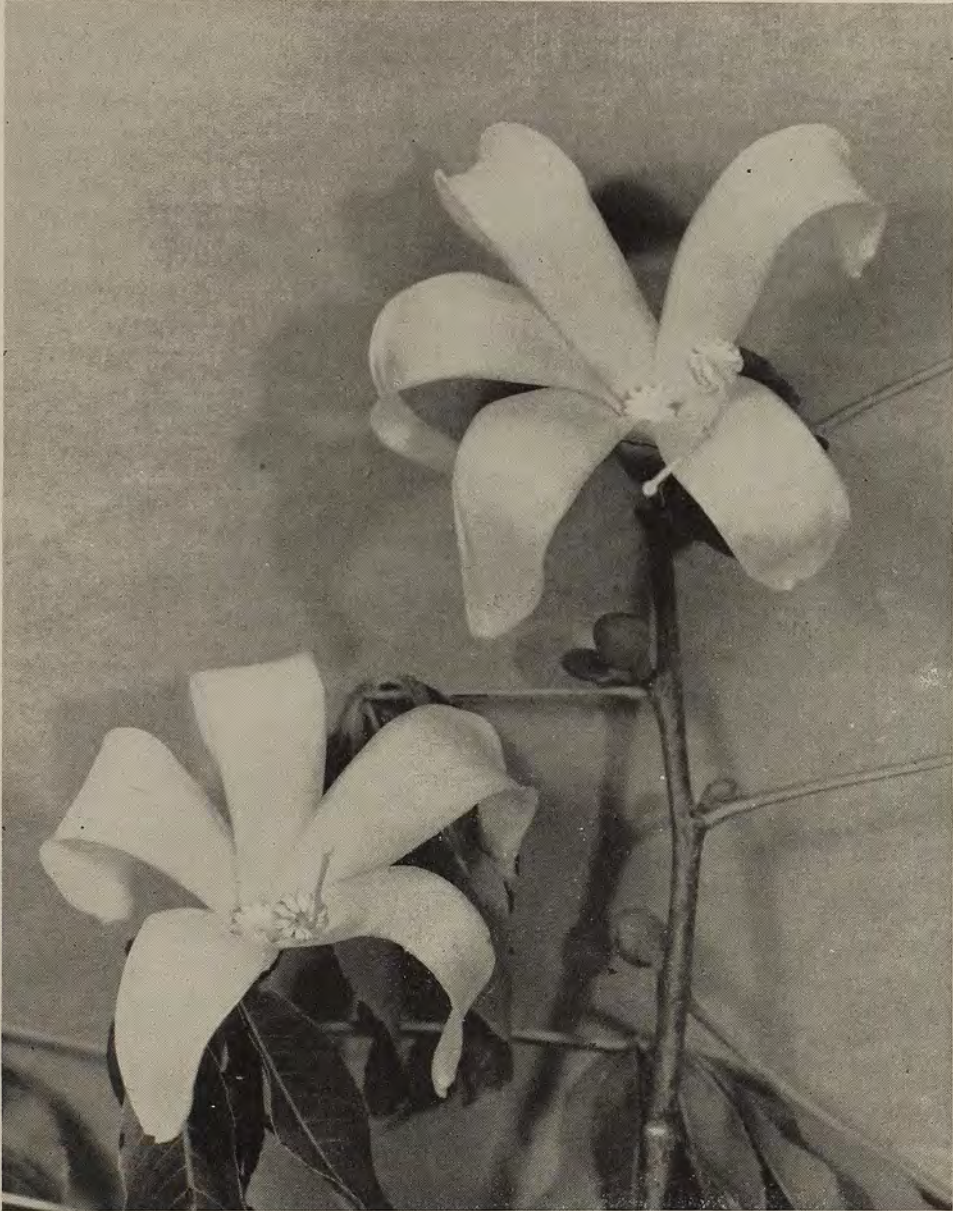
(a) staminal column white; crown dark, drooping, solid.

(b) staminal column colored, crown white, split, flared, not drooping.

(c) staminal column colored, petals not overlapping.

WHITE LILY CHORISIA: TYPE II—Petals tipped forward, white or shell pink with pink or red markings; filaments partly split.

PINK LILY CHORISIA: TYPE III—Like Type II except filaments split half-way down, petals narrower and more pointed, bright pink on outer half.



Lamm Photo

The Samohu Chorisia, *Chirosia insignis* H.B.K. This flowering branch was taken from a thirty foot spreading tree at the Boynton Landscape Company's nursery at Boynton Beach, Florida, in the summer of 1951. It is believed to have been planted about 25 years ago by Alfred Kay of Palm Beach. The petals when fresh are clear butter yellow. The branch bark, like the trunk, is dark green. The flowers with petals extended are about five inches across. There is another specimen of this species at the old Zill homestead in Delray Beach, Florida, with similar flowers except style is exerted only one-half inch instead of two inches as in this illustration. Neither of these trees has ever set seed.

PURPLE CHORISIA: TYPE IV—

Like II and III except filaments are completely free; ends of petals bright pinkish-purple, streaked. Petals overlap left-handed instead of right.

Probably all the older flowering specimens of *Chorisia* in the United States were introduced by the United States Department of Agriculture through the Plant Introduction Garden at Coconut Grove, Florida; the Plant Introduction Numbers are 88221, 104108, 118374 and 139276.

SHOWY CHORISIA IN INDIA.

At the Forest Research Institute, Botany Department, New Forest (Dehra Dun), U. P., India, the officer in charge, Mr. M. B. Raihade, makes these observations of *Chorisia speciosa* Type I in cultivation there:

Flowers deep pink with yellowish and brown stripes at the base.

Petals long, strap-shaped, narrowed at the base, pubescent on the back.

Petals stand out more or less straight.

Edge of petal may be termed crepy.

Staminal tube united its full length.

Collar at the end of staminal tube white, darkening later; solid.

Style extends beyond the collar about $\frac{3}{4}$ ".

Base of trunk thorny, thorns not shed; branches thorny.

SHOWY CHORISIA IN TEXAS.

At the Baker-Potts Nursery, Harlingen, Texas, Mrs. Marie P. Kornegay reports on her *Chorisia speciosa* Type I, as follows:

"We obtained our tree from the U.S.D.A. (originating in Sao Paulo, Brazil), and it has done very well. It reached 20-25' high and 12-18" diameter when a very severe cold spell in 1948 cut it half way back. It again reached 25' and was hit pretty hard by cold in December 1950, when in full

bloom. It was frozen to the ground in that storm, but has made good recovery and in September 1952 it was again 15 to 18 feet high. It appears to sustain no lasting damage. It has never set seed. The flowers come in November-December. The flowers are a dark rose pink turning to white at the base, and resemble a single white hibiscus in many respects. I believe there is little or no fragrance."

SHOWY CHORISIA IN MADEIRA.

RA. G. E. Maul, Museu Municipal do Funchal, Madeira, writes as follows:

"Regarding *Chorisia*, this tree is very common here in parks, avenues and private gardens, and the predominant colour of the flowers is a bright pink with a creamy-white inner half of the petals which is mottled with brown. The enclosed photograph is of a representative of the most common type. On the other hand, colors vary from very pale mauve, almost creamy-white, to fairly dark purplish-red with yellowish inner halves. I have never seen a yellow flower. The seeds of one and the same tree may produce any of these aforementioned shades of colours.

"The petals generally stand at a right angle to the pedicel of the flower, but sometimes they reflex and fall back slightly.

"The tree trunks are generally quite straight, only some showing a slight tendency towards a bottle shape during their younger stages. The colour of the trunk is dark brown only in very old and large specimens, otherwise it is bright green. They are always very thorny and sometimes, in large specimens, the main roots become visible above the ground, but I have never seen any forming buttresses, as in *Bombax*."



Chorisia speciosa St. Hil. A—Flowering branch. B—Staminal tube. C—Base of same, cut lengthwise. D—Apex of same, cut lengthwise. E—End of tube. F—Ovule. G—Seed. From Engler and Prantl, *Die Natürlichen Pflanzenfamilien*, after K. Schumann, *Bombaceen der Fl. Bras.*

SAMOHU CHORISIA. *Chorisia insignis* H.B.K.

Simplest separation is accomplished by calling these the yellow-flowered *Chorisia* trees. Native of Peru and northeastern Argentina, this species has three recognized forms, differing as the result of ecological conditions under which they grew. Dr. Teodoro Meyer of the Miguel Lillo Institute, in his book, "*The Indigenous Trees Cultivated In The City Of Tucumán*" (1947) says that the cultivated specimens of *C. insignis* in the city of Tucumán, Argentina, are of two distinct forms, one with flowers whose yellow petals have chestnut-colored blotches on them, and the other whose whitish-yellow petals are without spots. An entirely different form is found in the driest parts of Argentina where the tree's appearance is grotesque because the trunk swells enormously in the middle to give a pronounced bottle shape. This misshapen enormity has perhaps given rise to the native name "Drunken stalk." (*Palo borracho*).

