

American Rhododendron Society





American Rhododendron Society

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ARS Home Page: <http://www.rhododendron.org>

ARS Office: <http://www.arsoffice.org>

ARS On-line Journals: <http://scholar.lib.vt.edu/ejournals/>

JARS/

ARS Archives: <http://www.lib.virginia.edu/small/>

Society's Purpose

To encourage interest in and to disseminate knowledge about rhododendrons and azaleas. To provide a medium through which all persons interested in rhododendrons and azaleas may communicate and cooperate with others through education, meetings, publications, scientific studies, research, conservation and other similar activities.

Membership Benefits

- Chapter affiliation with scheduled meetings
- Journal American Rhododendron Society* published quarterly
- Annual convention and regional conferences
- Seed exchange
- Listing of registration of names and descriptions of new rhododendron hybrids published in the Journal

To Join the Society

Membership categories:

(January 1 – December 31)

Student (include proof if over 18)	\$10.00
Regular	\$40.00
Commercial	\$90.00
Sustaining	\$75.00
Sponsoring	\$150.00
Life single	\$1,000.00
Life family	\$1,500.00

You can join the ARS through your local ARS chapter (check the website www.rhododendron.org for chapter contact info) or by sending a check or money order directly to the Executive Director of the American Rhododendron Society at the above address. Checks must be in US funds. Make checks payable to the "American Rhododendron Society." Membership includes one year (4 issues) of the *Journal American Rhododendron Society* and affiliation with the chapter of your choice. **To receive the winter issue of the Journal, renewals must be postmarked no later than Dec. 1.**

From the President

Here in the Pacific Northwest, it seems like summer just got here and now it's starting to look like fall already. It was a summer that was pretty easy on my water bill though. Watching the news and seeing what's happening in the rest of the country, I can see that's not the case everywhere. One news story last month said that heat records were being set in 47 of the lower 48 American states. The whole map was red except for the Evergreen State—Washington. We'll see what it does for our rhododendrons for next year. This year was a banner year for bloom.

I'd like to give you an update and some kudos for the ARS and some of its members. Last year the US National Arboretum was going to destroy the Azalea collection. Through the efforts of many members, but especially Don Hyatt and Steve Henning, the collection was saved "by an act of congress." The ARS contributed to the "Save the Azalea" fund via a grant from our Endowment Fund.

As a result of these efforts the Director of the National Arboretum, Colien Hefferan, has announced the Arboretum's first "Living Collections Policy," to describe the purpose and procedures for the Arboretum's decisions and practices related to the collective horticultural heritage at the Arboretum. This plan, which reflects guidance from the scientific and broader stakeholder communities, will help the Arboretum continue the conservation of plants for research, discovery, and visitor enjoyment into the future. This information came from the new Director of the Friends of the National Arboretum, Linda Dooley, in FONAs summer newsletter. I would like to think that our efforts had some influence on the new policy.

This summer the ARS took on an intern for a pilot project to interview and write oral histories of some of ARS members who have made significant contributions to the society. These oral histories will be published in the Journal, on the ARS blog and may be linked in social media platforms to reach younger generations of potential horticulturalists. If these articles are well received, we will work on a way to continue this type of intern project. This year's trial project was fully funded from outside the ARS, which was much appreciated. Future internships could be unpaid, for college credit, or funded from chapter resources or private donations.

On a serious note, the ARS Board of Directors is working diligently to approve a balanced budget for 2012-13. The membership of the Society has continued its downward trend, but many of the costs of the day-to-day operations and providing you with a great quarterly Journal have not been reduced by the same percentage. The current deficit amounts to only about \$3 per member. I would like to encourage all of you to add a small donation to the ARS when you renew this year or to upgrade your membership to Sustaining or Sponsoring levels. This would not only help the ARS, but also give more to your chapter. Together we can sustain a healthy Society.

Thanks for all your support and to the many volunteers that make the ARS a great Society,

Don Smart
Carnation,
Washington



From the Editor



Glen Jamieson
Parksville, BC
Canada

This has been a busy year! The cool and wet spring in the Pacific Northwest where I live resulted in stupendous growth in virtually all plants in our garden, which when followed by a regional summer drought has meant that we have had to do more watering than usual to keep some of the more shallow rooted trees and shrubs healthy and alive. In Parksville, we have experienced no rain in either July or August, although some nearby locations have had some rain because of localized thunderstorms! The consequence is that it has also been necessary to do much pruning, particularly of the more aggressively growing plants, to keep light and air circulation at reasonable levels. All this was compounded by my personal travel venture, as I chose to walk by myself the 800 km (500 mile) camino pilgrimage from St-Jean-Pied-de-Port, France, to Santiago, Spain, over June and early July. It was an incredible experience! This is the biggest walk in the world and about 200,000 are expected to walk it this year. Apart from the physical challenge of walking about 30 km (18 miles) a day over hill (some as high as 1500 m (almost 5000 ft)) and dale for 28 consecutive days through rural Spain and sleeping in crowded albergue (camino pilgrim hostels) dorms, it was a real cultural experience. I met people from over 50 countries who were also walking “the way” for almost every personal reason possible, including self-discovery, religion, a personal loss (job, friend, or partner), and so on. It’s well worth doing, and if you have more time, can be walked at a slower pace!

The 2013 spring ARS convention is in the Pacific Northwest and will be held in the Seattle-Tacoma area of Washington State in May. I hope that many of you can attend this meeting as rhodos in the spring in the Pacific Northwest are really a sight worth seeing. The organising committee is doing a great job in planning a wonderful meeting!

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Cover Photos

Clockwise from top left: Glacier Peak and Suiattle River Valley, Washington by Peter Kendall; *Castilleja* spp. (Indian paintbrush) by Peter Kendall; *Rhododendron calendulaceum*, Hooper frilled red by Don Hyatt; From left to right, *Rhododendron pachystigma*, *Rhododendron ×diversiflorum* and *Rhododendron herzogii* by Frédéric Danet; *R. 'Sparkling Stars'* by Don Wallace.



Rhododendron calendulaceum, Hooper frilled red. Photo by Don Hyatt.



Rhododendron calendulaceum, Hooper gold. Photo by Don Hyatt.



Rhododendron calendulaceum, Hooper peach pink. Photo by Don Hyatt.

Hooper Bald Native Azalea Project

Carolyn Beck
Oak Hill, Virginia



On October 7–8, 2011, a diverse and robust group converged on a section of the Nantahala National Forest, about 100 miles (161 km) west of Asheville, NC, and very close to the Tennessee border. Some of the workers lived locally. Others came from Georgia, District of Columbia, Pennsylvania, South Carolina, Alabama, Maryland, Virginia, and other parts of North Carolina. Represented were members of the ARS, Azalea Society of America (ASA), Boy Scouts, and local people whose predecessors had an historical connection with Hooper Bald, a peak in the southern Appalachian Mountains. Jim Brant, a member of the ARS Middle Atlantic Chapter (MAC), from Gloucester, Virginia, was the

coordinator for this project. All were there with a common goal: to plant 800 native azalea seedlings back into the wild.

Travelers arrived at the planting areas via the scenic Cherohala Skyway, an undulating course across the crest of the pristine Unicoi Mountains, part of the Appalachians. With its many twists and turns, it is obviously a route

much favored by motorcyclists. As we approached the higher elevations, we were greeted with breathtaking displays of fall color, and along the side of the road, we were pleased to catch a glimpse of a flock of wild turkeys.

The first of the planting spots was located a short climb from the highway on top of Oak Knob. This large, grassy knoll is a subpeak of Huckleberry Knob, the highest elevation in the range. At 5,560 feet (1695 m), it affords a panoramic view of the majestic Unicoi Mountains.

On the first day of planting, all was in readiness. The area had been mown, the planting site had been rimmed with posts, the spots where the seedlings were to be planted were defined, and the seedlings distributed. Lady shovels, perfect for penetrating the tough turf, were available. Jim supervised, as he helped to plant. Revonda Williams, a descendant of the Hoopers, for which Hooper Bald was named, helped to provide transportation for all the seedlings, tools, and supplies.

That Friday morning, the crew set to work in pairs. Some were diggers, others planters—a real team machine. They followed the green spots sprayed on the grass, which meant “this is the place to plant an azalea.” The process was thus: remove a small section of turf, loosen the wonderfully loamy soil, and nestle in one of the *Rhododendron calendulaceum* seedlings. By Saturday midmorning, 700 plants were in the ground. And then it was on to the nearby Hooper Bald for the last 100. All had been grown by The Southern Highlands Reserve from seed collected on Hooper Bald.

Lauren Stull, District Ranger of the Cheoah Ranger District of the Nantahala National Forest, and Jeremy Waite, Forestry Technician and Volunteer Coordinator, were in attendance that weekend, letting the volunteers know that they recognized the significance of their productive labors, and expressing their appreciation. They



Map showing location of Hooper Bald, a peak in the southern Appalachian Mountains near the Sherohala Skyway in North Carolina.

remarked how closely Jim had worked with the Forest Service, and on the considerable energy he had expended to manage this project

We could not have asked for more perfect weather. The mornings were cool, the skies marbled with interesting cloud formations, and there was but a whisper of a breeze. By midday, we were glad for some



Rhododendron calendulaceum overgrown. Photo by Don Hyatt.

peripheral shade in which to lunch, relax, and chat. It was here that we heard how individuals had spent their time on the way from home. Some had included stretches of the Blue Ridge Parkway in their route. Some had stopped at J. Jackson's nursery in Mountain City, Tennessee, called "Appalachian Native Plants." A few had visited Roan Mountain.

After our break, we were treated to a tour by George McLellan. As we walked down the ridge, he pointed out the local flora, including some of the many unique, mature *R. calendulaceum* specimens that have been documented, named, and tagged. Also noted were *Kalmia* (mountain laurel), conifers, southern ground cedar (the club moss *Diphasiastrum digitatum*), other mosses, and natural *R. calendulaceum* seedlings. At the end of the trail, we were introduced to the *R. calendulaceum* called "Hooper Copper," discovered by members of the Middle Atlantic Chapter (MAC) Species Study Group (SSG) and named by George for its star-shaped, 3.5" flowers that change from yellow to coppery-orange as they age. In the fall, the foliage also becomes a coppery color. As a favorite, this had been one of the first plants to be freed from encroaching trees and shrubs. It responded with vigor, putting on new growth and flowering abundantly, possibly giving rise to the idea of expanding the restoration effort.

We saw evidence of the hard work that had gone into this venture over the years in the form of huge piles of brush, and we heard stories of the history behind the Hooper Bald Project.

Blunt summits that are covered only with grasses and shrubs, where one would expect to find trees, are known as balds. They occur primarily in the Appalachian Mountains, and their presence is a mystery. Why are some mountain peaks treeless, while others of the same elevation are of heavy forest? Several theories have evolved. Among them is that areas were opened up by fires started by lightning, and that these areas were



Jim Brant and George McLellan and *R. calendulaceum*. Photo by Don Hyatt.

kept clear by the grazing of animals such as deer and elk. When the early European settlers arrived, the balds were used for grazing their livestock, and they probably extended these pastures (http://www.nps.gov/history/history/online_books/grsm/4/intro.htm and http://en.wikipedia.org/wiki/Appalachian_balds).

Between these open expanses of native grasses and the surrounding mixed deciduous and coniferous forest, *R. calendulaceum* flourished. In spring, their flowers paraded a sea of vibrant oranges, orange-reds, and golds. In fall, the foliage presented another burst of color, which could be seen from miles away. When the Forest Service started buying land in the 1930s and ended the grazing practices, the native azaleas started spreading throughout the balds. But trees and other shrubs also seized this opportunity to extend their range, and eventually crowded out and overshadowed the less aggressive understory plants. So the native azaleas were at serious risk of losing their place in the sun.

In 1990, a few members of the Middle Atlantic Chapter of the ARS formed a Species Study Group (MAC SSG) chaired by George McLellan. The mission of these members was to find, observe, describe, photograph, catalog, and map the location of native azaleas in the Eastern United States, and then to share this knowledge with the horticultural community. A more recent goal added was to identify, preserve, and distribute the genetic diversity of the best clones.

Starting in the early 1990s, some of the MAC SSG members began a series of botanical excursions, exploring numerous sites each year, searching for native azaleas. Using the writings of Dr. Henry T. Skinner (1955), *In Search of Native Azaleas* (a trip of over 25,000 miles (40,234 km) through the eastern US), they mapped their course. It was during one of these trips that a treasure trove of *R. calendulaceum* was noted on Hooper Bald; I can barely imagine their excitement. These azaleas had exceptionally large flowers for the type, many attaining diameters of 2-3 inches (5.1-7.6 cm) or more, and the group discussed the importance of preserving the gene pool.

Jim Brant took on the task of organizing the effort. He contacted Dr. Duke Rankin, a botanist with the Nantahala National Forest. Duke was able to open the doors that lead to approval for the ARS and ASA to proceed with what became

known as the Hooper Bald Project. George McLellan, Bob and Audrey Stelloh, Don Hyatt, and John Brown, along with Jim, became the core members for this project. People came from across the nation, like Mike and Maria Stewart from Oregon and Buddy Lee from Louisiana. The objective was to reclaim the balds for the native azaleas.



John Brown on Hooper Bald. Photo by Don Hyatt.

