THE AZALEAN

Journal of the Azalea Society of America

Volume 7 Number 4 December 1985

AZALEA SOCIETY OF AMERICA

The Azalea Society of America, organized December 9, 1977 and incorporated in the District of Columbia, is an educational and scientific non-profit association devoted to the culture, propagation and appreciation of the series *Azalea* (subgenus *Anthodendron*) of the genus *Rhododendron* in the Heath family *(Ericaceae)*.

OFFICERS FOR 1985-1986

PRESIDENT - John U. Rochester, Jr.
(Franklinton, Louisiana)

VICE-PRESIDENT - L. Malcolm Clark
(West Caldwell, New Jersey)

SECRETARY - Valerie Lorenz
(Fairfax Station, Virginia

TREASURER - Glenn W. Taylor
(Springfield, Virginia)

IMMEDIATE PAST-PRESIDENT - James A. (Tony) Dove, Jr.
(Edgewater, Maryland)

BOARD OF GOVERNORS

AT-LARGE MEMBERS

Terms expiring in 1986

L. Malcolm Clark
August A. Dietz IV
Fred C. Galle
Alice J. Holland
Frank B. White, Jr.

Terms expiring in 1987

James A. (Tony) Dove, Jr.
Charles H. Evans, M.D., Ph.D.
Donald W. Hyatt
Ryon A. Page (chairman)
Russell L. Scott

EX-OFFICIO MEMBERS
(chapter presidents)

CHAPTERS

Brookside Gardens (chartered August 1979)
Deborah Van Vechten, president
Richmond, Virginia (chartered August 1979)
Nancy Swell, president
Robert D. Gartrell (chartered May 1980)
Jerry Goodman, president
Ben Morrison (chartered May 1980)
George S. Switzer, Ph.D., president
Northern Virginia (chartered May 1980)
Charles A. Grandjean, president
Louisiana (chartered June 1981)
John U. Rochester, Jr., president
Ralph W. Pennington (chartered June 1981)
Roy Kelly, president
Tri-State (chartered October 1981)
Fred N. Sievers, president
Mobile (chartered March 1983)
Pat Egan, president
Northwest (chartered October 1983)
Eleanor Stubbs, president
Flame Azalea (chartered May 1984)
James G. Egan, president

HONORARY MEMBERS

Robert D. Gartrell
William M. McCrillis (dec.)
Virginia McCrillis (dec.)
G. Albert Reid

LIFE MEMBERS

I. Lee Amann
Hugh A. Caldwell
Chevron Chemical Co.
R. A. Comunale, M.D.
Teresa Dunnington
M. Patton Echols, Jr.
Ann and J. Raymond Goza
Charles A. Grandjean
Alice and Graham Holland
Janet and William C. Miller III
Nuccio's Nurseries
Helen Schroeder
M. Thais Spencer
Frank B. White, Jr.

Regular membership is open to all interested parties for an annual contribution of $15.00. Life membership is $225.00. Members receive *THE AZALEAN* and are eligible for participation in all activities of the Society including those of the chapter with which the member affiliates. For information and membership application, write to the Secretary, Azalea Society of America, P.O. Box 6244, Silver Spring, Maryland 20906.

THE AZALEAN

The Journal of the Azalea Society of America, Inc.

Dr. Charles H. Evans, Editor

THE AZALEAN is published during March, June, September, and December by the Azalea Society of America, Inc., P.O. Box 6244, Silver Spring, MD 20906. Additional copies of the current and back issues are $2.50 each and can be obtained from the Secretary.

Address all editorial and business correspondence to The Editor, *THE AZALEAN*, 9233 Farnsworth Drive, Potomac, MD 20854.

Volume 7 No. 4 December 1985

IN THIS ISSUE:

COMMUNICATING PERCEPTIONS OF COLOR

Donald H. Voss
Vienna, Virginia

When the chiefs and indians gather in the bureaucratic rite known as the "management conference," a consensus will be reached that the prime obstacle to smooth operation of the firm or department is "communication." Once that remarkable conclusion has been voiced, they return to the "real world"—and old habits. What has this to do with horticulture and, specifically, with azaleas?

The answer is simple: the reader is perusing ***THE AZALEAN***, a journal dedicated to the communication of information (including color information) relating to the various facets of breeding, growing, study, and enjoyment of azaleas. But—because of lack of standardization in techniques used to evaluate flower colors and the confusing diversity of common names for colors—the communication of color information is often less effective than it should be.

To communicate color information successfully, we need to achieve a common understanding of some of the factors that affect perception of color, break away from some old habits, and adopt standard procedures for the description and naming of colors.

Color is an important aspect of the description, identification, and enjoyment of azaleas. But a hermit growing azaleas on an otherwise deserted island (perhaps near Kyushu?) would have no need—and, indeed, no opportunity—to communicate color information. He would not need standard color charts, color terminology, color names, or other "baggage" of color description in connection with his horticultural pursuits—so long as his record-keeping remained a pattern of psychological color perceptions retained in memory. But as soon as he determined a need for external records, the lone azalea enthusiast would face many of the same problems we grapple with in our attempts to communicate perceptions of color. He could, of course, solve his record-keeping problem by placing small stones beneath his plants—perhaps one for Orange, two for Red, three for Purple, and an additional, larger stone to distinguish darker from lighter colors.

Difficulties in achieving communication of color perceptions present themselves to the azalea fancier in many ways, including:

- small talk at chapter meetings
- hybridizers' records
- plant registration descriptions
- nursery catalogs
- landscape planning

If everyone were to have a standard color chart, then looking at a color chip cited in a description would provide a direct visual impression of the designated color—almost! This procedure would be fully valid only if viewing conditions (quality and intensity of light source, color of background, and procedural steps) for both the preparer and user of the description were identical.

Many horticulturists and most gardeners do not possess or have access to a standard color chart. Unfortunately, they have only very limited opportunity to acquire such a chart, because the ones commonly used in horticulture are out of print. The *Munsell Book of Color* (a set of some 1,600 high-quality color chips sampling the psychological "color solid") is available—but at a price of about $700 and out of reach for most private horticulturists.(1) The Royal Horticultural Society (R.H.S.) is considering reissue of its *R.H.S. Colour Chart*, which originally sold at a modest price and has been used in describing many of the azalea and rhododendron cultivars registered in the past two decades.(2) Manufacture of additional sets of the chart however, would require the R.H.S to tie up a very large sum of money—a course of action that the society may not consider to be financially prudent.

Older color charts that have been used in horticulture include Ridgway's *Color Standards*, the *Horticultural Colour Chart*, and the *Nickerson Color Fan*, all of which are out of print. Many other color charts exist—house paints, automobile paints, textile colors, and artists colors, for example—but these are not practical for color evaluations that are to be incorporated in plant descriptions for registering and establishing a valid name for a species or cultivar. For these purposes, a color chart should be recognized as a viable international color standard by color experts and by the registration authority for the genus. This calls for a chart that has certain technical properties, among which are the following.

- The chart should represent—ideally—a perceptually evenly spaced sampling of the color solid. Even spacing facilitates interpolation between colors represented on the chart.
- Stability of the colors over time is important in a color standard. The paper on which the colored lacquers, paints, or inks are deposited should be resistant to discoloration and deterioration due to age, and it should be free of fluorescence. The applied colorants should themselves be physically and chemically stable, to prevent or minimize color shifts from reactions triggered by factors such as light, heat, and humidity.

The following sections first explore the confusion that can result from the use of common names for colors and from failure to use comparable concepts and techniques in evaluating and describing colors. Reasons for becoming familiar with color fundamentals are suggested, and basic color concepts underlying the Inter-Society Color Council-National Bureau of Standards (ISCC-NBS) color-name system are presented. The remainder of the article addresses specific procedures and considerations relating to the application of color names in plant descriptions. The discussion touches on

the selection of plant parts for color evaluation and provision of an appropriate environment for color evaluation, and it gives suggestions for application of correct technique. Although much of the discussion has general applicability to botanical and horticultural color description, the sections referring to specific plant parts are directed primarily to readers concerned with azaleas and with other members of the genus *Rhododendron*.

Color-Names Confusion

The reader well may ask whether accurate color information can be conveyed verbally instead of visually.[a] After all, everyone recognizes some basic descriptors of color: red, yellow, green, blue, purple; light, dark; grayish, brilliant. But do different individuals mean the same thing when they say "red" or "blue"? Precisely where is "red" in the range of hues between purple and orange? Where is "blue" in the range between green and purple? Derivative color names such as "rose" are even more treacherous—is the rose an 'American Beauty', 'Queen Elizabeth', or the "Yellow Rose of Texas"?

Each of us has a frame of reference established by experience with color and color names. The artist, scientist, or industrial color expert who carries in mind a systematic association between color names and color perceptions can use color names relatively effectively to communicate—but only with someone who has in mind the same pattern of association. Thus, the problem of using color names to communicate information about perceived color can affect color professionals as well as amateurs. For both, a common frame of reference is the key to understanding.

A number of the color charts that have been widely used in botany and horticulture provide arcane color names. These diverse and often strange color names are listed and related to the Inter-Society Color Council - National Bureau of Standards (ISCC-NBS) Method of Designating Colors in the "Color Names Dictionary" section of National Bureau of Standards Special Publication 440.(3) A tabular concordance between the *R.H.S. Colour Chart* and the ISCC-NBS color names has been provided in a pamphlet by Robert D. Huse and Kenneth L. Kelly, recently published by the American Rhododendron Society.(4) The choice of color names has often reflected the profession of the person providing the names. Scientists have tended to use the names of minerals, birds, flowers, and even stains used in preparing microscope slides. Textile colorists have adopted names thought to be appealing to users of the product. One name used in the *Horticultural Colour Chart* to describe a deep purplish Pink is a pet peeve of the author: Neyron Rose. (5) As noted above, "rose" is not the most precise of descriptors—and what, who, or where is "Neyron"?

[a]A third alternative, used in technical colorimetric work, is to evaluate color instrumentally with a spectrophotometer or tri-stimulus colorimeter and to record the spectral reflectances or CIE chromaticity coordinates (coefficients specifying the proportions of precisely specified primary colors in a specimen color, according to the colorimetric standards of the Commission Internationale de l'Eclairage—The International Commission on Illumination). Such techniques are, however, beyond the technical competence of most persons who need to communicate botanical and horticultural color information. Moreover, the use of precise colorimetric techniques is frequently not warranted because of the color variability present in many species and cultivars as a result of genetic or cultural factors, including the pH of the growing medium and whether the plant is in full sun or is shaded.

Why Bother?

Having had an interest in color for many years, I was startled recently to hear a serious horticulturist comment that, because he does not have access to a color chart, he sees no point in learning some color fundamentals, including the basics of the ISCC-NBS color-name system. Nor does he believe that color references in published cultivar registration statements are useful. In my view, there are cogent reasons for investing time and effort in order to learn a few color basics—whether or not one has a color chart.

- With Fred C. Galle's adoption of the ISCC-NBS Method of Designating Colors in his comprehensive new book *Azaleas,* a clear understanding of the method will be imperative for azalea enthusiasts. (6) In the past, descriptions of color by different hybridizers were based on various color standards, often applying different names to the same color or the same name to different colors! The ISCC-NBS color names provide a *lingua franca* that is more fully comprehended when one understands its basic structure.
- Great restraint in the naming of cultivars is to be applauded; but, once named, a cultivar should be registered to establish an authentic record of the origin and description of the plant, including colors. For horticulturists, reference to registration statements can be the starting line for an effort to select an authentic specimen of a cultivar and the finish line for efforts to unscramble problems caused by mislabelling of plants or by erroneous catalog descriptions.
- Understanding color basics can enhance the aesthetic aspects of color perception. For the azalea enthusiast, understanding can lead to heightened enjoyment of the color contrasts and shadings found in favorite plants. For the landscape designer, the product can be added finesse in the selection and placement of plants.

Before proceeding, it is necessary to note that the subsequent discussion relates to the observation and study of color perceived over relatively short distances—out to perhaps eight or ten feet. Much beyond that distance (depending of course on lighting conditions), very light ("pastel") tints tend to appear "off White" or even White. Thus, a very pale Pink flower that may be striking in its subtlety when planted close to a path can appear nondescript when viewed across a lawn.

Out Of The Wilderness

A major step toward improving the communication of perceived color by means of color names systematically related to a color standard was taken when the ISCC-NBS Method of Designating Colors was developed. The method divides the psychological color solid (a systematic arrangement of all the colors) into 267 color-name blocks defined in terms of the Munsell scales of **hue** (red, yellow, green, etc.), **value** (degree of lightness), and **chroma** (saturation or intensity, from grayish to vivid). To the extent possible, the hue, value, and chroma boundaries of each color-name block were adjusted to include in the block colors reflecting common usage of the associated ISCC-NBS color name. If the Munsell notation of a color (an expression identifying hue and stating value and chroma in terms of numerical scales) is known (for example, in a published registration description), the corresponding ISCC-NBS color name can be readily determined by reference to the Color-Name Charts found on pages 16 through 31 of NBS Special Publication 440.

