THE AZALEAN

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AZALEA SOCIETY OF AMERICA

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Dr. Charles H. Evans, Editor

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IN SEARCH OF NATIVE AZALEAS

Henry T. Skinner
Washington, D.C.

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NEW YORK AND WESTWARD

A check of the flowering guide at this stage indicated the need for northern samples of the early species and for more westerly collections of both these and *R. calendulaceum.* Accordingly on May 26th a route was chosen via the Pocono Mountain area of northern Pennsylvania to the Finger Lake region of central New York for Pinxterbloom and Rose Shell Azaleas—or for what passes as these two species after their too rapid or too sociable post-glacial trek to the Carolina Hills of Ithaca. They were here in abundant bloom, in excellent color and in oft-proved hardiness but both species are a little more like one another than are *R. roseum* and *nudiflorum* of Virginia—a fact which has worried both botanist and azalea growers of the north on more than one occasion. Good collections of New York State Pinkshell were also made in the entertaining company of Dr. C. G. (Rhododendron) Bowers in the hills above Binghamton.

Travelling southwest into Pennsylvania the same azaleas were now getting past bloom except for some very showy specimens of *R. nudiflorum* in the high and late-season plateau area of Somerset County, Pennsylvania On further into West Virginia *R. roseum* and *nudiflorum* were in flower at higher elevations and in the region south of Morgantown and Elkins *R. calendulaceum* was abundant in the early, large flowered form in shades of yellow to deep orange. Recognizing a possibly parallel situation to that in certain of the native blueberries Dr. W. H. Camp had earlier suggested that orange *R. calendulaceum* in this evidently tetraploid early flowering phase may quite logically represent a species originally derived from early hybridization between diploid red and yellow progenitors. Towards furnishing proof for this hypothesis an evident need is the field discovery of such suitable red and yellow diploid azaleas, if they should still be in existence. The Oconee Azalea is a red with suitable characters except perhaps, its time of flowering, and at this stage of collecting it was hoped that a small-flowered, fairly late, clear yellow azalea might perchance be found on some secluded slope of these westerly hills of the Virginias, Kentucky or in the Ozarks. Anticipating our story we can say that a late flowering diploid yellow was never found, and probably never existed but the diligent though fruitless search for it covered many square miles of territory and was always interesting. A number of unusual yellows actually turned up in West Virginia, in Kentucky, Georgia and Tennessee but always they were solitary plants and usually the product of hybridization between a late phase of *R. calendulaceum* and either *R. arborescens* or *viscosum.*

HYBRIDS

One of the very interesting hybrid swarms was found on June 14 on the eastern slope of Spruce Knob Mountain in West Virginia. The plants were scattered through an abandoned pasture in a region where *R. calendulaceum, nudiflorum* and *roseum* all grew and bloomed together. The progeny of these triple matings were bizarre in the extreme—short and tall bushes bearing large or small flowers in every color from coral pink through salmons to rich lavender, pale yellow or pure white. The last was large flowered and otherwise identical with the Flame Azalea. Such happenings, exciting to the horticulturist, could obviously be most confusing when unexpectedly encountered in an herbarium where such specimens customarily lack any reference to flower color to peculiarities of their occurrence. White-flowered hybrid progeny seem relatively frequent when parental *R. nudiflorum* is involved.

Returning to Virginia, final collections were made from the highest elevations of the Pinnacle Mountain transect before again striking southwest for later investigation of the more southern species. A later flowering and somewhat redder phase of Flame Azalea was found in partially open bud on White Top Mountain and High Nob in southwest Virginia, at a time when the last blossoms of the normal large and orange-flowered *R. calendulaceum* were scattered on the lower slopes. This same joint occurrence was likewise met on June 6th on Big Black Mountain in Kentucky, only here at the higher elevation of over 4100 ft. the later "Camp's Red" phase of the summit would obviously not be at its best for another two weeks or more.

IN QUEST OF *R. cumberlandense*

Planning a return to the interesting azaleas of Black Mountain, we headed northwest for a general Kentucky reconnaissance in an eleven county circular swing to Yahoo Ridge, type locality for *R. cumberlandense* at the Kentucky end of the Cumberland Plateau.

Within a few miles the first little red and red-orange flowered azalea plants were found on a ridge of Pine Mountain in Letcher County, an azalea which in "best"

forms makes a low, twiggy bush, often quite stoloniferous, with glossy green leaves often glaucous beneath and which may or more probably may not be quite the same as the late azalea of Black Mountain. At least on Pine Mountain this is undoubtedly *R. cumberlandense* of E. L. Braun's description and its smaller, thin-tubed flowers are immediately suggestive of a diploid if the earlier, coarsely large-flowered Flame Azalea is truly tetraploid—a point to be tested by later cytological examination of living plants collected for this purpose.

Leaving Pine Mountain there was an interval of several miles in which only normal *R. calendulaceum,* past bloom, was seen, but again at higher elevation in Owsley County beautiful little geranium-red azaleas were in shining bloom on a rocky cliff face; they remained with us in Clay County in Laurel County and in fact seemed quite common throughout these wooded hills of southeast Kentucky, all the way to Yahoo Ridge where the type locality for *R. cumberlandense* was revisited with the aid of detailed directions kindly furnished by Dr. Braun. Unfortunately the station where Braun had collected some time after logging operations in 1935 was now so rapidly reforesting that the shade was becoming heavy and the azaleas poor—a rotation which was frequently observed on this journey. Again and again the most striking displays of azaleas were in open woodland which had obviously been logged, cleared or burnt a few years previously. Presumably it is the scattered parent plants which burst into bloom with the sudden sunlight, set abundant seed and populate the forest floor before young trees again almost shade them out. In the long view one gains the impression of ephemeral, constantly shifting populations, except perhaps in the case of conservative *R. prunifolium* of West Georgia or *R. speciosum* of the Savannah River. By the average plant age the latter species seem to have occupied the same territory for many years. They reproduce sparingly.

As noted in this region perhaps the finest single Kentucky collecting point for the Cumberland Azalea was on a fire tower hill in west central Knox County. The road up this hill was one of those eroded rock and mud affairs which may have been passable to a jeep in good weather but which caused the Chevrolet to rest quietly near the main highway during an attack on foot. The hill was covered with open deciduous forest and towards the top, flowing over the ridges and down the sides of steep gullies was a multicolored riot of azaleas. It must have been a fairly old growth for while some of the flat-topped bushes were only waist-high others were well above eye level, indicating that fair height is attained by this species, at least in partial shade. Under these conditions, and compared with normal Flame Azalea, the flowers seemed especially thin-tubed and delicate and with a color luminosity, in the filtered sunlight, which the other wholly lacks. The shades of color were infinitely and widely variable from pale straw yellow through yellow-orange to red, and from salmon through pink to translucent cerise as lively as shot silk. Such diversity was often later found, although a constant leaning toward orange-red and red suggests that the latter may possibly have been the original color of this azalea.

Having confirmed the Kentucky occurrence of this distinct phase of former *R. calendulaceum* the next obvious task was to determine with some accuracy the limits of its distribution. So far it had been confined to the northern heights of the dissected west escarpment of the Cumberland Plateau so that a logical course was to follow this westerly escarpment southward—and the decision proved a wise one. Leaving Kentucky on the 9th of June, this same little azalea was followed in comparative abundance into the upland woods of Scott County, Tennessee, into Fentress County, Overton County, Van Buren County, Sequatchie County, both west of the Sequatchie Valley and to the east on Signal Mountain. For here we were headed for Georgia—and the azalea was there too on Fort Mountain in Murray County. Continuing at about 3000 ft. elevation (in contrast to early *R. calendulaceum* of the lower mountain slopes) it was found toward the summit of Mt. Oglethorpe in Pickens County, and on Branch Mountain in Dawson County. It was on this mountain that a spot of brilliant red, like a scarlet tail-light, shone from the top of a cliff bordering the new highway 136. This little beacon was too fascinating to pass up, even though the only approach lay by way of a long flanking climb. But the reward was a tiny twiggy, rock-clinging, azalea plant 6 inches high, a foot across, gray leaved and covered like a pin cushion with its little red bells—as extreme a form of this *R. cumberlandense* as one could hope to find and a gem for the garden if its habitat is not unduly altered by cultivation. Traveling northeast into adjacent Lumpkin County the azalea stays with us near Woody Gap. In Union County it is especially abundant on the mountain slopes above Lake Winnfield Scott and not far away, just east of Wolfpen Gap in Vogel State Park, it covers a hillside in a billowy patchwork of clear yellow, orange, orange-red, cerise and all shades of salmony pink to apricot—both colors and plants so reminiscent of those of our fire tower hill in Kentucky that even before making a detailed check of less obvious characters one could scarcely doubt that this was the same Kentucky azalea. But was it? This particular spot happened to have been sought out by design for it is the type locality of *R. Bakeri* described by Lemmon and McKay in 1937, four years before *R. cumberlandense* was named by Braun from Yahoo Ridge. Since both descriptions fit these plants with reasonable accuracy it would seem that this gay little bush of the Cumberland Plateau must soon shed its dual personality to be recognized by the single, prior, though less happily descriptive name of *R. Bakeri.* Here in Georgia its color may tend slightly more toward the yellow and yellow-orange and its flowers may be slightly larger than when it was seen in Kentucky but such differences would seem to be of very minor consequence.