In preparation for the work on Hooper Bald, Duke arranged for and led a conference for those who had a vested interest in the project. Represented were the U. S. Forest Service, the Southern Highlands Reserve, the U.S. Fish and Wildlife Services, the North Carolina Wildlife Resources Commission, and the MAC Species Study Group, to make known their concerns and to create guidelines. One of the major concerns was the protection of the Carolina Northern flying squirrel (*Glaucomys sabrinus coloratus*) that is now listed as endangered. And so it was established that the yellow birch (*Betula alleghaniensis*), which provides nesting sites for these delightful nocturnal creatures, and the red spruce (*Picea rubens*), an important food source, would be safeguarded. Vegetation that could be removed where it encroached on the azaleas included blackberry (*Rubus* spp.), certain types of *Vaccinium*, hawthorn (*Crataegus*), and some saplings of other species.

Jim now had his work cut out for him: complete the required paperwork, arrange for volunteer workers, and continue to communicate with the various involved organizations, which people agree is one of his strengths. Both Jim and George were very involved in the planning process and found the Forest Service terrifically cooperative and supportive.

Under Jim's initiative and Duke's supervision, work was initiated on Hooper Bald. Duke commented on how carefully the group attacked their tasks. And, over time, with the help of other associations like the Sierra Club, areas around the azaleas were cleared so that they could bask in the light that they need to thrive and set seed. Mowing twice a year keeps the areas from reverting back to dense thickets.

The concept of reintroducing seedlings was followed by establishment in 2010 of a test plot of *R. calendulaceum* on Hooper Bald by Jim, George, and Don. This was done to determine what culture technique would produce the most viable plants. Factors,

such as pruning at various stages of growth, watering, and the use of fertilizer, were assessed, and the most favorable outcomes were employed in the 2011 plantings.

R. calendulaceum, the flame azalea, was named for the resemblance of its expanded, yet unopened buds, to candle flames. They typically flower in late May or June, depending on altitude, in colors ranging from yellow, yellow-orange, apricot, orange, orange-red, to red, often with an orange blotch on the upper lobe. Exceptionally long stamens protrude from the corolla tube. The usual size is 1.5-2 inches (3.8-5.1 cm) across. They are naturally occurring tetraploids, having twice the number of chromosomes as other native species. Both leaves and branches often appear in whorls. The loosely branched, upright plants grow from 4-15 feet (1.2-4.6 m) high and wide in the wild. Propagation is difficult from cuttings, but rather easy from seed. They enjoy humus-rich, acidic, moist, well-drained soil and several hours of sunlight. These azaleas are hardy from USDA zones 5b to 8b and have a distribution extending from southern New York, Pennsylvania and Ohio, southward through the Appalachian Mountains to northern Georgia. E.H. Wilson, the famous plant collector, said of *R. calendulaceum*: "It must be considered one of the most gorgeous of the American shrubs" (http://www.rosebay.org/chapterweb/spec_calendulaceum.htm).

In the future, plans are to continue to maintain the cleared areas as vegetation previously cut back to the ground will make a comeback from the roots; to gather information on the azaleas, especially new finds; to develop GPS maps of the sites; and to monitor the planted seedlings. Revonda Williams, along with members of her family, has offered to continue to assist with maintenance by mowing the bald and maintaining the trails. Persons with permission from the Forest Service will continue to collect and distribute seed so that rare germplasm may be preserved. A longer term goal is to create a databank for all the information that will have been collected over the years.

Deservedly, a number of awards have been received for this outstanding project. Jim Brant was given the ARS MAC Bronze Medal for leading the efforts that benefited Hooper Bald. George McLellan received the ARS Silver Medal for his long-term commitment to locating native azalea in Eastern North America, documenting their characteristics, and the sharing of this information. The Middle Atlantic Chapter was presented a plaque that expressed the thanks of the National Forests in North Carolina to all volunteers for "conserving and enhancing both the valuable habitat for rare species, as well as an important recreation site for forest visitors" on Hooper Bald.

If you are planning a trip to the Nantahala National Forest, think of stopping by the Cheoah Ranger Station in Robbinsville, NC, to obtain a map that can help you find specific interesting azalea sites along the Cherohala Skyway. Huckleberry and Oaks Knob are to be found near Milepost 9; Hooper Bald is closer to Milepost 8. One of the clues to finding Hooper Bald is a set of telephone pole-like structures, one on either side of the road, just east of the entrance to the parking area. These are actually

there to accommodate the Carolina Northern Flying Squirrel by providing a safe way for them to cross the highway— they can climb one, and then glide to the other!

Please leave all plant materials where you find them. If you are interested in having some *R. calendulaceum* in your garden, there are two ways to obtain them. Each year, *R. calendulaceum* seed is collected on Hooper Bald by authorized persons, and later shared via the ARS and ASA seed exchanges. The hope is this will perpetuate the best of the species, and prevent theft of plants from the wild. If you are interested in seed from this special area, please check with the ARS Seed Exchange (<http://www.rhododendron.org/seedexchange2.htm>) or the ASA seed exchange (<http://www.azaleas.org/azseedlist2012.html>). Also, the Potomac Valley ARS Chapter has a local seed exchange for its Members and Associate Members which runs on the last page of their winter newsletter each year (<http://www.arspvc.org/newsletter.html>). For container grown plants, which establish readily in the garden, the following are sources:

Appalachian Native Plants, Inc
676 Waddekk Road, P O Box 746
Mountain City, TN 37683
423.727-4264
appalnativeplants@gmail.com

East Fork Nursery
2769 Bethel Church Rd
Sevierville, TN 37876-6388
865.453-6108

Octoraro Farm
698 Lees Bridge Rd
Nottingham, PA 19362
610.932-0225
webinfo@octorarofarm.com

In summary, we are fortunate that the *R. calendulaceum* on Hooper Bald are protected by the Forest Service for all to enjoy and we are grateful for all the volunteers who have spent so much time preserving their habitat for future generations.

For more information and photographs of *R. calendulaceum* on Hooper Bald, visit Don Hyatt's website at <http://www.donaldhyatt.com/natives>. There is also a MAC Chapter PDF of a PowerPoint show that you can view at <http://www.macars.org/HooperBald.pdf>. If you would like to participate in the ongoing efforts in this, or other, native azalea projects, contact Jim Brant at jandpbrant@verizon.net.

Reference

Skinner, H.T. 1955. *In Search of Native Azaleas*. Morris Arboretum Bull. (Univ. of Penn.), Pennsylvania. Vol. 6, Nos. 1 and 2.

Carolyn Beck is a member of the Northern Virginia Chapter of the ASA and the Potomac Valley Chapter of the ARS.

Pentanthera Webs: Interspecific and Interploid Hybridization among Sympatric Azaleas in the Southern Appalachian Mountains

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Summary

Modern evolutionary research suggests that new species often arise rapidly from hybridization and chromosome doubling, augmenting the slow, divergent processes originally detailed by Darwin. Relationships between kindred species are thus best represented not by a simple branching candelabra or tree, as pictured in our old biology texts, but by a complex web of exchanges and ploidy variations. Such complexities seem especially evident in the highly compatible and multi-ploidal Southeastern deciduous azaleas, especially on those spectacular and much-visited mountaintops called “balds.” We have conducted a survey of 92 samples taken from the azalea swarm on the bare top and adjacent woodlands of Gregory Bald within Great Smokies National Park. Flow cytometry was used to determine ploidy and published component traits of recognized species were used to elucidate mating interactions at that highly diverse site. A similar study was undertaken with 12 samples from along the interfaces between the *Rhododendron calendulaceum* (tetraploid) and *R. arborescens* (diploid) colonies on Wayah/Wine Spring Bald, to the south of the Park. Cytometry revealed no tetraploids within the open bald area of Gregory, belying previous suggestions that *R. calendulaceum* is directly involved in that famous swarm. There were tetraploids keying out to *R. calendulaceum*, some with unusual variations (e.g., fragrance), within nearby woodlands. The traits of several of the samples from Wayah/Wine Spring gave evidence for genetic

exchanges between the diploid and tetraploid species; one triploid, such as might serve as a two-way bridge between the azalea species, was in fact found. In addition, triploids had previously been discovered from *R. calendulaceum*-*R. perichlymenoides* hybrids in northwestern South Carolina. Thus mechanisms for gene exchange between diploid and tetraploid species do indeed exist. Examination of the complex diploids of Gregory was still more suggestive. Flower colors, odors, and forms evince origins in *R. cumberlandense* and *R. arborescens* and possibly *R. viscosum*. Diploid plants consistent with *R. cumberlandense* at this site could not, based on flower sizes and forms, be distinguished from tetraploid *R. calendulaceum*. The lack of differentiating morphological traits between *R. cumberlandense* and *R. calendulaceum* and similarity in average chromosome size suggests that tetraploid *R. calendulaceum* at this site is primarily derived from the diploid *R. cumberlandense* with limited genetic infusions from other species. Moreover, the indeterminacy of species upon this bald suggests that the present azalea species in the Southeast are likely to be recent products of cycles of migration and interaction attending the as many as 20 glaciations and warm periods since the beginning of the Pleistocene. Our contemporary list of recognized azalea species that seem so distinct and certain may simply be a momentary snapshot of a complex and rapidly changing evolutionary web that is the *Pentanthera*.

Introduction

Beginning with Charles Darwin (Darwin 1859), the evolutionary process typically has been illustrated as a tree of life with radiating limbs that branch and diverge but never reconnect. This concept is rooted in the notion of reproductively isolated populations accumulating genetic variation over time. Subject to natural selection, these populations become increasingly distinctive as they gradually evolve along a one-way course without intersections. Current research provides ample evidence that this tree-of-life illustration is an oversimplification at best (Arnold 2006; Arnold and Larson, 2004). The process of evolution is more aptly depicted as a reticulate web of genetic exchange integrating periodic hybridization among nascent “species.”

Interspecific hybridization and intro-gression are common among plants and are a significant evolutionary mechanism that can give rise to new evolutionary lineages and species (Arnold 1997, 2006; Barrier et al. 1999; Grant et al. 2005; Rieseberg and Carney 1998; Soltis et al. 2009). By some estimations, at least 25% of plant species hybridize naturally (Mallet 2005) and as many as 50-70% of all flowering plants are of hybrid origin (Ellstrand et al. 1996; Rieseberg 1997). This process of introgressive hybridization can afford evolutionary benefits by enhancing genomic diversity. Through the development and combination of novel adaptations, introgressive hybridization can enhance fitness, colonization success, and adaptive radiation in new and changing environments (Arnold 2006; Grant et al. 2005; Lewontin and Birch 1966; Lindqvist et al. 2003; Rieseberg and Carney 1998; Soltis et al. 2009).

Rhododendron species of the sub-section *Pentanthera* are known for their widespread natural hybridization, including over 18 different combinations that sometimes involve multiple species (Millais 1924; Skinner 1955, 1961; Galle 1968; Leach 1958). Leach (1958) remarked that “hybridity is the most conspicuous single feature of the entire Azalea population of our Southern mountains.” Skinner (1961) also emphasized what he considered to be the reticulate nature of the evolutionary lineages within this section.

The development of polyploids is also a fundamental evolutionary process in flowering plants. Most angiosperms are believed to have undergone whole genome duplication events, often followed by rediploidization, throughout their evolutionary history (Soltis et al. 2009). Polyploids have numerous traits that can contribute to successful speciation and radiation, including a greater number of potential alleles, greater potential heterozygosity, tolerance of deleterious mutations, novel gene expression(s), and enzymatic multiplicity (Adams and Wendel 2005; Comai 2005; Hegarty and Hiscock 2008; Osborn et al. 2003; Soltis et al. 2003; Soltis and Soltis 1993). The formation of polyploids can also contribute to the development of more abrupt speciation as a result of reproductive isolation. Once tetraploids arise in a population, they generally hybridize readily with other tetraploids. Crosses with diploids are typically less successful. Successful crosses between tetraploids and diploids typically yield triploids with low or nonexistent fertility (Ehlenfeldt and Vorsa 1993; Ramsey and Schemske 1998). This reproductive barrier between cytotypes can foster sympatric divergence. Yet little is known about the potential for *in situ* interplloid gene flow among coexisting taxa of different cytotypes.

Hybrid zones can provide an opportunity to study the degree of reproductive isolation and the presence of interspecific and interplloid crossing within mixed populations. *Pentanthera* azaleas native to the Southern Appalachian Mountains often form hybrid zones or “swarms” with unusual phenotypic diversity indicative of natural hybridization (Galle 1987; Kron 1993; Rehder 1921; Skinner 1955, 1961; Towe 2004). A number of studies have confirmed interspecific hybridization and introgression among these azaleas, but these have been limited to diploid cytotypes (King 2000; Kron et al. 1993).

A well-known hybrid zone of azaleas is located on Gregory Bald in the Great Smoky Mountains National Park on the Tennessee-North Carolina border near Cades Cove. Based on morphology and the overlapping ranges of numerous species, this swarm has been thought to represent a complex hybrid zone among *Rhododendron arborescens* (Pursh), *Rhododendron cumberlandense* (E.L. Braun) Copeland, *Rhododendron calendulaceum* (Michx.) Torr., and *Rhododendron viscosum* (L.) Torrey (Hyatt 2001). Potential hybridization events in this population are of particular interest on account of the complex genetic interactions that may be occurring between species that vary in ploidy level. Of the four species found in that region, *R. arborescens*, *R. cumberlandense*, and *R. viscosum* are diploid ($2n = 2x = 26$), while *R. calendulaceum* is tetraploid ($2n$

Table 1. Morphological characters of four deciduous azaleas (*Rhododendron* sp.) and putative hybrids sampled at Gregory, Wayah and Winespring Bald.