Basic to an understanding of the ISCC-NBS color-name system is the ability to visualize the hue, value, and chroma relationships of the colors comprising the color solid. The reader is encouraged to consult the excellent article, with color plates, supplementing the "color" entry in *Webster's Third New International Dictionary* (Unabridged) published by G. and C. Merriam Co.(7) (The section below on "Approximating Color By Estimation Without A Color Chart" may be helpful when consulting the dictionary article.) Alternatively, imagine a spheroid (considerably less regular in form than the Earth) that contains all colors, sorted and arrayed in terms of hue and the value and chroma scales.

For convenience, we may begin by visualizing the Earth and relate color concepts to commonly recognized geographic features. Along the axis of the color solid—corresponding in our visualization to the axis of the Earth between North Pole and South Pole—is the lightness or **value** scale, with Black at the South Pole, progressively lighter shades of Gray along the axis as one moves toward the North Pole, and White at the North Pole. Now view the color solid from a point in space above the North Pole. Scanning around the perimeter of the color solid, we observe a succession of **hues**. If, for example, we assign the longitude of the Ural Mountains in the Soviet Union the color Red, then Yellow will be centered on the longitude of southern Japan; Green, on Hawaii; blue, on Atlanta, Georgia; and Purple, just west of Ireland. Finally, from the observation point above the North Pole, visualize radial lines—at some particular latitude (such as the Equator)—running from the central axis of the color solid to its surface. Moving outward along one of these radial lines in the Red sector will present a succession of colors of increasing saturation or **chroma**, from Gray (on the axis) through grayish Red to pure Red on the surface. A skeletonized depiction of the three dimensions of the color solid is shown in Figure 1.

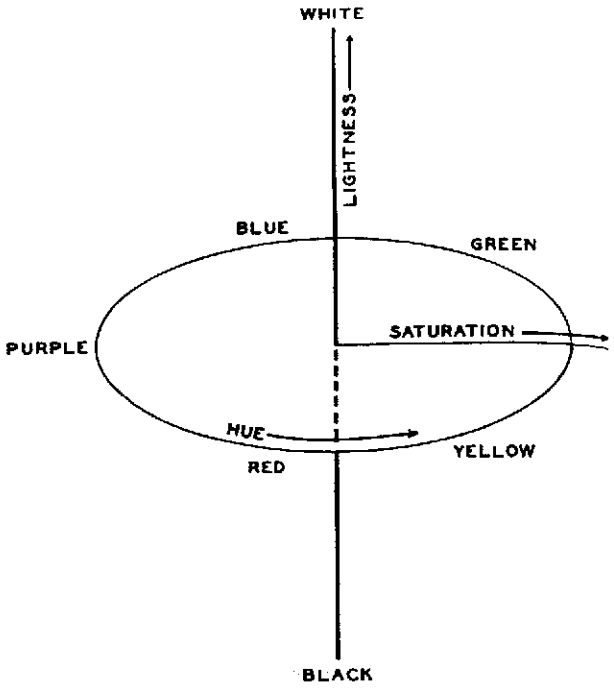


Figure 1. Dimensions of the color solid—Hue, Lightness (= Value), and Saturation (= Chroma) (16).

A segment of the color solid (visualize the shape of a segment of an orange!) will span a range of hue, value, and chroma. The millions of distinguishable colors can be grouped into the 267 color-name blocks of the ISCC-NBS color name system. Each color-name block is given a name designed to provide identification of hue, together with a modifier suggesting value and chroma. The ISCC-NBS color-name blocks and color names for the Purple segment of the color solid shown in Figure 2 illustrate this usage. Most of the color names in this

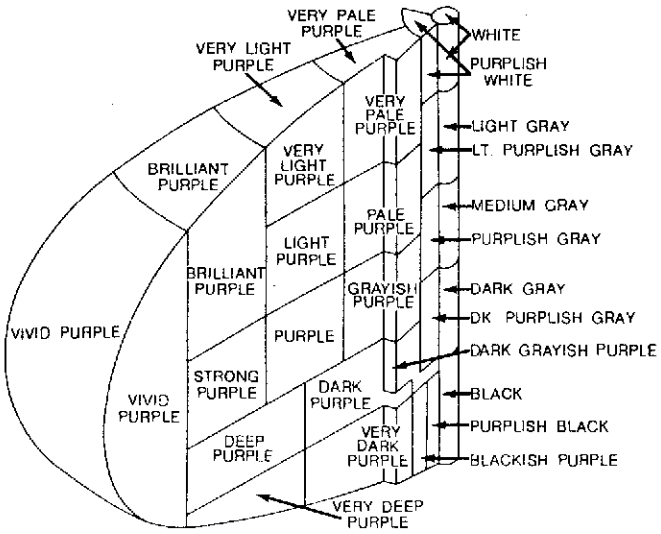


Figure 2. Purple segment of the color solid (16).

system will communicate quite clear and accurate impressions of perceived color. In some areas of the color solid, adaptation to use of the ISCC-NBS color names may require adjustment of the individual's experientially based identification of colors. One name in the ISCC-NBS system of color names is, moreover, new to most of us—yellowish Pink. This name refers to a group of colors often described by common color names such as Coral Pink, Peach Pink, Salmon Pink, and Shrimp Pink. Since Pink (stated without hue modifiers) refers to light tints of Red, the indicated color range, which contains admixtures of Yellow with Pink, is aptly described

Because several standard color charts have been translated to Munsell notation and the ISCC-NBS color-name blocks are defined in terms of Munsell notation, it is possible to convert color references from one system into another through the relation of their Munsell notations. Translation tables are available for the *Ridgway Color Standards, Horticultural Colour Chart,* and, as noted above, *R.H.S. Colour Chart.* (8) The Nickerson Color Fan was published with the Munsell notation printed on each color chip. (9)

For several technical reasons, use of the NBS Centroid Color charts is not recommended. (10) This statement is not inconsistent with advocacy of the use of the ISCC-NBS color-name system. The color-name system is based on a conceptualization tied (albeit indirectly) to international colorimetric standards. The Centroid Color chart is, in contrast, a physical representation of the colors at the midpoints of the various three-dimensional color-name blocks (hence, centroids) defined by the ISCC-NBS system—and as such is subject to the frailties of paper and lacquers with respect to stability and permanence. Some of the chips on the Centroid Color charts reportedly have undergone substantial color shift since the charts were manufactured. Moreover, even when the charts were new, according to the accompanying documentation, many of the chips were not within specification as representations of their respective centroid colors. Other problems relating to use of the Centroid Color charts are discussed in the editor's appendix to the Huse and Kelly pamphlet mentioned above. (4)

With the appropriate color charts out of print or beyond budget, what does one do when faced with the need to perform a workmanlike color evaluation for registration or other serious descriptive purpose? Attempt to find a chart-owner in your local chapters of the Azalea Society of America and American Rhododendron Society. But—because the charts are scarce—don't be surprised if borrowing the chart's owner is a part of the deal. For less rigorous applications, the "chartless" procedure for color approximation described later in this article may be useful.

Applying Color Names

Much of the foregoing discussion is applicable to both sides of the process of communicating color information—the description of plant colors with reference to a standard color chart (or, at least, to a widely understood color-name system) and the interpretation of such descriptions. The following comments apply primarily to describing the colors of plant parts considered to be diagnostic for the purpose of identifying a species, variety, or cultivar; these comments may also be useful to those interpreting plant descriptions.

The process of describing plant colors involves comparing the color of a specimen with a standard subset or "sampling" of the color solid, either by reference to a color chart or by the process of approximation that will be described below. Several steps are involved:

- selection of plant parts for color evaluation, and determination of criteria for dealing with ambiguities encountered,
- provision of an appropriate environment for the evaluation or approximation of the specimen color, and
- application of correct technique.

Failure to follow these steps is an invitation to error. If someone describing plant colors is determined to mislead, he will take his color chart into the garden, select a plant illuminated by early morning or late afternoon sunlight, find a flower surrounded by green foliage (possible adjacent to another flower of contrasting color), fan out his color chart to display a broad range of hues, and quickly select the color chip that appears closest to the specimen color. Another path to erroneous color description would be to attempt working from a color photograph (whether transparency or color print). Photographs almost never reproduce specimen color exactly. Always work from live material in prime condition.

Selecting Plant Parts For Color Description

Differences in criteria for selection of plant parts to be described, in usage of technical terms, and in application of techniques of color evaluation can result in non-comparable or variant descriptions of a particular plant. Moreover, depending on cultural conditions (soil chemistry; fertilizers applied; precipitation, temperature, and solar radiant energy received)—especially during the period of flower-bud formation and development from late summer through winter—many plants exhibit variation in the color of floral parts and leaves. An additional factor complicating the task of creating a diagnostic description is variability in corolla marking traceable to genetic sources, a feature particularly notable in the Satsuki azaleas. For an authoritative discussion of the phenomenon, the reader should consult "Pattern of Sporting" by Charles H. Evans and William C. Miller III, noting the reproduction of an annotated drawing by B.Y. Morrison that clearly shows the principal patterns. (11)

At this time, there are no definitive guidelines for coping with the variability that will be observed as one records color evaluations for a given plant from year to year. The procedures described below must, therefore, be viewed as the author's working hypotheses, which need further testing and would benefit immeasurably from comments and suggestions from members of the

Azalea Society of America, the American Rhododendron Society, and other groups dedicated to the study of plants.

In selecting plant parts for color evaluation, when can be almost as important as **what**. The author uses a rule of thumb that floral parts should be selected for measurement and color evaluation when about one-half of the flower buds on the plant have opened. Ideally, the individual flowers selected for evaluation should be at anthesis; that is, the flowers are fully opened and ready for pollination.

Clearly, the petals (and, in the case of double and hose-in-hose flowers, the petaloid parts) are the primary source of color interest during the flowering period. The petal color is important not only to identification of a species, variety, or cultivar but also to harmonious use of a plant in the landscape. Specification of the petal color obviously is useful in eliminating gross errors in identification. For example, a plant labelled 'Sherbrook' but having brilliant Red petals can readily be determined not to be 'Sherbrook', which is described in its registration statement as having petals colored RHS 78B—a strong reddish Purple. What can one conclude from knowing that a flower has petals colored RHS 78B? It may or may not be 'Sherbrook', but much more information would be required to establish identity.

Some of the distinguishing features are matters of form and dimension—form of the corolla (a collective term for the petals), diameter and length of corolla, length and shape of corolla and calyx, length and curvature of stamens and pistil, and even the presence and character of vestiture (in azaleas, the minute glands and wand-like hairs on branchlets, leaves, and some floral parts). Always remembering the possibility of some variation in plant colors, we can list as diagnostic primarily the colors of petals and petaloid parts (usually ground color and spotting), stamens (comprising the filaments and the anthers, or pollen-producing structures), and pistil (the ovary, the style, and the stigma, or pollen receptor). In some cases, the colors of a foliaceous calyx (more or less leaf-like and green), receptacle, and pedicel are significant, but oftentimes these colors are virtually indistinguishable from cultivar to cultivar. The colors of these normally green structures, moreover, may in some cultivars be more subject to variation due to harsh weather than are the colors of corolla, stamens, and pistil.

Environment For Color Evaluation

A paramount consideration in color evaluation (and important even in simple color approximation) is the quality of the light source. A useful—if incomplete—measure of light quality is its **color temperature**. The color temperature of a light source, measured in terms of the kelvin (K), is the temperature at which a black body emits radiant energy competent to evoke a color of the same hue and saturation as that evoked by the radiant energy from the light source under consideration.(7) The color temperatures of some familiar light sources are approximately as follows:

Iron glowing dull red	800 K
Household tungsten lamp	2,900 K
Photoflood lamp	3,400 K
Early or late daylight	4,300 K
Mean noon skylight	5,400 K
Daylight fluorescent lamp	6,500 K
Hazy sky	8,000 K
Blue sky	9,000 K and up

The reader who has made the mistake of exposing daylight color film under tungsten lighting conditions will recall the yellowed colors resulting from the use of light containing a higher proportion of the Red and Yellow spectral components than the daylight for which the film emulsion was balanced. For those without experience in color photography, another example may be useful. Visualize a late-afternoon scene, imagining that the sky is blue and that you are looking at a White wall, part of which is strongly shadowed. Your visual mechanism transmits two conflicting messages—1) that the wall is White and 2) that the sunlit portion of the wall is yellowish Pink and the shaded portion is dark bluish Gray. Perception of the wall as White is a result of the observer's subconscious discounting of the illuminant colors (sunlight and blue sky light) and a phenomenon known as memory color—a shift in color perception of a familiar object in the direction of the color perceived previously.(12) Although the paint on the wall is "White" (that is, capable of reflecting light from all portions of the visible spectrum), the light reflected from the unshaded part of the wall is in fact yellowish Pink, because in the late afternoon (or early morning) the sunlight reaching the wall has passed through more of the atmosphere than would be the case at midday. The atmospheric filtering and refraction of the sunlight means that the light striking the wall in late afternoon (or early morning) contains an abnormally high proportion of Red and Yellow spectral components and a low proportion of Blue.