CONFUSION IN MACON COUNTY

Still anxious to find where else this little late red azalea might be, another visit was next paid to the Nantahala region of North Carolina, a few miles across the Georgia border. The first plants were found in a deep valley on the approach to Wayah Bald from the west. The plants were 2 ft. high in stoloniferous patches deep red in color and just coming into bloom at this higher elevation. But they were not alone. On all sides were bushes in a bewildering array of colors, of heights to fifteen feet or more and of flower sizes to 6 centimeters across the "wing" petals. Either *R. Bakeri* had gone crazy or it had met up with something else. The latter seems probably the better guess, for not far away were a few late-flowering individuals of normal, early Flame Azalea. The sampling and collecting of this amazing population consumed a full half day during which time the characteristics of these intermediates became reasonably familiar. Finally heading to Nantahala Lake and Wayah Bald, imagine our astonishment at discovering that the fast opening azalea display around the lake and well up the slopes of the mountain was composed not of *R. Bakeri* or "normal" *calendulaceum* but entirely of recurring batches of these vari-colored intermediates which eventually settled down to something resembling a reasonably uniform "type" of their own.* Other collections were made on later visits to this region, and many more in principally orange and orange-red colors were subsequently found at higher elevations (above 3000 ft.) north through the mountains and right back again to southwest Virginia and Kentucky. A seeming third phase of the *R. calendulaceum* complex presents a puzzling pattern which will need much further study for elucidation of its true nature and origin; but the fact of its existence begins to shed light on the confusing flowering-time behavior of *R. calendulaceum* from different collection sources.

AND INTO ALABAMA

Having followed the Cumberland Azalea to Georgia and North Carolina there remained the possibility that it might also occur in Alabama—since the Cumberland Plateau enters into the northeastern part of this state. On the eighteenth of June the Chevrolet was consequently headed towards Jackson County, Alabama. Along the way some excellent Sweet Azalea, *R. arborescens*, was found in full flower, white with pale yellow blotch, growing with Catawba Rhododendron in a moist valley near Cloudland in DeKalb County and again not far away, while after crossing the Tennessee River and making a sharp climb of the steep ascent of the plateau north from Scottsboro in Jackson County abundant Cumberland Azalea was still in flower in open forest near Kyles on Crow Mountain. It was certainly in northern Alabama and on reflecting the matter in camp that night there came a wild thought of Alabama's highest point, isolated Mt. Cheaha, a hundred miles south in Talladega County. Pulling a long shot, we packed lunch the next morning, took to the mountain road which became poorer and very dusty through the forest climb up Cheaha, and by noon were enjoying this lunch seated amid Cumberland Azalea right on the summit of the mountain! They were a little past bloom but there was ample color to aid recognition of this gratifying find at a lone point so far from Kentucky and Yahoo Ridge. But this was no large batch of azaleas; beneath the windbent oaks were perhaps a few hundred plants in this colony which must have been isolated for a very long time. It was hoped that they might show something more of original characters or flower color but on superficial examination they were similar indeed to the little azalea we had followed so far. It is of passing interest that Rehder did not record the existence of a *calendulaceum*-like azalea in Alabama and that the reference in the Eighth Edition of Gray's Manual should properly refer to the Cumberland Azalea rather than to *R. calendulaceum* proper.

THE TEXAS AZALEA

Two further geographic possibilities remained for this fascinating plant, the southward extension of the Cumberland Plateau south of the Tennessee River in North Central Alabama and—a very long shot—the Ozark Mountains of Arkansas and eastern Oklahoma which has azaleas and certain interesting representatives of other eastern plants. The next day, June 20th, was spent in the *R. alabamense* hills of Cullman and Winston Counties, but only late forms of the latter species were found, no Cumberland Azalea since the hills are perhaps too low and, strangely, not even any *R. arborescens*, which had been expected.

No collections were made on the long drive through Hot Springs, Arkansas to Mt. Ida for the night but luck was better during the next two days coverage of the principal mountain peaks of the Ouachita and Boston Mountains, the length of Rich Mountain and adjacent LeFlore County, Oklahoma, impressive Magazine Mountain, Flat Top Mountain and northerly White Rock Mountain in Franklin County, Arkansas. There was no Cumberland Azalea as had been vaguely hoped but local *R. oblongifolium*, the Texas Azalea, was found in several places with sufficient plants still in flower for at least representative collections. This generally white and rather small flowered species is confusing in that it so frequently grows side by side with a pubescent-leaved pink azalea akin to *R. roseum*, and evidently breeds with it; the white form may be more adapted to moist valley sites and the other to drier hillside slopes but the line of preference is not strong. There is needed an earlier season and more careful study of these Ozark plants than was possible in this too rapid survey.

*Though not realized at the time, distinctive qualities of the Flame Azalea of the Nantahala region have previously been pointed out by Braun in *The Red Azalea of the Cumberlands*, Rhodora, 43: 33, 1941.

On the third morning in Arkansas, on June 24th, the car was again headed back towards the now-passing eastern azaleas. It chanced to be a Sunday, with Sunday drivers in slow lines on the highways but nevertheless nearly 600 miles were covered before nightfall in eastern Kentucky. No azaleas were collected; none was seen and they were doubtless sparse to nonexistent over most of the rich agricultural land traversed.

BACK TO THE ALLEGHENIES

The next week was spent in a run north through the mountains of Virginia and West Virginia and back south into Tennessee and North Carolina in quest of late forms of *R. calendulaceum* and of northerly *R. arborescens* and *viscosum,* wherever it might occur. A last visit was paid to the late red azaleas of Kentucky's Big Black Mountain and more of the Cumberland Azalea was found in Wise County, Virginia, but farther east at elevations of 3000 ft. and above it gave way to the late phase of *R. calendulaceum*, mentioned earlier, which was also of plentiful occurrence on the high points of the Alleghenies from Grandfather Mountain and Mt. Pisgah, west to the Tennessee border. Throughout this tour the Sweet Azalea was fairly plentiful along streamsides of the upland valleys and in some places, as at Mountain Lake, Virginia, and on Great Pisgah in North Carolina, it was hybridizing freely with *R. viscosum* to produce variable and often pink-flowered hybrids quite similar to entire populations seen in northern Pennsylvania a month later.

The Sweet Azalea tends to be quite variable in certain characteristics and throughout its range from New England to Georgia and Alabama. It may be variable in habit from low, widespreading and bushy in open places to tall and leggy in denser woods; its foliage may be glaucous beneath or entirely green; its corolla may be pure white or carry yellow blotches of varying intensity and in flower size it may be a plant of mediocre attraction to one of quite outstanding quality. A clone with especially large and showy flowers was found on the east fork of the Pigeon River in Pisgah National Forest but others almost equally good were seen at intervals. Such individuals from the horticultural standpoint were quite superior to overextolled "var. *Richardsonii*" of Wayah Bald whose flowers are medium in size and whose dwarfness seems a product of wind-swept exposure which is not expressed in the forest shelter at a few feet lower elevation.

A MOUNTAIN-TOP MARVEL

A fine fourth of July found the Chevrolet headed towards headquarters of the Great Smoky Mountains National Park in Gatlinburg, Tennessee, but wisdom prevailed in time for the effective substitution of a collecting detour over little-travelled Max Patch Mountain. Holiday makers had thinned somewhat by the next day, permitting a visit to Park Headquarters for the advice of Arthur Stupka, Park Naturalist, concerning the azaleas of the park and especially of now famous Gregory Bald on the park's southern rim. Representatives of the Gregory Bald population, as collected earlier by W. H. Camp, had been inconclusively studied previously and there was a real need to discover what this puzzling situation might actually be. Mr. Stupka was helpful indeed in providing access to the Park Herbarium and in giving suggestions on appraoches to Gregory. A day's food supplies were laid in, the distance was covered to Cades Cove, a pack was made up with temporary presses, photographic equipment and a blanket and the stiff 4½ mile climb to the mountain top was started in rather late afternoon. A cabin at about 4,900 ft. elevation was reached at dusk, leaving just time to complete the distance to the summit for a preview of the azalea display before cooking supper and turning in for a night's rest. Unfortunately the "night's rest" was enjoyed in the damp cold against which one blanket afforded little protection. It was also amid rather noisy wildlife from inquisitively reconnoitering mice to larger creatures, perhaps bears, which by morning had spirited away my lone loaf of bread. But there was enough food for a good breakfast and with warming sunlight and the azaleas, discomforts were soon forgotten.