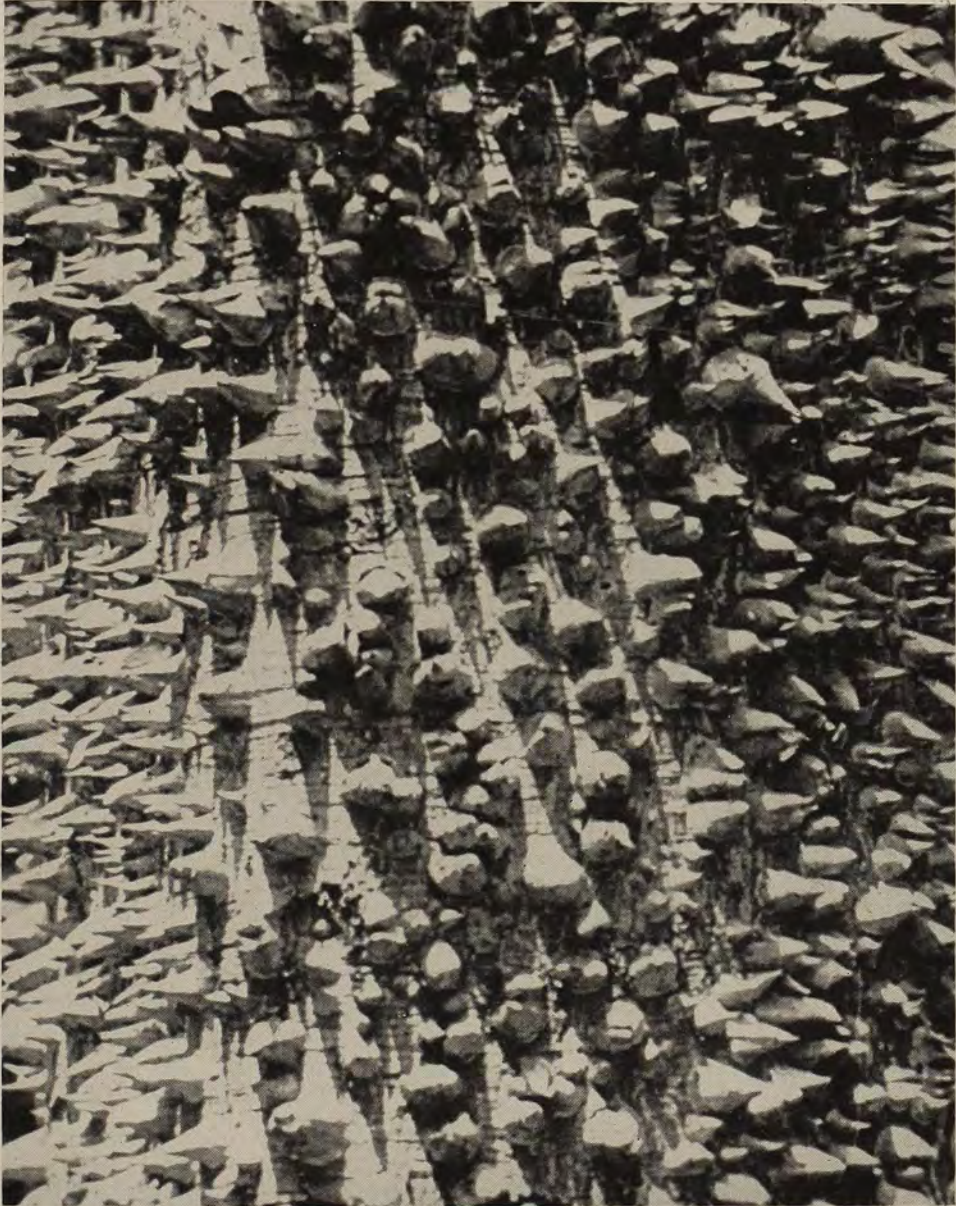
This *Chorisia* regardless of the type, would scarcely be classed as an ornamental flowering tree. Its over-fat trunk, sometimes to 6 feet in diameter, with the smooth green bark covered with stout spines or cones, seems too big for the tree, even though it occasionally rises to 50 feet, for the crown is open and rather sprawling. Sometimes the spines disappear as the tree ages.

The color of the flowers depends on which type is being described. Kunth was not describing the same tree as Meyer when he recorded the color of the petals as "pale pink margin, center yellowish." Bailey calls the petals "yellowish striped with brown, about the size of those of flowering dogwood." Sturrock describes the tree at the Harvard garden in Cuba as having "large,

open creamy-white flowers."

Genevieve Dawson (*Revista Argentina de Agronomia*, II (1); 1-10, 1944) separates *C. insignis* H.B.K. from the other species cultivated in Argentina by its white flowers. The author notes concerning it "ésta especie, es bien conocida por sus flores blancas o marfilinas." In *Bull. Jard. Bot. Buit.* 3 (6): 201 (1924), *C. insignis* is also separated from the other species by its white flowers, "petala alba vel ochroleuca."

In the face of these divergent records of the flower color, be it recorded that the tree at Boynton Beach, Florida, which is pictured with this article, has flowers from July to November that are a beautiful golden yellow, without spots, streaks or marginal improvements. This fades to whitish-yellow, streaked, when the blossoms become quite unattractive; they hang on, and give the tree an untidy appearance. The tree at Delray Beach, Florida, is very similar; the flowers are the same bright yellow. The only readily discernible distinction is that the style on the Boynton Beach blossom extends two inches or more beyond the staminal tube (see illustration); the Delray Beach tree has flowers with the style extended only one half inch. Herbarium material from both of these trees was examined at the New York Botanical Garden and was reported "in size of flower and shape of petals" to match material filed under *C. insignis* in the herbarium there. In view of the fact that on the Florida trees the color of the petals quickly fades in the sun from clear butter yellow to a streaked yellowish-white, is it not understandable that examination of herbarium material would adduce the conclusion that the flowers were white before they were dried? Neither of these Florida



Pasco Roberts Photo

*Spines an inch or more long, sharp and fat, cover the trunks on most *Chorisia speciosa* trees. They are most persistent when the tree is young. Sometimes they are entirely absent. This photograph was made in the Sunken Gardens, St. Petersburg, Florida.*

trees has ever set any seed pods and efforts to propagate vegetatively have been unsuccessful.

Botanists' descriptions of *Chorisia insignis* are so widely different as to suggest they were talking about differ-

ent trees, whereas actually they probably were observing varying types of the same tree. For example, contrast Kunth in H.B.K. Nov. Gen. Sp. 5: 231. 1821, with Karl Schumann in Martius, Fl. Bras. 12³: 206. 1886.

	Kunth	Martius
Shape of leaflet	obovate-oblong	oblong or obovate-oblong
Apex of leaflet	acuminate	cuspidate
Base of leaflet	cuneate	round or acute
Margin of leaflet	faintly undulate-crenate towards apex	revolute, apex serrulate
Petals	spatulate, obtuse, emarginate, silky-tomentose outside, pubescent inside	oblong, obtuse, not undulate. 5-6x1.7 cm. Outside whitish tomentose, inside tomentulose.

There have been several introductions of *Chorisia insignis* into the United States, notably P.I. 42292 and P.I. 82220 by the U.S.D.A., and the author has distributed trees he raised from seed received from Argentina in 1946. Other than the trees at Boynton Beach and Delray Beach, he has no record of flowering specimens in the United States.

OTHER SPECIES OF CHORISIA.

In the Index Kewensis, only two other species of *Chorisia* are recognized. One of these is *C. crispiflora* H.B.K. (Syn. *C. ventricosa*), a tree to 75 feet in the coastal area of Brazil. Losing its leaves in February-March, the flowering season, "its large pink flowers make it a very showy tree." Petals are 8-9 cm. long, 11-14 mm. wide. Common names for it in Brazil are "Barriguda" and "Paineira." This species is also reported as introduced to Kenya Colony, Africa, "with large pinkish-red flowers; does well up to 6500 feet." This tree is not in cultivation in the United States.

The other recognized species is *Chorisia soluta* from Guatemala, which is unknown here. And now the confusion is resumed. *C. rosea*, listed in In-

dex Kewensis, probably should be *Ceiba rosea* Seem. K. Sch. One of the collections in the herbarium of the New York Botanical Garden is titled MORONG 1075. This originally was named *Chorisia speciosa* and cited as such in Mor. & Britton's *Enum. Pl. Paraguay*, but it was re-named *Ceiba pubiflora* K. Schum., by Britton & Baker in the *Journal of Botany* 35:176 (1896). Hassler, in B. H. Boise 2 (7): 176 (1907) cites the same number as *Ceiba Glaziovii* K. Schum. G. Dawson cites it as *Chorisia pubiflora* (St. Hil) Dawson.