Taxa	Genome Size (pg)	Ploidy Level	Color	Blotch	Flower								
					Corolla Length + Corolla Tube (mm)	Corolla Width (mm)	Tube Flare	Petal Margin	Fragrance (Y/N)	Style & Filament Color	Sepal Margin	Pediceal Hairs	
<i>Rhododendron arborescens</i> (Pursh) Torr.	1.65 ± 0.05	2x	White/Pink	Varies	36-48	40-52	G	F	Y	Red	F	G	
<i>R. calendulaceum</i> (Michx.) Torrey	3.14 ± 0.09	4x	Yellow Orange Red	Present	34-45	40-65	A	W	N	Yellow Orange Red	F	G (E)	
<i>R. cumberlandense</i> (E. L. Braun) Copeland	1.63 ± 0.02	2x	Yellow Orange Red	Absent	29-39	38-45	A	W	N	Yellow Orange Red	B	E (G)	
<i>R. viscosum</i> (L.) Torrey	1.67 ± 0.04	2x	White Pink	Absent	28-43	25-40	G	F	Y	White Green-White	F	G	
Gregory Bald													
ID#	GPS Coordinates												
A001*	35°31.230' N, 83°51.880' W	1.65 ± 0.03	2x	Orange Red	N	32.03	37.43	A	F	N	Red	B	E
A002*	35°31.230' N, 83°51.881' W	1.61 ± 0.04	2x	Pink	Yellow	37.64	44.13	A	W	N	Pink	B	E
A003*	35°31.230' N, 83°51.880' W	1.63 ± 0.04	2x	Red Orange	N	39.20	38.70	A	W	N	Red	B	E
A004*	35°31.226' N, 83°51.880' W	1.60 ± 0.07	2x	Pink	N	44.13	37.33	G	W	Y	Pink	F	G
A005*	35°31.229' N, 83°51.884' W	1.62 ± 0.03	2x	Pink	Orange	37.30	40.50	A	W	N	Pink	F	G
A006*	35°31.226' N, 83°51.884' W	1.64 ± 0.05	2x	Dark Red	Some Orange	31.16	37.01	A	W	N	Red	B	G
A007*	35°31.240' N, 83°51.870' W	1.65 ± 0.02	2x	Pink and Yellow	Yellow fade	37.27	37.61	A	W	N	Pink/Red	B	G
A008*	35°31.235' N, 83°51.863' W	1.58 ± 0.07	2x	Pink	orange	31.28	35.21	A	W	N	Dark Pink	B	E
A009*	35°31.217' N, 83°51.884' W	1.62 ± 0.02	2x	Orange Peach	N	44.91	42.30	A	W	N	Dark Pink / White to Pink	B	E
A010*	35°31.216' N, 83°51.883' W	1.63 ± 0.04	2x	Yellow Pink	N	38.76	41.80	A	W	N	Yellow with White	B	G
A011*	35°31.213' N, 83°51.887' W	1.61 ± 0.03	2x	Pink	Orange	45.71	34.43	A	W	Y	Pink/Red	B	G
A012*	35°31.213' N, 83°51.884' W	1.60 ± 0.04	2x	Orange	N	U	U	A	W	N	Red	B	E
A013*	35°31.210' N, 83°51.886' W	1.63 ± 0.01	2x	Red	N	36.93	48.69	A	W	N	Red	B	E

(Table continued on next page.)

= 4x = 52) (Jones et al. 2007; Sax 1930). Approximately 47 kilometers to the SE of Gregory Bald, Wayah Bald and Wine Spring Bald are located in the Nantahala National Forest in North Carolina. Both Wayah Bald and Wine Spring Bald host sympatric populations of *R. calendulaceum*, *R. arborescens*, and their potential hybrids. Although these grassy balds have certainly been disturbed and impacted by human beings (Lindsay 1976), they contain hybrid zones of deciduous azaleas and provide model sites to study ongoing genetic exchange.

The species found on these balds are characterized and may be differentiated in the following ways (Galle 1987; Kron 1993; Luteyn et al. 1996; Willingham, Jr. 1976) (also see Table 1):

- *Rhododendron arborescens* is known as the sweet azalea due to the sweet clove or heliotrope-like fragrance. Flowers are white, sometimes with a pink or reddish blush, 4.0-5.2 cm across, with or without a yellowish blotch. The transition from tube to corolla is gradual; sepals typically have a fringed margin. Pistil and stamens are characteristically reddish.

- *Rhododendron calendulaceum*, the flame azalea, is named for its brilliant flower color which can range from yellow to orange to red. Flowers are often larger than the flowers of other species, 4.0-6.5 cm across, and have a blotch on the upper lobe. There

Table 1 continued.

A014*	U	1.60 ± 0.02	2x	Orange	N	32.14	28.37	A	W	N	Red	F	E
A015*	35°31.219'N, 83°51.887'W	1.62 ± 0.02	2x	White	Yellow	48.06	51.87	A	W	Y	Red	F	E
A016*	35°31.204'N, 83°51.958'W	1.61 ± 0.02	2x	Red Orange	N	33.00	37.42	A	W	N	Red	B	E
A017*	35°31.197'N, 83°51.959'W	1.65 ± 0.01	2x	White Pink	Yellow	37.94	36.13	A	W	Y	Pink-red/Pink-white	B	G
A018	35°31.191'N, 83°51.960'W	1.64 ± 0.03	2x	Orange Pink	N	41.46	47.03	A	W	N	Orange-pink	B	E
A019*	35°31.179'N, 83°51.954'W	1.62 ± 0.03	2x	Yellow	N	34.22	41.53	A	W	N	Yellow	B	E
A020*	35°31.179'N, 83°51.954'W	1.62 ± 0.001	2x	White	Yellow	38.48	38.41	A	W	N	White	F	G
A021*	35°31.169'N, 83°51.963'W	1.62 ± 0.02	2x	Orange	Yellow	28.05	28.74	A	W	N	Red	B	E
A022	35°31.178'N, 83°51.961'W	1.63 ± 0.02	2x	Pink	Orange	40.04	50.80	A	W	N	Red	B	E
A023	35°31.178'N, 83°51.961'W	1.63 ± 0.04	2x	Orange Red	Yellow	39.54	42.29	A	W	N	Red	F	E
A024*	35°31.181'N, 83°51.974'W	1.62 ± 0.03	2x	Pink	Yellow	40.74	46.76	G	W	Y	Pink	F	G
A025*	35°31.184'N, 83°51.971'W	1.62 ± 0.02	2x	White	Yellow	43.54	37.29	A	W	Y	Red	B	E
A026*	35°31.194'N, 83°52.038'W	1.62 ± 0.03	2x	Orange	N	36.74	43.14	A	W	N	Red	B	E
A027*	35°31.181'N, 83°52.038'W	1.63 ± 0.04	2x	Pink Red	N	39.14	47.18	A	W	N	Red	F	E
A028	U	1.62 ± 0.02	2x	Orange	Yellow-orange	32.07	35.17	A	W	N	Both Pink-red	B	G
A029	35°31.240'N, 83°51.948'W	1.61 ± 0.04	2x	Light Peach	Yellow	38.53	35.08	A	W	N	Both Peach-pink	F	G
A030	35°31.240'N, 83°51.940'W	1.60 ± 0.04	2x	Peach	Orange	37.21	42.84	A	F	N	Red	B	E
A031	35°31.240'N, 83°51.948'W	1.61 ± 0.02	2x	Orange Red	N	35.53	38.81	A	W	N	Pink/Red	B	E
A032	35°31.228'N, 83°52.395'W	3.21 ± 0.03	4x	Orange	N	42.21	49.77	A	W	N	Orange	B	E
A033	35°31.229'N, 83°52.394'W	3.20 ± 0.02	4x	Orange	N	42.93	49.47	A	W	N	Yellow	F	E
B001*	35°31.254'N, 83°51.864'W	1.60 ± 0.02	2x	Pink	Yellow/ Orange	40.44	52.13	A	W	N	Red	B	U
B002*	35°31.263'N, 83°51.877'W	1.61 ± 0.05	2x	Light Yellow	Dark yellow	37.14	40.77	A	F	N	White-red/White	B	U
B003*	35°31.266'N, 83°51.868'W	1.66 ± 0.03	2x	Pink	Orange/ yellow	37.00	44.00	G	W	N	Pink	B	E
B004*	35°31.276'N, 83°51.868'W	1.60 ± 0.04	2x	Pink	Orange	33.83	32.38	A	W	N	Red	B	E

(Table continued on next page.)

is an abrupt transition from tube to corolla, no substantial fragrance, and typically a fringed sepal margin. Flowers ($2n=4x=52$) often bloom before leaf emergence (though highly variable). *Rhododendron calendulaceum* is the only tetraploid species of the four taxa considered here (Jones et al. 2007; Li 1957; Sax 1930).

• *Rhododendron cumberlandense* (*R. bakeri*), the Cumberland azalea, closely resembles *R. calendulaceum* but is diploid. This species has been described as having smaller flowers, 3.8-4.5 cm across, a bristly sepal margin, and it typically blooms after leaves expand. The pedicel is typically eglandular.

• *Rhododendron viscosum* (*var. montanum*), the sticky azalea, has fragrant white flowers, 2.5-4.0 cm across, a glandular/viscid tube, a gradual transition from tube to corolla, and a strong spicy fragrance. *Rhododendron viscosum* can be confused with *R. arborescens* as they both have fragrant white flowers; however, unlike the *R. arborescens*, *R. viscosum* does not typically have the tell-tale, red pistil and stamens and is a low, stoloniferous shrub.

In order to better differentiate these species (e.g., *R. calendulaceum* and *R. cumberlandense*) and to understand interploidy hybridization, it is essential to know the ploidy levels of the plants in question. Cytological determination of chromosome numbers and ploidy levels for *Rhododendron* is notoriously difficult because of the small

Table 1 continued.

B005*	83°51.840'W 35°31.274'N, 83°51.831'W	1.60 ± 0.04	2x	Orange with Red Striations	N	33.60	40.00	A	F	N	Red	B	G
B006*	35°31.289'N, 83°51.830'W	1.62 ± 0.001	2x	Orange Red	Orange	35.68	39.18	A	W	N	Red	B	E
B007*	35°31.258'N, 83°51.793'W	1.61 ± 0.0001	2x	White	Yellow	41.27	39.28	A	W	Y	Red/White	F	G
B008*	35°31.239'N, 83°51.712'W	3.13 ± 0.09	4x	Light Yellow Pink blush	N	41.55	42.22	A	W	N	Yellow	F	G
B009*	35°31.234'N, 83°51.750'W	1.56 ± 0.03	2x	Red	Orange	33.92	44.57	A	W	N	Red	B	E
B010*	35°31.254'N, 83°51.806'W	1.63 ± 0.02	2x	Pink	Orange	37.95	42.90	A	F	N	Pink/Red	F	E
B011*	35°31.254'N, 83°51.804'W	1.63 ± 0.01	2x	White	Yellow	40.67	32.30	A	F	N	Red/White	F	G
B012*	35°31.246'N, 83°51.806'W	1.63 ± 0.01	2x	Pink Yellow	Orange	38.19	49.93	A	W	N	Yellow/White	B	E
B013*	35°31.227'N, 83°51.821'W	1.63 ± 0.01	2x	Pink with White Stripes	yellow	40.39	43.71	A	F	Y	Light Pink	B	E
B014*	35°31.216'N, 83°51.851'W	1.59 ± 0.04	2x	Red Orange Yellow	N	38.08	53.15	A	W	N	Orange	B	G
B015	35°31.207'N, 83°51.854'W	1.58 ± 0.04	2x	Peach	N	37.38	32.37	A	W	N	Red	B	G
B016	35°31.257'N, 83°51.943'W	1.58 ± 0.02	2x	Red Orange	N	38.75	33.03	A	W	N	Red	F	E
B017	35°31.263'N, 83°51.956'W	1.68 ± 0.02	2x	Pink	Yellow	33.45	35.19	A	F	N	Pink	B	G
B018	35°31.227'N, 83°51.990'W	1.55 ± 0.003	2x	Red	N	31.41	33.67	A	F	N	Red	F	E
B019	35°31.216'N, 83°51.990'W	3.22 ± 0.03	4x	Orange Yellow	N	39.29	41.42	A	W	Y	Orange/Red	B	E
B020	35°31.209'N, 83°52.035'W	1.64 ± 0.04	2x	Orange Red	N	34.52	42.84	A	W	N	Red	F	E
B021	35°31.192'N, 83°52.043'W	1.63 ± 0.03	2x	Orange	N	U	U	A	F	N	Pink-red	F	G
B022	35°31.192'N, 83°52.045'W	1.63 ± 0.02	2x	Orange Red	N	44.90	50.04	A	F	N	Red	F	G
B023	35°31.173'N, 83°52.043'W	1.65 ± 0.02	2x	Orange Red	N	36.67	43.27	A	F	N	Red	F	E
B024	35°31.186'N, 83°52.031'W	1.64 ± 0.06	2x	Peach Red	N	43.26	42.19	A	W	N	Red	B	E
B025	35°31.184'N, 83°52.029'W	1.63 ± 0.04	2x	Orange Red	N	36.75	44.31	A	W	N	Red	F	G
B026	35°31.176'N,	1.60 ± 0.04	2x	Orange	N	36.79	27.21	A	W	N	Peach/Orange	B	G

Table continued on next page.)

chromosome size. However, the recent development of flow cytometry provides for rapid measurement of genome size (DNA content) and associated ploidy levels and has been used extensively for *Rhododendron* (Jones et al. 2007). This method allows for rapid and accurate screening studies of cytotype distribution (Kron et al. 2007).

The objective of this study was to utilize morphological and genome size data to determine the presence of interspecific and interploid hybridization in selected hybrid zones of *Pentstemon* azaleas in the Southern Appalachian Mountains.