The azaleas of Gregory Bald are at first glance bewildering and almost unbelievable. The mountain is a true "bald" having a broad, grassy summit fringed by scrub trees leading quickly into vigorous deciduous forest. The origin of the bald is unknown but it is probably man-made, resultant from earlier Indian grazing. It is the marginal region between trees and the grass sod which supports a peripheral band of a bizzarre collection of azaleas—thousands of plants in every imaginable hue from pure white to pale yellow, salmon yellow, clear pink and orange-red to red. Many of the flowers are yellow blotched, many of the bushes are stoloniferous and foliage varies from normal to deep glossy green, often glaucous beneath. Obviously it is a complicated hybrid swarm dating, in the older plants, to perhaps thirty years ago when some happening such as a brush or forest fire may have been responsible for the start of this strange and fascinating collection. Assuming that these were in fact hybrids the evident procedure was to search for the species which might have been involved in the hybridization process. The red and red-orange colors were an obvious lead and bushes of a *Bakeri*-like late flowering phase of *R. calendulaceum* were soon recognized, particularly on the west and southern sides of the bald. Such azaleas had been observed lower on the trail on the approach to the summit. From previous experience the clear pinks suggested hybridization between a red and white and white clones gave surer evidence of a parent of this color. Glossy leaves and glabrous shoots suggested that one such white might well be *R. arborescens.* A quick search for this species was unsuccessful but it too had been seen on the approach to

Gregory Bald. That it actually grew in the vicinity of the Bald has since been confirmed by F. C. Galle of the University of Tennessee who has made a special study of this population. In the search for *R. arborescens* a visit was paid to nearby Parson Bald a mile to the south and on this mountain was found a splendid growth of a second white azalea, the dwarf and stoloniferous from of the Swamp Azalea, *R. viscosum,* var. *montanum* whose characteristic small, sticky flowers and suckering root system had also been recognized as being carried by many of the Gregory hybrids. *R. viscosum* may have been growing on Gregory itself or its pollen could easily have been carried this short distance by flying insects. Certainly it, with the other two species mentioned, was involved as an original parent of these plants. These three species are the only ones likely to be met at this elevation and in this particular region. Full collections were made of the Gregory population for later detailed study. While hybrid swarms involving as many species are not rare among eastern azaleas, not other yet seen has equaled this one in impressive size and effect. While many of the plants are beautiful from the horticultural standpoint it is fortunate that they are protected by National Park authorities for all to enjoy. Each color could be simply reproduced by cross-pollinating the same species under artificial conditions.

The study and photographing of this collection was still not complete by dusk, necessitating a second night on the mountain which was rendered slightly more comfortable by a harvest of fern fronds for softness and little warmth. Dry cereal provided a slim breakfast next morning but work was completed in time for a rapid descent starting at noon.

Being reasonably close to Knoxville, Tennessee, a visit was paid to the University to discuss azalea problems with members of the Department of Botany and to review briefly a fine set of herbarium material well worthy of later study. This was July 9th and since more late material was still needed from the mountain areas a route was chosen via Wauchecha Bald in Graham County, North Carolina, Robbinsville, a return to Wayah Bald via the Winding Steps road, a northern swing over Cowee Bald, memorable for dew-laden red azaleas and a brilliant sunrise over its cloud filled valleys, and thence to Highlands, North Carolina. The principal collections of this tour consisted of *R. arborescens,* late specimens of the red-orange Flame Azalea including an especially fine stoloniferous clone in full bloom near Nantahala Lake on July 10th, and *R. viscosum,* var. *montanum,* also in excellent bloom, pure white, in low thicket growth in open woods near Highlands. Occasional hybrids of this plant with the Sweet Azalea can be striking with their large pink flowers, as are similar hybrids with *viscosum* itself at lower elevations.

THE PLUMLEAF AZALEA

It being now the 12th of July a reference to the collecting map indicated that the late red azalea of Georgia, *R. prunifolium,* should be in flower. Its type locality is near Cuthbert in Randolph County, southwest Georgia, and in this direction the Chevrolet was turned from the hillsides, the rhododendron forests and the delightful climate of Highlands, North Carolina. The only detour made in crossing Georgia was in search of the Sweet Azalea at the southernmost part of its range in Upson County in central Georgia. The search consumed nearly a full day but the azalea was at last found in splendid quantity and, strangely enough, in full bloom in spite of this low elevation so far south. In pure white flower it followed the banks of a small Moccasin-infested tributary of the Flint River, the same azalea by all outward characteristics as its counterpart of 800 miles away in West Virginia.

Fort Gains, Georgia, is a sleepy little town on the banks of the Chattahoochie, the river separating Georgia and Alabama which, 75 miles farther south, joins the Flint River (from Upson County) to become the Appalachicola of northern Florida. Both Fort Gaines and Cuthbert, twenty miles northeast, are situated in a region where the clays of the rising Coastal Plain have been cut into deep gullies by small meandering streams. The sides are often so steep that the only access is by wading the stream, and one is almost forced to do this (in spite of the Water Moccasins) by the dense cat-briar tangles of the wooded surroundings.

It is in these gullies of a few Georgia and Alabama counties, generally centering on Fort Gaines, that the Georgia late red azalea, *R. prunifolium,* is at home. Here, on steep slopes, wherever enough light has penetrated to permit flowering, it is found in round-topped bushes up to twelve feet high in reds, red-oranges, apricots and orange-yellows. The color range is not far different from that of the Cumberland Azalea and after seeing the latter for so long one is impressed by the similarity between the two. They both have those characteristic ridged flower tubes in the bud stage; they are both late, both red, and in more detailed morphology have little to show reason why they could not be quite logically and quite possibly regarded as high and low elevation derivatives from a common ancestor. By its lateness of bloom and geographic isolation *R. prunifolium* has not had the opportunity for recent gene exchange with other species. Thus it lacks the aggressive adaptability of its mountain counterpart, so that now, even in its chosen locale, young seedlings are seen so infrequently that one wonders how much longer it may persist without more effective protection than it now receives.

The type locality for this species, 2¼ mi. N.E. of Cuthbert, is now a golf course with no azaleas evident but a good collection was made in a small ravine 1¼ miles distant. The visit to Fort Gaines also provided an oppor-

tunity to discuss mutual interests with that authority on southern azaleas, Mr. S. D. Coleman who not only showed me his own unusual plants, so well tended and arranged, but who also provided a valuable lead to a curious little May-flowering white azalea of Central Georgia and Alabama, hitherto overlooked. The next day or so was spent in following this low growing plant, now past bloom, as far as Mississippi. On a basis of characteristics which lie somewhere between *R. viscosum, serrulatum* and *oblongifolium,* it has not yet been taxonomically assigned as a previously described entity and should certainly be credited to Mr. Coleman if a new designation is warranted.

HAMMOCKSWEET

Returning to Mississippi on a stifling 18th of July with the thermometer hovering around 104°F. the first plants of true *R. serrulatum,* the Hammocksweet Azalea, were found in flower the day following on the edge of a wooded swamp in Jones County. Through the following week and a half, it was chased in equally good flower into southeastern Louisiana, east around the Gulf Coast to within a few miles of Lake Okeechobee in South Central Florida, back to its type collecting locality in Lake County, Florida, north again to the edges of the Okefenokee Swamp and again east to Folkston, Georgia, and the type locality of Rehder's *R. serrulatum* var. *georgianum.* Throughout this thousand miles and more the Hammocksweet Azalea showed no excessive variation. At times it is true that its leaves or dormant buds became more silky pubescent, its flower pedicels varied from pale green to deep red in color and its flowering season was obviously prolonged in lower Florida where single individuals may bloom from July to October or later, but essentially it remained the same sticky-tubed and rather inconspicuous little white azalea of the bog tussocks and the cypress islands of the southern waterways. At times it formed rounded bushes ten feet tall, but it was often low or producing but a few rangy stems seeking light through a dense cover of vine-covered holly or palmetto. The very late flowers of individual specimens could well be a characteristic worthy of exploitation in some future race of garden hybrids.

THE NORTHWARD RETURN

With good collections of *R. serrulatum* one could feel with fair satisfaction that the gamut of soiuthern azaleas had been about run, until such time as return visits to puzzle areas might be called for in another year. A northward return was thus in order, so planned as to catch any further outliers of the *R. serrulatum* complex together with a fairly detailed survey of its northern counterpart, *R. viscosum,* which should now be in scattered bloom well into New England.

Leaving Folkston on the 28th of July, our route headed towards Savannah and the Georgia side of the Savannah River where late azaleas had been observed during the *R. speciosum* season. The only collections this day were of fine specimens from a northerly distribution of *Befaria racemosa,* the curious ericaceous Tar Flower which, with its spikes of pink blossoms, is suggestive of a primitive azalea form. Here in coastal Georgia it grows on dry soils of the Pine-palmetto forest. Farther south the scattered clumps of this single North American representative of a Central and South American genus is a frequent sight along the Florida roadsides.