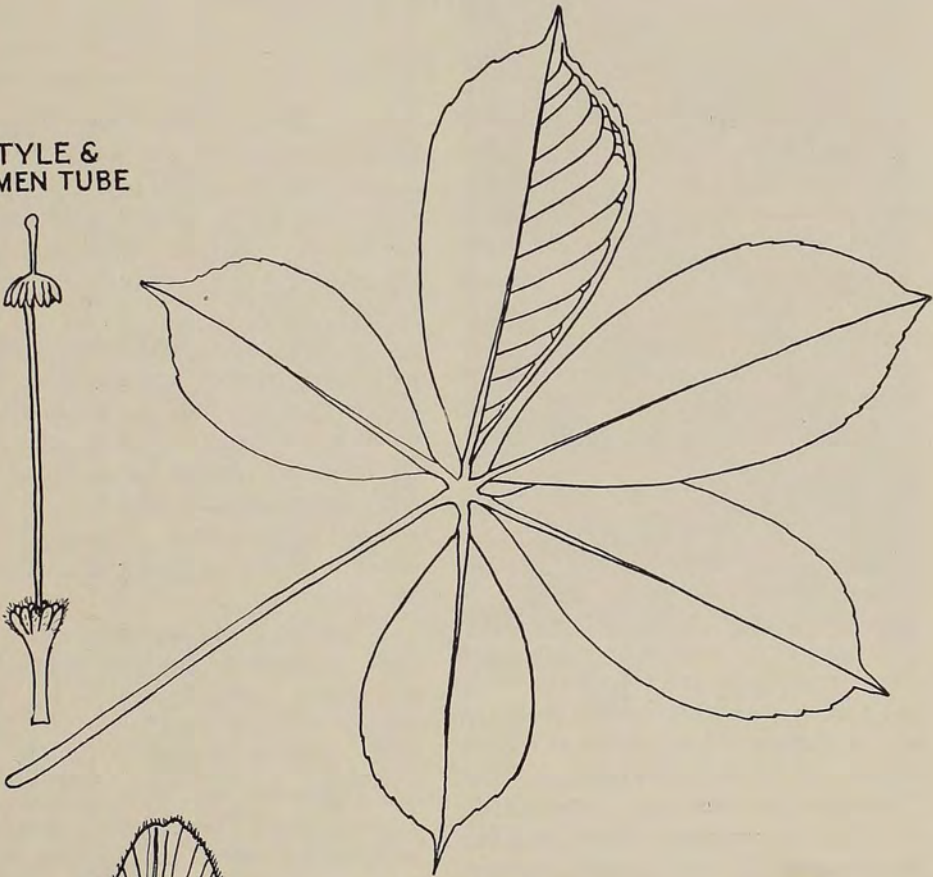
Until some scholar makes a systematic study of the genus *Chorisia*, there will continue to be a wide difference of opinion on which species is which.

ACKNOWLEDGMENTS

Grateful acknowledgment for assistance in obtaining data for this article is given not only to those individuals mentioned in it, but to Miss Mary F. Barrett of Bloomfield, New Jersey, Morgan Evans and Dr. Samuel Ayres Jr. of Los Angeles, Pasco Roberts of St. Petersburg, Florida, and Dr. Jose Augustin Maldonado and Dr. Teodoro Meyer of Tucumán, Argentina.

CHORISIA INSIGNIS KUNTH

STYLE &
STAMEN TUBE



LEAF



PETAL



CALYX

Drawing from H.B.K., Nov. Gen. & Spec. 5:t.485.1815.

Concerning Episcias

PEGGIE SCHULZ

Due to the rise in popularity of the *Saintpaulia* other members of the Gesneria family are becoming increasingly popular. GESNERIACEAE is a large and varied family consisting of about 1,100 species. Many of these are herbs, a few are shrubs, and growth habits range from herbaceous climbers to a number of trailing or stoloniferous plants: among the latter we find the genus *Episcia*.

This genus is comprised of about thirty species. Before the last decade these plants were seldom, if ever, found in any but the most extensive private collections or as material in botanical gardens. They have slowly infiltrated window gardens and now there are at least eleven different varieties that may be purchased from a few special dealers. Proof of the increasing popularity of these intriguing plants lies in the fact that they are acquiring a variety of common (and as usual, far-fetched) names; among them begonia-violet and flame violet.

Episcia is derived from the Greek word *episkios* meaning shady and furnishes us with a clue to their successful growth.

Although Episcias do bloom several times a year their chief charms lie in their luxuriant, colorful foliage and their ability to reproduce through their pendulant shoots, or stolons.

Episcia fulgida is the variety most often found in greenhouses, plant counters, and window gardens. The leaves, under proper growing conditions, will expand and approximate those on home-grown specimens of Gloxinias. Bold color and design make up the foliage on this variety. The basic leaf texture is pebbly and copper

colored. Brilliant chartreuse veins cut through the leaves and mark them in a most interesting manner. This plant sends out many stolons and usually blooms in March or April and continues to flower at intervals during the summer months.

The flowers are bright red, covered with hairs, tubular, and the petal edges are sharply serrated. A halo of silvery dew-like substance clings to the center of the petals. If the air is moist and the room reasonably cool these flowers will last about a week. Toward the end of the week the pistil emerges from the blossom and it is ready for fertilizing.

E. coccinea has leaves of dark metallic green three to four inches long and often three inches wide. This plant is sometimes sold under the name of *E. metallica* or even *E. fulgida*.

E. cupreata has hairy leaves of a coppery tinge. A well-grown specimen includes an overall cast of blue in the color scheme of its leaves. It has been my experience that the stolons on this plant generally shoot straight up in the air as if looking for a rooting spot before they finally give up and begin their descent toward earth.

E. cupreata var. *viridifolia* has smooth, glossy, green leaves and is considered by many growers to be the best bloomer in the lot.

E. cupreata var. Silver Sheen is a really outstanding variety. The leaves are a soft cream and the margins are rusty brown. The whole plant has the appearance of being touched with frost. Flowers on this variety are pale orange shading into yellow and have darker speckles in the center, extending into the throat.

E. chontalensis has the smallest leaves of any of the *Episcias* in my collection. It does not grow from one husky main stalk; the whole plant is made up of cascading stolons. The slender pointed leaves are green shading into a faint brown at the margins. Although I have never had this plant flower for me the blossoms are reported to be light blue and fringed.

E. lilacina is new in my collection and has not had sufficient time to get well established. However, it looks just as promising as the other members of the genus. The leaves are somewhat thinner than some of the other varieties, lightly haired, slightly pebbled, red bronze in color. Flowers on this variety are rather large for an *Episcia* and are blue.

E. splendens is another smooth leaved variety. The leaves are pale green with markings of silver.

Species Number One is an unnamed variety featuring large, glossy, silvery green leaves with a wide band of cocoa-brown around the edges. The leaves are so shiny they appear to have been sprayed with oil.

Species Number Two has hairy leaves with a near rose colored midrib.

Species Nova is similar to *E. fulgida* in coloring but the leaves are much smaller and it is a bushier plant.

Nautilocalyx tessellata, more commonly known and usually referred to as *E. tessellata*, is listed here because of this practice and its allied generic relationship. It does not grow in a rippling cascading fashion as do the real *Episcias*; instead, it grows upright. The leaves are long, very wrinkled, heavy olive-green shaded into bronze on the upper side and flushed with wine on the underside. The flowers are pale yellow and borne from the axils.



Mass. Hort. Soc.

Episcia splendens

All *Episcias* can be propagated by leaf cuttings, plant divisions, stolons, or seeds. If any of the vegetative methods of propagation are used it is best to employ the aid of a close container for rooting. They appreciate warmth and humidity at all times and especially so when these severed portions are expected to produce new progeny. A covered fishbowl makes an ideal incubator.

When the leaves or stolons are well rooted they should be planted in loose fibrous soil. Here is a mixture I have used successfully: equal parts of rich loam, sand, peat moss, and rotted leaf-mold. The addition of small pieces of charcoal will help aerate and condition the mixture. When potting allow plenty of drainage in the pot.

If *Episcias* are being grown in a home where the temperature is constantly kept at seventy five degrees or

over they will most certainly have to be supplied with extra amounts of humidity in order to thrive. They do well when grown pot-in-pot method. The larger or outer pot should be lined with sphagnum moss and the smaller pot containing the plant should be placed into it. If the moss is always kept well moistened it will help keep the edges of the leaves from drying and shrivelling.

Although a north window helps *Episcias* produce leaves of excellent color and substance there is seldom enough light in this spot to bring about any amount of flowering. *Episcias* need the east sun or rays from fluorescent lights to push them into bloom.

Episcias lapse into a semi-dormant period in the winter. As fall nears the older leaves begin to curl and die back and there are no new ones to take their place for at least three months. Advanced growers usually keep a supply of rooted stolons on hand to be potted when the old plants want to go into hibernation. As the leaves start falling the mature plants can be cut back to an inch from the soil line and new plants propagated from all the material that has been removed. If small amounts of moisture are administered weekly to the remaining stalk new growth will appear in about two months and from that time on it will need the treatment given full grown *Episcias*. I often store these barren appearing plants in a terrarium where the moisture is held at just the right degree and they need little or no care

during this winter sleep.

Since Mother Nature has seen fit to equip these plants with such a wonderful vegetative reproduction system they do not set seed as readily as do many other house plants. I have never found their seed offered in any list sent me from anywhere in the world. Occasionally we do hear of someone who maintains they have found the plants rather easy to fertilize. If you are the adventuresome sort and want to try your hand at it the procedure is simple. Fertilization is accomplished by transferring pollen from one flower to the stigma of another. The seed ripens in about six weeks, and is as fine as dust. It has to be treated like seeds of African Violets or *Gloxinias*, and is sown in a covered dish on chopped sphagnum, vermiculite, sterile sand or any other medium that has proven satisfactory for other fine seeds. Germination usually takes place within two weeks and the plants are ready for transplanting into "community pots" or pans when they have two good leaves. They are ready for individual pots after a sixth leaf has grown. It is difficult to set a time limit on this as individual growing conditions vary so much.

Sources of supply for plants and/or seeds will be furnished by the Editorial Office of the AHS. Please send stamped, self-addressed envelope for a prompt reply.

A contribution from The American *Gloxinia* Society, Gray, Oklahoma. Mrs. Schulz is Co-Editor of *The Gloxinian*, their official publication. Ed.

Daffodil Section

ROBERTA C. WATROUS, *Editor*

DAFFODIL STARS AS OF 1952

The following notes are taken from an article written for members of the Washington (D. C.) Daffodil Society by Carey E. Quinn, current President. Judge Quinn grows more than five hundred varieties and is constantly testing the new introductions. Space does not permit the reproduction in full of his article, which includes comments on "also good" varieties and other categories in addition to the "stars," however, a limited number of copies of the complete article are available for distribution to members of The American Horticultural Society who request them.