Why are the characteristics of the light source critical to color evaluation? If a specimen color appears the same (or nearly the same) as that of a standard color chip under one light source, will it not appear the same under another light source? Unfortunately, the answer is no! It was stated above that color temperature is an incomplete measure of light quality, and the discussion of late afternoon (or early morning) light referred to differences in the spectral composition of light. Thus, while daylight (under some conditions) and a daylight fluorescent lamp may both have a color temperature of 6,500 K, light emitted by the latter source will contain much greater relative amounts of energy in certain spectral bands because of the mercury emission lines and the properties of the phosphors in the fluorescent tube.

An additional complication arises when we factor in the spectral reflective characteristics of the specimen

and of the color chip. It is possible for colored surfaces that appear identical in perceived color under one light source to be reflecting different spectral mixtures. Such colors, known as **metamers,** may appear quite different under an alternative light source.

For reliable communication of perceived color, the individual evaluating color and the individual interpreting the resulting description should use light sources similar (ideally, identical) in color temperature **and** spectral composition. Under these conditions, replication of the color evaluation is possible, and the chance of error involving metamerism is greatly reduced or eliminated.

The preferred light source is northern-sky daylight, avoiding any direct sunlight and avoiding the early morning or late afternoon hours when reddish light may be reflected from clouds or from particles in the atmosphere. In using skylight, it is necessary—and often difficult—to avoid light falling on the specimen and color chart from colored reflecting surfaces such as a colored wall or green leaves in the canopy of trees. Second best to northern sky daylight are special artificial light sources manufactured for use in art studios and in scientific and industrial color evaluation and matching applications. The General Electric "Chroma 75" fluorescent lamp has proven useful for horticultural color evaluation; it has a high color rendering index and is available from many large electrical supply firms. Household incandescent lamps and ordinary fluorescent lamps should be avoided.

Ideally, the comparison of specimen and color chip (or the critical study of a specimen for simple color approximation) should be made against a hue-neutral Gray background, so that the only chromatic objects (that is, objects having discernible hue) in the field of view are the specimen and the color chip. Color vision can be distorted by the inclusion of extraneous colors in the field of view. In color evaluation, the specimen surface and the color-chip surface should be in the same plane or in parallel planes. For either procedure, so-called 45° viewing conditions are recommended—that is, the viewing angle should be about 45° from the axis of the light falling on the surfaces being compared. The reason for using this viewing angle is avoidance of including specular reflection of the light source in the field of view (13). This consideration is especially important in evaluating light tints when using color chips that have some gloss. Inclusion in the field of view of skylight reflected from the glossy surface of the color chip can shift the perceived color of the chip toward blue and cause error in evaluation of the specimen color. In some cases, reflection from the surface of the specimen can create a similar problem. The use of "45° viewing conditions", therefore, is recommended to minimize the chance of introducing such error.

Illumination for color evaluation of specimens should be about 100 to 125 foot-candles (about the light level under a dual-tube fluorescent desk lamp) at the center of the viewed area.(14) For very light specimens, the illumination may be as low as 50 foot-candles; for very dark specimens, it may be as high as 200 foot-candles. Assuring adequate illumination is important, because the color sensitivity of the human eye is to some degree a function of the light intensity.(15) In greatly simplified terms, under bright lighting conditions the image is formed on the central portion of the retina, where the sensors are primarily the color-sensitive "cones." Under dimmer lighting conditions, the image is formed over a broader area of the retina, where more of the sensors are the relatively color-blind "rods." As the rods account for an increasing proportion of the nerve impulses sent to the brain under conditions of inadequate illumination, the ability to discriminate accurately among colors will be degraded.

Approximating Color By Estimation Without A Color Chart

If a color chart is not available to permit a color evaluation, one should resort to an analytical procedure that will lead to a "best-estimate" of the ISCC-NBS color-name block into which the specimen color falls. The resulting color identification will, of course, be rough and should be annotated to indicate that it was determined "by approximation," just as the results of color evaluation with a color chart should include reference to the chart used. The necessary reference materials for color appoximation are not difficult to find: the Hue Modifier chart (Figure 3) and the definitive article

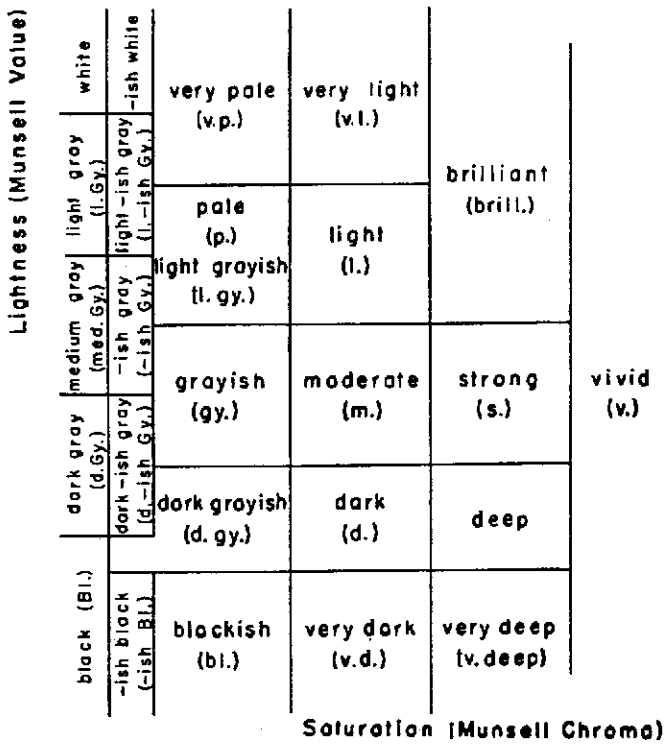


Figure 3. Scheme of modifiers for hues and neutrals (16).

accompanying the "color" entry in the G. & C. Merriam *Webster's Third New International Dictionary* (Una-

bridged).(7) This dictionary is widely available in libraries and offices, as well as in many homes. An added requirement is the investment of time and effort to study the charts, text, and list of ISCC-NBS color names in the dictionary article. The essential steps are as follows.

- Fix in mind the concept of **hue** from the hue circle (B) on the color plate in the dictionary article, paying particular attention to memorizing and visualizing the appearance of the red, red-purple, and purple illustrated.
- Examine the color solid—illustrations (H) and (I), on the reverse side of the color plate—noting that the colors toward the "South Pole" are darker, and those toward the "North Pole" are lighter, than those at the "Equator." Also note that the colors on the outer surface of the color solid are saturated colors (not grayed).
- Now study illustration (C), examining the horizontal row of colors ranging from gray through grayish red to pure red—all of the same degree of lightness. The dimension or property of color measured along this scale of gray-grayish-pure color is referred to as **chroma**. Thus, the saturated colors on the surface of the color solid are "high-chroma" colors.
- Next, note the vertical scale of grays between black and white at the left side of illustration (C). Measurements along this scale refer to **value**—high value means light color, low value means dark color.
- For any hue, the appropriate hue modifiers to describe value and chroma are shown schematically in Figure 3 of this article. This figure also appears in the dictionary article, together with illustrations of application of the scheme to purple and orange hue segments of the color solid.
- Finally, study and, when needed, refer to the text of the dictionary article and the included list of ISCC-NBS color names.

To select a color name for a specimen color by the method of approximation without a color chart, identify the appropriate hue range—Purple, reddish Purple, purplish Red, Red, reddish Orange, and so forth. Then recall that light (high-value) colors in the reddish Purples and purplish Reds are referred to as purplish Pinks; high-value Reds, as Pink; and high-value reddish Oranges and Oranges, as yellowish Pink. Finally, apply to the selected hue designation an appropriate modifier selected from Figure 3. By keeping in mind the basic concepts of hue, value, and chromas as one "assembles" the color name, a far better descriptor can be chosen than by arbitrary application of a common name. Some will disagree, but I maintain that the ISCC-NBS color names convey more information to more people than "Ecclesiastes" or "Pink Rapture"—both of which equate to "strong reddish Purple." Or consider two common names for a moderate yellowish Brown: "Bunny" and "Bismarck brown" (visions of spiked Prussian helmet and speeches about "blood and iron")!

Performing Color Evaluation With A Color Chart

After providing a proper light source and a hue-neutral Gray environment in which to perform the color evaluation, one should adhere as closely as is practical to an established procedure. First, locate in the color chart the approximate range of chips bracketing the specimen color. Then recall the concepts of hue, value, and chroma. Intuitively, most individuals will give the greatest attention to hue, but color technicians consider that the closeness of match between colors depends relatively more on value (degree of lightness) than on hue. Juxtaposing the specimen and a tentatively selected color chip—with no other color (except the hue-neutral Gray background) in the field of view—ask the following questions.

- Is the specimen higher or lower in value (lighter or darker) than the color chip?
- Is the hue of the specimen somewhat to one side or the other of the hue of the tentatively selected color chip in terms the traditional circular arrangement of hues? (For a typical evergreen azalea color in the purplish Pink range, one would ask whether the petal color is somewhat more bluish or more reddish than the color chip.)
- Is the specimen color lower or higher in chroma (grayer or more saturated) than the color chip?

From the results of this comparison, another color chip may be selected, and the process iterated until the closest match is determined. (Note that when using the *R.H.S. Colour Chart,* it may be necessary to skip around among several leaves of the color fans to find the most closely related hues in the appropriate value range. The relation of R.H.S. color chips to ISCC-NBS color-name blocks has been tabulated and discussed by Huse and Kelly. (4)

Because the human eye can distinguish millions of colors and the number of color chips in a color chart is but a small sample of the color solid (for example, there are 808 color chips in the *R.H.S. Colour Chart*), it is likely that the specimen color will fall between color chips. In this case, the result of the color evaluation may be expressed as a range such as "moderate" purplish Pink to strong purplish Pink." If the Munsell notation is available for the color chips that bracket the specimen color, an interpolated Munsell notation may be estimated, reflecting the evaluator's estimate of the differences of the specimen hue, value, and chroma from those of the color chips.

Considerations Relating To Specific Plant Parts

The corolla presents the greatest challenge to the color evaluator. Some corollas have a solid, even color. Others are White or pinks (pale or light tints of Purple, reddish Purple, purplish Red, Red, and reddish Orange) with flecks, stripes, or sectors of a deeper color. Not infrequently, a plant bearing flowers so marked will also

have one or more flowers that are solidly colored with the marking color—such flowers are referred to as "self" or "selfed." Flowers may have other patterns of coloration. Pastel colors often present themselves suffused on a White ground or spreading with increasing value (lightness) from the central axis of the petal. In some, the center of the corolla is White and the margin solidly colored, or the center colored and the margin White. The author finds the most difficult situation to be that of a corolla showing a substantial gradation of color. Multicolors with intergrading hues are found most often in deciduous hybrid azaleas.

The relatively uniform area of color to be evaluated in a solid, selfed, or margined corolla calls for generally straightforward application of the iterative process described above. When dealing with the corolla, it may be advisable to remove the specimen from the rest of the flower, either as individual petals or by cutting along a suture between petals and removing the entire corolla, so that the specimen surface can be compared with the color chip in the same (or parallel) plane.

Even these relatively solid areas of color can present difficulties, especially when the petal surface is somewhat lustrous instead of mat. For example, if the light source is a clear blue northern sky, a pale tint in an lustrous petal may appear slightly bluer than under an alternate daylight source. A more complex situation arises when the corolla color appears overlaid with a faint "haze" of noticeably different hue. A White petal may show a haze of Yellow, or Pink or purplish Pink petals may have a faint but distinct haze of Orange. In such cases, both the ground color and the color, intensity, and persistence of the haze should be clearly stated.

When a corolla has a fairly uniform ground color and distinct markings (flecks, stripes, sectors), these should be evaluated separately. Avoid falling into the trap of assuming that the ground color will be a tint, or "let-down," of the marking color—it may or may not be. Moreover, in some color charts (including the *R.H.S. Colour Chart*), the "let-down" color chips on a given leaf frequently demonstrate some hue shift from the full-color chip.

The spotting that usually appears on the adaxial (inner, facing toward the central axis of the flower) surface of the upper lobes of the corolla is a particularly interesting color phenomenon. (Spotting is sometimes referred to as "blotch," but that term is properly reserved to describe an area of solid color in the same location.) The spotting is frequently of different hue and lower in value (darker in color) than the ground color of the petal (or of the blotch, if present). A fascinating variation in the color of spotting between flowers on the same plant—or even in the same flower—is dependent on the presence of marking (striped, sectored, or selfed corolla). On 'Sara Holden', for example, the petals may be White, White marked with light Pink to strong Pink, or selfed. Where the spotting appears over White or only slightly tinted White ground color, the spots are a light yellow Green; over the striped, sectored, or selfed areas, the spots are a deep Red. Obviously, both conditions should be evaluated and recorded in a description of this cultivar.

Before leaving the corolla, it should be noted that additional features require comment. The adaxial surface of the throat of the corolla is often a greenish White or pale greenish Yellow. If the abaxial surface of the corolla (the outside surface, facing away from the axis of the flower) is slightly different in color from the adaxial surface, so note. Occasionally the color of the abaxial surface of a Purple or Red corolla shows a slight shift toward Red or Orange, respectively, near the base.