Occasional Hammocksweet Azaleas were seen on the way to Savannah while, bypassing this city, the first low white azaleas resembling *R. viscosum* rather than *R. serrulatum* were found at a woodland edge in Effingham County. Farther along, in Screven County, there was found a swamp near Oliver where the swamp tussocks were covered with quite normal *R. serrulatum,* the swamp margins with a very variable dwarf and stoloniferous azalea, sometimes highly pubescent in its buds and leaves which was clearly much more akin to *R. viscosum* than the other species. On drier land an outer circle of *R. canescens,* past bloom, completed the azalea picture. This was the last collection of *R. serrulatum,* which does not seem to spread north of the Savannah River. It is clearly a region where the two late white azaleas meet and as such it is likely that gene exchange with resultant variability could be expected here in East Central Georgia.

Crossing the Savannah River on Route U.S. 301, this road was followed north to Baltimore, as it parallels the coast some 100 miles inland. Throughout the distance of the Carolinas, Virginia and Maryland, *R. viscosum* was mass-collected, usually in good bloom, at intervals of approximately 60 miles. From Baltimore it was followed past Philadelphia into New Jersey, across New Jersey to Connecticut, and across Connecticut and Massachusetts to Cape Cod and even to the island of Martha's Vineyard where it was flowering on August 8th. This was another thousand mile run in which the variation of one species could be observed, step by step, until it became a fascination that terminated only as the last plants were collected. From the dwarf, twiggy and semi-evergreen bushes of the marshes of South Carolina to the tall, gray leaved and large flowered shrubs of the pond margins of Cap Cod, the Swamp Azalea is much more changeable than its sister of the Gulf Coast. Rehder has divided it into eight varieties and forms. One could make these many more, or less, depending upon the viewpoint of the observer. It seems certain that not a little of the trouble is due to *R. viscosum* and *arborescens* having met on occasion in the northern states, as was strongly suggested by the last New York State and Pennsylvania collections on the return to Philadelphia. In some of these northern swamps genes have been so freely exchanged between these two species that nomenclatural assignment of present populations becomes virtually impossible. The situation is similar to that previously noted with regard to *R. roseum* and

nudiflorum. But in spite of these local happenings, *R. viscosum* can still be regarded as "good" a species, though variable, as *R. roseum, nudiflorum* or *serrulatum*.

This last run from central Pennsylvania to Philadelphia was on Sunday, August the 12th, and thus ended, after 21 weeks and 25,000 miles of almost continous collecting, our quest for native azaleas. A few additional collections have since been made, as doubtless there will be others in the future. From this major field survey were secured 8,000 herbarium specimens and 500 living plants whose study should throw much new light upon the nature and the behavior of these plants. The herbarium specimens, now mounted and catalogued, are deposited in the herbarium of the Morris Arboretum of the University of Pennsylvania, at which institution the collection of living plants is also maintained for further observation and for their use in current cytological studies.

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"Azalea Classics" are articles published in the past which *THE AZALEAN* staff deems worthy of being brought to the attention of today's azalea enthusiasts.

CULTIVATING RHODODENDRON SPECIES IN THE GREENHOUSE

David J. Ballantyne
British Columbia, Canada

Dormancy is an important factor in forcing rhododendron and azalea species and hybrids under glass.

Growers often use greenhouse culture to force rhododendrons to flower for specific holidays, such as Christmas, Valentine's Day, or Easter, or so that breeders can cross two parents that flower at different times.

However, if rhododendron plants are to be forced in a minimum time so that they flower uniformly (so that most of the flowers open at the same time), growers must break their dormancy. They usually do this by exposing the plants to low, not freezing, temperatures before forcing them.

GREENHOUSE CULTIVATION

A number of references on cultivating rhododendrons and azaleas in greenhouses are available. I have found three to be particularly useful: Leach (12) on rhododendrons; Kofranek and Larson (11) on azaleas; and Batson (6) with an update on azaleas.

I should point out that there are about as many successful watering techniques, soil mixtures, and fertilizing schedules as there are growers. It is often best to stay with a satisfactory technique and to first try out any new ones on a small scale.

GROWING MEDIUM

Usually, I grow azaleas in a mix of equal parts of coarse sand and peat. They are acid-loving plants and require good drainage. When they reach a size that requires 6-inch or larger pots, you can put a small amount of moist, coarse sand or rubble in the bottom of the pot.

After the cuttings have rooted, I generally pot them up in 2-inch pots and then repot them into 4-inch and 6-inch pots as they require.

In pots larger than 2 inches, I may mix 2 parts peat, 1 part soil, and 1 part coarse sand. Some growers prefer perlite to sand for rhododendrons.

WATERING

Watering azaleas and rhododendrons growing in pots in the greenhouse is extremely critical. Most growers like to keep them quite moist. However, overwatering can be a major problem, especially with rooted cuttings that have been recently potted.

The soil-born fungus *Phytophthora cinnamomi* thrives in wet soils and can attach itself to a young plant's roots.

Ideally, I like to water my plants just as the soil begins to appear dry. Also, rhododendrons generally prefer a high humidity. I syringe the plants and wet the greenhouse walks one to three times a day during summer.

The plants have to be watered once a day in summer. But in winter, they may need to be watered only two to three times a week, depending on the weather.

FERTILIZING

Greenhouse-grown azaleas and rhododendrons may be fertilized by liquid feeding, provided the growing

medium is not dry at the time of application. When the greenhouse is warm at night (15°C or 60°F), I feed my plants once a month. When the greenhouse's night temperature is lower (5°C or 40°F), I fertilize every six to eight weeks. I do not feed the plants when I have just cut them back.

The solution I use contains ammonium sulfate and 20-20-20 fertilizer. I use 21 grams (¾ ounce) of ammonium sulfate and 6 grams (1/5 ounce) of 20-20-20 in 8 liters (2 gallons) of water.

The mixture may be watered on or applied with some form of automatic feeding system. Generally, I apply liquid fertilizer with a Hozon diluter.

The most common deficiency symptom that shows on greenhouse-grown azaleas appears to be nitrogen deficiency, which produces pale green older leaves. This may be due to heavy watering and the resulting leaching.

VEGETATIVE GROWTH

Vegetative growth follows rooting, flowering, or pinching. For greenhouse-grown azaleas, it generally increases along with temperature and photoperiod.

The night temperature range for the vegetative growth of azaleas is 13° to 32°C (55° to 90°F) (13). As temperatures increase, vegeative growth increases with long photoperiods (18 to 24 hours) but does not with short periods (10 hours) (18).

You may be able to reduce vegetative growth with growth retardants, such as Cycocel (2 chloroethyl trimethyl ammonium chloride) or B-Nine (succinic acid-2, 2-dimethyl hydrazide) (23).

You must pinch terminal buds to build a plant that has a satisfactory shape. Usually, make the final pinch eight to ten months before the estimated flowering date.

BUD SET

Floral initiation, or bed set, for greenhouse-grown azaleas requires high light intensities and relatively high night temperatures—at least 16° to 18°C (or 60° to 65°F) (10). Apparently, optimum flowering requires considerable photosynthesis.

Growth retardants like Cycocel and B-Nine can induce or increase floral initiation on azaleas and rhododendrons (8,9,19,23). Such a spray may be applied two to four weeks after the final pinch.

Day length, especially short days (8 hours), may encourage or increase the amount of floral initiation in azaleas (9,10,18).

FLOWER BUD DORMANCY

If azaleas are to flower uniformly, they must be exposed to low but not freezing temperatures (5° to 10°C or 40° to 50°F) after bud set and some subsequent development has occurred but before forcing. The plants are usually exposed for four to six weeks.

This treatment may be provided in cold frames, but some commercial growers use controlled-temperature rooms. If storage temperatures are above 5°C (40°F), provide some light to prevent leaf drop.

There have been a number of reports stating that sprays of various forms of gibberellic acid replace the need for low-temperature storage (5,7,14,15). However, the cost and trouble of applying gibberellic acid usually discourages its use.

When an azalea is grown under glass and does not receive low temperatures, it tends to flower most irregularly. A few flowers usually open at a time. Generally, if a plant is to be commercially acceptable, most of its flowers must at least be showing color.

After the azaleas are exposed to low temperatures, they may be forced into flower by night temperatures of 16° to 18°C (60° to 65°F). Azaleas and rhododendrons may flower satisfactorily in a cooler greenhouse but early flowering or timing is out of the question.

When azaleas are forced, vegetative shoots frequently appear around the flower buds. These must be removed by hand, or the buds will "blast." Removing these shoots should be carried out as soon as easily possible.

PESTS AND DISEASES

Pests and diseases of greenhouse azaleas and the appropriate control measures have been covered by Streu (22) and Aycock and Daughtry (1).

In my greenhouses in British Columbia, the principal problem has appeared to be root rot among young plants, which has been caused by *Phytophthora cinnamomi*. This can be eliminated only by eradicating infected plants, avoiding overwatering, and practicing general greenhouse sanitation.

Occasionally, I must use Pirimor to control aphids and Thiodan to control cyclamen mites. A sequence of Diazinon, malathion, and Diazinon (applied 7 to 14 days apart) controls red spider mites, and *Exobasidium* leaf gall can be controlled by removing the galls and spraying with Zineb or maneb.