Classification numbers follow the Royal Horticultural Society Revised System for the Classification of Daffodils, published in full in *The National Horticultural Magazine*, April 1952.

EARLY GROUP

1a: Moonstruck. Clear pale yellow trumpet, a deeper colored Content and with Content's superb shape and quality.

1b: Preamble. A perfect bicolor, of real health, with the contrast the better bicolors don't have, yet a real harmony with fine form and finish.

1d: Spellbinder. This sulphury reverse that is better than Binkie.

2a: Armada. Guy Wilson's large tall vigorous red-gold of superb quality, balance, and contrast. Cibola. Grant Mitsch's self in deep yellow, smooth heavy perianth, flaring crown, tall, and looks you in the eye; a daughter of Malvern Gold. Rouge. A medium size jewel gem in gold and red—chorus girl rouge—with the material and poise of an aristocrat.

2c: Silver Bugle. An all white of

heavy material and fine form and finish, turns in a superb score for me every year.

EARLY MIDSEASON GROUP

1b: Content. Everyone knows Content—the lemonade bicolor of perfect shape and style. Trousseau. Or is it a 1c? Doesn't matter, because its smooth finish, fine substance, and form are its features—not its contrast.

1c: Cantatrice. Best of the Beersheba children. An ethereal dainty quality you don't look for in trumpets.

2a: California Gold. A candidate for the best red-gold, a big flower, smooth flat perianth, big bowl-shaped orange red crown with a frill. Tall. Vigorous. Ceylon. Generally accepted as best yellow-red *Incomparabilis* to date. Perianth gold with metallic sheen, goblet cup of deep orange red, smooth, heavy, a worker. Golden Torch. Brodie's great self golden yellow, dividing crown for the finest of its type with Galway. Sun Chariot. Tall, vigorous. Heavy flat, deep gold perianth of pointed outline; sunproof goblet cup of solid fiery oriole scarlet. Tinker. A neat medium red-yellow, brilliant, jewel-like orange cup.

2b: Bizerta. Polindra in bright apricot. Perfect show flower. Jules Verne. A big tall bicolor *Incomp.* with Daisy Schäffer freshness. Milk and Cream. A chilled smooth white perianth, a big flat amber crown with salmon tones. Penwith. Big tall bicolor with a buff peachy cup and gold edge.

2c: Arctic Moon. An old parchment item with a neat rolled crown of fine texture. Ave. I believe this to be the most beautiful moderate size all white Leedsii of perfect form and material I ever saw. Carnlough. A vision in a

perfect white Leedsii with everything including a faint apricot pink shadow in the crown. Truth. Another superb white Leedsii featuring a very broad flat perianth and a trumpet crown. Zero. Snowy white, very large. Flat perianth of pointed petals. Long frilled crown. Perfect balance. Best quality. My favorite Leedsii.

3b: Amateur. Very broad heavy snowy perianth with a flat orange crown. Features balance and contrast.

MIDSEASON GROUP

1a: Dungiven. A light golden trumpet, tall, fair size bloom, perfect shape and texture. Goldcourt. A superb Golden yellow, trim, smooth, balanced. Gold-digger. Another fine golden yellow trumpet with some artful variances. Grape Fruit. Combines size, smooth soft satiny yellow, and exemplary shape. Kingscourt. Here is the reigning queen of golden yellow trumpets—balance, smoothness, everything. Milanion. Tall, clear, deep yellow, appealing, trim shape and balance. Lasts well.

1b: Straight. Snow and citron, good contrast, noble is the word. My pick of the midseason bicolor trumpets.

2a: Alamein. One of those superbly finished fresh red-gold items with a perfect flat clear yellow perianth and a medium cup of sharp orange red. Aranjuez. A perfect yellow-red that is a yardstick in quality and form. Dunkeld. Always a star, intense gold and glistening scarlet. Round. Fine substance. Galway. The reigning queen of self golden yellow Incomps., featuring form, proportion, and substance. Pathan. A very distinctive item in smooth soft yellow perianth, a big saucer crown of blazing solid red-lead scarlet. Royal Mail. One of four finest red-yellow Incomps. at this season. Magnificent exhibition, bright yellow and a large brilliant orange red crown. Tamino.

My standard of measure in perfect gold-yellow Incomps. at this season. Very round perianth, almost flat orange red crown. This one, Dunkeld, and Garland are the circular girls.

2b: Greeting. Starry, carved, snowy white reflexed perianth of best quality with a lemon goblet cup. Polindra. The yardstick still in bicolors, white and lemon yellow. Signal Light. The queen of white-red Incomps. A crown so long held by Flamenco, one of its parents. Statue. A beautiful and larger variant on Polindra, as are Bizerta, Sebastopol, and Tramore.

2c: Ludlow. The yardstick of perfection in formal shape and balance in white Leedsii. Rostov. A fresh looking snowy white Leedsii that shares honors with Ludlow.

3a: Chungking. Who needs a description of the reigning queen of gold-red Barrii?

3b: Masaka. A huge white and solid red Barrii, tall and strong.

7b: Trim. The most perfect Jonquil I ever saw. Trim is the world in gold.

8: Orange Wonder. Here is about the only Tazetta I ever thought a star. A perfect head in perfect white-orange.

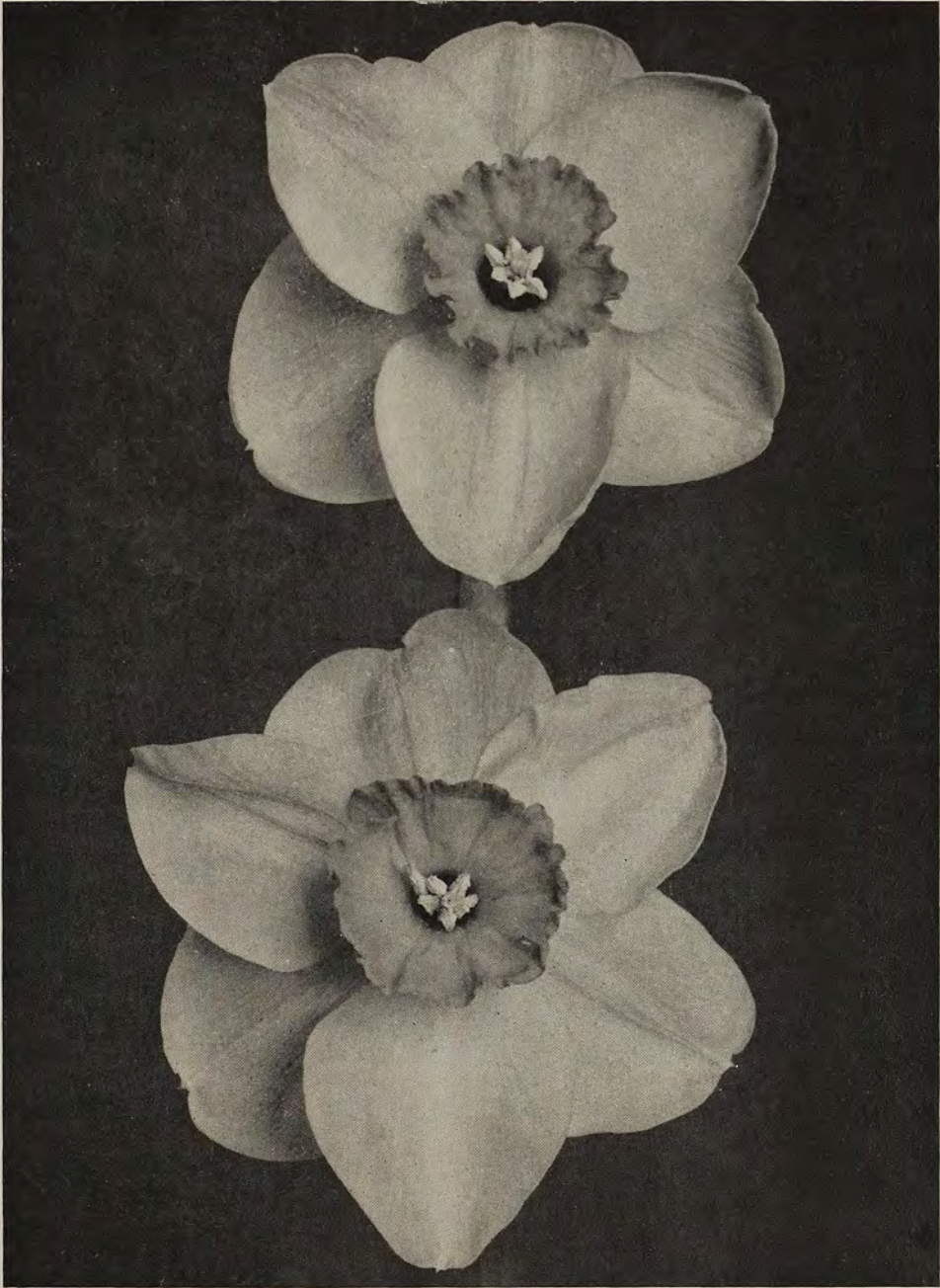
LATE MIDSEASON GROUP

1a: Virginia Wright. Formal perianth, frilled trumpet. Self gold.

1b: Oklahoma. Huge flower. Pure white velvety petals. Big bold intense orange trumpet. You can't pass it.

1c: Broughshane. A big white trumpet featuring form and balance. A sort of yardstick and the parent of many greater, more beautiful things to come. Spitzbergen. Tall balanced aristocratic lady in ivory white and fine material.