Stamens and pistils present special problems, not the least of which is the small size of the surfaces to be evaluated. Accuracy in color evaluation decreases markedly with decrease in specimen size. The pollen-producing anthers are borne on thread-like filaments. The anthers face inward, and color is evaluated for the adaxial surface. The anther colors are usually difficult to pinpoint, because they fall in a range of brownish or grayed colors and the specimen size is small. The filament may be uniform in color along its length but frequently grades from a relatively strong color at the base to White or nearly White at the anther.

The surface of the stigma may appear to be uniform in texture and color, or it may appear bullate (puckered) and mottled in color. In the latter case, the "integrated" color of the stigmatic surface should be evaluated (blur the eyes slightly). A word of caution: be sure that the stigma is free of pollen grains or, at least, try to ensure that their presence does not influence the color evaluation. The style, which bears the stigma, is subject to the general considerations stated for the filaments.

Finally, it is desirable to record the colors of the calyx and the pedicel (flower stalk). When the calyx has been transformed into petaloid structures, the comments relating to color evaluation of the corolla are applicable. When the calyx lobes are foliaceous, their abaxial surfaces are frequently clothed with flattened hairs. The presence of these whitish or moderate reddish Orange hairs calls for extra care in the color evaluation of the green surface of the calyx. The pedicel may be similarly clothed and—although usually yellowish Green or greenish Yellow—may have patches ranging from moderate Red to grayish reddish Brown.

Conclusion

Careful attention to detail, including a reasonable attempt to perform color evaluation under standard lighting and viewing conditions, will greatly enhance the ability to communicate impressions of perceived color. We cannot ignore these strictures and hope to have another person visualize with reasonable accuracy a color that we have recorded, whether by reference to a color chart or through descriptive color names.

REFERENCES

1. *Munsell Book of Color.* Glossy Edition (1,600 samples). Baltimore: Munsell Color.
2. The Royal Horticultural Society. *R.H.S. Colour Chart* (with introductory pamphlet and Table of Cross-References). London, (1966).
3. Kelly, Kenneth L. and Deane B. Judd. *Color: Universal Language and Dictionary of Names.* National Bureau of Standards Special Publication 440. Washington, U.S. Government Printing Office, (1976, 1978).
4. Huse, Robert D. and Kenneth L. Kelly. (Edited by Donald H. Voss). *A Contribution Toward Standardization of Color Names in Horticulture: Application of the Universal Color Language to the Colors of the R.H.S. Colour Chart.* n.p.: American Rhododendron Society, (1985).
5. The British Colour Council in collaboration with The Royal Horticultural Society. *The Horticultural Colour Chart.* London, (1938, 1940). (Also issued as the Wilson Colour Chart.)
6. Galle, Fred C. *Azaleas.* Portland, OR, Timber Press, (1985).
7. *Webster's Third New International Dictionary* (Unabridged). Springfield, MA, G. & C. Merriam Co., (1966).
8. Hamly, D.H. "The Ridgway Color Standards with a Munsell Notation Key." *J. Opt. Soc. Amer.* 39:592 (1949); Nickerson, Dorothy. "Horticultural Colour Chart Names with Munsell Key." *J. Opt. Soc. Amer.* 47:619 (1957).
9. Nickerson, Dorothy. *Nickerson Color Fan* (40 Hues—Maximum Chromas; 262 Samples). Baltimore, Munsell Color Co. (1957).
10. National Bureau of Standards, *ISCC-NBS Centroid Color Charts* (Standard Reference Material No. 2106). Washington, D.C.
11. Evans, Charles H. and William C. Miller III. "Pattern of Sporting," *The Azalean,* 7:1-2 (1985).
12. Judd, Deane B. and Gunter Wyszecki. *Color in Business, Science and Industry* (3rd ed.). pp. 371-2. New York, John Wiley & Sons, (1975).
13. *Ibid.,* pp. 122-5, 402-9.
14. *Standard Practice for Visual Evaluation of Color Differences in Opaque Materials* (ASTM Designation: D1729-82). Philadelphia, American Society for Testing and Materials, (1982).
15. Judd and Wyszecki, *op. cit.,* pp. 8-13.
16. Figure reproduced from National Bureau of Standards Special Publication 440 (Reference 3 above).

Donald Voss is a member of the Northern Virginia Chapter and is a previous contributor to ***THE AZALEAN.***

Editor's Notes:

For more information on color vision and color perception, see also: Hurvich, Leo M. *Color Vision.* Sunderland, Massachusetts: Sinauer Associates, Inc., 1981.

The *Munsell Book of color*—Glossy Finish Collection, 1976 Edition (Catalog Reference 4-A) is available from:

Munsell Color
2441 North Calvert Street
Baltimore, Md 21218
(301) 243-2171

January 1, 1985 price is $640.00 (F.O.B. Baltimore, MD).

The National Bureau of Standards offers for sale (in limited quanitites) the following Standard Reference Materials (SRM's):

SRM 2106 - Centroid Color Charts ($31.00) - consists of 251 color chips on 18 constant-hue centroid color charts.

SRM 2107 - Color Kit ($40.00) - combines SRM 2106 with Special Publication 440 (*Color: Universal Language and Dictionary of Names*).

Orders should be addressed to:

Office of Standard Reference Materials
Room B311, Chemistry Building
National Bureau of Standards
Washington, DC 20234
(301-921-2045)

The American Rhododendron Society pamphlet *A Contribution Toward Standardization of Color Names in Horticulture* (Huse and Kelly) may be ordered for $8.00 (including postage) from:

Executive Secretary
American Rhododendron Society
14885 S.W. Sunrise Lane
Tigard, OR 97224

1985 GUIDE TO AZALEA HARDINESS

Charles H. Evans
Potomac, Maryland

The Azalea Society of America presents its first member assessment of the hardiness of azalea hybrid groups and individual varieties. The evaluation was undertaken in response to continuing inquiries concerning the hardiness of azaleas in different climatic areas. The great number of azalea varieties with their many colors, flower forms, leaf shapes, and growing habits, as well as one's personal preferences, make any assembly of hardy azaleas difficult. Nevertheless, an evaluation of overall azalea hardiness based upon current member experience provides a useful guide when selecting established or newer varieties for planting in a particular locale. A guide to azalea hardiness should also be a useful resource to hybridizers in developing new varieties and to amateur and professional growers in selecting and evaluating the strengths of recently introduced and new varieties.

The years 1983, 1984, and 1985, with their extreme temperature, precipitation, and other climatic flucuations in widespread regions of the United States stressed old and new azalea hybrid groups in many areas represented by the society's membership. This provided a good opportunity in 1985 for a organization-wide evaluation of overall azalea hardiness in terms of growth, flowering and general appearance. Forty-nine members, based upon their experience with plants growing in the ground for five or more years, selected the three most hardy and three least hardy hybrid groups and azalea varieties. This is an outstanding recommendation of azalea hardiness when one considers the number of individuals growing a diverse number of established azalea varieties representing the many hybrid groups. The member ratings are summarized in the accompanying tables according to the society as a whole and also according

Table 1. 1985 Guide to Hardy Azalea Hybrid Groups

Azalea Group	Number of reports[a]	*Hardiness*[b]						
		Society wide	NE	MA	SE	S	MW	NW
Gable	22	1		1	2	3	2	1
Glenn Dale	26	2		2		2		2
Kurume	15	3		3	3	1		
Robin Hill	9	4	1					
American Natives	9	5	1		1	3		
Girard (evergreen)	11	6	3				3	
Shammarello	5	7					1	3
Satsuki	8	8						
North Tisbury	5	9	2					
Kaempferi	4	10						
Southern Indian	3	11						
Linwood	5	12	2					
Exbury, Mollis, Ghent, Knaphill	3	13						
Greenwood	2							
Back Acres	2	14						
Beltsville	1							
Chisolm Merritt	1							
Kehr	1							
Loblolly	1							
Pennington	1							
Pericat	1							
R. kiusianum	1							

[a]Total number of respondent ratings as the first, second, or third most hardy hybrid group.

[b]Computed based upon 3 points for the most hardy group, 2 for the second most hardy group and 1 for the third most hardy group listed by each respondent. Listed as 1-14 society wide and 1-3 in each geographical area according to the total number of points received by the hybrid group. Duplicate ratings in a geographic area indicated by a tie score. Northeast (NE) includes reports from New York, Pennsylvania, Massachusetts, and northern New Jersey. Middle Atlantic (MA) includes reports from southern New Jersey, Delaware, Maryland, the District of Columbia, and Virginia. Southeast (SE) includes reports from North Carolina, South Carolina, and Georgia. South (S) includes reports from Florida and Alabama. Midwest (MW) includes reports from Indiana. Northwest (NW) includes reports from Oregon.

to the major geographical areas where Azalea Society of America members currently reside. Commentaries dealing with a variety of points relating to azalea hardiness provided by Society members are also included to broaden the scope of the evaluation.

Twenty-five hybrid groups are included in the listing of the most hardy (Table 1) and thirty-one hybrid groups are included in the listing of the least hardy (Table 2) hybrid azalea groups. This is a surprisingly good balance considering the inherent bias introduced by the previous planting of groups known to grow well in one's locale as well as by the popularity of favorite plants with each grower. Thus, it is noteworthy that the three most hardy and four least hardy groups were listed in approximately one-half of the reports. Less agreement is present when individual varieties are compared due to the very large number of azalea cultivars. Even so, it is interesting that five or more society members rated 'Elsie Lee', 'Herbert', and 'Martha Hitchcock' as the most hardy varieties (Table 3) and that seven members rated 'Formosa' and 'George Lindley Tabor' as the least hardy varieties (Table 4). The apparent agreement among Azalea Society members as to the most and least hardy hybrid groups and azalea varieties must, however, be viewed in conjunction with a number of additional considerations and observations contained within members comments in the following paragraphs.

Table 2. 1985 Guide to the Least Hardy Azalea Hybrid Groups

Azalea Group	Number of reports[a]	*Hardiness*[b]						
		Society wide	NE	MA	SE	S	MW	NW
Southern Indian	18	1		2	1	2		3
Back Acres	18	2		1		3		
Pericat	10	3		3	3	3		
Satsuki	14	4	3					1
Belgian Indian	8	5				1		2
Linwood (evergreen)	6	6						
Eden	4	7						
Robin Hill	5	8					2	
Exbury	3	9						
Pennington	2	10						
Glenn Dale	3	11	1				3	
Harris	2	12						
Kurume	3	13						
Mollis	2							
North Tisbury	2						1	
Rutherford	3							
American Natives	1	14	2					
Belgian Glenn Dale	1		1		2			
Carla	1							
Chisolm Merritt	1							
Gable	1							
Harris	1							
Hershey	1							
Kehr	1							
Knaphill	1							
Kurume	1							
Mossholder	1							
Nuccio	1		2					
Sherwood	1							
Vuyk	1							
Whitewater	1							

[a]Total number of respondent ratings as the first, second, or third most hardy hybrid group.

[b]Computed based upon 3 points for the least hardy group, 2 for the second least hardy group and 1 for the third least hardy group listed by each respondent. Listed as 1-14 society wide and 1-3 in each geographical area according to the total number of points received by the hybrid group. Duplicate ratings in a geographic area indicated by a tie score. Northeast (NE) includes reports from New York, Pennsylvania, Massachusetts, and northern New Jersey. Middle Atlantic (MA) includes reports from southern New Jersey, Delaware, Maryland, the District of Columbia, and Virginia. Southeast (SE) includes reports from North Carolina, South Carolina, and Georgia. South (S) includes reports from Florida and Alabama. Midwest (MW) includes reports from Indiana. Northwest (NW) includes reports from Oregon.

Table 3. 1985 Guide to the Most Hardy Azalea Varieties

Variety	Hybrid Group	Number of Reports	Overall Ranking
'Elsie Lee'	Shammarello	6	1
'Herbert'	Gable	5	2
'Martha Hitchcock'	Glenn Dale	5	3
'Ben Morrison'	Glenn Dale	3	4
'Hershey Red'	Hershey	3	5
'Madame Butterfly'	Deerfield	3	6
'Nancy of Robinhill'	Robin Hill	3	7
'Coral Bells'	Kurume	3	8
'Addy Wery'	Kurume	2	
'Gaiety'	Glenn Dale	2	
'Mildred Mae'	Gable	2	9
'Peach Fuzz'	Linwood	2	
poukhanense	Korean native	2	
canescens	American native	2	
'Corsage'	Gable	2	
'Ellie Harris'	Harris	2	10
'George Lindley Tabor'	Southern Indian	2	
'Hardy Gardenia'	Linwood	2	
'Picador'	Glenn Dale	2	

Overall hardiness rating was determined by the method described in Table 1.

Varieties receiving one report as the most hardy: 'Amy', *bakeri*, 'Sunlight', 'Becky Curtis', 'Beni-kirishima', 'Cattleya', 'Chanson', 'Cora Brandt', 'Delos', 'Fritz Aichele', 'Girard's Rose', 'Helen Close', 'Hilda Niblett', 'Hinode-giri', 'Judge Solomon', 'Kikoshi', 'Louis Gable', 'Mai-hime', 'Motley', 'Orchid Beauty', 'Parfait', 'Peggy Ann', 'Rukizon', 'Stewartstonian', 'Yoshio Red', 'Watchet', 'White Rosebud'.