Cylindrocladium problems may be controlled with Benlate or another recommended fungicide spray or soil drench.

THE PHYSIOLOGY OF DORMANCY

Several investigators have researched the physiology of flowering in azaleas because the process is key to understanding why the plants flower when they do.

Ballantyne (2) found that low-temperature storage decreases the concentration of a growth inhibitor and that gibberellic acid sprays caused a growth promoter to appear.

Later, Sydnor and Larson (24) found that the concentration of a growth inhibitor, abscisic acid, decreases in azalea flower buds during cold storage and that levels of gibberellic acid increase. Gibberellic acid induces early flowering in azaleas.

In several experiments (3,4,5), I found that gibberellic acid sprays can induce an increase in respiration (oxygen uptake) of azalea flower buds and of small flowers within the buds. I also discovered that gibberellic acid induces more efficient respiration.

However, increasing the small flowers' respiration by removing bud scales did not produce early flowering. Therefore, an increase in respiration did not cause early flowering and was probably a consequence of the gibberellic acid stimulating the young flowers' growth.

Respiration of small flowers decreases during and immediately after cold storage, which perhaps induces a decrease in abscisic acid levels.

Schneider (20) found that removing scales early can induce early flowering. He suggested that a growth inhibitor might be able to move from the scales to the primordial flowers within the buds.

Schneider (21) also found that starch and protein bodies build up in the petals of flowers within the buds before dormancy. After dormancy, the starch and protein bodies break down.

Pemberton and Wilkins (17) demonstrated that the effectiveness of low-temperature storage, long day lengths and gibberellic acid sprays may depend on when azaleas are ready for forcing.

Pemberton, Brenner, and Wilkins (16) reported that low-temperature storage may induce decreases in abscisic acid levels in various parts of azalea flower buds. However, there may be little correlation between the buds' capacity for continued development and their level of abscisic acid.

These latter reports are two of the few studies done in the past 10 years. Little, if any, work has been carried out on the physiology of rhododendron species dormancy since then. However, some researchers continue to investigate dormancy in other plants.

Rhododendron flower primordia are relatively small and inaccessible. Thus the primordia are somewhat difficult to study.

However, new research techniques are continually being developed. Perhaps investigators may someday find rhododendron species to again be suitable subjects for research.

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A SIMPLE METHOD TO PROPAGATE SHRUBBERY

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New York, New York

Rooting a stem cutting taken from the tip of a favorite rhododendron is not always easy. But there is almost sure success in bending a low branch to the ground and rooting the tip. This technique is called layering.

It sometimes is used in commercial production of rare plants, especially in Holland and Belgium, and it is an almost foolproof method for home gardeners. Of course, there is a need for a tool—a shovel and patience. Refinements of the technique call for more equipment, but these are just the fixin's. The basic process is extremely simple.

The basic process of layering calls for pulling down a low-growing branch that is not more than two or three years old and burying a portion of it. The foliage is exposed above ground and the branch still is attached to the parent plant. The buried portion will strike root. After rooting, the branch is severed where it goes into the ground and the new plant can be moved to its permanent position in the garden.

Commercially, woody plants are layered any time the soil is manageable and when manpower is available. Nurserymen may layer shrubs and low-branching trees almost any month of the year. In my home garden, I like to layer trees and shrubs as flowers fade or at least before midsummer. Usually the layers are rooted some ten to twelve months later, often much earlier.

When I layer in June, usually I check for roots the following spring, and if they are plentiful, I cut the new plant loose from the parent at that time. If rooting is not well along I leave the layer alone until fall when surely it has rooted. A plant cut from the parent in spring may be transplated in the fall or the following spring. One cut loose in the fall can be transplated the next spring or the following fall. Give layers plenty of time to get roots down and allow six months to a year on their own before transplanting them.

The actual technique of layering is easy. With a lawn broom sweep up the all the debris beneath the branch spread of the tree or shrub and remove all weeds and grass. Tie tags or strips of rag on the branches to be layered.

With a sharp spade, turn the soil beneath each branch; for a tree, make a patch at least two feet on the side, larger is better.

Select carefully the portion of a branch to be propagated. It ought to be unbranched, free of injury, one to three years old if possible and still flexible, and with a nicely branched "broom" of leafy growth at the end. With rhododendrons and azaleas, sometimes it is impossible to have more than a few inches of leafy twigs beyond the layer, but with magnolias, dogwoods, witchhazels and some other species, there may be 12 to 24 inches of leafy branches. I have found that a maximum of 12 inches is a good bet if fast rooting is important.

Dress the turned soil beneath the branch with a handful of 5-10-5 fertilizer (special acid fertilizer is better for rhododendrons, and camellias), and an inch or so of damp brown peat or oak leafmold. If the soil is very heavy, add a bit of sand. Fork these materials through the soil. Scoop out a depression, rather long and narrow, and four to six inches deep.

Then take the branch that is to be propagated.

One way is simple to flex it gently where it will be buried. The leafy tip must be bent upward, so a rather broad U-shape is necessary. Do not crack or crimp the branch; rather, hold it firmly and gently work it into a bend, sliding your hands back and forth while applying pressure. No matter if it won't hold its curve, it can be braced with soil.

Various methods to stimulate rooting are used. In most cases, a bent buried branch eventually will root of its own accord. Some experts use a sharp knife to cut through the branch about one fourth of the way, and then make a three-inch long lengthwise slit (less for small branches) paralleling the length of the branch. When the branch is curved to be buried this cut opens and at least in some cases the wound tissue that develops produces roots rather readily.

Some propagators dust the wound with a root hormone powder such as Rootone. Some slip a small clean sliver of wood, such as a match stick, into the wound to keep it open. If there are sufficient low branches, try these various methods. I almost always make the cut and apply the hormone powder but seldom bother with the wood sliver. But when I am short on time, I just scratch up the soil, bend and bury the branch, place a stone over the buried portion to secure it, and usually the thing roots in time.

When the branch is bent, wounded, hormone treated, and poised over hole, hold it with one hand in the small excavation and with the other hand pull in peat and fertilizer enriched soil to cover it, working the soil under, in, and around the branch with your fingers. No air spaces, please. Keep the layer firm until the excavation is filled, then rest a brick or stone over the buried portion of the branch. This, of course, keeps the branch from pulling up as wind works it.

There are various other ways to securely fasten the layer into the ground. An immobile branch is essential to rooting. One way is to make a heavy wire staple, like a large hairpin, and insert it directly over the center of the buried portion before pulling in the soil. This works well, but there may be a danger of damage to the conducting tissues just under the bark if the tree or shrub is soft-

barked. I have bent an eighteen inch length of No. 9 galvanized wire into staples.

Another way is to drive wooden pegs where the branch goes into the ground and emerges again (do it before covering the layer) and tie the branch to these mooring stakes with soft rag strips. If the layer is small, a brick above the buried portion of branch usually sufficies.

Now, you must wait. Water the soil often enough that it never dries completely, but avoid a soggy condition. In summer, a coarse, porous mulch may be beneficial. Wood chips, partially composted shredded leaves or old chopped straw are good. Over winter deepen this mulch to a blanket four inches or more in thickness. When the layer has been in place six to nine months, dig down beside it and gradually scrape away the soil to look for roots. If there are none, refill the test hole and wait until next spring or fall. Magnolias, evergreen oaks, and mock-orange may take more than two years!

When roots are present, with a sharp pruning clippers or a lopping shears cut the parent branch loose where it enters the soil. Leave the layered plant in place to grow on its own for an entire year, or at least six months. Then lift it carefully, moving it ot its new position.

Right now in my garden three rhododendrons are layering, one with nine branches pulled down because I need several plants for a new shrubbery. Several unusual azaleas are layering to build up stock as they are expensive cultivars, and I have more time than money. A very fine magnolia in a friend's garden has three branches down, one for me and two for him. At another friend's garden I gave a demonstration on layering with several shrubs and included a particularly fine, heavily-flowering wisteria.

High bush blueberries, currents, gooseberries, and all of the bramble fruits layer readily. With brambles, especially with raspberries and their hybrids, simply pull down the cane and buy the tip straight into the soil to a depth of four to six inches. It will root and a new shoot will come up. In a matter of weeks, cut loose the parent cane, lift the tip layer plant, and move it to its growing place.

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CULTURAL HINTS FOR SATSUKI AZALEAS TRAINED AS BONSAI

Douglas K. Ruffner
Rocklin, California

MONTH BY MONTH CULTURAL HINTS FOR GROWING CONDITIONS IN THE SACRAMENTO, CALIFORNIA AREA

JANUARY
Do not do major bending during January and February. Trunks are too brittle and may break. Remove any wire that is cutting into bark. Do not over-water. Mist leaves when north wind blows. Study your plants and plan future shape.

FEBRUARY
Plan ahead. Purchase your peatmoss, pumice and Kanuma soils now. Do not wait till the last moment. Mix soil ahead of time and store. If a plant looks unhappy, repot immediately and keep in a sheltered place.