Materials and Methods

Flower and foliage samples were collected from 92 plants growing on and around Gregory Bald and 12 samples from Wayah Bald and Wine Spring Bald in mid-June 2011. Samples were collected throughout the sites in an attempt to represent a broad range of phenotypes that were present including plants that appeared to have hybrid phenotypes. Samples for cytometric analyses were placed in bags with moist paper towels and were transported in coolers. Photographs and GPS coordinates were taken for each plant to allow for follow-up research. Plant locations and cytotype distributions were mapped (Google Earth, Google Inc., Mountain View, Calif.). Additional samples were collected from selected plants and pressed for herbarium vouchers that

Table 1 continued.

	83°52.014'W			Yellow									
B027	35°31.191'N, 83°52.006'W	1.61 ± 0.03	2x	Pink	Yellow	33.53	33.48	A	W	N	Pink	B	E
B028	35°31.191'N, 83°52.001'W	1.58 ± 0.06	2x	Red	N	31.19	37.65	A	W	N	Red	B	E
B029	35°31.190'N, 83°51.982'W	1.63 ± 0.02	2x	Pink	Yellow	42.03	44.16	A	W	N	Pink/Red	F	E
B030	35°31.187'N, 83°51.974'W	1.64 ± 0.03	2x	Pink	Orange	38.97	40.73	A	W	Y	Pink-red	B	E
B031	35°31.184'N, 83°51.974'W	1.64 ± 0.002	2x	White	Yellow	42.53	44.97	A	W	Y	White-red	B	E
B032	35°31.211'N, 83°51.952'W	1.64 ± 0.01	2x	Red	N	31.30	36.55	A	W	N	Red	F	E
B033	35°31.211'N, 83°51.926'W	1.64 ± 0.01	2x	Pink Orange	N	34.00	33.10	A	W	N	Red	B	E
B034	35°31.205'N, 83°51.930'W	1.62 ± 0.06	2x	Pink	Orange	33.40	35.20	A	W	Y	White-pink	B	G
B035	35°31.206'N, 83°51.924'W	1.61 ± 0.02	2x	White Yellow	N	32.00	28.60	G	F	N	White-pink/Red	F	G
B036	35°31.229'N, 83°51.898'W	1.67 ± 0.08	2x	Orange Red	N	35.56	43.26	A	W	Y	Pink-red	F	E
B037	35°31.248'N, 83°51.924'W	1.64 ± 0.02	2x	Orange	N	29.47	31.80	A	W	N	Pink-Red	F	E
B038	35°31.231'N, 83°51.901'W	1.65 ± 0.04	2x	Red	N	38.41	42.32	A	W	N	Red	F	E
B039	35°31.227'N, 83°51.887'W	1.60 ± 0.01	2x	Pink Orange	N	34.06	50.26	A	W	N	Red	B	E
B040	35°31.227'N, 83°51.880'W	1.63 ± 0.01	2x	Pink	N	42.76	47.91	A	W	Y	Red	F	G
B041	35°31.226'N, 83°51.883'W	1.62 ± 0.01	2x	Orange Yellow Peach	N	33.09	37.36	A	W	Y	Orange	F	G
B042	35°31.230'N, 83°51.877'W	1.61 ± 0.03	2x	Red Orange	N	35.95	51.77	A	F	N	Red	F	E
B043	35°31.228'N, 83°51.879'W	1.61 ± 0.003	2x	Orange	N	32.47	33.38	A	W	N	Peach	B	E
B044	35°31.237'N, 83°51.868'W	1.61 ± 0.04	2x	Pink	Orange	31.48	39.54	A	W	N	Pink to Red	F	E
B045	35°31.241'N, 83°51.861'W	1.60 ± 0.01	2x	Yellow Peach	N	33.73	34.26	A	F	N	Red	F	G
B046	35°31.248'N, 83°51.866'W	1.59 ± 0.004	2x	Pink	N	33.80	41.26	A	W	N	Pink	B	E
B047	35°31.247'N, 83°51.855'W	1.59 ± 0.02	2x	Pink	Yellow	38.70	36.03	A	F	Y	White to Pink/Red	B	E
B048	35°31.251'N, 83°51.858'W	1.64 ± 0.04	2x	Red Orange	N	30.22	31.33	A	F	N	Red	F	E
B049	35°31.257'N,	1.62 ± 0.02	2x	Pink	N	38.94	38.34	G	W	Y	Yellow to Red	F	G

Table continued on next page.)

are now maintained at the NC State Herbarium, Raleigh, N.C. (K. Shearer, 1-38). Morphological characters, listed in Table 1, were determined. Presence of fragrance was confirmed by three individuals.

Genome sizes of all collected samples were determined using flow cytometry. Approximately 1 cm² of tissue was finely chopped in a petri dish with 400 µL of nuclei extraction buffer (CyStain UV Precise P Nuclei Extraction Buffer, Partec, Münster, Germany) using a sharp razor blade. The suspensions were then filtered through 50 µm filters and nuclei were stained with 1600 µL 4', 6-diamidino-2-phenylindole (DAPI) staining buffer (CyStain UV Precise P Staining Buffer, Partec). Relative genome sizes were determined using a flow cytometer (Partec PA-II, Partec) using *Pisum sativum* 'Ctirad' (8.75 pg) (Doležel et al. 1998) as an internal standard. Ploidy levels were determined based on genome size as determined by Jones et al. (2007).

Results and Discussion

Gregory Bald (A & B Group)

Of the samples collected on and around Gregory Bald, 83 were diploid, while the remaining nine were tetraploid (Table 1). No triploids were identified at this site. Plants that were sampled in open areas at the top of the bald were exclusively diploids

Many of the diploids displayed morphological characters that were consistent with hybrids. For example, diploid plants with pink/peach flowers, with or without a blotch, sometimes with fragrance, and sometimes with a red pistil and stamens were common (e.g., A002, A004, A005, A007, A011, A022, A024, A029, A030, B004, B010, B013, B015, B017, B022, B027, B029, B030, B040, B041, B044, B045, B049, B051). Based on morphology, these are most likely hybrids between *R. arborescens* and *R. cumberlandense*. Plants with very similar appearance were discovered in Vogel State Park at Neel Gap, Georgia in 1934 and were named *R. furbishii* (Lemmon 1941). Leach (1958) later recreated this general phenotype by hybridizing *R. arborescens* and *R. cumberlandense* and concluded that *R. furbishii* was really an interspecific hybrid. Leach (1958) further speculated that blotched *R. arborescens* may be the result of introgression from *R. cumberlandense*. Other plants, including B002 (yellow flowers, no fragrance, but with red stamens and pistil) and B011 (white flowers and no fragrance), are also most likely advanced hybrids between *R. arborescens* and *R. cumberlandense*. Evidence for hybrids involving other species was difficult to discern based on morphology. These observations support the premise that there is considerable interspecific hybridization among diploid species on Gregory Bald, most com-

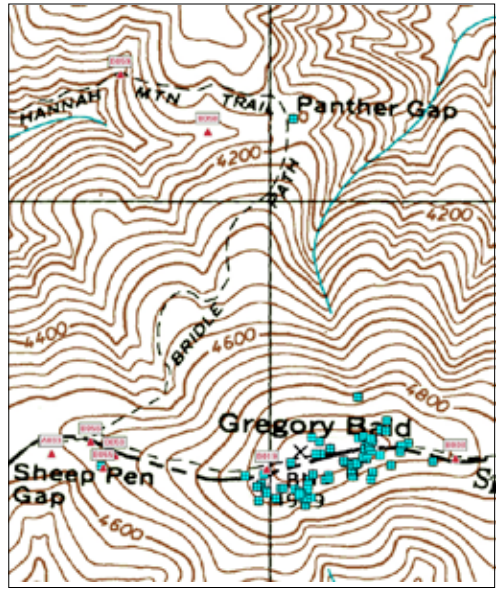


Figure 1. Topography map of Gregory Bald showing the location of sampled plants. Triangle symbols indicate tetraploids and squares indicate diploids.



Figure 2. Topography map of Wayah and Wine Spring Balds showing the location of sampled plants. Triangle symbols indicate tetraploids and squares indicate diploids with the exception of W10 being a triploid.

monly between *R. arborescens* and *R. cumberlandense* (Galle 1987; Kron 1993).

Tetraploids were only found in understory conditions in areas surrounding and below the open bald, often in association with diploids. Many of these tetraploids were consistent with *R. calendulaceum* (e.g., A032, A033, B008, B053, B055, B058, B059), though none of these plants had distinctive blotches, a common trait in *R. calendulaceum* (Kron 1993). Two tetraploids (B019 and B056) were noteworthy in that they had phenotypes consistent with *R. calendulaceum* but were also fragrant. These plants appear to represent introgression of fragrance from a diploid species (e.g., *R. arborescens*) into *R. calendulaceum*.

Without considering genome size and ploidy level, *R. cumberlandense* and *R. calendulaceum* were virtually indistinguishable at this site. Various traits that have been presented as key distinguishing characteristics, including flower size and sepal margins (Table 1), were variable within both cytotypes. Both taxa were blooming well after leaves had emerged at this site and displayed a range of flower colors from yellow to dark red. In a more extensive survey of *R. calendulaceum* and *R. cumberlandense* in the Nantahala Mountains of N.C., Willingham, Jr. (1976) found it was difficult to separate the two species in the field—their flowering period overlapped—and the cited distinguishing characters (Bowers 1968; Galle 1968; Lemmon 1937) were of little value to the point of making field identification difficult or impossible. Perhaps introgression between these two species in Western North Carolina has made it particularly difficult to clearly separate them there.

There has been considerable debate and discussion on the origin of the tetraploid, *R. calendulaceum*. Li (1957) indicated that *R. calendulaceum* had two distinct sizes of chromosomes, suggesting it was an allotetraploid hybrid, possibly between *R. cumberlandense* and *R. prinophyllum* (Small) Millais (King 1977; Kron 1993). However, more recent work by Jones et al. (2007) using flow cytometry showed that the base genome size (1Cx) for Pentanthera azaleas is highly conserved and that there is no discernible difference in average chromosome size between *R. cumberlandense*, *R. prinophyllum*, and *R. calendulaceum*. King (1977) found, in a limited sampling, that *R. cumberlandense* and *R. calendulaceum* varied slightly in flavonoid constituents; yet his phylogenetic analyses, based on flavonoid constituents, showed them to be closely allied. Phylogenetic analysis based on morphological, phenological, and chemical characters also show *R. cumberlandense* and *R. calendulaceum* to be very similar (Kron 1993). Considering these two species are virtually indistinguishable morphologically at the Gregory Bald site, we suggest that *R. calendulaceum* there are primarily derived from *R. cumberlandense*, with limited introgression from other species, i.e., the two species represent a primarily autopolyploid series. However, it is not unlikely that elsewhere tetraploid *R. calendulaceum*-like plants have arisen, and continue to arise, through independent genome duplication events involving *R. cumberlandense* by itself or in various combinations with other diploid species. This scenario would certainly

contribute to the great range of morphological variation noted in *R. calendulaceum* (Willingham 1973; Kron 1993).

Wayah Bald (W1-W4)

Of the samples collected at Wayah Bald, one plant was a tetraploid and consistent with *R. calendulaceum* (W4), though lacking a blotch (Table 1, Fig. 2, Google Earth Map, <http://www.ces.ncsu.edu/fletcher/mcilab/publications/pentantheramap.kmx>). Three other plants from Wayah were diploid and fairly typical of *R. arborescens* (W1, W2, and W3). However, all three had wavy petal margins, W2 and W3 had yellow blotches, and W3 lacked any fragrance, possibly indicating some introgression from either *R. calendulaceum* or *R. cumberlandense* (if it has existed in this area).

Wine Spring Bald (W5-W12)

Of the plants surveyed at Wine -spring Bald, six were tetraploid, one was diploid and one was triploid. The tetraploid plants (W5, W6, W7, W9, W11, and W12) were fairly typical of *R. calendulaceum*, yet most lacked a blotch, and W5, W6, and W7 had eglandular pedicel hairs. The diploid plant W8 had a yellow flower with red pistil and stamens and an unusually long corolla (50.52 mm), suggesting hybridization between *R. arborescens* and either *R. calendulaceum* or *R. cumberlandense*. The triploid specimen, W10, had an orange-pink flower with an orange blotch and red pistil and stamens, consistent with an interploid hybrid between *R. calendulaceum* and *R. arborescens*. Although triploid plants do appear to be rare, Li (1957) also reported apparent triploids ($2n \sim 30-40$) on Wayah Bald. Other naturally occurring triploid *Pentanthera azaleas* have been reported by Jones et al. (2007). We have also documented three triploids (e.g., *R. 'Chameleon'*) in hybrid zones of *R. calendulaceum* and *R. periclymenoides* found along Lake Keowee, S.C. (Towe 2004; unpublished data).

Introgression between diploid and tetraploid plants can occur in various ways. Diploid plants may produce an unreduced gamete ($2n = 2x = 26$) that combines with a reduced gamete from a tetraploid ($1n = 2x = 26$) to produce a tetraploid with balanced genetic contributions from each parent (Bretagnolle and Thompson 1995; Galletta and Ballington 1996; Ramsey and Schemske 1998). B019 and B056 from Gregory Bald could have arisen in such a manner with an unreduced gamete from *R. arborescens* or an *R. arborescens* hybrid crossed with *R. calendulaceum* to produce a fragrant tetraploid in either F_1 or subsequent generations. Unreduced gametes are relatively common in *Rhododendron* spp. (Widrechner et al. 1982; Widrechner and Pellett 1983). In many cases, hybrids have been found to produce unreduced gametes at higher frequencies than parental species (Ramsey and Schemske 1998).