Varieties receiving one report as the second most hardy: 'Acrobat', 'Ambrosia', 'Annabella', *austrinum*, 'Campfire', 'Chinsoy', 'Cinderella', 'Dancing Butterfly', 'Fisher's Pink', 'Garden State White', 'Geisha', 'Glamour', 'Helen Curtis', 'Hexe', 'Karen', 'Kow-koku', *kiusianum* f. *album*, 'Magnifica', 'Marilee', *nakaharai* 'Mt. Seven Star', 'Narcissiflora', 'Opal', 'Palestrina', 'Pat Kraft', 'Pied Piper', 'Pink Cascade', 'Pleasant White', 'Red Fountain', 'Shimmer', 'Shoqua', 'Sir Robert', and 'Zulu'.

Varieties receiving one report as the third most hardy: *atlanticum* Choptank River strain, 'Buccaneer', 'Cora Brandt', 'Damask', 'Dauntless', 'Easter Parade', 'Eleanor Cole', 'Girard's Scarlet', 'Gumpo', 'Hakatashiro', 'Heiwa', 'Hino Crimson', 'Hino Red', 'Hot Shot', 'Indica Alba', 'Kate Arendall', 'Kathy' (Girard), 'Kotobuki', 'Linwood Lustre', 'Little White Lie', 'Marian Lee', 'Mary Margaret', 'Miss Susie', 'Painted Lady', 'Paradise', 'Petite Pink', 'Seneca', 'Sherwood Orchid', 'Silver Mist', 'Spring Bonnet', 'Sue Bell', 'Tara', and 'Youth'.

Difficulties in Rating Azalea Hardiness

"We have probably 2000 or more azaleas with many of them being 25 or more years old. (We have continued to add some 25 or more azaleas each year). The survey is difficult for me to answer as so many of the azaleas have come through the past winters in excellent shape. Last Spring we had poor blooms, but this was due to a freeze (about 20°F) about one and one-half weeks before the early azaleas were ready to bloom and the buds blasted at that time. Last winter I had only one azalea die, and it was a Linwood seedling only about 5 inches high. A rabbit instead of the weather may have been the culprit as everything was missing.

"Clearly 'Sweetheart Supreme' is my most damaged azalea by cold weather. I have about 8 of them (25 years old) and they die back toward the roots. After 2 cold winters they have spotty foliage. My next worst performer is 'Pink Ruffles' which in cold winters also loses most of its foliage and blooms. By May they look very bad but by July they show no evidence of cold damage. They may be partially deciduous in the cold weather. I have about 20 'Pink Ruffles' and they all respond the same.

"For the past 2 years my Mollis (red—name unknown) has gone into a major decline. I can't be sure it is the weather as I have only one mollis. My other deciduous azaleas show no winter damage. I have about 100 or more native azaleas (nudiflorum) and about 20 Exbury, and they show no damage from cold. I also have 4 'Yodogawa' deciduous azaleas, and they also show no winter damage.

"Cold weather, while not hurting the foliage of the Back Acres or Satsukis does affect the blooming of some varieties. The clear winners in terms of standing cold weather are the Gables, Kaempferis and the Glenn Dales. With regard to some of the minor hybrids, 'Madame Butterfly' (Deerfield) has bloomed beautifully the past 2 years. 'Redwing' (Brooks) has survived but not bloomed. I have a number of 'Hexe'. They have been a mixed bag with some blooming fine and others showing winter damage and no blooms.

"I have a large number of Kurume and they all survived the winter in fine shape, but most are early bloomers and were blasted by the cold weather about one and one-half weeks before they would have bloomed.

Table 4. 1985 Guide to the Least Hardy Azalea Varieties.

Variety	Hybrid Group	Number of Reports	Overall Ranking
'Formosa'	Belgian Indian	7	1
'George Lindley Tabor'	Southern Indian	7	2
'Sweetheart Supreme'	Pericat	3	3
'Gumpo'	Satsuki	4	4
'Treasure'	Glenn Dale	4	5
'Koromo-shikibu'	Kurume	3	6
'Conversation Piece'	Robin Hill	2	7
'Frosted Orange'	Harris	2	
'Gardenia Supreme'	Pericat	2	
'Red Slippers'	Back Acres	2	
'Coral Bells'	Kurume	2	8
'Warai-Gishi'	Satsuki	2	
'Ivan Anderson'	Back Acres	2	9
'St. James'	Back Acres	2	10

Overall hardiness rating was determined by the method described in Table 1.

Varieties receiving one report as the least hardy: 'Anne Chenee', 'Boldface', 'California Sunset', 'Corsage', 'Georgia Giant', 'Getsutoku', 'Gillie', 'Glacier', 'Gloria', 'Great Expectations', 'Hatsushima', 'Hershey Red, 'Hinode-giri', 'Joseph Hill', 'Kohan-no-tsuki', 'Manhattan', 'Mrs. G. G. Gerbing', 'Patti Ann Hames', 'Pennington White', 'Silver Sword', 'Sligo', 'Vuyk's Scarlet', 'White Heart', and 'Zulu'.

Varieties receiving one report as the second least hardy: 'Anna Kehr', 'Content', 'Dayspring', 'Dr. Curtis Alderfer', 'Garden State White', 'Guy Yerkes', 'Hershey Red', 'Hexe', 'Hino Crimson', 'Kathryn J. Pennington', 'Leopold Astrid', 'Macrantha', 'Marian Lee', 'Marilee', 'Martha Hitchcock', 'Mayo's Perfection', 'Mother of Pearl', 'Pericat White', 'Pink Ruffles', 'Sekidera', 'Shinnyo-no-tsuki', 'Sterling', 'Vestal', and 'Yodogawa'.

Varieties receiving one report as the third least hardy: 'Alight', 'Blue Tip', 'Carillon', 'Cora Brandt', 'Eikan', 'Geisha', 'Gunrei', 'Hearthglow', 'Keisetsu', 'Lilacina', 'Merrymaker', 'Mother's Day', 'Myuno-no-tsuki', 'Pinocchio', 'President Claeys', 'Rogetsu', 'Sherwood Red', 'Stewartstonian', 'St. James', 'Vibrant', 'Wendy', and 'Wintergreen'.

'Salmon Beauty' seems to be the most tender of the Kurumes I have. (I have a number of 'Hino Crimson' in bloom now—August 10.) The Sherwoods have been hardy as have been both 'Anna Kehr' and 'White Rosebud'.

"Several of the species type azalea have performed well during the cold winters including 'Delaware Valley White'. 'Macrantha Red' and 'Beni-kirishima'.

"The last azalea I would like to mention is an azalea unlike any other I have seen. I was told it was 'Kirishima'. It has very thick stems and leaves (large) which are very sticky and unpleasant to touch. The blooms are about two and one-half inches, white with a pink blotch. I was told cuttings would not root, but I rooted everyone I tried. After realizing the size of the azalea (about 10 feet tall and probably 25 feet in diameter in 25 years) I quickly got rid of all but one cutting. This azalea has never shown any winter damage."

Fred J. DeMeritte, Silver Spring, Maryland

Hybrid Group Hardiness May Be Misleading

"I agree that our last few winters have certainly been a great test of azalea hardiness. In my own garden, many flowers did not bloom normally in spring 1985, but no established plants were winter-killed.

"I have been concerned for some time that many gardeners believe that hybrid groups are more mutually distinctive than they really are and I don't think we can over-emphasize the fact that not every member of a "hybrid group" has the same degree of hardiness. The only group that I know with an exclusive species heritage is the North Tisbury group. Other groups are usually distinguished by the location where they originated or by the name of the hybridizer and generally have a mixed ancestry. For example, the Glenn Dales include in their ancestry: *kaempferi, poukhanense, mucronatum,* Kurumes (ancestry unknown), *indicum, phoeniceum,* and *simsii.* Most of the other evergreen hybrid groups also include plants derived from one or more of these same ancestral species."

Deborah K. Emory, Silver Spring, Maryland

"There's no way I could say which are the worst groups because I avoid the ones that are suited only to zone 8 to 9 or to above-freezing greenhouses. I do have a few Southern Indicas in a very protected spot, but only 'G.L. Tabor' and 'Lady Cavendish' ever bloom and neither did this year.

"Location is a factor (and sometimes a puzzler). One 'Delos' in woods that get constant northwest winds has bloomed the last couple of years but others on the "protected" side of the house have not. Some Linwoods that bloomed in the woods have not since moved to what I considered a better spot."

Jane Newman, Great Falls, Virginia

"The main problem is that the best azaleas cut straight across hybrid lines; therefore, there is no clearcut best. . . I am pushing Linwood 'Orchid Beauty' as the plant for all seasons and purposes. For my reasoning, even the last two winters have not affected the time or amount of bloom. Unlike most of the very hardy azaleas, it seems to hold most of its leaves over the winter, turning a very shiny reddish green that seems to be unburnable. It would be an excellent landscape plant if it never bloomed! We need more plants that are outstanding broad-leaf evergreens, in bloom or out. . . So many plants of all hybrid groups did not bloom. In some cases, the buds were ready to open when the freeze hit, in others, the buds looked normal, but were killed. . . 'Ben Morrison' in one location was one of the best varieties, in another, the same age plant was one of the worst varieties."

Nancy Swell, Richmond, Virginia

Hardiness Criteria Make Comparisons Difficult

"1—Size of Hybrid Group: I find it very difficult to compare a group such as the Glenn Dales or Satsukis due to their magnitude, with groups such as Yavorsky's or Kehr's.

"2—Best/Worst Criteria: I also find it difficult to describe varieties such as 'Leopold Astrid' (Herns), 'Variegated Dogwood' (Sport of 'Dogwood'-OSU), 'Yvonne' (Belgian Indian), all of which are superb plants, as worst just because they are not hardy in this area.

"3—Hybrid Group/Variety Hardiness Disparity: As a general rule, one must classify the Aicheles and Sonoma Horticulture hybrids as Worst in terms of hardiness in our area; however, as an exception 'Posaeman' is an excellent addition to anyone's garden and 'Sonoma Dwarf Scarlet Picotee', which I have been growing for 8 years, is an outstanding variety and is certainly included in my list of 25 favorite clones.

"4—What Constitutes Hardiness: To me true hardiness for a particular area entails, at a minimum, a plant displaying full bloom and suffering no more than 5 percent foliage damage in 5 out of 6 years. As one gardener wrote me this summer, "Those plants which you advised me to get rid of (they were frozen back to the soil line) are all hardy—they are all putting out new growth."

". . . Hybridizers and sellers tend, as a general rule to grossly exaggerate plant hardiness. . . . Some sellers assume because a group was developed in New Jersey, Pennsylvania, or Massachusetts that it is automatically hardy (I estimate that only approximately 20-25 percent of the Edens are hardy in this area and certainly the Robin Hills have been grossly exaggerated as a group). Sellers also frequently just don't know a clones hardiness because of their being grown under temperate or greenhouse conditions. Lastly, microclimates within one's own garden will result in unusual growing conditions which will confound normally accepted hardiness factors."

Ronald C. Vines, Springfield, Virginia

"We had fairly good bloom on some 25 year old Southern Indians with normal (?) foliage this spring but at this time the plants are 95 percent dead, with only a few shoots coming from the roots.

"I can state without reservation, however, that the Kurumes came through the winter with less damage than any other group. (At least for me.)

"The Belgian Indians that I listed as worst are marginal here in a normal winter. I had been able to keep 'California Sunset' until the winter of 83-84, also 'Albert-Elizabeth' but this is not normal."

Russell Scott, Mobile, Alabama

Patience With Dwarf Azaleas

"I have heard many people comment that the Beltsville Dwarf azelas don't prove hardy or do well for them. In the rooting process in the greenhouse this has proven true for me so I just do a larger quantity. But outside in pots as well as in the ground, they are just fine. Have had five varieties growing, without any problems in the ground for five years. As I especially like the small, low, or slow growing varieties of all plants, these especially appeal and I regret their questionable reputation."

Betty Cummins, Marlboro, New Jersey

"I did not fill out the form because I just do not have enough varietal material to be helpful. Instead, I am making a few observations on the azalea parental material that I have. My garden is at present very small and I have a moss garden where there are a number of dwarf azaleas. This environment must be right because I can collect any number of seedlings under the plants every year. These are mostly *R. kiusianum* selections that Skip March and I brought back from Japan. They certainly did well this past winter when our temperature went to -15°F. I did not see them during the flowering season because I was in Japan but I consider that one azalea for the future is pure *kiusianum* as a parent in breeding.