2a: Garland. Waxy texture, round soft yellow perianth. Large shallow crown of rich dark orange shading to a gold center. A model flower. Makassar. A large orange gold self with



Robert L. Taylor

Narcissus, Chunking

spreading crown of finest shape and quality. Narvik. Gold-orange-crimson masterpiece in form, quality, and, brilliance. My favorite of the type. Ross-lare. A model gold-orange-red that outlasts any flower I have. Velveten. Glowing velvety sulphur self on order of St. Egwin but better.

2b: Arbar. Rated by many as best white-red. Heavy flat perianth. Saucer-shaped reddish orange cup. I give the nod to Signal Light. Blarney's Daughter. Bigger Blarney with a gold rim on the cup. Buncrana. White perianth and a long peach-orange crown that is frilled. Nothing like it. Green Island. Featuring substance and waxy texture in a large flower with a frilled shallow bowl cup and a greenish lemon margin. Kilworth. A vigorous, contrasty, much improved Hades. Nairobi. Thick smooth rounded white perianth balances a large expanded frilled solid orange red crown. Red Hackle. A perfected Folly—bigger, brighter, better form. Rosy Diamond. A true pink crown, no salmon. Fine white perianth. A smallish beauty. Best true pink I have seen that also rates otherwise.

2c: Glenshane. A big white Leedsii with a shallow saucer crown of pale cream frilled gold. Killaloe. A huge balanced pure white flower featuring texture and substance. Scarva. A vigorous glorified Mitylene with some Green Island in the wide saucer cup.

3a: Apricot Distinction. Heavy true apricot mirrors a burning red cup. Goyescas. A smooth soft yellow perianth. A deeper crown with a red band. Therm. Lemon petals, bright ruby cup—here is a true trim jewel. Win All. A big yellow-red of superb quality and style.

3b: Blarney. Everybody knows this sparkling salmon orange flat cupped Barrii. Limerick. A superb white-red.

Flat intense cherry red cup. Features contrast. Sylvia O'Neill. A Glenshane with pale lemon for a frill instead of gold.

3c: Altyre. A five inch frilled cup, improved Chinese White.

4: Swansdown. A perfect heavy white perianth and a double center of white feathery petals.

7b: Golden Perfection. An all-time great in golden Jonquil hybrids—two perfect trumpets per stem.

LATE GROUP

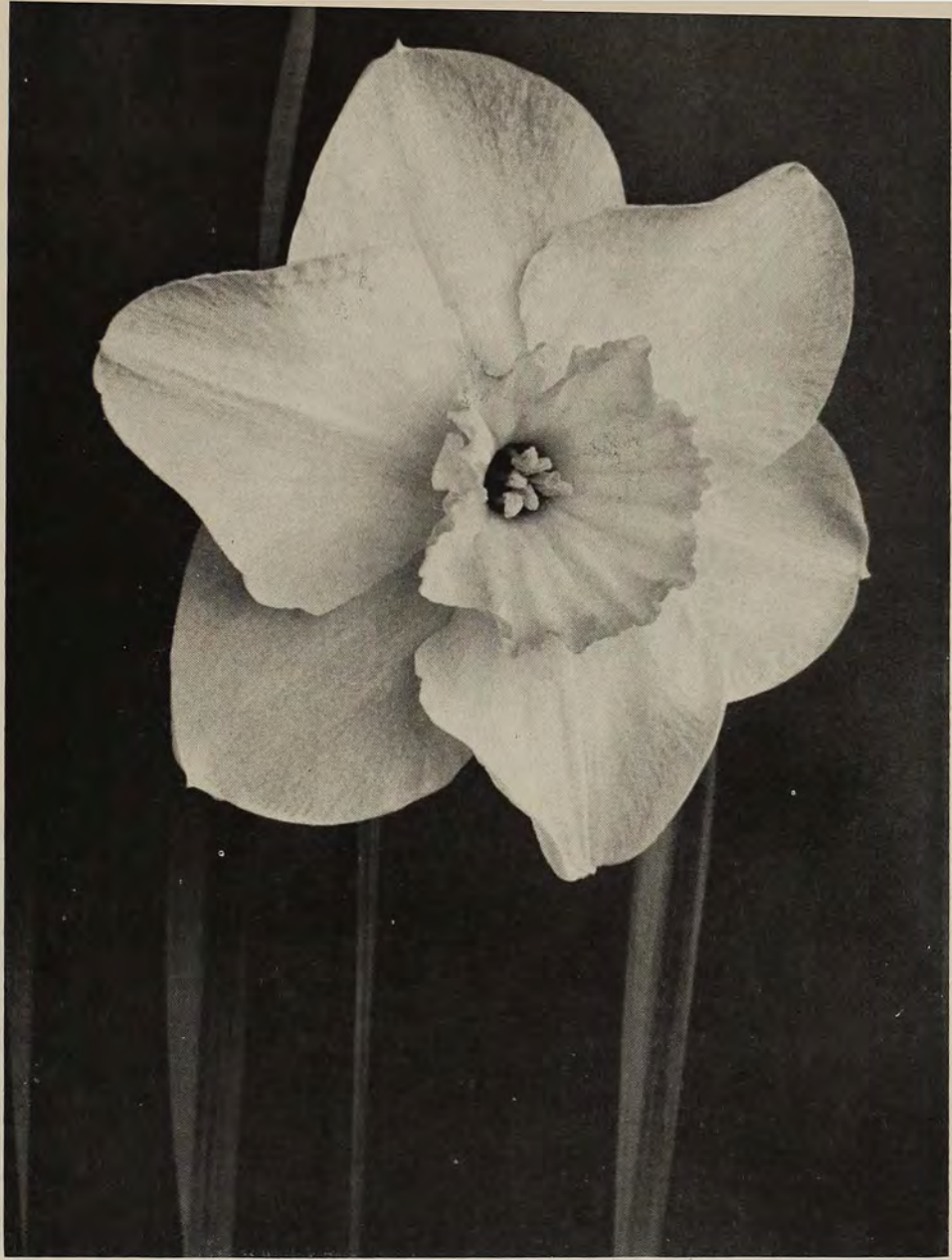
2a: Prince Regent. A later edition of the superb Narvik minus the crown frill. Red Flyer. A very smooth clear yellow, carries a saucer crown of twinkling red.

2b: Killala. A neat flat white perianth. A straight citron crown shaped like a trumpet with an orange-red flanged rim. Small flower. Neat. Rose of Tralee. A Carnlough with a real balanced trumpet-like crown in solid apricot pink. Best of the so-called pinks in commerce. I believe Salmon Trout may be better. Some say Rosario is better. But Salmon Trout cannot be bought, and Rosario was not so fine for me. Satin Queen. A beautiful bicolor—perfect smooth, heavy perianth. Flat yellow crown with orange in frill.

2c: Templemore. A perfect show white in the late column—a rarity.

3a: Russet. Chunking with a primrose perianth and ten days later.

3b: Artist's Model. A trim Australian lass in a smooth perianth and a flat apricot orange crown which crimps in at edges to the perianth. Bravura. A smooth heavy white perianth—and a vivid orange scarlet crown. This and Mahmoud are my favorites of these big Barriis. Crete. Another red-white Barrii of very heavy substance you can't pass over. Glenvar.



Robert L. Taylor

Daffodil, Silvia O'Neill

A bigger, better, more sunproof Lady Kesteven. Mahmoud. Broad, waxy, smooth, snowy perianth. Flattish ruby red crown. What a beauty! Put Satin Queen between this one and Bravura and call it a day. Ortona. Mitylene with a flattish orange red crown and a green center. Big flower. Rideau Hall.

A Mahmoud in pastel tints. A pretty miss. Teboura. A better, bigger Limerick.

3c: Chinese White. A big small-crowned Leedsii, heavy, smooth, round, with a touch of green in the eye. A fresh crystal effect. Cushendall. One of Guy Wilson's many ethe-



Robert L. Taylor

Narcissus, Cantatrice (upper)
Content (lower)

real editions of small Chinese Whites no one can describe. But very beautiful and perfect. Dallas. And here is a bigger, taller Cushendall. Foggy Dew. See those mother-daughter dress sets? Chinese White is Mother. Frigid. Round, cold white, green eye. Portrush. A tall late item, rather

large flower, heavy smooth material, deep green eye in a flat white crown.

4: Cheerfulness. An all-time beauty everybody knows. Shirley Temple. A sort of semi-double white, multiple center segments. Chaste. Heavy material. Yellow Cheerfulness. Cheerfulness in soft yellow.

Mexico—Begonia Treasure Chest

STANLEY SPAULDING

"Once upon a time," in the footsteps of the Spanish conquistadores, botanists and associated plant collectors swarmed across Mexico, describing and collecting new plants. They were assisted by interested missionaries; in fact, one of the earliest known pictures and descriptions of a Begonia was by Fra Hernandez in 1649, before this strange and fascinating genus was officially named. These collections were usually pressed specimens but sometimes seeds made their way back to European and English gardens.

Early in the 1800's such collectors and Ferdinand Deppe and Dr. C. J. Schiede and Ghiesbrecht, Linden and Rogers were finding Begonias of almost all types except true canes. The nearest to those was probably the famous *B. incarnata*, bushy and nearly cane-like, which was so much used in early hybridizing. However, many strange and wonderful rhizomatous types were introduced into cultivation. *B. caroliniaefolia* with palmately compound leaves and *heracleifolia*, also palmate, ancestors of our widely popular "star" type Begonias, are Mexican, as are *manicata* and its variations which have been such staunch houseplants. Then there is the *imperialis* and *pustulata* groups with their intricately textured surfaces in the smaller-leaved types; the *Martiana-gracilis* group—the "hollyhock" Begonias with tubers and bearing bulbils like lilies in their leaf-axils; the large-growing water-lily leaf Begonia *nelumbiifolia* and still others.