Alternatively, triploids can also serve as genetic and reproductive bridges. Triploid *Rhododendron* spp., though somewhat infertile, can produce unreduced gametes at relatively high (>5%) frequencies (Jones and Ranney 2009), often at higher frequencies

than diploids (Dweikat and Lyrene 1988; Veilleux 1985). The union of an unreduced gamete from a triploid ($2n = 3x = 39$) with a normal reduced gamete from a diploid ($1n = 1x = 26$) offers an alternative pathway, sometimes called a triploid bridge, for diploids to introgress/transform into tetraploids (Ramsey and Schemske, 1998).

Introgression from triploids and tetraploids into diploid populations is less common, but can occur. In some cases, tetraploids can produce diploid offspring through the parthenogenetic development of reduced gametes, a form of apomixis sometimes referred to as polyhaploidy (de Wet 1971; Shoemaker 1986). The production of $1x$ or $\sim 1x$ gametes by triploids and tetraploids through complement fractionation, asynchronous meiotic rhythms, chromosome elimination, random chromosome assortment, fertile aneuploids, and other unusual meiotic pathways may also allow for introgression from higher to lower ploidy levels (Avers 1954; Burton and Husband 2001; Husband 2004; Lim et al. 2005; Norrmann and Quarin 1987; Peckert and Chrtek Jun. 2006; Ramsey and Schemske 1998; Risso-Pascotto et al., 2004; Smith-White 1948; Widrlechner et al. 1984).

Although instances of interspecific and interploid hybridization may initially be rare, once they do occur, they can provide a gateway for introgression. In studies of hybrid Iris zones, hundreds of advanced hybrid genotypes were detected (e.g., F_2 , F_3 , BC_2 , BC_3) but no F_1 s were found (Arnold 2006). This observation suggests that F_1 hybrids may represent the most restrictive bottleneck for genetic exchange, but once they are formed, they serve as bridges for further exchange. Rare events of interspecific/interploid hybridization can thus be extremely important and have substantial evolutionary impacts (Mallet 2005). Infrequent triploids, like the one found at Wine Spring Bald, may play a key role in introgressive hybridization between *R. calendulaceum* and *R. arborescens* there.

Habitats can change dramatically over both the short- and long-term. Natural events like succession, fire, and climate shifts lead to ever-changing distribution patterns and new species associations. As recently as 18,000 years ago, during the last glacial maximum, the Southern Appalachian region consisted of boreal and tundra environments (Delcourt and Delcourt 1975; Shafer 1988). Reconstructed paleovegetation maps for the Holocene epoch illustrate the continuous nature of climate-induced changes in vegetation biomes in this region, often without modern analogs (Overpeck et al. 1992). On an even broader scale, throughout the Pleistocene epoch, the flora of Southeastern North America were subjected to multiple glacial cycles (as many as 20 over a period of 2 million years) (Davis 1983; Hays et al. 1969). Temperate species, including *Pentanthera azaleas*, probably survived these glacial periods on higher terrain at refugial sites throughout southern Tennessee, southeastern and northern Louisiana, southwestern Mississippi, southwestern Georgia, Alabama, and northern Florida (Davis 1976; Delcourt 1980; Parks et al. 1994; Watts and Stuver 1980). Over time, surviving lineages appeared to have undergone cycles of southern migrations

followed by re-radiation that contributed to a reticulate pattern of evolution. These periods of melting-pot sympatry ostensibly led to rehybridization and reinforcement of reproductive compatibility that effectively compromised divergence (Levin et al. 1996; Rieseberg 1997). These interludes would also have generated novelty and diversity and spread successful alleles that allowed for enhanced fitness in new and varied habitats during expansion phases (Arnold 1997; 2006; Rieseberg and Carney 1998). Although this ongoing genetic mixing appears to have contributed to a poorly differentiated web of species, this retained capacity for hybridization most likely afforded evolutionary and adaptive benefits for the common *Pentanthera* gene pool, a mechanism ideally suited to a rapidly changing climate.

Accumulated evidence suggests that hybridization among the *Pentanthera azaleas* is more than a taxonomic muddlement and botanical curiosity; rather, it reflects a pervasive and ongoing evolutionary process that has provided these plants with a successful adaptive outcome over recent millennia. The process has been less of a breakaway divergence of individual lineages and more of an ongoing, intertwined, evolutionary exchange.

Conclusion

Results of this study provide new evidence of both interspecific and interploid hybridization among species of *Pentanthera azaleas*. Despite sympatric populations of diploids and tetraploids with overlapping blooms, triploid hybrids were rare at these sites. However, rare triploids can provide bridges for genetic exchange between diploids and tetraploids. Other reproductive mechanisms, particularly unreduced gametes, may also allow for direct genetic exchange between ploidy levels. Furthermore, the substantial reproductive compatibility among species, ongoing hybridization, and the phytogeographic history suggest that the *Pentanthera azalea* species in the Southeastern United States continue to evolve with a high level of genetic exchange through a successful evolutionary web.

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A Rhododendron Untamed: *R. albiflorum*

Peter Kendall
Portland, Oregon



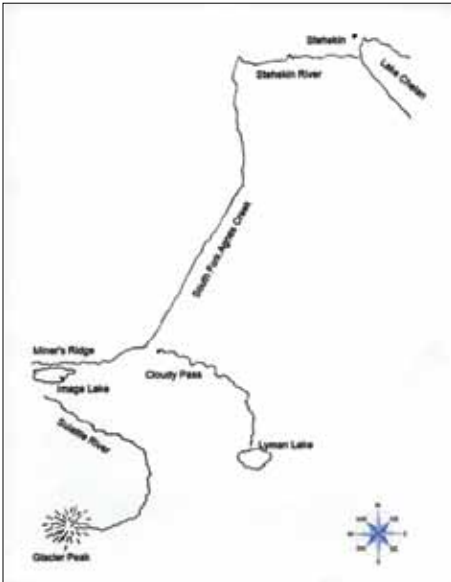
R. albiflorum near Lyman Lake.

Photos by the Author

Of the five rhododendron species that call the northwest outback of the United States, excluding Alaska, home, perhaps none is less attended to in many ways than *Rhododendron albiflorum* (the others are *R. macrophyllum*, *R. occidentale*, *R. groenlandicum* (formerly *Ledum groenlandicum*), and *R. menziesii* (formerly *Menziesia ferruginea*)). It occurs principally in concentrated thickets in the highest reaches of the Cascade Mountains, and, while not altogether eye-catching, its subtle presence and ability to thrive offer an understated elegance. This is especially appreciated given its reluctance to perform outside its native haunts in cultivated settings.

Over the years, my jaunts and explorations have led me into far-ranging circumstances where a combination of flora against spectacular mountain backdrops has instilled a reverence for such juxtapositions. While the list of such sites is legion, one stands out.

This recollection is from a fair number of years ago, when I ventured north from Portland, Oregon (my home base), to the tiny outpost of Chelan, Washington, located at the southeastern end of the



Map showing the area in the North Cascade National Park where the author found stands of *R. albiflorum*.



South Fork Agnes Creek Drainage.

long and massive (75 miles (121 km) long) Lake Chelan, whose base was ground out by a lengthy ice age glacier. At the other end of the lake, the village of Stehekin provided access to the very heart of North Cascade National Park, where I joined a group to hike a week-long counter-clockwise circuit through the high country to the south, west and east, a route with spectacular drainages, ridges, and lakes. Given a fortuitous stretch of great weather, which is not all that frequent, I was able to appreciate the singular beauty of this domain.

That this unrivaled wilderness exists to this day is no accident. In large part, the push to preserve wilderness from the exploitive ambitions of timber and mining interests fell to a well-known figure whose boyhood wanderings and sensitive nature introduced him to this particular magnificence. Growing up in Yakima, Washington,



Miner's Ridge.

he happened to attend my alma mater, Whitman College, and later found himself a lawyer in Washington, D.C., after having graduated from the University of Chicago Law School. He went on to become an Associate Justice of the United States Supreme Court, and thereby wielded considerable influence. His name was none other than the Honorable William O. Douglas.

In his writings of a number of books on this region, the one book that most particularly addresses the specific area to which I refer is titled *My Wilderness, the Pacific West*. The chapter “Glacier Peak” covers the very area into which I ambled. Included with this article are a number of photographs of the stellar territory I entered, and a glimpse of *R. albiflorum*, its setting and accompanying flora.



Lupinus spp. (lupine), *Castilleja* spp. (Indian paintbrush), etc., on Miner's Ridge.



Glacier Peak and Suiattle River Valley.

We initiated our trip from the town of Stehekin and the mouth of the Stehekin River, which flows into Lake Chelan, and proceeded up the precipitous drainage of the South Fork of Agnes Creek which flows from the high interior to the south and west into the Stehekin River. We eventually came to a place called Cloudy Pass where we established our primary encampment. From here, we took a day hike to Image Lake to the west and hiked along Miner's Ridge (named after early mining efforts), which afforded breathtaking views toward Glacier Peak and the wild Suiattle River valley to its east. This area and the earlier mentioned Agnes Creek area were early targets of timber interests, which evaporated with the area's National Park designation. To the east and beneath our Cloudy Pass encampment is Lyman Lake, where marvelous thickets of *R. albiflorum*, in conjunction with other delightful alpine plants in full bloom, welcomed us.

Reference:

Douglas, William O., 1960, *My Wilderness, the Pacific West*. Doubleday & Company, Inc., Garden City, New York: 206 pp.

Peter Kendall is a member of the Portland Chapter and a frequent contributor to the Journal.

Evolution, Adaptive Radiation and Vireya Rhododendrons

Part I

Peter Adams
Pahoa, Hawaii



“... evolution consists of an infinitude of trivial, unconscious events...” (Pollan, 2001)

Species are one of the basic means by which botanical science organizes its view of the plant world. But with the advent of genetic analysis the interpretation of the species concept has moved from field observations and dried specimens in the herbarium to the clinical atmosphere of scientific laboratories. Here the hard science of chemistry, complex instruments and precise measurements take place and new details of living organisms can be discovered. Recently new discoveries regarding vireyas based on genetic analysis have been published and we will try to convey these findings.

In traditional taxonomy (study of classification), from the pioneering work of Linnaeus in the early 18th century to recent times, botanists have had to rely on observations of physical characteristics (“morphology” or study of shape or configuration) of plants, supplemented with evidence from anatomy, cytology and other areas. Both microscopic and large-scale structures are compared to characterize species. Vireya species are distinguished by flower colors, leaf arrangement (pseudowhorls, spirals) and the size, and shape of flowers and leaves, and other parts. Like all rhododendrons, vireyas also have several distinct types of complex hairs called “scales” (multicellular hairs) which may be found on many parts of the plant and distinguish species.

But species are not only organized by their individual visual characteristics. Species are also grouped together into relationships beginning with subsections, then gathered into sections, subgenera, genera, families and so on. Most importantly, ever since Darwin developed the concept of evolution, it has been understood that these relationships should reflect a species’ evolution from its ancestors to the present. Remember the many species of finches Darwin found in the Galapagos Islands? All were related back

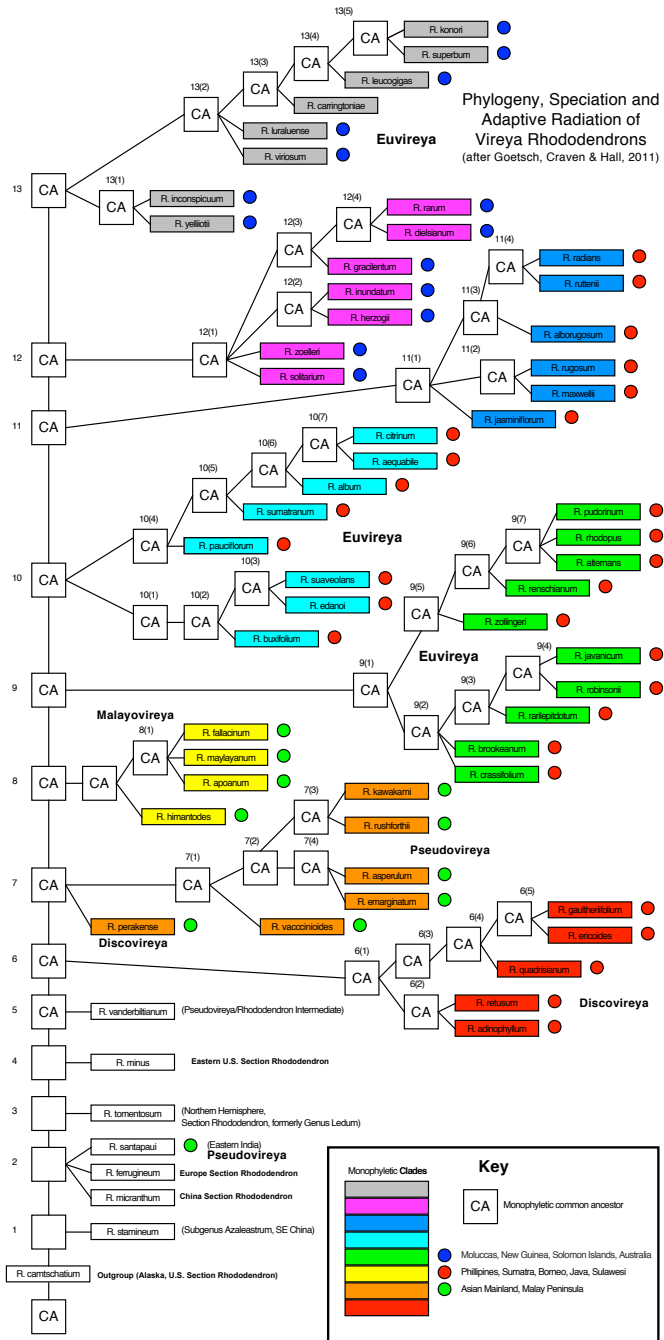


Figure 1.

to individuals called common ancestors. This is called phylogenesis, the development and diversification of species through evolution. Genes, a familiar term to many now, are those parts of DNA that determine the physical characteristics of all organisms. Therefore, today the scientific study of phylogenesis is based on genetic analysis. As Lyn Craven stated: “Modern taxonomic classification is based upon the findings of rigorous genetic investigations” (Craven, pers. comm.) and that “formal classification should always be based upon evolutionary relationships, as far as these are known” (Craven et al. 2008).