"*R. eriocarpum* killed completely and of course, a number of the satsukis were badly damaged but are coming back. Some cultivated forms of *R. indicum* were also badly damaged but other wild collections of *R. indicum* were untouched. I suspect that if *R. eriocarpum* is as we believe, a parent of the satsuki azaleas, its lack of hardiness is a distinct disadvantage. *R. sataense*, that's the one Leach says does not exist, came through with some damage but I have only one plant. If I were starting in on a breeding program, I would use our recent collections of *R. kaempferi* from nothern Japan, not from Kirishima where I believe only the poorest remnants of the population have been left to interbreed. The best ones were long since collected by the Japanese. We have never used *R. komiyamae* from around Mt. Fuji although there are natural hybrids with it and *R. kaempferi* and these may have been introduced into cultivation as deviant forms of *R. kaemkpferi*. It came through the winter with no more difficulty than *kaempferi*.

"The Gable *poukhanense* hybrids of course had no problem but like most others probably did not flower. Again I was away so cannot comment on flowering.

"Thus my views are that there is still room for breeding new and better azaleas by selecting the specific parents to use. Maybe it is time for another Morrison approach now that we have observed his Glenn Dales for over twenty years plus all the recent hybrids that seem to repeat earlier combinations."

John Creech, Hendersonville, North Carolina

Conclusion

The search for a hardy azalea may often seem to be an elusive quest. Hybrid group and variety reputations, however firmly established, frequently do not match the local pattern of temperature, wind, drainage, acidity, and other ecological characteristics of the area designated for azalea planting. The potential performance of an azalea variety and local ecology assume even greater importance when plant hardiness is considered over a widening span of years. The increasing variety of evergreen and deciduous azaleas insures, however, that there are several if not many amongst the thousands of old and new azalea hybrids that possess the characteristics and hardiness desired for any location where azaleas will grow. Any recommendation as to specific hardiness of an azalea group or variety in light of the considerations presented in this report must be carefully considered in relation to the local microenvironment. The listings in this report are, therefore, at best overall hardiness ratings subject to adjustment depending upon local conditions and additional experience with more recently introduced azaleas varieties and refinements in the culture of azaleas.

BREEDING OBJECTIVES OR HYBRIDIZING FOR A PURPOSE

Louis Mensing
Eugene, Oregon

I feel a little ill-at-ease talking to you about hybridizing azaleas. My problem is that I know so few plants. And I believe to really be an effective hybridizer I would need to know as many as possible. By knowing plants I mean observing their characteristics. For most people, flower color is the most important characteristic, then perhaps flower size and shape, plant size and habit, and hardiness follow. But when we think of our favorite plants, we see that there are other equally important characteristics that make them special. Along with flower color, some other important qualities are the time of bloom, the amount of bloom, the length of bloom time and whether the flowers come all at once or are spread out over time, thickness of flower petals, and the ability of the flowers to last. Many of our favorite plants also have leaf qualities that make them unique. Their size, shape, persistence, leaf hairs or glossy surface, and color can be important at bloom time and throughout the year. The complaint of the look of sameness of many hybrids by the species collector may be the result of the lower priority usually given to leaf characteristics by the hybridizer. And finally, as growers, you have experience with qualities that frequently go unnoticed by most. The ease of propagation, if and how long it takes to make a good plant, and disease resistance are major characteristics that probably determine how long a plant

remains popular. These traits should be important in every breeding program. Most of the other traits, however, work well in some combinations and less well in others. What is good is determined by who is looking at the plant. The characteristics are up to the individual hybridizer—tiny flowers, glossy leaves, large flowers, etc. the satisfying aspect of hybridizing is finding which characteristics look good in combination, then working out a plan that makes it possible, and finally, hopefully seeing that well-composed plant.

Breeding objectives or hybridizing for a purpose are terms that frequently make people just beginning to hybridize uncomfortable. Perhaps the absoluteness of these terms sounds so threatening. In the United States at the present time, you can cross any rhododendron or azalea with any other. You are limited only by whether or not the cross "takes." Objectives, however, help in several ways. The hybridizer begins to get a notion of how a plant shows up in the next generation. After several crosses with a plant, the recessive traits become more visible. A plant gets to be known as a good parent or a bad parent. Also, objectives aid in charting out crosses. When the desired qualities are stated, then a plan of action can help in making sure all the desired traits are present in the parents.

Trends in hybridizing are changing. Hybridizing really only began in the mid 1800's. Up until the present time, the advice was to cross only similar plants—red with red, white with white, and so on. The Seattle Hybridizing Group recommends making wide crosses. In wide crosses, the two very dissimilar parents are hoped to give some unique combinations not seen before. Wide crosses, however frequently need to be followed by a second cross, or more, to bring out all the desired characteristics. Whether the hybridizer wishes to stabilize characteristics or to have the recessive or submerged traits expressed, he has several possible ways to make this happen. Selfing, or pollinating a plant with its own pollen, is one way to reorder the limited number of chromosomes. Sibling crossing is another way. It is usually done by taking the two plants of a cross that best show the characteristics wanted and crossing them. Sometimes a plant refuses to cross with itself or even with a sibling. Then backcrossing to the parent that best shows the traits wanted or crossing with a more distant plant showing the desired traits brings about the objective.

Next, I would like to discuss a couple of my crosses. The first is 'Late Love' open pollinated. 'Late Love' is a North Tisbury hybrid. It is a cross of 'Chinyeyi' x *Rhododendron nakaharai*. These seedlings of mine are most likely selfed, but as I did not do it, they are called open pollinated. There is very little variation in either flower color or size. There is some variation in plant size and habit. I don't know 'Chinyeyi' or the form of *R. nakaharai* that was used, but from the plants that have bloomed so far, I would guess that both parents are pink.

Next is a seedling from a cross of a white Kiusianum with the salmon form of *nakaharai* from Harold Greer. Harold has stated that it may be a hybrid. This cross produced lavender flowers. Orange is supposedly composed of carotenoid yellow in the cells overlaid with anthocyanin purple. I am not sure why the seedling came out lavender pink, as the white kiusianum has no carotenoid or anthocyanin color pigments. I had hoped for a lighter salmon. A further cross with one of the orange Kiusianums gave offsprings that were all lavenders and pinks. I do not know why. This is a plant I am dropping from further use. I did learn that *R. nakaharai* passes on its more evergreen look to the next generation.

My most successful cross so far is *R. nakaharai* 'Mt. Seven Star' x 'Shinnyo-no-tsuki'. This is an example of what Jack Lofthouse calls an "Analog cross". You take a successful formula from another breeder and substitute related plants that you hope will make better parents or produce slightly different results. I borrowed quite freely from the formula that created 'Late Love' and others in that group. It is crossing a Satsuki with *R. nakaharai*. I hoped that 'Mt. Seven Star' was a better parent than was used in 'Late Love'. 'Mt. Seven Star' has excellent, glossy, dark-green foliage and clear rich-red flowers. Its fault is its slow growth. 'Shinnyo no Tsuki' is not shy about growing. It has large deep pink flowers with a light to white center. It also has a spreading procumbent growth habit. Its main fault for us (in Eugene) is that it is slightly tender. I am hoping that the blotch will show up with age as it does in some Satsukis.

Another breeding line I am interested in developing is that of maximizing the long bloom period of a few azaleas I have only heard of. I am assuming that this trait is recessive to the "all at once" bloom cycle of most azaleas. I would like to develop azaleas that would be good as ground covers and in hanging baskets. These should be good for bedding plants. 'Mt. Seven Star' would make one parent, but I need help in locating the everblooming plants. I have heard of one in California but perhaps it is not very hardy. My present thoughts include adding a hardier plant to the program as the margin of hardiness of 'Mt. Seven Star' is not that great in itself. Do any of you know of plants that keep on blooming all summer? (Suggestions from the group included—'Ripples' which has massive bloom in the spring and spot bloom for the whole summer, Robin Hill's 'Sir Robert', and Eden's 'Pauline Becker'.)

P.S. It is important to keep records-charting the qualities of each new hybrid.

Louis Mensing is as member of the Northwest Chapter, an Elementary School teacher for the past 20 years in Eugene, Oregon, and has been gardening since the age of 5. Originally from Minnesota, he began his hybridizing in 1974 mainly with dwarf rhododendrons and recently with azaleas and presented this account of his experiences to the June 1985 meeting of the Northwest Chapter.

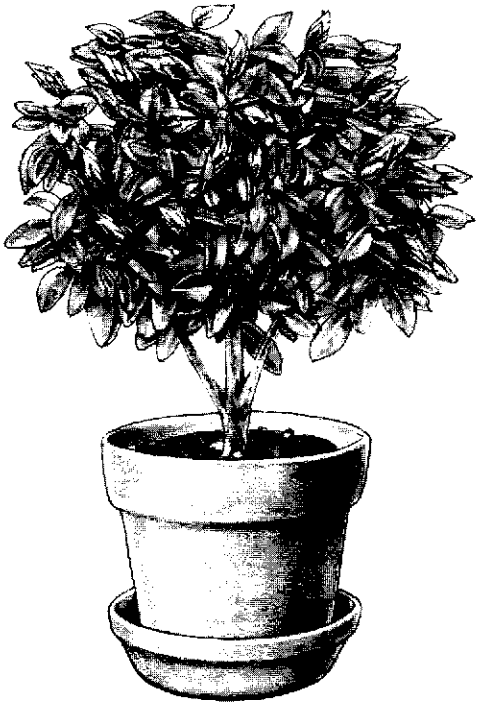
Caring for a Potted Azalea

Rosalie H. Davis

December brings ice-white chrysanthemums, turned-back cyclamens, and pointy-leaved poinsettaias to the florist's window. These winter bloomers look beautiful now, but it will be next to impossible to bring them round again. A forced azalea, however, is a long-lived specimen. Give this small shrub with its pretty, fluted flowers and dark evergreen leaves the care it needs, and it will bloom each winter for many years to come.

Pick out an azalea with lots of flower buds beginning to show color. Pass up those with tight, unbroken buds, or those in full bloom. The former may never open and the latter's blooms will go by before long. The breaking buds may drop their light-brown scales on the surface of the soil, which is fine, but beware of peat littered with yellow leaves, which may indicate that the plant has been poorly watered.

A healthy azalea has dark-green leaves without any cobwebby strands left by red spider mites, which lurk on the undersides. When not in bloom, the plant benefits from an occasional mild bath in slightly soapy water, followed by a clear, lukewarm rinse to wash off intruding mites.

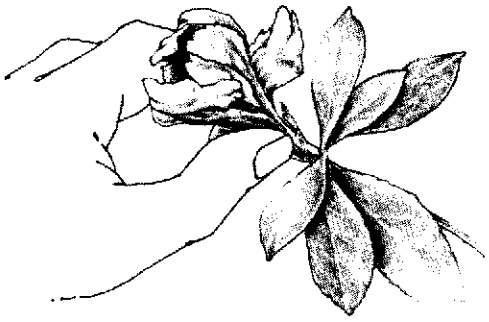


If you purchase your azalea on a cold day, be sure to swaddle it in paper before you leave the shop, to protect it from freezing. Many indoor azaleas will not be hardy in the colder climates of the temperature zone.

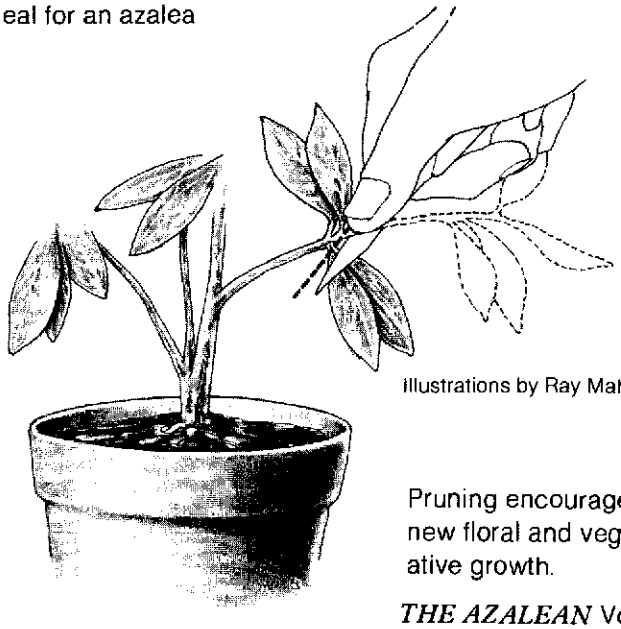
Like other *Rhododendron* species, a florist's azalea likes an acid potting medium and good drainage. It needs at least four hours of bright, indirect sun every day, and cool room temperatures. Night temperatures ranging between 40 and 55 degrees Fahrenheit with day temperatures not higher than 68 are generally considered ideal for an azalea grown indoors.

Keep the azalea on the warm side of the range to force the buds open, and to encourage new roots just after repotting. Keep it on the cool side of these temperatures before setting it out in spring and after bringing it indoors in fall.

The blooms should last from two to four weeks. The warmer the room, the briefer the season of bloom. Keep the plant out of warm drafts and direct sunlight. A tray of pebbles filled with water and placed under the pot will improve humidity. Water the azalea regularly. It is a fibrous and shallowly rooted plant, and will not tolerate drought for long. An extremely dried-out azalea with limp, drooping leaves should be immersed in water until air bubbles cease, then drained and returned to the windowsill. Check your azalea daily to see if it needs water. Heft the pot; the heavier it is, the wetter the soil. With a clay azalea pot, the cooler the pot feels and the darker its color, the damper the potting medium is. Look at the azalea's trunk; the water line on it should be visible about half an inch above the level of the medium. Finally, touch the soil. It should be neither dusty nor sodden but cool and damp.