MARCH
The first month you can start to wire trunks. Let soil dry out a little, so plants will be more pliable for bending. Wire all branches to obtain branch structure. Fertilize this month with one of the following: Miracid, Gro Power, or fish emulsion. Miracid is good for the first fertilizing to help raise the acid level in the soil. You can also repot this month. Do not do drastic root pruning yet. Tie plant in pot, protect from wind, and spray with Malathion for pests. Seal all wounds.

APRIL
Do not fertilize with anything but 0-10-10 or Bloom Food this month, as fertilizer with nitrogen can affect color of your flowers. Trim all errant branching. Cut extra long stems back to two leaves or remove altogether. Repot to more fancy "Show" pots. Tie plant in pot to protect from wind. Spray with Malathion for pests. Seal all wounds. Spray plants with Benomyl to prevent leaf spot and flower blight.

MAY
Do not fertilize this month unless you have young plants you want extra growth on and are not going to exhibit them this month. Use Miracid, Grow Power, or fish emulsion on these plants. Trim off excess growth where not needed on plants in training. Repot to "Show" pot. Tie plant in pot to protect while transporting to Show.

Trim all shoots that extend higher than flowers or flower buds. Mark branches you want to make cuttings from. If plants are blooming too early, move to a dark, cooler place. To speed up bloom, should this be needed, move into a warmer, sunny place—inside the house, if the weather is cool—to make blooms come out. Clean pots of soil spots or stains. Pull any weeds or liverwort growing on surface of soil in pots. Spray with Malathion for pests. Seal all wounds when you trim.

JUNE
After azalea flowers pass their peak blooming time and flowers begin to de, remove all remaining flowers, buds and all flower stems. New shoots, growing up, should be cut short. Cut all shoots back to two leaves each and trim all unwanted portions of each branch off. Wire plants and trim to shape.

This is the time to do your heavy root trimming and repotting. Mist plant leaves once or twice a day for the first week after repotting. Do not over-water soil or you will cause root rot. Water plants when top of soil is dry to your feel. If in questio, use water meter or stick finger in soil. Seal all wounds.

JULY
Do not trim after the first week in July or you will cut off all forming flower buds for next year. You may wire and bend this month. Be very careful wiring, as the bark scuffs and peels off very easily. Seal all wounds. Watch for pests. Spray with Malathion. Use Benomyl for leaf spot. Mist leaves and water when needed. Fertilize with Gro Power, Miracid, or fish emulsion.

AUGUST
Trim all new shoots to two leaves. Check wiring for cutting-in and fertilize. If leaves are not a good healthy green color and look yellowish, fertilize with iron supplements. August is a good time to start using 0-10-10. This helps to form flower buds as well as roots and adds extra resistance to winter cold. Mist leaves and water when needed.

SEPTEMBER
Fertilize with 0-10-10 and add a little Fish Emulsion if extra growth is desired. :Spray for pests. Mist leaves and water when needed.

OCTOBER
This is the end of the growing season. Plants will begin to shed summer leaves and grow winter leaves. This is the last month to use 0-10-10 or any other fertilizers. Spray for pests with Malathion. Remove any wire that is

cutting into plants. Remove all wire if plant branches have settled into desired trained position.

This is a good month to wire and bend trunks as bark not does not mark easily. Let plants dry out a little for easier bending and training. Clean up plant area and get ready for winter.

NOVEMBER

No more fertilizer this month. Watch out for pests. Spray, if needed. This is a good wiring month for your plants. Wire trunk and branches for further design. Don't let your plants dry out and don't over-water. Protect your plants from wind.

DECEMBER

No fertilizer this month. Watch for pests. Do not do any major bending of trunk this month as plants are very brittle. Do not over-water but be sure that your plants are getting enough water. Rain does not always penetrate throughout soil in pots. They may be just wet on top. Check your plants thoroughly all winter.

Reprinted from a pamphlet by the same name compiled by Doug Ruffner, when he was President of Sacramento Satsuki Aikokai-Group A, Sacramento, California. Mr. Ruffner has approximately 700 Bonsai azaleas in his Bonsai collection.

ARE YOU GUILTY OF OVER-MULCHING?

Francis R. Gouin
College Park, Maryland

Over-mulching has become a disease with many landscape contracting and landscape maintenance firms. It is not uncommon to find mulch piled deep among the branches of hollies and azaleas and around the trunks of trees. Matter of fact, it is becoming difficult to find an industrial landscape that does not have mulch piled 10" to 12" high around the base of an old established tree. In some instances, from a distance it appears as if ants have been building their nest around the base of trees. How can a mound of mulch piled high

around the trunk of a tree look attractive? In my opinion, they look like they are targeted for death and destruction. And, there may be more truth to that statement than you think.

Not only is over-mulching a waste of mulch, but also it is rapidly becoming the number one cause of death to azaleas, rhododendrons, dogwoods, andromedas, boxwoods, mountain laurel, hollies, cherry trees, ash, linden, spruce, etc. Repeated applications of mulch cause suffocation of the roots of shallow-rooted species and cause cankers to form around the trunks of susceptible species. Often the problems are irreversible and the plants are doomed. However, I find it difficult to explain to people that mulching is a recommended horticultural practice, but like everything else it can be over-done. With the increased availability of pine bark mulch, the problem is becoming more severe every year.

In order to fully appreciate the problems that over-mulching causes, it is important to understand its mode of destruction. Most organic mulches used, except for barks of conifers, are high in cellulose and low in lignins. Cellulose decomposes rapidly and leaves little residue behind. Except for the minerals, most of the residues are converted to carbon dioxide and water relatively quickly. On the other hand, the barks of coniferous trees are low in cellulose but high in lignin; therefore, they are more resistant to decomposition. Because the bark of coniferous trees rots more slowly, they stay around longer. The ground beneath the mulch appears to accumulate high franctions of fines as it decomposes. Because people like that fresh-mulched appearance, the tendency is to add another layer of mulch every spring, even though it is not necessary. The end result of yearly mulching is an accumulation of compacted bark fibers and organic colloids often several inches thick. This accumulation tends to remain wet and acts as a seal over the surface of the soil.

Over-mulching kills the roots of shallow-rooted plants by suffocation. The roots of plants need a constant supply of oxygen at all time. In other words, over-mulching has the same effect as flooding the roots of plants with water. Other than weeping willow, bald cypress and salt bush, there are relatively few ornamental trees and shrubs that can tolerate growing with their roots under water.

Symptoms of over-mulching shallow-rooted trees and shrubs include: chlorotic foliage often resembling iron deficiency, abnormally small leaves, poor growth and die-back of older branches. In boxwoods, the initial symptoms' often appear as yellowing foliage on scattered branches followed by the death of those branches. A close examination of the entire root system will often reveal an original root system which is badly decomposed, a root system that may be only a year or two old but dead, and a root system that is growing in the mulch and struggling for survival. Also it is not uncommon to find such disease-causing organisms as *Phytophthora cinnamomi* and *Botryosphaeria ribis*. Although these disease-causing organisms are widely distributed in most soils, they do not become active until conditions are favorable for their growth, such as low oxygen and excess moisture.

Well-established trees have been killed because of having mulch piled high around their trunks. When examining the base of some of these well-mulched trees, it is not uncommon to find roots growing out from the trunks into the moist mulch layer. In the field of plant propagation, the practice of piling mulch and soil around and over the stem and branches of difficult to root plants is called stoolbedding. However, in this instance the mulch is pulled away every spring to prune away the rooted stems for growing on and the stoolbedded plants are allowed to recover and resume normal growth the following growing season before being covered again. For trees that are prone to stem cankers, such as cherry, ash, and dogwoods, the mulch piled high around the stem provides ideal conditions for canker-causing organisms to become established. Their presence may remain unnoticed until the top of the tree begins to exhibit symptoms of decline. Then it is too late to do anything about it.

The practice of yearly piling mulch around ornamental plantings and around the trunks of trees must stop. The problems that over-mulching creates are not immediate but progress slowly with time. The symptoms may take three to five years to express themselves and sometimes longer depending on the species and soil type, but by the time the symptoms are recognized it is generally too late to apply corrective measures. When the symptoms first appear, the natural tendency is to fertilize and fertilize some more because fertilizing is believed, by some, to cure all plant problems.

Ornamental planting need only be mulched every two to three years at the most. A light raking of the existing pine bark mulch will generally fluff it up and give it that fresh mulched appearance. However, when it is time to apply a new layer of mulch, take the time to lightly incorporate it, by raking the existing mulch into the soil. That new mulch layer that you apply should not exceed two inches. This is adequate to conserve moisture, control weeds, and improve the appearance. If weeds are a persistant problem, then you should consider using a preemergence herbicide such as Surflan, Eptam, Dachtal, Ronstar, etc. to control the annual weeds and a wick applicator loaded with Roundup for those difficult to control perennial weeds. Mulches will not control weeds once they become infested with weed seeds. And no amount of mulch will control well established perennial weeds.

Reprinted from *Maryland Nurserymen's News*, September-October 1985.