From all these one might think the treasure-chest had been exhausted. However, like a true treasure-chest, Thomas MacDougall, New York's ex-

plorer of the back country of Mexico's mountains, pried off this "false bottom" and uncovered a fresh new treasure-trove which he commenced sending back to U. S. Begonia botanists. This started a new wave of interest among collectors and hybridists, which spread even to orchid-hunters like William Brooks, who is now also scouring the southern lands for Begonias.

At this end, Mr. Rudolf Ziesenhenné of Santa Barbara, California, studied Mr. MacDougall's plants and promptly sent world-wide for type-sheets, herbarium specimens and original descriptions of the old Western Hemisphere introductions to prove beyond a shadow of doubt that these were basically different enough to rank as new species.

His next problem in scanning the old material was the meager descriptions and imperfect dried specimens of some. One plant was named a new species on the basis of a single leaf. Such unscientific botany rubbed against the grain and Mr. Ziesenhenné promptly set about organizing a fool-proof system of describing the intricate differences between two Begonia plants.

First he evolved a standard method of drawing the various parts of the plant under study carefully to scale, and then he spent years devising a complete list of physical details which would leave no feature of any Begonia undescribed. So far he has compiled over six hundred points to check against. From this list, with his scale drawings, he writes up the description of the plant in question and then checks off its various features against those of the plants bearing any similarity from their herbarium specimens, type sheets or

original published descriptions, and so, slowly but surely, the duplicates of older named plants are identified and the new one are christened. This information Mr. Ziesenhenné has elected to disseminate through "*The Begonian*" to scientists around the world, such as Dr. Edgar Irmscher of Germany, foremost authority of begonias today who has himself named more new begonias than any other man.

One of the first to meet the tests in 1947 Mr. Ziesenhenné named after Don Maza on whose plantation it was found—*Mazae*. Given something to lean on or a stake, it will grow to about three feet, covered with small soft leaves having a light green dot at the sinus and with darker veins against the sage green, lighter between veins toward the margin while the veins darken to red-brown at the edge. Delicately showered with bloom in late winter and spring, the reddening of the backs of the flowers gives the whole inflorescence almost a Christmas red effect. Hardy and not too large, it has proved very popular as an addition to the fibrous-rooted class.

Since then have come such opposites as the giant *Begonia MacDougalli*, honoring its finder, with flowerstalks 8 feet tall in the wild leaves palmate-compound over a foot across on tall stems; the tiny *Begonia cavum* three inches high and with tiny tubers and strange flowers, found growing in mountain caves; white-hairy *B. hispidavillosa* with green medium-sized leaves; little *B. Boweri* (named for hybridist Connie Bowers of California) the edges of whose dainty green leaves are daubed with black and charmingly eyelashed. Then there were the "ivy-leaved" *B. Kenworthyi* (after the late Eva Kenworthy Gray of La Jolla) of slate grey-green, dusted with pearly "bloom"; its

leaves turn color like some ivy.

B. chivotoa was named for the Cerro Chivato on whose 8000 foot slopes it was found. It is another upright-stemmed plant not as delicate as *Mazae*, with usual height of two-and-a-half feet and smooth, spinach-green leaves with veins beneath traced in Indian red, coming from a husky stem that ages to a woody tissue. The leaves run to about 7 inches long and almost 5 inches wide. The winter flowers are carmine-tinted.

This is one of those plants that contradict the popular conception of this plant family, as it grew on limestone outcrops in collections of humus-soil amid echeverias, sedums, bromeliads, agaves, a dahlia, solandra, some fuchsias, etc., and some of the strange, legendary "Hand-flower Trees," and it likes to go almost dry between waterings, especially in cold weather.

Latest finds were the "dry-stemmed" *Begonia aridicaulis*, another small one, and an interesting vining plant originally described 30 years ago by Dr. A. D. Houghton for the University of California—*B. Purpusii* (named for its finder, Charles Purpus); and still the treasure is not exhausted. While these new importations keep scientifically minded persons happy with the many problems to be solved, they are even more entertaining to the plant hobbyist who can enjoy them from an aesthetic point of view.

A contribution from The American Begonia Society, El Segunda, California. Mr. Spaulding is Editor of *The Begonian*, their official publication. ED.

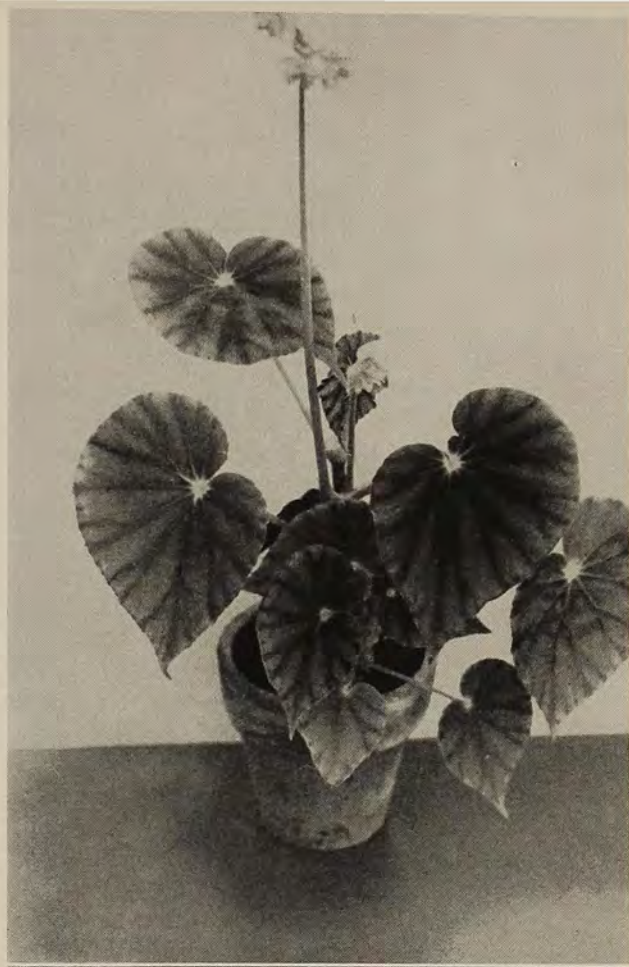
Top: Begonia Mazae
Bottom: Begonia chivota

Ziesenhenné Photographs

NOTICE TO MEMBERS

This issue of THE NATIONAL HORTICULTURAL MAGAZINE is being mailed to all members of The American Horticultural Society having paid their membership dues for the calendar year 1952. It is an acknowledgment to those members having paid their 1953 dues and is a reminder to others that dues for the calendar year 1953 are now payable.

The April issue of the Magazine is scheduled for mailing by April 1 but will not be mailed to members whose 1953 dues are not recorded in the Secretary's Office by March 15.



Recent Advances In Horticulture

FREEMAN A. WEISS, *Editor*

CHEMISTRY AND HORTICULTURE

Shortly after the end of armed conflict in World War II, when plans for peaceful living were again being made, one of the large oil refining companies announced its intention of embarking upon a long term research program on the use of petroleum products and derivatives in agriculture. It may have seemed to some at that time that such a program was superfluous on two counts: 1) that the potential demand for petroleum by-products was already so great in other directions that outlets for them in agriculture were unnecessary; 2) that agricultural production, what with increased mechanization, greatly expanded use of fertilizers (especially nitrogen, now that it would no longer be needed for making military explosives), and the multiplicity of new pest-destroying agents already available, was doing well enough without any further stimulus. Vain thought, that the opening of a veritable Pandora's box, when research in chemistry first seriously asserted proprietorship in the agricultural field, would ever be undone and its outpouring of ills or blessings checked! Nor, by the same token, the constant emergence of new problems and the need for agencies to solve them.

The ensuing years—less than a decade since peace made its illusory appearance upon our horizon—have only fortified this conclusion. In this short time agricultural methods, were it not for the fact that they have been “revolutionized” so many times in the past, could be said to have been threatened several times with violent overturn because of chemical discoveries. First

there was the final conquest of the problem of obtaining “unlimited” amounts of nitrogen from the atmosphere, then the development of synthetic herbicides and innumerable pesticides which promised to make weeds and many kinds of insect pests virtually obsolete. There was the demonstration of successful “foliage feeding,” which demanded an important adjustment in traditional concepts of plant nutrition. More recently there have been applications of antibiotics, hormones, and vitamins, in the stimulation or regulation of plant growth, and within the present year we have again been amazed at the versatility of agricultural chemists, who have now given us Krilium to control the physical nature of some of our soils, and a host of chlorophyll products to do almost anything we would like to have them do. In the future looms the electronic desalination of water supplies, even sea water on occasion, to supply plants in arid regions with the only element that has been lacking to make the desert veritably bloom.