The subject of genetic analysis is, no surprise, the gene. Genes are sections of the long, helical-shaped double strands of chromosomal DNA in the cell nucleus. Genes are like a long array of poppit beads on each chromosome. The “beads” are named for simplicity A, T, G and C [the four nucleotide bases of a DNA strand—adenine, cytosine, guanine, thymine]. Each DNA chromosome strand is formed because one side of each bead acts like a socket and the other side acts like a plug. Between the two DNA strands, the A beads are paired only with T beads, and G beads with C beads. These are termed the “base pairs” and these bonds join two strands together. The sequence of genes in DNA provides the overall blueprint for any organism. The identity of these base pairs in any location within a gene may change over time as the result of mutation. This variation between species defines a major physical basis of evolution.

For each plant variety, the sequence of base pairs within a gene can then be compared with the sequence of base pairs in the same gene in any suspected related species. Then a phylogenetic tree, a branching structure diagram, may be constructed of related species. The mathematics of building a phylogenetic tree minimizes the total number of base pair changes required to join the sequences of all species considered in a single tree. In this tree, species that share the same inner branch are related and the lengths of outer branches indicate degrees of difference from their common ancestor. This results in a diagram that progressively shows increasing differences between ends of the branches, as shown in Fig. 1.

Using genetic analysis, the modern scientific goal is to assemble “monophyletic” groups of organisms called “clades” that have evolved from a common ancestor and that include all its living descendents. For instance, all reptiles have a common ancestor. But in recent years it has been established that birds are descended from reptiles. So reptiles can only be called a monophyletic clade if birds are included.

This change in approach is exemplified by several genetic analyses of vireyas that have begun to illuminate the genetic relationships between vireya species. These results have required a reconsideration of how vireya species are organized in subsections and sections. In addition, teasing out genetic relationships has also allowed new insights in how vireyas traveled from the Asian Mainland throughout the Malesian region (Malay Peninsula east through New Guinea), Philippines and further.

In an important paper with new and fascinating results, major speciation was shown to accompany the dispersal of vireya rhododendrons (Goetsch et al. 2011). There were three goals in their study: determining the monophyletic groups that comprise vireyas, correlating monophyletic groups and the geographical distribution of vireya species, and finally, comparing determinations of phylogenetic relationships of vireyas with previous morphological-based taxonomic classifications.

To accomplish this, they performed complex and detailed genetic analyses of three nuclear genes as they occur in 113 vireya species. Species were obtained from the Rhododendron Species Foundation and Botanical Garden, WA; Craven's collection in Australia; and contributions from the Royal Botanic Garden, Edinburgh, and from two New Zealand collectors, David Binney and Richard Currie.

The details of their molecular analysis in the laboratory are numerous and beyond the scope of this article. Briefly, DNA was extracted from young growth of the various species and then cleaned and purified. Specific regions of the DNA of each species were then "amplified" from the tiny amounts available from the cells in order to provide sufficient material for analysis. Special marker chemicals, "DNA primers," are able to bracket relatively active (more variable) regions of DNA, and an enzyme, DNA polymerase, is directed by the markers to amplify regions between the markers. Using automated machines, this amplified material is then sequenced to determine the order of the base pairs in these particular regions. Then the corresponding regions from various species are visually "aligned" on a desktop computer to show the base differences between the species. Then, from these alignments, a computer program constructs a branching phylogenetic tree that reflects the relative similarity or differences in sequence between the various species. As noted earlier, relatively fewer differences between two species place them closer together on the tree and greater differences place them further away on the branches. Very similar sequences are grouped together into clades. In the majority of relationships in the study, very high levels of statistical confidence in the inherited sequences were found and in many cases, almost complete certainty.

One of their exciting results is that a monophyletic clade has been discovered for all vireya species (except one, *R. santapauii*; see Fig. 1). This means perhaps only one common ancestor existed for nearly all the vireya species tested! Further, their results indicate that much of the organization of vireyas suggested by Drs. Sleumer (1966) and Argent (2006) needs to be revised into much broader groups of subsections and sections because much closer genetic relations were discovered between many species. Within vireyas, three of the seven distinct clades they discovered correspond to the existing *Pseudovireya*, *Discovireya* and *Malayovireya* subsections of the earlier classifications. But subsections *Albovireya*, *Phaeovireya* and *Euvireya* from these existing classifications were determined to be polyphyletic (mixed into several distinct clades). Since the classification of species must rest on discrete evolutionary relationships, the two former subsections of *Albovireya* and *Phaeovireya* could not thus be supported as separate entities. Four

of the clades found were therefore folded into the remaining *Euvireya* subsection. Finally, their research showed that vireyas (which for technical purposes is now named section *Schistanthe* (Craven et al. 2011) are genetically subsumed within the subgenus *Rhododendron* (within the species *Rhododendron*) and that Argent's (2006) elevation of *Vireya* to subgenus level was not supported by their genetic analysis.

In a subsequent article (Part II), I will summarise other fascinating findings of the Goetsch et al. (2011) study, including significant genetic support for the eastward geographic dispersal of vireyas from mainland Asia all the way to Papua New Guinea and Australia.

References

- Argent, G. 2006. *Rhododendrons of subgenus Vireya*. London: Royal Horticultural Society: 382 pp.
- Craven, L.A., Goetsch, L.A., Hall, B.D. & Brown, G.K. 2008. Classification of the *Vireya* group of *Rhododendron* (Ericaceae). *Blumea* 53:435-442.
- Goetsch, L.A., Craven, L.A. and Hall, B.D. 2011. Major speciation accompanied the dispersal of *Vireya* *Rhododendrons* (Ericaceae, *Rhododendron* sect. *Schistanthe*) through the Malayan archipelago: Evidence from nuclear gene sequences. *Taxon* 60 (4): 1015–1028.
- Sleumer, H. 1966. *Rhododendron*. Pp. 474–668. In: Sleumer, H., *Flora Malesiana, Ser. 1, Seed plants*. Vol. 6(4). Groningen: Noordhoff.
- Pete Adams is a member of the Hawaii Chapter.*

LED Lights

Dave Godfrey
Courtenay,
British Columbia



(From the May 2012 Rhodoteller, the North Island Chapter Newsletter)

Recently, a friend sent me a tip for emergency lights during a power outage. If you have solar lights around your garden, during a power outage bring a few indoors to light the rooms. Our member Chris Aldred tried this experiment. She brought in a solar light at 8:30 p.m. after a relatively cloudy day and placed it in a vase in her darkened kitchen. It lit up the room all night and was still working fine at 7:30 a.m. the next morning. Although the early versions of solar lights did not have much longevity, the newer lights, with LED technology and improved battery life, work much longer. Give them a try sometime!

Planning a Rhododendron Bed

Bill Heller
Enumclaw,
Washington



(Modified from the May 2012 Rhododendronland, the newsletter of the Seattle Rhododendron Society.)

This year I'm going to try to keep a better record of what blooms and when it blooms. First to know what I have blooming and second to know what plants to put together for the best Landscape Display. Most of my rhododendrons are not in their permanent location, so I need to know which rhodies go together color wise, shape wise and blooming time wise.

In planning a rhododendron bed, you want to put things together that do not clash in color. Most rhododendrons go together pretty well, but there are some color combinations that just don't look right. So knowing what color, what size and when they bloom will help you plan your rhododendron beds better.

Also, when you're planning a rhododendron bed, you don't want all of your rhododendrons to bloom at the exact same time, for then your rhododendron bed will be green, bloom for a couple weeks and then just be green for the rest of the year. You want to plan your beds so that while some rhodies will bloom at the same time to give a nice display, others will bloom a little bit later so that your display will last longer and look beautiful for an extended length of time. Once you have planned for color and bloom timing, you can start looking at leaf texture, but I'll leave that discussion for another issue!

Bill Heller is a member of the Seattle Chapter.

ARS Chapter Bronze Medal Awards

CALIFORNIA CHAPTER

Bronze Medal: Primo Facchini

You have always been a most enthusiastic member of our Society. You have served on our Board of Directors for about 20 years, and your guidance has been invaluable. You have served as our Show Chairman since 2004. For many years you have been the first to arrive at our Members' Meetings and the last to leave—you have very quietly made sure that our programs take place "without a hitch."

California Chapter is pleased to honor you with its highest award. June 16, 2012

Bronze Medal: Don Selcer

You have been generous with your plants, time, and knowledge. For many years you have been a mainstay in our shows. You have served on our Board of Directors multiple terms. You have given programs at our Members' Meetings and shared the experience of your plant hunting expeditions. Your garden is beautiful and unique, and thank you for sharing it with us and those who attended the 2007 American Rhododendron Society Annual Convention.

California Chapter is pleased to honor you with its highest award. June 16, 2012

MOUNT ARROWSMITH CHAPTER

Bronze Medal: Marilyn Dawson

In recognition of her long and dedicated service, Mount Arrowsmith Rhododendron Society is pleased to present the Bronze Medal to Marilyn Dawson. For many years Marilyn has been a dedicated secretary and director and has organized all publicity for MARS. She has been a driving force behind MARS' participation in Seedy Saturday and the Spring Fling plant sale. She has been on the Garden Tour committee, the Truss Show committee and the Christmas Party committee. She has hosted many potluck celebrations and directors' meetings and has had her garden on the club tour. The awarding of this Bronze Medal is our way of saying thank you for her service, dedication and enthusiasm for MARS.

NORTH ISLAND CHAPTER

Bronze Medal: Christine Aldred

It was with great pleasure that President Diana Scott presented the American Rhododendron Society Bronze Medal to Christine Aldred on June 16th, 2012. The ARS Bronze Medal is awarded for outstanding contributions to a Chapter and is the highest commendation awarded by a local Chapter in the Society. Christine has served on the Executive since 2006 first as Publicity Chair and then heading up our Revenue Table. Christine has been part of the Garden Tour Fundraising Committee, taken a lead role in making our Christmas Socials a success, coordinated our community charity program, been a regular at our work parties, and has been available whenever needed. We congratulate Christine on being awarded the ARS Bronze Medal by the North Island Rhododendron Society.

The Bronze Medal was presented as part of a framed certificate stating: "North Island Rhododendron Society recognizes Christine Aldred for the ARS Bronze Award for her many years of service and continued dedication to the Society."

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Bronze Medal: Brian Staton

It was with great pleasure that President Diana Scott presented the American Rhododendron Society Bronze Medal to Brian Staton on June 16, 2012. The Bronze Medal is awarded for outstanding contributions to a Chapter and is the highest commendation awarded by a local Chapter in the Society. Brian has served on the Executive as Membership Chair since 2006, coordinated a number of bus tours for both the Executive and Members, planned several Garden Tour fundraisers, been a vendor at our Rhodo Sale, a regular at our work parties, and has been available whenever needed. We congratulate Brian on being awarded the ARS Bronze Medal by the North Island Rhododendron Society.

The Bronze Medal was presented as part of a framed certificate stating: "North Island Rhododendron Society recognizes Brian Staton for the ARS Bronze Award for his many years of service and continued dedication to the Society."

In Memoriam

Galen Baxter

The Eugene Chapter has lost one of its oldest members, Galen Baxter, June 12, 1925–June 15, 2012, a pioneer of Northwest rhododendron lore. His quiet manner, sense of humor, and affection for rhododendrons brought him many friends. In later years his infallible memory for rhododendrons was invaluable in the restoration of the O. Howard Hinsdale Garden.

Galen worked five days a week for 34 years at the Long-Bell Mill, which was sold to International Paper not long after Galen was hired. O. Howard Hinsdale owned Umpqua Navigation Company and was deeply involved in banking and associated Oregon businesses. In the 1950s, Hinsdale began developing an eight-acre (3.2 ha) English style woodland garden on Spruce Reach Island between Hwy 38 and the Umpqua River near Reedsport. Premium plants were sourced worldwide with great planning. In 1952, Galen began working weekends at the garden, soaking up rhododendron knowledge from Hinsdale. In 2005, because of both his planting experience at Spruce Reach and his plant identification skills, he was invaluable in the ongoing restoration of the garden.

Galen and wife Helen owned a small nursery, with seeds ordered from England. His interest in new hybrids was life long. Even in his 80s, his polite requests for cuttings were irresistible, and his grafting skills induced quick plant bloomings. Joining the ARS as "at-large members," Galen and Helen later became founding members of the Siuslaw Chapter, dedicating themselves to the success of this then fledgling chapter by serving as various officers multiple times, and they were always very involved in the truss shows. Galen was recipient of a Bronze Medal in 1984.

In the 1990s, they traveled extensively in South America, Mexico, China, Spain, and the United States. In 1997 they joined Steve Hootman's trek to Sikkim. As Galen's health began to fail, they moved to Eugene where they were actively involved as associate members of the Eugene Chapter.

Galen was laid to rest with military honors in the Veteran's Cemetery in Roseburg, Oregon. A memorial service attended by many of his rhododendron friends was held July 15 in Eugene.

Note: Further information on the history of the Hinsdale Spruce Reach Garden may be found in three articles by John Hammond and Gordon Wylie in *JARS* 61 (4) Fall 2007, 62 (1) Winter 2008, and 62 (2) Spring 2008.