SLOW RELEASE FERTILIZERS INCORPORATED INTO THE PROPAGATION MEDIA PRODUCE A BETTER PLANT

K. C. Sanderson, W. C. Martin, Jr. and D. Hannings
California Polytechnic State University

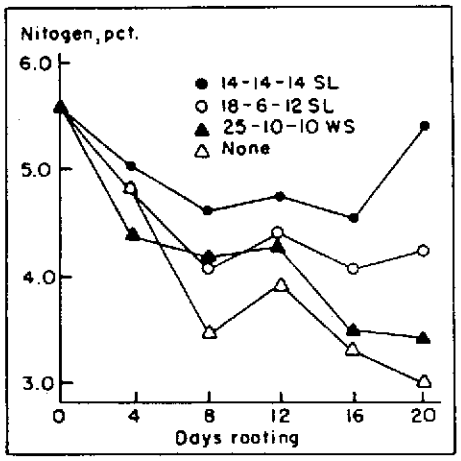
Adding commercially available slow release fertilizer to propagation media prior to rooting ornamentals can result in an improved plant at maturity, according to research at the Alabama Agricultural Experiment Station. This "earlier the better" approach improved rooting nutrition and produced more height and flower numbers at maturity in the Auburn tests.

The slow release fertilizers (SL) were compared to a water soluble fertilizer and a treatment consisting of no fertilizer in two experiments. Unrooted chrysanthemum cuttings were propagated in steam pasteurized sand, six cuttings per 6-in. pot, under intermittent mist, at 70°F, with 10% shade in a glasshouse.

Since nitrogen (N) is an important nutrient in rooting and early growth, an initial experiment was conducted on 'Improved Albatross' variety chrysanthemum to determine if and when cuttings absorbed N and the effect on rooting quality. Commercial slow release fertilizers (SL), Osmocote® 14-14-14 and 18-6-12, were incorporated into the sand medium at the rate of 6.4 oz. per cubic foot. Peters® 25-10-10, a water soluble (WS) fertilizer, (1 lb. per 100 gal.) was applied weekly at the rate of 6 fl. oz. per 6-in. pot. A no-fertilizer treatment was also included.

Starting at propagation and continuing at 4-day intervals for 20 days, leaf samples were taken by removing all ½-in.-long or longer leaves from five cuttings per fertilizer treatment. The leaves were analyzed for nitrogen content.

The figure shows a decrease in nitrogen content in all cuttings until the 8th day. By the 12th day the N content had increased, however, it was still below the amount recorded prior to experimentation. Leaves of cuttings propagated in Osmocote fertilizers generally had higher N contents than the water soluble fertilizer and no fertilizer treatments. At 20 days, leaves of cuttings propagated in a medium containing Osmocote 14-14-14 SL had the highest N content.



Foliar content of 'Improved Albatross' chrysanthemum cuttings during potting in a sand medium treated with fertilizers.

In a second experiment, cuttings of 'Orange Bowl' variety chrysanthemum were propagated as in the first experiment. In addition to the Osmocote SL Fertilizers, Mag-Amp® 7-40-6 SL was compared to Peters 25-10-10 WS and to no fertilizer. Leaf samples were collected for foliar nitrogen, phosphorous, and potassium analysis at 6 and 18 days. Following rooting, a set of cuttings not used in foliar analysis was potted into an amended medium of equal part of soil, sphagnum peat moss, and perlite. To assure adequate nutrition, 8 oz. of Osmocote 14-14-14 SL per cubic foot was incorporated at planting and the plants were fertilized weekly with Peters 20-20-20 WS at 2 lb. per 100 gal. Standard commercial practices for flowering branched, potted chrysanthemums were used. Height and flower number per plant were recorded at flowering.

Foliar phosphorous content did not differ between fertilizer treatments on either sampling date. Osmocote 18-6-12 SL leaves consistently contained more N than other fertilizer treatments at both 6 and 18 days, however, this treatment also yielded less foliar K than untreated cuttings. The highest foliar K at the 6th and 18th day occurred with Mag-Amp 7-40-6 SL and no treatment, respectively (see Table 1.)

Table 1. Nutrient Percentage of Dry Weight

Fertilizer	N		K	
	6 day	18 day	6 day	18 day
7-40-6 SL	3.0	3.0	4.8	3.2
14-14-14 SL	3.7	2.9	4.2	4.1
18-6-12 SL	3.5	3.2	3.6	3.7
25-10-10 WS	2.9	1.9	4.6	3.6
No fertilizer	3.0	2.9	4.4	4.6

Slow-release fertilizers incorporated at propagation produced taller plants than Peters 25-10-10 WS. Osmocote 14-14-14 SL produced the tallest plants and Osmocote 18-6-12 SL produced plants with the most flowers (see Table 2).

Table 2. Height and Flower Production of Fertilizer Treatments

Fertilizer	Height	Flowers per pot
	In.	No.
7-40-6 SL	12.6	4.9
14-14-14 SL	13.1	4.9
18-6-12 SL	12.8	5.2
25-10-10 WS	12.0	4.6
No fertilizer	10.7	4.5

Results of these experiments show that nitrogen content declines during rooting, nitrogen and potassium fertilizer can be absorbed during rooting, and fertilization of cuttings during rooting influences final plant height and the number of flowers per plant. Slow-release fertilizers, especially Osmocote 14-14-14 and 18-6-12, incorporated in the propagation medium were most effective.

Sanderson is Professor of Horticulture; Martin is Research Associate of Horticulture; and Hannings is Associate Professor at California Polytechnic State University. Reprinted from *Highlights of Agriculture Research*, 32: 14 (1985) with thanks to Russell Scott for bringing this article to our attention. Although azaleas may respond somewhat differently than chrysanthemums we agree with Russell that since containerized growing is no longer restricted to commercial growers this information will be of interest to many azalea enthusiasts (Eds.)

ASA NEWS AND VIEWS

IN MEMORIUM

G. ALBERT REID

On February 17, 1986 G. (George) Albert Reid, hybridizer of the Linwood Hardy Azaleas, of Linwood, New Jersey died at the age of 77 after a long bout with emphysema.

Al, as he was known to his friends, worked for Fisher's Greenhouses from 1953 to 1967, where he started his work on hybridizing the Linwood Hardy's. When Al retired from Fisher's in 1967, he continued to hybridize with the goal to produce a better type of garden azalea with larger flowers, a longer blooming period and to develop additional bloomers (fall and spring) such as his 'Opal'.

His goals were achieved with the blooming time of his plants extending from May through early July in the Linwood area. In his hybridizing program he eliminated all single flower plants. All registered Linwood Hardy's are either double, semi-double or hose-in-hose flowers.

Al was an honorary member of the Azalea Society of America. He also was a charter member of the American Rhododendron Society, Pine Barrens Chapter, and was an associate member of the Philadelphia Chapter. Over the years he registered over fifty varieties of his crosses, many of which were named after his family and friends.

He is survived by two brothers and a sister.

Theodore S. Stecki

AZALEAS BY GALLE A GREAT SUCCESS

Azaleas by Fred C. Galle, after repeated great expectations was finally ready for distribution in November 1985. For those awaiting their autographed copy, however, shipping during the Christmas holidays caused even further delays. In mid-January Fred received the copies to be autographed and by the end of the month most everyone had their "hands-on-encounter" with this magnificient publication.

Many thanks to Fred for his generous offer and untiring efforts in providing autographed first edition copies for Azalea Society members. It was quite a job and Betty Galle, Fred's wife engineered its smooth course. When the books arrived at Fred's home they had to be unpacked, each book had to be un-wrapped, personally inscribed and autographed, re-wrapped, labeled and sorted for point of distribution, re-packed (sometimes requiring tailor made boxes), the boxes labeled and trucked off to the shipper!

Prior to making the offer in *The Azalean* for a prepublication, personally inscribed and autographed first edition of *Azaleas* at $52.50, consideration had been given by Fred and the Society's Board of Governors that the price would cover the costs of handling and shipping to the point of distribution and in some instances directly to the buyer. These costs were kept to the absolute minimum through the efforts and in many cases donated time and materials of everyone who worked on this endeavor. The result after distribution of the books and all expenses had been paid was a net proceeds of $1,000 which the Board of Governors has directed be placed in the General Endowment Fund of the Azalea Society of America.

The society greatly appreciates your participation in this project. Many of you have said that you are really enjoying the book and consider it to be one of your most prized possessions. Less than 1000 of the initial 5000 copies of *Azaleas* by Fred C. Galle remain for sale and plans are underway for a second edition that will include additional varieties.

Robert K. Barry

THINGS NOT TO DO:

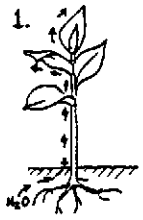
Do not fertilize in the fall. High fertilizer levels encourage late growth and make plants more susceptible to winter injury since dormancy is inhibited.

Do not make small plastic "greenhouses" that will catch the winter sun. Plants will warm up during the day, but will still freeze during the night. Wide temperature fluctuations cause far more harm than sustained cold. Covering with a single thickness of burlap with adequate air circulation underneath is much better than covering with plastic.