The upshot of all this is that *The National Horticultural Magazine*, which heretofore has been concerned mainly with the art of horticulture must henceforth give more attention to its science, and especially to the interrelations between research in chemistry and horticulture. Therefore, the Editor is establishing a new department of the magazine, which will bear the heading which introduces this article. This column will attempt to present in each issue of the magazine (unless the project is vetoed by our readers) an informative review of certain aspects of chemical research in rela-

tion to agriculture. It will emphasize novelty but not at the expense of verity and conservatism. It will especially eschew the role of an oracle on plant pests and methods of combatting them, for research in chemistry relates to horticulture in many ways as significant or more so than its output of pest killers. And finally, the Section Editor, as well as the Editor-In-Chief, will welcome comments, pro and con, relative to the material presented in this column; will, indeed, even solicit contributions from all and sundry who have in mind something new that they deem appropriate to be told here.

FOLIAGE FEEDING

This refers, of course, to the process of *supplementing* the plant's normal intake of mineral elements (including nitrogen) through the roots by applying a dilute nutrient solution to the leaves. It has no relation to the universal process by which plants feed themselves (and ultimately us) from the carbon dioxide of the air. That is another subject that has interested chemists, and has been investigated experimentally with some success by artificially raising the naturally low concentration (3/100 per cent) of carbon dioxide in the atmosphere. It is, of course, practicable only in enclosures such as a greenhouse or "light box." But we are speaking now of mineral feeding (nitrogen, though a gas, is regarded as a mineral in plant nutrition because it is ordinarily taken up from the soil in mineral combinations) and this is practicable in the open as well as in experimental enclosures.

Plant physiologists have long speculated that an important factor in the oft-observed vitalizing effect of rain, in contrast to artificial watering, upon plant growth is the presence of ammonia, which contains nitrogen, in rain

water. It occurs there as an ingredient of smoke or product of fermentation and electric discharges. Thus the plant's supply of nitrogen may be increased from rain, but whether it is taken up through the leaves or only from the soil is uncertain.

More than 20 years ago it was observed that plants increased in verdure quickly after applications of the nitrogenous compound, urea, to the leaves. A fertilizer based on urea and known as Nu-Green was developed primarily for use on golf greens and is still on the market. In this application, the nitrogen might have been effective both through leaf and root absorption. Subsequently Nu-Green was found to stimulate growth when applied only to the foliage and carefully excluded from the soil by washing from the leaves. This was a new concept in plant physiology, which had regarded the soil as the sole source of the nitrates and ammonium compounds required by plants. Besides, here was an organic nitrogen compound, so-called because it also contains carbon, apparently serving directly in plant nutrition.

In the ensuing years a large amount of experimental evidence has accumulated showing that marked benefit may accrue to plants from the application of nitrogen compounds to the leaves. This is not limited to ailing (chlorotic or nitrogen-deficient) plants, but is a general invigoration comparable to the effect of fertilizer applications to the soil. Azaleas, boxwood, hollies, roses, even shade trees, and many lesser plants have responded favorably to this method of feeding.

The subject has been well reviewed recently by Dr. P. P. Pirone in the *Garden Journal* of The New York Botanical Garden for March-April, 1952. At least one firm has commercialized a general foliage fertilizer under the

name of Rapidgro; it contains phosphorus and potassium in addition to nitrogen, all in water-soluble form. It and Nu-Green are applied in solution at the rate of one pound in thirty gallons, with repetitions at two-to-three week intervals. They may even be combined with certain fungicides or insecticides in a general purpose spray for controlling pests and stimulating plant growth.

Doubtless the organic gardeners will shudder at this perversion of natural nutrition of plants. Or perhaps they will resort to the same process of rationalization by which they classify rock phosphate as "organic" and therefore respectable, whereas superphosphate (which is made from rock phosphate) is inorganic, chemical, and poisonous. By this standard the use of the organic nitrogen compound, urea, on foliage would be acceptable, even though contrary to nature, but to combine it with inorganic phosphorus and potassium would smack of chemistry, and be altogether repugnant. But we, in our benighted state, only suggest that you try foliage feeding and observe the results for yourselves.

ANTIBIOTICS FOR PLANTS

A bare decade after the advent of the first commercialized antibiotic, penicillin, not only has the word be-

come familiar to nearly all the adult population but most of us have been dosed at some time with one or another of the antibiotics which have become almost indispensable in the medical care of human ailments. Their use is almost as extensive with domestic animals, not only in the treatment of disease but as growth-promoting supplements in the diet.

About four years ago the first successful application of an antibiotic to the control of a plant disease was announced. Now comes news of their use as growth-promoting factors in plant nutrition. Several of the antibiotics familiar in medicine, such as penicillin, bacitracin, and terramycin, as well as others thus far known only in the laboratory, are reported by chemists of Chas. Pfizer & Company to have produced two- and three-fold increases in the growth of experimental plants, using dilutions as great as one part of the antibiotic in 900,000 of water. Although the price of antibiotics has been reduced phenomenally since they were introduced, they are still a bit expensive to use as fertilizers. The novelty of this discovery and its possible effect on present theories of plant nutrition must, however, excite our interest.

A Book Or Two

Systematics Of Flowering Plants. Patricia Mann. Pitman Publishing Corp., 2 West 45th Street, New York. 1952. 307 pages, with 182 line illustrations. \$4.50.

Systematics, by co-ordinating all aspects of the study of a plant's existence, forms and ideal foundation to the study of botany. To all other aspects of botany—morphology, anat-

omy, cytology, physiology, ecology, and genetics, it bears a reciprocal relation. No natural classification can be compiled without reference to each, nor can any be profitably studied unless the individual plants have first been classified.

This book begins with an account of the history of systematics and nomenclature, and then deals with the vari-

ous principles involved. Part II demonstrates the application of these principles to twelve families of flowering plants. Part III contains an illustrated glossary of the morphological terms used and Part IV gives practical instructions for floral dissections and the construction of floral diagrams.

The first book of its kind to be published, it should prove of great value to students and lovers of flowering plants.

Plants Of Colonial Days. Raymond L. Taylor. Colonial Williamsburg, Williamsburg, Virginia. 1952. With illustrations by Dorothy L. Park. \$1.25.

The sub-title of this interesting study of plants grown in the eighteenth century American gardens is, *A Guide To 160 Flowers, Shrubs, And Trees In The Gardens Of Colonial Williamsburg.* The author's study covers plants now growing in the gardens of this reconstructed colonial city. These gardens were recreated in their eighteenth century form after painstaking research into the types of plants then used. The book is limited to 160 principal species of ornamental trees, shrubs, and flowers, and does not include cultivated fruits, herbs, grasses, sedges, rushes or "weeds."

The book gives the history of each species, and traces the origin of its name, often back into folklore and ancient medical science. It describes the strange household and medical uses that were made of plants from the days of mythology through the American colonial period. Each plant is illustrated by Miss Park of Dover, Massachusetts, specialist in botanical drawings.

Dr. Taylor was an Austin Teaching Fellow in Botany at Harvard University, did research for the Maine Forest Service and taught at the New York

State College of Forestry. He began this opus while on the faculty of William and Mary College. Dr. Taylor, a botanist, is Assistant Administrative Secretary of the American Association for the Advancement of Science.

Orders for this book should be sent to The Craft House, Williamsburg, Virginia.

Weed Control. A Textbook And Manual. Wilfred W. Robbins, Alden S. Crafts, and Richard N. Raynor. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, New York. 1952. 503 pages, illustrated. \$8.00.

This new textbook and manual is designed to cover the subject of weeds and weed control from the economic and agronomic standpoints, to present a modern view of the rapidly developing field of chemical weed control, and to answer many questions that are constantly being asked concerning the control and eradication of common weed pests.

The material is presented on the college level, but may be successfully used by botanists and agronomists. It gives a balanced and comprehensive coverage compatible with established curricula in botany, ecology, and agronomy. It presents in some detail research upon which much of modern herbicide usage is based.

Changes in this new edition include: 1) Modernization and streamlining of the chapters covering the economics and ecology of weeds; 2) Almost complete rewriting of the chapters on chemical and weed control. Newer chemicals are carefully and adequately covered. References to all pertinent research are included; 3) Material on brush control, aquatic weed control, and pre-emergence methods reflecting the modern trend in chemical weed control; and 4) Revised illustrations

which show recent developments in chemicals and modernization of machinery, particularly the spray airplane.

This book is broad yet fundamental in its approach; it is thorough in coverage; and it reflects the long experience of its authors in research, teaching and practical agricultural extension work.

The book was revised by Richard N. Raynor, Plant Physiologist, Technical and Development Division, The Dow Chemical Company, San Francisco, California; Alden S. Crafts, Professor of Botany and Botanist in the Experiment Station, College of Agriculture, University of California; and Wilfred W. Robbins, Late Professor of Botany, Emeritus and Botanist in the Experiment Station, College of Agriculture, University of California.

My Great Oak Tree And Other Poems

Liberty Hyde Bailey. Chronica Botanica Company, Waltham, Massachusetts. 1952.

This keepsake was issued by the Editor of Chronica Botanica for the Members of the American Institute of Biological Sciences, attending the Cornell University Meetings, September 8-10, 1952. The brochure contains a dozen of Dr. Bailey's poems. Gratis copies may be obtained from the publisher.

Soil Microbiology. Selman A. Waksman. John Wiley and Sons., Inc., 440 Fourth Avenue, New York 16. New York. 1952. 356 pages, illustrated. \$6.00.

The biological, physical and chemical activities of the soil in which microbes are involved are discussed in detail by Professor Waksman. The author surveys the nature and abundance of microorganisms in the soil and reviews the important role they

play in soil processes. Dr. Waksman describes the general flora and fauna of the soil, the decomposition of plant and animal residues, the formation of humus, and the transformation of various elements essential for plant growth.