View Online ARS Journal

The ARS Board of Directors has authorized the Fall 2012, and subsequent editions of the *Journal American Rhododendron Society*, to be made available in electronic format. ARS members who wish to do so may conveniently view the Fall 2012 issue of the *Journal* via the world wide web. Instructions on how to access the digital edition of the *Journal* are provided below.

A personal log in name and password will be needed to view the online edition of the *Journal*. Members who have not previously obtained a personal login will need to complete a one-time registration at the Office of the ARS website. If you have registered for online access to the ARS membership roster, the same login name and password should be used to view the online *Journal*. For those registering for the first time the steps required are:

1. Open your Internet browser and go to web page: <http://www.arsoffice.org/protect/login.asp>
2. Click on the "Register Now" button.
3. Fill in the required fields in the registration form. Enter your name, a working email address, create a username (minimum of four characters) and password (case-sensitive and a minimum of four characters), and enter your ARS member number and ARS chapter. Your member number can be found printed on the paper wrapper of the *Journal* mailing label for volume 64, number 1, and later issues.
4. Type in the four characters requested in the colored human verification box. This security check prevents bogus registration forms being submitted by spammers.
5. Read and accept the "terms and conditions of use" by checking the box provided.
6. Click the "Register" button.
7. Next you will receive an email message with the subject "American Rhododendron Society On-Line Registration." Open the message and click on the link in the message body. You must complete the email confirmation step in order to verify your registration. **Note:** some email providers may mistakenly place the message in a spam folder so one may need to look for it in this folder if it is not quickly delivered into your normal "in-box".

The electronic edition of the Fall 2012 *Journal* will be available for viewing after November 1, 2012. To view the online *Journal* open your Internet browser and navigate to web page <http://www.arsoffice.org/jars/toc.asp> or click on the "View Online Journal" link on the home page of the Office of the ARS web site. When the Login/Register prompt is displayed, click the "Login" button. Enter your "personal" username and password and click on the "Login" button. **Please note:** login usernames and passwords used by ARS chapters to view chapter reports are different and cannot be used to access the online *Journal*.

The web page that now appears will have links to enable reading the online *Journal*. Links are provided to view the entire *Journal* issue at medium quality resolution, and if desired, to view each of the major articles in the issue at high quality resolution of the photos. Articles with photos are best viewed at high resolution if you want to see close-up detail. All articles are in PDF format and you will need Adobe Acrobat Reader to view them. If you don't already have Adobe Acrobat Reader installed on your computer or digital appliance, you can download a free copy of the software from Adobe's web site. You can save the *Journal* pdfs on your own computer for later viewing at your convenience.

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ARS Chapter Newsletter Contest Rules

The purpose of the Chapter Newsletter Contest is to foster quality newsletters for the purpose of providing information to the chapter membership. Certain types of information have been identified as desirable for inclusion in a chapter newsletter.

Newsletter editors, you are invited to enter a current (2012) newsletter in the competition. Send your entry via e-mail in a .pdf file format to: samnjerryrock@frontier.com no later than December 31, 2012. Your entry will be judged by a select committee using the following criteria:

Meeting information

- Date, time, location
- Program description
- Photos of speaker, topic, etc.

Technical information

- Monthly horticulture (what to do that month with regard to storm damage, fertilizer, pruning, planting, etc.)
- Special programs or workshops (e.g. cuttings, grafting, DNA, etc.)
- Truss or plant spotlighting

Membership and chapter specifics

- Biography or recognition of members
- Chapter issues to consider
- Calendar of events
- Chapter officer contact information

ARS promotion

- Articles and information regarding conventions and conferences

Overall appearance and timeliness of the newsletter

What do you win? You will earn bragging rights and recognition by your peers, but perhaps most importantly, you will help to establish guidance for other chapter newsletter editors. We also welcome suggestions from editors as to how they obtain their technical content material (e.g., other newsletters, specific websites, magazines, contacts, etc.), as this seems to be a topic that many chapter newsletters lack in. Many newsletter editors are newcomers who will benefit from seeing what can be produced, and by sharing experiences, the whole society can benefit.

Questions? E-mail Shirley Rock at samnjerryrock@frontier.com

Rhododendron Calendar

- 2013** ARS Annual Convention, Olympia, WA/Tacoma, WA area. May 1–5. Board meeting.
- 2013** ARS Western Regional Conference, Newport, OR. Sept. 27–29.
- 2013** ARS Eastern Regional Conference, RSC Atlantic Region. Oct 4-6, Dartmouth, NS Canada. Board meeting.
- 2014** ARS Annual Convention, Cleveland, OH, May 16–18. Board Meeting.
- 2014** ARS Western Regional Conference, District 2, Everett, WA. Oct 3–5
- 2015** ARS 70th anniversary, open

ARS Endowment Grant Update

I was recently asked why the Society is giving endowment grants when it's experiencing a difficult time balancing its budget. The timing of this question caught me off guard and I did not have what I felt was an adequate answer at the time. Since being asked this question I have ruminated over the Society's continuation of this program.

The purpose of the Society is the encouragement of the culture of rhododendrons, including azaleas and vireyas, and the increase in understanding of and interests in all aspects of these plants. Ken McDonald of the Mid-Atlantic Chapter gives a bit more perspective towards funding these types of projects. To paraphrase he states: "To meet the primary purpose of our Society, we should seek out and embrace projects which not only need our money, but to which we can also devote our personal time, enthusiasm, talents and skills. These projects should advance our stated mission and basis for existence and should become a driving force for our Society." He captures the essence of what the Society is doing in supporting projects that will promote and enhance rhododendrons and azaleas for the benefit of the general public.

The grant program was established to support this objective and will continue—unless circumstances become so acute as to require its suspension.

In the fall of 2011, Bob Weissman, Chair of the ARS Digital Publications Committee, requested a grant from the endowment fund of \$2,100, to meet the cost of scanning volumes 36 through 54 (years 1982 to 2000) of ARS Journals. Volumes 1 to 35 had been done by Herb Spady and are available at the Virginia Tech Digital Library and Archive (<http://scholar.lib.vt.edu/journals/JARS/>) as will be these additional volumes. Appreciating Herb's and Bob's accomplishments thus far, the Board granted this fund request for additional scanning. What is significant is that this was the first request made by a committee internal to the ARS for the use of endowment funds.

Although the Endowment Fund Committee had received requests for \$26,717, at this year's annual meeting in Asheville, North Carolina, the Board awarded five endowment grants for a total of \$10,000. This is the ninth year that the Society has been able to distribute funds to worthy recipients. What was particularly interesting this year was the diversity of applicants, both in size and geographic location.

The 2012 recipients are:

•Norfolk Botanical Garden/Middle Atlantic Chapter

The Norfolk Botanical Garden (NBG) intends to expand its azalea collection by adding more native plants and more plants developed by Dr. Sandra McDonald in addition to approximately 150 varieties of Glenn Dale hybrids. These exhibits will include a new water feature to showcase the two collections. The application was for plant signage, acquiring potting mix and pots and 240 intern hours for planting and label-making. The board awarded \$2,000 to the NBG for educational and interpretive signage.

•Portland Parks and Recreation

The City of Portland Parks and Recreation Division is developing the Cloud Forest Rhododendron Garden in Washington Park and seeks funds to procure additional rhododendron species, specifically Sino-Himalayan species and companion perennials. The garden is in close proximity to several other attractive garden locations such as the Portland Japanese Garden, International Rose Test Garden and Portland Zoo. This activity is spearheaded by Bill Zanze (of the Portland Chapter) and Stefan Bump. Portland Parks and Division was granted \$2,000 towards establishing the Cloud Forest Rhododendron Garden.

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•Georgia Mountain Fair

The Georgia Mountain Fair is a nonprofit organization that is a project of the Towns County Lions Club. In 1982 Fred Hamilton donated his extensive rhododendron collection to the Georgia Mountain Fair initiating the Hamilton Gardens. The garden contains over 400 varieties of rhododendron and various native azaleas and other native mountain plants. Due to lack of funds the gardens have not operated at its full potential. The Georgia Mountain Fair was provided a \$1,750 ARS grant to assist in restoring the gardens to a functional state that will have both recreational and educational value.

•The Holden Arboretum

The Holden Arboretum has embarked upon a capital campaign—the “New Leaf” Campaign and a major element of this effort is the creation of its new Rhododendron Exploration Garden. This garden of 4.5 acres will consist of the renowned Helen S. Layer Rhododendron Display Garden. A target goal of \$7.85 million was set for Phase One, with \$5.32 million already reached; the board provided a grant of \$2,750 to support this landmark education project.

•The Bayard Cutting Arboretum

The 691 acre Bayard Cutting Arboretum was the former home of William Bayard Cutting. The arboretum was begun in 1887 utilizing plans of Frederick Law Olmstead and aided by Charles Sprague Sergeant, then director of the Arnold Arboretum. The arboretum, operated by the N. Y. State Office of Parks, Recreation and Historic Preservation is undergoing a major push to improve all areas of the garden. This Parks office enlisted the help of ARS members Bud Gehnrich, George Woodard and Bruce Feller to improve the Royce Rhododendron Garden established in 1986. Doris Royce was a rhododendron hybridizer and ARS member. The Parks Department was provided \$1,500 toward the purchase of rhododendron plants and labeling and interpretive signing.

2013 Grant Program Guidelines

The Society grant program supports its mission providing grants utilizing funds from its endowment. Activities to be supported may include the development of programs, projects or publications that educate the general public in the growing and culture of rhododendrons. Amount of grants will generally not exceed \$3,000.

Proposals are accepted up to the deadline of February 15, 2013, and must be submitted to the Endowment Fund Committee at the address below. The applicant must notify the appropriate District Director of the application and request a “letter of assessment” to accompany the application. The appropriate District Director is the one whose geographic responsibility includes the location where grant will be utilized. The application and letter of assessment will be reviewed by the Endowment Fund Committee. The Society’s Board will act on the committee recommendations at its spring meeting. A successful applicant will be supplied a “Condition of Acceptance” letter and upon its completion and return to the Society, funds will be sent to the applicant. An unsuccessful applicant will also be notified after the Board meeting.

Proposals should request funding for a single calendar year or less and only one proposal per applicant will be considered. A complete proposal must include:

- 1) Background and history of the applicant group and the role it provides in the encouragement and understanding of rhododendrons and azaleas. Newsletters and other publications that describe the applicant are welcome. If the applicant has a website, please provide the name of the website.

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- 2) Description of the project and its objective.
- 3) Statement of how the project fits the interest of the American Rhododendron Society. How does it educate? How many people will be affected?
- 4) Budget for the project, a timetable for its completion, and a statement of whether partial funding would or would not be useful. Approximately, what percent of the organization/agency budget is the project budget?
- 5) Listing of the group's current sources of support and income. If the organization/agency files any IRS Form 990, please provide copies of those tax returns for the last two years.
- 6) List of all sources, from which funds are currently being sought for the proposed project, including any support already confirmed.
- 7) Letter of assessment from the appropriate District Director.

The application should be sent in an envelope that is no larger than 9" x 12" (23x30 cm). Applications sent by a method that requires signature for delivery, by fax, or by e-mail will not be considered. Generally, only a single copy of the application is required; however, if printed materials or digital photo files are submitted, please provide seven copies. No changes in the budget or nature of the application will be accepted after submission without prior approval from a co-chair of the Endowment Fund Committee. Questions regarding the grant program may be directed to either co-chair of the Endowment Fund Committee, Bill Mangels or Jeff Cheyne.

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Volume 66, 2012

The names of species and hybrid rhododendrons and azaleas occurring within the text of articles are not listed in the index. Reference to plants with colour images is made for the following entries: (AZALEA HYBRIDS, AZALEA SPECIES, RHODODENDRON HYBRIDS, RHODODENDRON SPECIES, VIREYA HYBRIDS, VIREYA SPECIES).

2011: An Unusual Weather Year in Georgia.
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The Biltmore Estate's Rhododendron Legacy

Charles Andrews
Cumming, Georgia



I have a book you plant lovers ought to read.

When George Washington Vanderbilt, youngest son of William Henry Vanderbilt and grandson of Cornelius Vanderbilt, embarked on his grand vision for a “mountain escape” in North Carolina in 1888, he did not just build a 135,000 square-foot (12,542 m²) chateau with 250 rooms. He developed acres of gardens and parkland. At its peak, the estate included 125,000 acres (50,586 ha), most of which became Pisgah National Forest. Vanderbilt hired the renowned Frederick Law Olmstead, who established the field of landscape architecture, to design the grounds.

When Vanderbilt purchased hundreds of parcels from eager farmers and absentee landowners, much of the land was worn out farmland and previously timbered forests where roaming cattle and hogs prevented natural rejuvenation. Olmstead’s plans called for formal gardens, informal gardens, a nursery, a world-class arboretum, a herbarium, managed forests, and roads through the estate giving the “sensation of passing through the remote depths of a natural forest.” The Vanderbilt vision included making the estate self-sustaining. His dairy, farms, market garden, nursery, forestry school, and managed forests were all part of that vision.

Chauncey Delos Beadle, a Canadian trained in botany and horticulture, was hired in 1890 as an assistant to help manage the operations of the Biltmore Nursery. He became nursery superintendent and eventually estate manager, remaining at Biltmore until his death in 1950. Beadle had a large role in the plantings of Biltmore Estate as well as the management of the nursery. The scope of these enterprises overwhelms those of us who contemplate landscaping our own yards. By 1893, just four years into Vanderbilt’s grand project, Beadle noted he had received 209,925 plants, propagated 2,935,615, collected locally 366,527, and had already planted 2,870,628 on the estate.