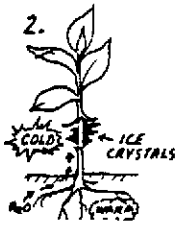
Do not encourage early spring growth. Late spring freezes cause bark split in plants that have broken dormancy. Flower buds of early blooming varieties are often "caught" before they have a chance to open.

WHAT IS "BARK SPLIT"?

1. Rooted cutting is not dormant. Mositure flows from roots to leaves.

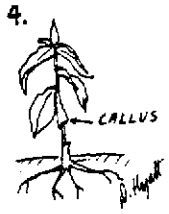


2. Cold Weather hits at top but roots are still warm. Water flows upward but rapidly freezes, splitting bark away from wood.



3. After ice crystals melt, bark is still separated from woody stem tissues.

4. Since roots and leaves are not connected by live bark, the cutting gradually dies. Heavy callus tissue is often visible at site of injury.



Things Not to Do and What is Bark Split reprinted from *The Azalea Clipper,* Volume 3, November 1982, published by the Northern Virginia Chapter, ASA.

ROOTONE FORMULATION CHANGE

If you have been using Rootone as your rooting compound please be aware that the manufacturer has changed the percentage of active ingredients. The manufactuer has come up with a green and white labelled rootone available in 1 lb. cans and 50 lb. drums specifically formulated for the commercial grower. The amount of the rooting hormones NAA and IBA in the formulation have doubled. The percentage of the fungicide Thiram has remained the same. Also as a result of using a higher quality carrier in the inert ingredients the bulk density has changed and you get more material on a volume basis than before. As with all chemicals please read the label before using, and this particular product because they have changed the formulation you will not be using the same physical amount of material that you have been using before.

SMALLER SIZE PRO-MIX

Premier the manufacturer of Pro-Mix BX has announced that it is going to make a smaller size Pro-Mix BX still in a compressed bale. The new compressed bale will be three cubic feet which expands to 5.5 to 6 cubic feet of material. The advantage of the new smaller size is ease of handling. The approximate weight is going to be around 50 pounds, which is about ½ of the weight of the large size Pro-Mix.

Rootone Change in Formulation and Smaller Size Pro-Mix from *Geiger News,* E.C. Geiger, Harleysville, PA.

BLACK-VINE WEEVIL CONTROL

Oxamyl 10% granular has been approved for black-vine weevil control in the nurseries and in landscapes. To kill the root feeding larvae broadcast on the ground at the rate of 1.4 lbs. to 1.9 lbs. per 1,000 sq. ft. (1 level tbs./13 sq. ft.) and water in thoroughly. This treatment will also control nematodes and grubs. To control the adult black-vine weevils, spray in the early evening with Orthene or Ficam (Bendiocarb) at the recommended rates.

From *Maryland Nurserymen's News,* September-October 1985.

PESTICIDE STORAGE

J. Lincoln Pearson
University of Rhode Island

Most insecticides, fungicides, nematicides, and rodenticides can be stored in the same storage room or cabinet. Herbicides should be stored separately as some of them are volatile and may contaminate other chemicals. However, the principles of storing pesticides are all the same, regardless of the types. The following is a list of do's and don'ts regarding pesticide storage.

1. All pesticide rooms, cabinets, or sheds should be locked.
2. Do not store pesticides where food, feed, seed, or water can be contaminated. Do not store herbicides where they can contaminate other pesticides.
3. Pesticides should be stored in a dry, well-ventilated place, at temperatures above freezing, or as directed by information on the label.
4. All entrances to the storage should be clearly marked "Pesticides Stored here—Keep out."
5. Always keep pesticides in their original containers. Make sure they are closed tightly and plainly labeled. Never put a pesticide in an empty food or drink container of any kind! This is a major cause of accidents from pesticides.
6. Containers containing pesticides should be examined periodically for leaks and tears. Spilled or leaky material should be cleaned up promptly. Dispose of leaking and torn containers immediately.
7. Where possible, a sink for washing should be located in or near storage.
8. Keep an inventory and eliminate all outdated materials. Date containers when purchased.

Special Instructions for Storing Herbicides:

Herbicides, like certain 2, 4-D esters, are volatile. Their fumes can be harmful to plants and to seeds. In addition, the fumes can temporarily contaminate soils, flats, pots, etc. Thus, special precautions must be taken when storing containers of these particular weed killers, especially those which have been opened and then closed for future use.

Put containers of herbicides in a building not connected in any way to the greenhouse, potting area, seed storage, etc. Volatile fumes can be concentrated in these buildings and eventually can find their way to all areas and cause damage.

Basements of barns are suggested for storage because they usually are not subject to freezing. Household basements, however, must not be used if plants are being grown somewhere in the home. They are likely to be damaged just as would plants being grown in a greenhouse.

Reprinted from Green Mountain Grower #125.

PESTICIDE CLEARINGHOUSE

The National Pesticide Telecommunication Network for the Pesticide Clearinghouse, San Benito, Texas, can be reached by anyone in the continental United States simply by dialing the "hot-line" number, 1-800-858-7378. Callers can receive general, technical and emergency information, including poison information for physicians on pesticides and their effect on human health and the environment.

THE AZALEA CALENDAR

June 23, 1986
Annual Brookside Gardens Chapter Azalea Auction
Contact Buck Clagett (301) 869-1059

July 17, 1986
Richmond Virginia Chapter Propagation Meeting and Distribution of Plants
Contact Page Calisch (804) 272-5195

October 19, 1986
Richmond Virginia Chapter Banquet
Contact Page Calisch (804) 272-5195

Future Azalea Society of America Convention sites
May 1987 Northwest Chapter, Eugene, Oregon.
May 1988 10th Anniversary Convention
Brookside Gardens Chapter
Washington, D.C.

THE AZALEA CALENDAR lists upcoming Society and chapter activities. Items to be included should be forwarded to the Editor together with name, address, and/or telephone number of contact person(s) at least three months prior to the month of publication of *THE AZALEAN* in which the notice is to appear.

LETTER TO THE EDITOR

THE REGISTRATION OF NAMED AZALEA CULTIVARS

In an article in the December 1985 edition of *THE AZALEAN*, attention was drawn to the registration of azalea cultivar names. As International Rhododendron Registrar, I would like to draw members' attention to a slight misunderstanding incorporated in that article. The suggestion was that names may have been registered with either the American Rhododendron Society (A.R.S.) Plant Registry or with the International Registrar of the Royal Horticultural Society (R.H.S.) and that it was difficult to obtain descriptions unless one knew with which organization any particular plant had been registered. The answer is that the International Register, maintained by the R.H.S., will always have a description if the name has been registered (and it holds details for many un-registered names as well). Names and descriptions submitted to the A.R.S. will automatically be forwarded to the R.H.S. whose approval for acceptance must be obtained before a name is published in the *A.R.S. Quarterly Bulletin*. Having a single central sorting body to which all rhododendron and azalea names have to be sent is the only way in which an international list can be effectively maintained.

The names and descriptions sent to the International Register are published in regular supplements contained within the *R.H.S. Rhododendron Yearbook* (now called *Rhododendrons, with Magnolias and Camellias)*, and anyone not having access to these is free to write to the International Registrar for information about any particular cultivar. When registrations of new North American cultivars are sent direct to the R.H.S. by the raiser, it is our practice to send a copy of an accepted application to the American Registrar and by this means their list of local raisings should be kept up to date. However, the ultimate source is, and must remain, the International Register.

Although *THE AZALEAN's* practice of publishing collated lists of azaleas from particular sources is a commendable exercise, it is a great shame that these lists often consist in very large part of un-registered names. Indeed, in many cases this results in the publication of names which would be unacceptable for registration, as they duplicate those already in use or in some other way contravene the *International Code of Nomenclature for Cultivated Plants*. This can help no one and only leads to confusion. Once a name is in print the harm is done.

I would strongly urge in the future that at the very least some check be made to ensure that such lists do not include unacceptable names and, preferably, that such lists should *only* consist of names which are registered. Indeed, technically, unregistered names in the genus *Rhododendron* are illegitimate, and it should be understood that registration is not just for the chosen few (plants or people!) but should be effected for all plants that are given a cultivar name. This should not necessite too much extra work for the compiler as, although the information usually listed is slightly less than is requested on the registration forms, it would be adequate to substantiate a new registration, providing the relevant fees were paid.

Naming a new plant is a responsibility that should not be taken lightly or in ignorance of International Rules and Recommendations. The individual raiser must realize that he or she is not working in isolation. Their plants may well eventually be grown around the world and they owe it to their fellow enthusiasts to ensure that the naming of their favourite plants is precise, stable, and internationally acceptable.

The A.R.S. Registrar is Mrs. J. W. Murray, 21 Squire Terrace, Colts Neck, NJ 07722, U.S.A., and the International Registrar is Dr. A. C. Leslie, R.H.S. Garden, Wisley, Woking, Surrey, GU23 6QB, England.

Alan C. Leslie

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