He deals further with the general applications of soil microbiology to other fields of knowledge, especially soil formation and fertility, plant nutrition, and crop production. Recent developments in the field and the most promising lines of future research are also pointed out. *Soil Microbiology* replaces the well known book entitled *The Soil And The Microbe* written by Dr. Waksman and Robert L. Starkey which was published by Wiley in 1931.

Dr. Waksman is professor and chairman of the Department of Microbiology at Rutgers University. Noted the world over for his discovery of streptomycin and other valuable antibiotics, he has devoted over thirty years to intensive research.

Seaweeds And Their Uses. V. J. Chapman. Pitman Publishing Corp., 2 West 45th Street, New York 36. New York. 1952. 287 pages, 20 halftone plates and 52 text illustrations. \$6.00.

Dr. Chapman has written a very reasonable book and has succeeded admirably in his avowed intention as expressed in the preface, as far as this "general reader" is concerned for he has no personal interest in seaweeds nor does it seem likely that he will ever live where he could take such an interest first-hand. Whether the reader with "technical knowledge" will be as happy, we do not know.

The author clearly defines his field and goes about his business of telling where seaweeds of possible economic importance grow, what has been done with them in the past, whether on the folk level or on attempted levels of

commercialism. He suggests whether or not some of the latter schemes are promising. Seaweeds as food, medicine, sources of chemicals, fertilizers, and laboratory products are all treated here and readably.

Now that there is such a rash on books about "the sea" some of the readers who have gushed over the more widely read volumes, might well take a diverting side trip into the present book. There are a good index, delightful pictures including some reproductions of oriental plates, and a group of plates at the end of the volume. The line drawings are beautiful and might intrigue even textile designers!

Our Amazing Birds. Robert S. Lemmon. American Garden Guild and Doubleday and Company, Inc., 575 Madison Avenue, New York 22, New York. 1952. 239 pages, with 102 illustrations in black and white by Don R. Eckelberry. \$3.95.

This volume, sub-titled, *The Little-Known Facts About Their Private Lives* is most appropriately named, bringing to the minds and hearts of all bird lovers a wealth of delightful and astonishing results of careful observations of our feathered friends, both water and land. The illustrations are splendid and, to the minds of those who have enjoyed field "birding," all are extremely accurate and beautiful.

For more than a hundred of our interesting birds the author has covered various phases of their ways of life—an accurate description of each as to coloring, habits, food finding, of mating, nesting, songs, and migration.

The author reminds us of the importance of protecting, through establishment of refuges, some of the very rare birds that are nearing extinction. It is a book of absorbing interest to the initiated in bird lore and should be stimulating to the novice. It is recommended as a means of cheer for shut-ins. The American Garden Guild could do nothing finer than its part in making this splendid work of a fine author available to bird lovers everywhere.

Mr. Lemmon has been a life-long bird student and was fortunate enough in his youth to be under the tutelage of Frank M. Chapman. A graduate of Yale University, he has been devoting his time for the past thirty years to editing, writing, and lecturing in the fields of agriculture, gardening, and nature. Mr. Eckelberry is one of America's young painters of birds. He has been a staff artist for the National Audubon Society and recently did the illustrations for the *Audubon Bird Guide* and the *Audubon Water Bird Guide*.

MARY G. VAN METER

The Gardener's Pocketbook

A Portable Propagating Case For Greenhouse Benches

The small commercial growers and those home gardeners who have a small greenhouse frequently find it difficult to supply the conditions necessary for propagation without sacrificing much needed growing space. Usually cuttings are rooted on an open bench, subject to the temperature and moisture conditions that prevail throughout the entire house. Frequently, a newspaper or cheesecloth laid on top of the cuttings is the only attempt at protection. Since such conditions scarcely approximate those found in the low, humid and warm propagating houses of the commercial propagators, the cuttings require more attention and the results are often mediocre. At the U. S. Plant Introduction Garden, Glenn Dale, Md., a lightweight, portable, propagating frame has been developed after several years of use and is now recommended generally for converting open greenhouse benches into adequate, temporary, closed beds. These units are inexpensive, easily constructed and will greatly aid the grower in his propagation work.

DESIGN AND CONSTRUCTION

The case illustrated here is made up of 1" wood stock, joined with angle irons. A unit four feet long is suggested as convenient for handling and the width of the particular bench used for propagation. The frame slopes from 4" at the back to 2" at the front thus permitting water to run off the cover and the narrow frontpiece is less likely to interfere with the placing of cuttings in the rooting medium. The cover is framed with 1" x 2" material fitted with 14 mesh wire screen cloth which is imbedded in moistureproof

plastic. This type of glass substitute is lightweight, shatterproof and durable. In addition, it cuts down the light intensity over the cuttings.

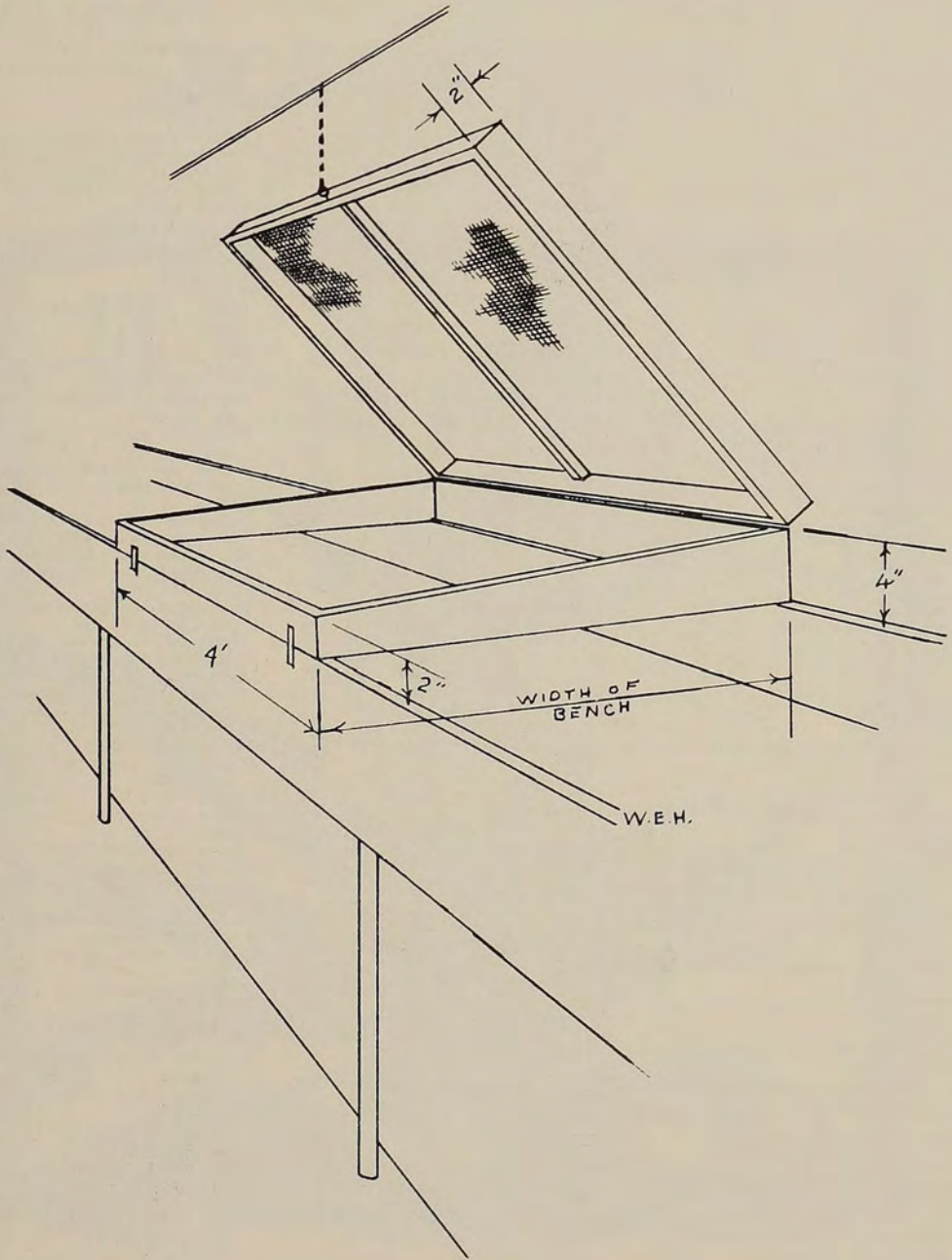
The case is aligned with the bench by means of flanges, two near the ends of the front and one at the center of the rear of the frame. The lightweight cover is conveniently held open by attaching it by a chain to a wire running along above the bench. For durability and finish, aluminum paint has been very satisfactory. The over-all weight of the case is approximately 22 pounds and can be easily shifted from one location to another by one person. Since the frame sits on top of the bench, it is desirable to fill the bench to the top with the rooting medium and to place glass strips down along the sides of the frame into the medium to give added insulation.

USES

The frames are most useful for rooting cuttings. However, for delicate seed, the case has been found to be equally desirable as a germinating chamber. Frequently, when plants are moved from a propagating house to the open bench, wilting and loss of leaves occur due to the change in temperature, light and humidity. Placing one of the units over such material and gradually ventilating the case will reduce this temporary setback the plants receive.

As a propagating bed, the case prevents the rapid drying of the rooting medium and the loss of high humidity around the cuttings. It also acts as insulation against heat loss, eliminates drafts and prevents the unnecessary wetting of the cuttings when adjacent potted plants are being watered.

JOHN L. CREECH, *Glenn Dale, Md.*



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