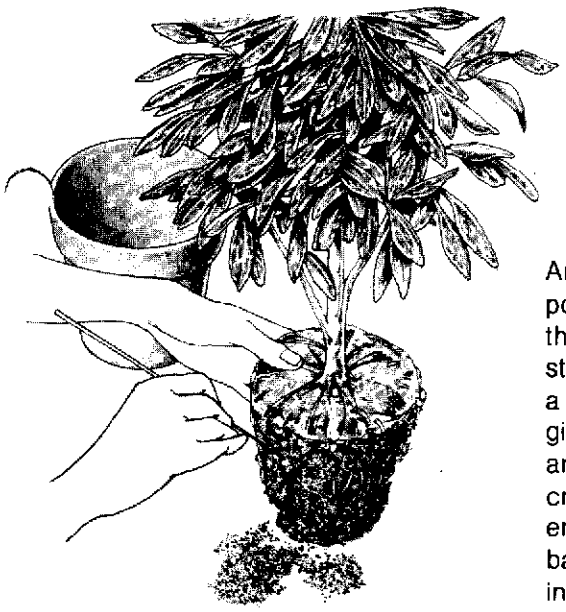
1. When in bloom, the azalea doesn't need fertilizer. Pinch off the fading blossoms and the whorls of lighter-green new shoots that appear before the blooming period is over.



2. When all the blooms have gone by, prune the leaves and branches lightly to shape. Take off about an eighth of the length of old branches, cutting just above a side shoot.

Illustrations by Ray Maher

Pruning encourages new floral and vegetative growth.

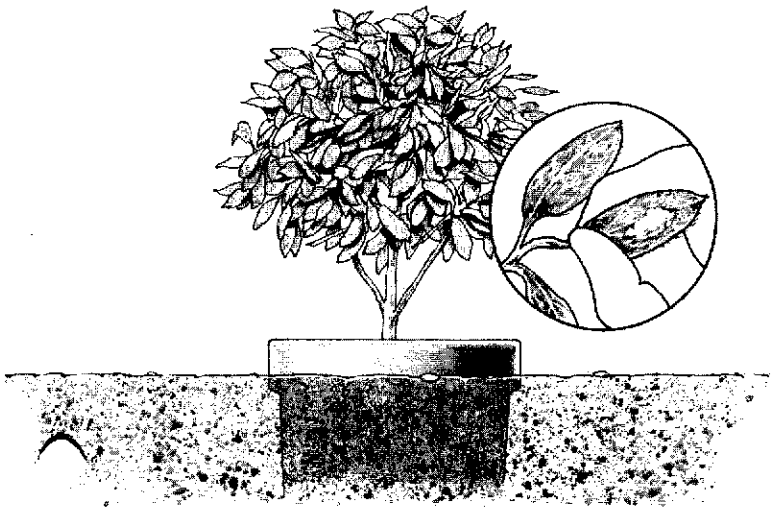


3. About every other year, the azalea should be root-pruned as well. Remove it from its pot, and with a clean sharp stick crumble away some of the peaty medium from the top and sides of the root ball. An indoor azalea should be slightly pot-bound, but unless you free up the roots from time to time they will strangle the plant. With the stick or a knife, sever any roots that are girdling the root ball and take out any dying roots. Pick out pieces of crockery that have become entangled in the bottom of the root ball. Lightly prune all around to invigorate old roots and encourage new ones.

4. This first year, pot the azalea on, into a pan an inch wider at the top. (An azalea pan is a clay or plastic pot that is 1½ times wider than its height. Its shallow shape accommodates the azalea's roots better than a standard pot can.) Add some new crocks and medium at the bottom of the pot, and with the stick pack in more firmly around the entire root ball. Hereafter, don't move the azalea into a bigger pot unless the root ball is crowded—perhaps only every two to four years. The spotting medium should be about 1 part peat, 1 part sand, and 1 part leaf mold.

5. In spring after the frosts are past, plunge the azalea up to its pot's neck in a protected (indirect light or dappled shade) spot in the garden—under a tree, say, nestled in among English ivy. It should not receive direct sun. A light bark mulch over the soil surface will help retain moisture in the root ball. Check it every day and see to its watering needs. Fertilize about once a month, with a 4-12-4 formulation of azalea fertilizer if possible. The organic fertilizer Electra is also good. Twist the pot every now and then to keep its roots from striking out into the surrounding garden.

The azalea may need a little less water after flowering, but continue to check it daily. After repotting, it will send up more new growth, which should be left to grow, as it will produce next year's flowers.



During prolonged damp spells, azaleas in the garden may get gall. Azalea galls are waxy, whitish or light-green blisters that grow on the leaves They can be as small as a peppercorn or as big as the end of your thumb. Ripe, they burst and send forth plumes of white spores, like so much chalk dust. The disease spreads quickly from one plant to another; all galls should be cut off and destroyed as soon as found. If you can't stop the infestation this way, spray with a fungicide like ferbam or zineb.

Before autumn's first frost, bring the azalea in and stop feeding it. It should have set some soft incipient flower buds; they need cool nights and warmer days to develop. A cool hallway, breezeway, cold pit, cold frame, or cloche can provide the proper environment. When the buds are full, bring the azalea into a slightly warmer room to encouarge them to break.

Reprinted from *Horticulture* 62:32-33 (1984).

H. R. SCHROEDER EVERGREEN AZALEA HYBRIDS

Stephen Schroeder
Evansville, Indiana

My father, the late Dr. H. R. Schroeder, began breeding evergreen azaleas in the early 1970's. His main goals were to develop evergreen azaleas to withstand climatic conditions of the midwest states, to develop compact forms with large single to double flowers, and to maintain the colorful flowers for which the evergreen azaleas are noted.

At the beginning, the breeding program seemed to be a "losing battle", as nature would eliminate all of the seedlings at the end of one year. He used as breeding stock *Rhododendron poukhanense* and the following hybrid groups: Glenn Dale, Kurume, Gable, Greenwood, Kaempferi, Vuyk, Robin Hill, Back Acres, North Tisburgy, Satsuki, and Shammarello. In 1973, he made crosses using Shammarello's 'Elsie Lee' as the seed parent crossed with the Robin Hill 'Frosty' and 'Chanson', the Back Acres hybrid 'Marian Lee' and the Satsuki hybrid 'Pink Gumpo'. He also crossed Gable hybrids 'Purple Splendor' and 'Mildred Mae' both as seed parents with 'Vuyk's 'Scarlet' and 'Avalanche'.

About four thousand seedlings were lined out in the spring of 1974. In the late 1970's this area experienced the coldest winters and the hottest, driest summers of the 20th century. By 1980, 37 plants survived out of four thousand seedlings. These plants were observed closer and were named in the spring of 1984.

The following is a list of these 37 named azaleas. Flowering time is not listed because it will vary so much in the midwest, but it will generally be from middle to late May.

CARRIE AMANDA (3216) - ('Elsie Lee' x 'Marian Lee') Flowers single, white in center with magenta-rose border; 2" across. Very compact with dark green foliage. A one year old plant will grow 15" high and 24" wide in ten years. Hardy to -15°F.

DAVID REYNOLDS (3309) - ('Purple Splendor' x 'Vuyk's Scarlet') Flowers single, purple with red blotch; 1½" across. Compact, dark green foliage with distinctive red stem coloration. A one year old plant will grow 24" high and 24" wide in ten years. Hardy to -15°F.

DR. H. R. SCHROEDER (3162) - ('Mildred Mae' x 'Avalanche') Flowers single, clear pastel pink with darker pink edging; 1½" across. Open and spreading upright habit, large dark green foliage. A one year old plant will grow 24" high 18" wide in ten years. Hardy to -15°F.

DR. JAMES DIPPEL (3608) - ('Purple Splendor' x 'Vuyk's Scarlet') Flowers single, clear brillant orange with dark red-orange blotch in upper petal; 2" across. Compact and spreading habit with dark green shiny foliage. A one year old plant will grow 15" high and 20" wide in ten years. Hardy to -15°F.

EARL WEBSTER (3401) - (*R. Kaempferi* selection) Flowers single, silver pink; 1½ across. Open and upright habit, dark green foliage on strong stems. A one year old plant will grow 30" high and 24" wide in ten years. Hardy to -15°F.

ELIZA HYATT (3802) - ('Elsie Lee' x 'Frosty') Flowers double, delicate pink with faint green blotch deep into throat; 1½" across. Compact, dark green shiny foliage. A one year old plant will grow 24" high and 24" wide in ten years. Hardy to -15°F.

FROSTY LEE (3805) - ('Elsie Lee' x 'Frosty') Flowers single, mulberry pink with scarlet blotch in upper petal; 1½" across. Compact dark green foliage. A one year old plant will grow 24" high and 24" wide in ten years. Hardy to -15°F.

GEORGE HYATT (3501) - ('Purple Splendor' x 'Vuyk's Scarlet') Flowers single, orchid purple with good red blotch, ruffled petals; 1½" across. Compact, dark green foliage. A one year old plant will grow 18" high and 18" wide in ten years. Hardy to -15°F.

HELEN ROGERS (3505) - ('Elsie Lee' x 'Chanson') Flowers double, lavender rose; 1½" across. Compact, dark green foliage. A one year old plant will grow 18" high and 18" wide in ten years. Hardy to -15°F.

HOLLY HILLS LATE PINK (3809) - ('Elsie Lee' x 'Pink Gumpo') Flowers double, rose pink; 1½" across. Very compact dwarf, dark green foliage, dense. A one year old plant will grow 10" high and 18" wide in ten years. Hardy to -15°F.

HOOSIER CHARM (3302) - ('Purple Splendor' x 'Vuyk's Scarlet') Flowers single, deep pink with red blotch in upper petal; 1½" across. Compact, upright, dark green foliage. A one year old plant will grow 18" high and 15" wide in ten years. Hardy to -15°F.

HOOSIER PEACH (3300) - ('Purple Splendor' x 'Vuyk's Scarlet') Flowers single, peach-pink; 1½" across. Compact, dark green foliage. A one year old plant will grow 18" high and 18" wide in ten years. Hardy to -15°F.

HOOSIER ROSE (3660) - ('Purple Splendor' x 'Vuyk's Scarlet') Flowers single, rose-pink with brown-red blotch in upper petal into throat; 1½" across. Compact, dark green shiny foliage. A one year old plant will grow 15" high and 24" wide in ten years. Hardy to -15°F.

HOOSIER SUNRISE (3807) - ('Purple Splendor' x 'Vuyk's Scarlet') Flowers double, bright pink with faint red markings in upper petal; 1½" across. Compact, dark green foliage. A one year old plant will grow 15" high and 18" wide in ten years. Hardy to -15°F.

MARGARET HYATT (3110) - ('Elsie Lee' x 'Frosty') Flowers double rosebud type, pale lavender rose with red dotting into throat; 1½" across. Compact, dark green foliage. A one year old plant will grow 18" high and 24" wide in ten years. Hardy to -15°F.

MARYANN HYATT (3016) - ('Elsie Lee' x 'Frosty') Flowers double, soft lavender rose; 1½" across. Somewhat upright and compact habit, dark green foliage. A one year old plant will grow 18" high and 15" wide in ten years. Hardy to -15°F.

MOBY DICK (3018) - ('Mildred Mae' x 'Avalanche') Flowers single, large white with just a touch of yellow-green in petal; 2" across. Dense, compact, dark green, large foliage. A one year old plant will grow 18" high and 30" wide in ten years. Hardy to -15°F.

MRS. MILDRED KINDER (3025) - ('Elsie Lee' x 'Frosty') Flowers double, bright, ruffled orchid with faint red blotch in upper petal; 1½" across. Somewhat upright and compact habit, and dark green foliage. A one year old plant will grow 24" high and 18" wide in ten years. Hardy to -15°F.

MRS. MARY SCHROEDER (3705) - ('Elsie Lee' x 'Frosty') Flowers single, clear, bright pink with brown-red blotch, 1½" across. Somewhat upright and compact with dark green foliage. A one year old plant will grow 30" high and 24" wide in ten years. Hardy to -15°F.

MRS. H. R. SCHROEDER (3026) - ('Elsie Lee' x 'Frosty') Flowers very double, rose-pink; 1½" across. Compact, dark green oval shaped foliage. A one year old plant will grow 18" high and 24" wide in ten years. Hardy to -15°F.

MRS. WEBSTER (3028) - ('Purple Splendor' x 'Vuyk's Scarlet') Flowers single, bright rose-red with dark red blotch in upper petal; 1½" across. Compact, dark green foliage. A one year old plant will grow 15" high and 24" wide in ten years. Hardy to -15°F.

MRS. NANCY DIPPEL (3835) - ('Elsie Lee' x 'Frosty') Flowers very double, variegated white to lavender with distinctive pink marking; 1½" across. Compact, dark green shiny foliage. A one year old plant will grow 24" high and 24" wide in ten years. Hardy to -15°F.

PURPLE PRIDE (3840) - ('Purple Splendor' x 'Vuyk's Scarlet') flowers single, wine red-purple ruffled petals; 2" across. Compact, dark green foliage. A one year old plant will grow 15" high and 24" wide in ten years. Hardy to -15°F.

RED-EYED ORCHID (3841) - ('Purple Splendor' x 'Vuyk's Scarlet') Flowers single, light orchid-lavender with red dotted eye in upper petal; 1½" across. Compact, dark green foliage. A one year old plant will grow 18" high and 24" wide in ten years. Hardy to -15°F.

ROBERT HYATT (3849) - ('Purple Splendor' x 'Vuyk's Scarlet') Flowers single, large salmon-red with dark rose blotch in upper petal; 2" across., Compact, dark green shiny foliage. A one year old plant will grow 15" high and 18" wide in ten years. Hardy to -15°F.

ROLAND (3852) - ('Purple Splendor' x 'Vuyk's Scarlet') Flowers single, salmon-red with pale red blotch in upper petal; 1½" across. Compact, dark green shiny foliage. A one year old plant will grow 18" high and 24" wide in ten years. Hardy to -15°F.

ROSEMARY (3860) - ('Elsie Lee' x 'Frosty') Flowers double, rosebud type, clear pink with dark red dotting into throat; 1½" across. Compact, dark green foliage. A one year old plant will grow 18" high and 18" wide in ten years. Hardy to -15°F.

SCARLET FROST (3865) - ('Purple Splendor' x 'Vuyk's Scarlet') Flowers single, scarlet pink; 1½" across. Compact, dark green shiny foliage. A one year old plant will grow 15" high and 18" wide in ten years. Hardy to -15°F.

SHCROEDER'S LAVENDER MIST (3870) - ('Elsie Lee' x 'Frosty') Flowers single, bright lavender; 1½" across. Compact, dark green foliage. A one year old plant will grow 18" high and 18" wide in ten years. Hardy to -15°F.

SCHROEDER'S LAVENDER ROSE (3872) - ('Elsie Lee' x 'Frosty') Flowers double, lavender with dark rose markings into throat; 1½" across. Compact, dark green foliage. A one year old plant will grow 24" high and 24" wide in ten years. Hardy to -15°F.

SCHROEDER'S PINK PERFECTION (3874) - ('Betty' x 'Elsie Lee') Flowers very double, bright pink, six petals in star shaped form; 1½" across. Somewhat upright and compact, dark green foliage. A one year old plant will grow 24" high and 15" wide in ten years. Hardy to -15°F.

SCHROEDER'S SNOWFLAKE (3876) - ('Mildred Mae' x 'Avalanche') Flowers double, white with faint yellowing into throat, flowers are unusually pendulous; 1½" across. Somewhat upright and compact, dark green foliage. A one year old plant will grow 30" high and 24" wide in ten years. Hardy to -15°F.

SCHROEDER'S SUNRAY (3880) - ('Purple Splendor' x 'Vuyk's Scarlet') Flowers single, bright red-pink with dark red blotch in upper petal; 1½" across. Compact, dark green foliage. A one year old plant will grow 15" high and 24" wide in ten years. Hardy to -15°F.

SCHROEDER'S WHITE GLORY (3882) - ('Elsie Lee' x 'Glory') Flowers double, white to pink variation; 1½" across. Compact, dark green foliage. A one year old plant will grow 18" high and 24" wide in ten years. Hardy to -15°F.

SUSAN CAMILLE (3885) - ('Elsie Lee' x 'Frosty') Flowers double, pastel pink to white; 1½" across. Compact, dark green foliage. A one year old plant will grow 18" high and 24" wide in ten years. Hardy to -15°F.

VONNIE (3886) - ('Purple Splendor' x 'Vuyk's Scarlet') Flowers single, deep clear pink with dark red blotch; 1½" across. Compact, dark green foliage. A one year old plant will grow 24" high and 24" wide in ten years. Hardy to -15°F.

WILLIAM HYATT (3887) - ('Purple Splendor' x 'Vuyk's Scarlet') Flowers single, bright red-purple with dark red dotting into throat; 1½" across. Compact, dark green foliage. A one year old plant will grow 18" high and 18" wide in ten years. Hardy to -15°F.

Some of the azalea hybrids mentioned will be available through Holly Hills, Inc. in the spring of 1986.

THE SAGA OF A LINEARIFOLIUM GREX

W. David Smith
Spring Grove, Pennsylvania

In the 1970's, a cross of Eden 'David Haskell' with Eden 'Mae Knapper' was made. Two important facts of this cross: first, it was not recorded in my journals, which was most unusual, and second, when the seedlings grew, part of them (*linearifolium*) looked like weeds to me. Out of curiosity, I saved one seedling thought to be from weed seed in the peat moss. But, because it was thought to be a weed, the cross was not recorded. When that thought to be weed turned out to be an azalea, it was regretable the cross was not recorded. For years, I called this azalea 'Odd Ball' and then 'Pride of 'Paradise'. Recently in as much as I was only the medium by which the "Pride of Paradise' came into being and not some hybridizing expertise on my part, I have changed its name to 'Joy of Paradise'. I am reminded of the scripture, Proverbs the 18th chapter, verse 16, which reads in short, "Pride goeth before a fall."

Now, during the 1982-1983 winter and spring, eighty new crosses were made to celebrate my 80th birthday. I repeated the 'David Haskell' x 'Mae Knapper' cross because it had not been recorded. This time, part of the seedlings again were *linearifolium*. Being wiser now, I saved six *linearifolium* seedlings. They have been named: 'Joy of Jane', 'Joy of David', 'Joy of Shangri-la', 'Joy of Eden', 'Joy of Verde Vista', and 'Joy of York'.

The last three are growing twice to three times faster than the first three. This fact should have close observation in the future. It is thought 1) they might prove to be dwarf, 2) there is a possibility they might prove to be hardier.

A word should be said about these unusual cultivars in regards to their parentage. There are two hypotheses: 1) there might have been some latent genes in the parents: come down through the Kaempferi or other Japanese azaleas used in hybridizing, from (*macrosepalum* f. *linearifolium*); 2) while it sounds far out, there are those who contend that there is a possibility of a mutation. When the crosses were made, both times, spores from a fern growing wild in the greenhouse were present. Since both times the seedlings from this cross were half and half (half with regular azalea foliage and half linearifolium), they contend part were fertilized with the fern spores. It is interesting to note that the ferns appeared after excavation at the base of a huge cliff of rocks, dating from the stone age. Coincidentally, one of the parents 'David Haskell', was named for the son of Doctors Susan and Brent Haskell of Des Moines, Iowa, who helped with the excavation. Were the spores that produced the fern viable after being buried all those years? Someone thought this fern grows wild in Florida. This has not been proven yet. They thought the fern must have been grown in the wild here before the ice age when a more tropical condition existed. They are not hardy here now. Again I say, this is far out, but certainly worth investigating.

What is the end result of all this? 1) We do not know exact parentage of these delightful azaleas. 2) We do not know exactly what prank nature performed in the cross although some learned men are still involved with this question. 3) We do have the beginning of a group of exciting azaleas and it seems only the Lord of Creation knows their true origin.

W. David Smith developed the Eden group of evergreen azaleas and is a previous contributor to *THE AZALEAN*.

ASA NEWS AND VIEWS

The President's Column

What a summer to remember here in Louisiana—two hurricanes in less than two weeks! First it was "Danny" striking the lower Louisiana coast in the heart of the cajun country and giving southeast Louisiana about six inches of rain. Then vicious "Elena" struck the Mississippi coast traveling into southeast Louisiana with 100 m.p.h. winds and four to six inches of rain. The "eye" passed directly over Franklinton on Labor Day toppling trees and power lines and blowing out store front windows. "Elena" had decreased in intensity by the time she reached us, but 90 to 100 mile per hour winds were felt here with some damage to the nursery, mostly to container stock caused by fallen tree limbs and uprooted trees. Several greenhouses were lost in the Franklinton-Bogalusa area. Some field stock in the surrounding nurseries was damaged and will not be saleable this fall or next spring. One of the large nurseries in the Mobile area was especially hard hit. Tree loss in the path of the storm was heavy in Alabama, Mississippi, and Louisiana. I think this was due to the excessive amount of moisture that we had prior to the storms—the trees were easily blown over. The weather of 1985 will be long remembered here.

The azaleas are looking excellent going into fall with lots of growth and plenty of flower buds. Most of the Southern Indicas seemed to have recovered from last January's severe freeze. Maybe Mother Nature will take pity on us in 1986. Here's hoping so anyway.

John U. Rochester

Introduction, Registration And Printing Format Of Named Azalea Cultivars

New azalea cultivars are introduced in a variety of ways—at plant shows or sales, at meetings or special occasions, and in printed announcements ranging from commercial and non-profit organization catalogs to official horticultural society publications. Introduction is frequently through one of the former and without a complete description of the variety. The description may follow sometime later if the cultivar is registered, but the descriptions of a related group of cultivars often do not appear together. This is the reason that Azalea Society of America encourages hybridizers to record the descriptions(1) of their new named azalea varieties in *THE AZALEAN*. Often, the only description of a new variety available to the average society member is that in *THE AZALEAN* and in a few other specialized horticultural journals. Descriptions accompanying the registration of a variety with the American Rhododendron Society Plant Registry or with the International Registrar of the Royal Horticultural Society may be easily missed and subsequently difficult to obtain unless one knows that the cultivar has been registered and with which registry. Descriptions published in *THE AZALEAN* may be considered as notice of introduction, if not previously introduced, but not registration which is within the province of the aforementioned registries.

In listing azaleas, *THE AZALEAN,* follows the rules of the International Code of Nomenclature of Cultivated plants-1980 (2), the definitive guide to naming plants. As such, each named variety, whether registered or not, is capitalized and enclosed within single quotation marks. This convention is followed as a named azalea cultivar is a horticultural not a botanical term. Horticultural names are also not italicized. Botanical names, regardless of their origin, are treated as Latin and are always italicized, e.g. *Rhododendron poukhanense*. The following text by the editors of *Horticulture* (3) provides an explanation for our practice.

"The taxonomic categories (taxa) from kingdom down to species are related as follows: kingdom, phylum, class, order, family, genus, species. Below species the taxa are related thus: subspecies, variety, form.

"A species is always designated by two words, the genus name plus the specific epithet. Species, subspecies, variety, and form names are always written in italics; the genus name is always capitalized, the specific epithet usually not. All are botantical terms and are based on wild plants. *Juniperus communis* is the species usually referred to as common juniper. *Juniperus* is its genus name, *communis* its specific epithet; the species is *Juniperus communis*.

"The term cultivar means "cultivated variety." Cultivar names are always written in single quotation marks and are capitalized. Cultivar is strictly a horticultural term, not a botanical one. It is used for any category of cultivate plant with distinctive characteristics that can be maintained from generation to generation by either vegetative or sexual methods of propagation. The term cultivar may be applied to a subspecies, a botanical variety, a form, or a member of a hybrid group. 'Big Boy' tomato is an example of a cultivar name.

"It is possible to have a cultivar of a botanical variety. Thus, the blue-spire juniper is named *Juniperus communis* var. *communis* 'Erecta Glauca'. This is the plant's full name, but is so cumbersome that it is usually contracted to *Juniperus* 'Erecta Glauca'—i.e., the genus name plus the cultivar name. Where the ancestry of a cultivar is complex, as with the hollies, only the genus and cultivar names are used. Ed."

The Swedish botanist Carolus Linnaeus in his *Species Plantarum* published in 1753 which introduced the biverbal names for all species of the vegetable kingdom listed azaleas as a distinct genus. Most botanists today, however, regard azaleas as one of the forty-three series or subgenera of the genus Rhododendron. The azalea family tree (4) branches into six subseries and a large variety of hybrid groups. The convention chosen in *THE AZALEAN* is to omit, unless necessary for clarification, the genus and hybrid group when listing a named azalea cultivar. Thus, *Rhododendron simsi* var. *vittatum* 'Vittata Fortunei' is listed as 'Vitatta Fortunei'.

---

1. Emory, D.K., Describing the Azalea, *THE AZALEAN,* 5:19-22 (1983).
2. The International Code of Nomenclature for Cultivated Plants-1980 is available for $10.00 per copy including postage and handling from the American Horticultural Society, P.O. Box 0105, Mount Vernon, Virginia 22121.
3. Naming Plants. *Horticulture,* 62:4(1984).
4. Evans, N.E., The Azalea Family Tree, *THE AZALEAN*, 6:2 (1984).

THE AZALEA CALENDAR

May 2-4, 1986

Seventh Brookside Gardens Chapter Azalea Show held in conjunction with the 33rd Landon Azalea Garden Festival. Bethesda, Maryland. Contact Denise Stelloh (301) 840-1714 for information.

May 16-18, 1986

Eighth National Meeting of the Azalea Society of America. Hosted by the Robert D. Gartrell Chapter, West Caldwell, New Jersey. Contact Malcolm Clark (201) 228-4406 for information.

INDEX FOR VOLUME 7 OF THE AZALEAN