Development of the nursery and the grounds of the estate would continue strongly for the next twenty years and more. The 1912 nursery catalog states the nursery had almost 300 acres (121.4 ha) under cultivation in trees and shrubs, 75,000 square feet (6968 m²) of greenhouses and cold frames, and over 3 acres (1.2 ha) of seed beds. Their catalog with price list comprised 189 pages and offered thousands of plants, both native

and non-native, including much of the rich flora of the southeastern United States. Biltmore Nursery may have been the largest nursery of its kind in the world at the time.

A look at the rhododendrons offered in this catalog shows what was available at the time and the state of naming conventions. Large leaf rhododendrons were listed in a section entitled “Rhododendron: The Rosebay and Laurels.” The description reads:

“These, the showiest of all ornamentals, are justly popular hardy evergreen shrubs. They are very effective as single specimens on the lawn, or in groups or masses in front of coniferous or other evergreens. Their handsome foliage and showy flowers make possible some of the most enchanting results, and add a zest and interest that cannot be obtained by any other plants. They thrive in porous, fertile soils, preferring a northern exposure with partial shade. When in the open, it is advisable to shelter the plantations against drying winds and hot sun by a belt of tall coniferous evergreens. After planting, the surface of the ground should be liberally covered with forest leaves or pine needles to protect the roots from sudden changes of temperature. The dwarf varieties are more effective if planted by themselves, as their smaller leaves and flowers do not harmonize with those of larger species. The Great Laurel is the largest and hardiest, while the Catawba Rhododendron and its numerous garden forms ranks second.”

Species as listed in the catalog were:

Rhododendron arbutifolium (*R. wilsonianum*) Dwarf Rhododendron

R. catawbiense Catawba Rhododendron

R. maximum Rose Bay

R. myrtifolium Myrtle-leaved Rhododendron

R. punctatum Small or Early-flowering Rhododendron

R. 'arbutifolium', as it is now known, then also known as Wilson's Rhododendron (there is actually another species that now has the name *R. wilsonianum*), is a hybrid between the European alpine rose, *R. ferrugineum*, and *R. minus* var. *minus* (previously known as *R. punctatum*). *Punctatum* is still sometimes used as a common name for this relatively small-leaved rhododendron. *R. myrtifolium* is a European lepidote, usually under 3 feet (0.9 m) in height. *R. catawbiense*, *maximum*, and *minus* are all American species.

Twenty-three Catawba hybrid rhodo-dendrons were listed:

'A. Lincoln'

'Album Elegans'

'Album Grandiflorum'

'Anna Parsons'

'Atrosanguineum'

'Betsy Parsons'
 'Caractacus'
 'Catabiense album'
 'Charles Bagley'
 'Charles Dickens'
 'Delicatissimum'
 'Everestianum'
 'General Grant'
 'Giganteum'
 'H. H. Hunnewell'
 'Lady Armstrong'
 'Lee's Purple'
 'Parsons' gloriosum'
 'Parsons' grandiflorum'
 'President Lincoln'
 'Purpureum elegans'
 'Roseum elegans'
 'Roseum superbum'

Descriptions and some black and white pictures are given in the catalog. For example, "Caractacus. Rich purplish crimson; grand truss."

Evergreen azaleas are called Indian Azaleas in the catalog and were included in the genus *Azalea*:

"Free-flowering evergreen shrubs, thriving in woods earth or other fibrous rich soils. They require for their best development partial shade and ample moisture. The varieties of *Azalea indica* are hardy in the Southern and Pacific States. *Azalea amoena* is hardy as far north as Missouri and New York."

The catalog lists nine *A. indica* varieties:

'Apollo'
 'Bernard Andre'
 'Comtesse de Beaufort'
 'Deutche Perle'
 'Dr. Moore'
 'Le Flambeau'
 'Mme. Van der Cruyssen'
 'Theo. Reimers'
 'Vervaeneana'

A. amoena was also then a synonym for *R. obtusum*, the Kurume azalea, and today this plant is thought to be a hybrid of several Japanese species (= Obtusum Group).

Today there is a specific Kurume cultivar called *R. kiusianum* 'Amoenum.' *Azalea indica*, now called *R. indicum*, is a parent of the Satsuki azaleas and what is now known as the Southern Indica Hybrids. 'George Lindley Taber' and its white sport 'Mrs G. G. Gerbing' are two of the better-known modern cultivars.

Deciduous azaleas are also classified in the catalog in the genus *Azalea*, with the following description:

"These beautiful shrubs are among the showiest of ornamentals and should have a prominent place in every garden. They thrive in moist, well-drained soils, preferring those containing leaf mold or woods earth, either in full sun or partial shade. A liberal mulch of forest leaves held in place by a light sprinkling of earth is advantageous, and while ordinarily quite hardy, a protection from cold piercing winds in bleak situations should be provided."

Six species are listed, along with Ghent hybrids:

A. arborescens Fragrant Azalea

A. gandavensis Ghent Azalea

A. lutea (*A. calendulacea*) Flamed-colored Azalea

A. mollis Japanese Azalea

A. nudiflora Pinkster Flower

A. vaseyi (*Rhododendron vaseyi*) Carolina Azalea

A. viscosa Small White Azalea

A. arborescens is now *R. arborescens*, *A. gandavensis* is now *R. × gandavense* (*R. luteum* × Mortieri Group); *A. lutea* is *R. calendulaceum*; *A. mollis* is *R. molle* ssp. *japonicum*; *A. nudiflora*, later called *R. nudiflorum*, is *R. perichlymenoides*; *A. vaseyi* is *R. vaseyi*; and *A. viscosa* is *R. viscosum*. Interestingly, one common but attractive, fragrant, deciduous native is not included in the catalog, the Piedmont azalea, *R. canescens*. Perhaps it was considered at that time just a southern form of *A. nudiflora*.

The Ghent azalea and the latinized *A. gandavensis* (*R. × gandavense*) are terms used for the deciduous hybrids developed in Ghent, Belgium, starting in the 1820s. Ghent hybridizers used the American *R. calendulaceum*, *R. perichlymenoides*, and *R. viscosum*, along with the eastern European Pontic azalea (*R. flavum*, now called *R. luteum*) and the Chinese *R. molle* ssp. *molle*. The Ghent hybrids listed were:

'Arthusa'

'Daviesi'

'Geant des Batailles'

'Guelder Roos'

'Louis A. Van Houtte'

'Mina Van Houtte'

Mollis hybrids from Belgium and the Netherlands involved crosses between the

Japanese *R. japonicum* (now called *R. molle* ssp. *japonicum*) and the Chinese *R. molle* ssp. *molle* (once called *R. sinense*) with perhaps some American *R. viscosum* thrown in. Mollis hybrids offered by Biltmore in 1912 were:

‘Anthony Koster’
‘Byron’
‘Charles Rogier’
‘Frederic de Merode’
‘Murillo’
‘Virgille’

Our native flame azalea (*R. calendulaceum*) is listed as *Azalea lutea*, a name now associated with the European Pontic azalea. It is identified as:

“One of the most gorgeous of flowering shrubs, producing in late spring profuse clusters of large flowers, ranging from flame color through shades of red and yellow. Grows naturally from New York and Pennsylvania to Georgia. A most valuable plant, remaining in bloom for several weeks. Usually grows from 6 to 8 feet tall in cultivation.”

For *A. viscosa*, the description reads:

“Usually a small shrub 2 to 4 feet tall, blossoming profusely at an early age. Grows naturally from Maine and Ohio to Florida. Flowers white, fragrant, is the last to bloom.”

R. canadensis is listed in the catalog under the genus *Rhodora*.

The nursery also offered much more than rhododendrons. The catalog has 13 pages of conifers and 23 pages of deciduous trees. Broad leaved evergreens include *Ilex*, *Magnolia*, *Camellia*, *Daphne*, *Kalmia*, *Osmanthus* and *Viburnum*. *Clethra*, *Deutzia*, *Forsythia*, *Fothergilla*, *Hydrangea*, *Hypericum*, *Rosa*, and many other deciduous shrubs are well represented. Biltmore offered *Clethra acuminata*, the mountain pepper bush, which I had some difficulty finding today. The catalog also includes vines, ferns, aquatic plants, ornamental grasses, and herbaceous perennials.

As to prices, a few examples are in order: *R. maximum*, 2 to 2 ½ ft. (0.6-0.76 m), were \$1.50 each or \$120 per 100. *A. vaseyi*, 15 to 18 in. (0.38-0.46 m), were \$1.00 each or \$80 per 100.

Two significant events brought the close of this mammoth nursery enterprise. In 1914, George Vanderbilt died, and his strong leadership was lost. Then only two years later, on July 16, 1916, a devastating flood on the French Broad River and its tributaries put the nursery, including its offices, greenhouses, and boiler plant, under seven feet (2.1 m) or more of water. Flood stage on the French Broad is four feet (1.2 m), but when the swollen river washed away Smith Bridge with the flood gauge still attached to it, the reading was 18.6 feet (5.7 m). Almost all the nursery stock was lost, and the

nursery ceased operation.

The *vaseyi* azalea had been discovered by George Vasey in 1878 and was described by Asa Gray in 1879. In 1903, Dr. John K. Small of Columbia University separated the distinct *vaseyi* into a new genus named *Biltia* and called this unique native species found growing in the Pisgah Forest portion of the Biltmore Estate *Biltia vaseyi*. Today, the species has been regrouped with all deciduous azaleas in the genus *Rhododendron* and is named *R. vaseyi*.

Chauncey Beadle was a devoted collector of native azalea his entire life. But beginning about 1930 when he was 62, Beadle, along with Sylvester Owens, William A. Knight, and Frank W. Crayton, who named themselves “the Azalea Hunters,” combed the eastern United States as far west as Texas collecting superior forms of native azaleas and other native plants. The Azalea Hunters drove thousands of miles each spring, looking for early- and late-blooming plants, color variety, tall or dwarf habit, and other interesting characteristics. In 1940, Beadle donated his “children,” his personal collection of native azaleas, to the Estate, which became the Estate’s Azalea Garden. Continuing until the end of his life, Beadle established the largest collection of native azaleas ever assembled at one place. An article by Alexander (1984) tells of “The Azalea Hunters of Biltmore.”

John C. Wister (1955) said there were then over 45,000 plants (more than just native azaleas) in the garden. In another issue, Dr. Frank Mossman (1980) said Beadle’s favorite was *R. calendulaceum*. Mossman goes on to describe Beadle’s planting method: “the beds were excavated to a depth of 18 inches [45 cm], then filled with a mixture of equal parts topsoil, sand and peat, finally mulching the plants with three inches [eight cm] of pulverized oak leaves yearly.”

Oh, yes, the book I mentioned. Much of the above information comes from the interesting and well-written book by Bill Alexander (2007) which includes the complete 1912 Biltmore Nursery catalog, and from the Biltmore Estate web site, www.Biltmore.com and related links. The Biltmore Estate grounds and house are open to the public for a fee. The book is worth a read, and the Estate is definitely worth a visit.

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Charles Andrews is a lover of plants, especially native American azaleas. He is fortunate to live in the epicenter of these natives at the southern end of the Appalachian Mountains. With the exception of R. canadense, R. prinophyllum, and R. occidentale, all American native species grow well in his north Georgia area. He is a member of the Azalea Chapter.

The Word: Plastid

Bruce Palmer
Cutten, California



Our rhododendrons are busy in the autumn season, trapping the diminishing hours of the sun's energy for use next year to produce the leaves, stems and flowers we will enjoy. Because photosynthesis takes place in chloroplasts, an appropriate related word is **Plastid**. Plastid is derived from the Greek *plastien*, to mold, form or shape. Plastic comes from the same root. Plastids are small organelles within plant cells. Plastids are responsible for photosynthesis, storage of products such as starch and for the synthesis of many classes of molecules, including fatty acids needed as cellular building blocks, volatile oils such as turpentine and other categories of molecules. There are several types of plastids, three of which are important for this discussion.

The plastids that make our rhododendron leaves green are called **chloroplasts** (Greek, *chloros*, light green, and *plastos*, shape). We discussed them in some detail in the previous issue of *JARS* (Summer 2012, p. 156). Your high school biology teacher might have kept *Elodea* in an aquarium in the lab for you to observe chloroplasts under the microscope. Chlorophyll (Greek *chloros*, green, and *phyllos*, leaf) molecules in the chloroplasts trap the energy of sunlight to produce chemically energetic molecules used by the plants and, by extension, us. A magnesium atom at the center of the active portion of each chlorophyll molecule is what gives the green coloration to leaves. As the amount of sunlight diminishes, many plants (though not most rhododendrons) abandon photosynthesis and drop their leaves. We call these plants deciduous. Chloroplasts aging during this season are sometimes appropriately referred to as **gerontoplasts**.

Green is not the only color in plants. Many of the colors we enjoy in our rhododendron flowers are contained in **chromoplasts** (Greek, *chromos*, color) in the flower's cells. The classic biology lab exercise uses tomato cells to show red chromoplasts. In flowers and fruits, one function of the chromoplasts appears to be attraction of pollinators and herbivores. In leaves, some of the accessory pigments that aid in photosynthesis are contained in chromoplasts. These pigments are called carotenoids (Latin, *carota*, a carrot, and Greek, *oides*, a form or shape). Xanthophylls (Greek, *xanthos*, yellow, and *phyllos*, leaf) are yellow accessory pigments and carotenes are red, orange and yellow. In the fall chlorophyll breaks down more rapidly than the accessory pigments. Thus when the chlorophyll is gone we see the beautiful fall colors in leaves that are given by the accessory pigments left in chromoplasts and chloroplasts.

Leucoplasts (Greek *leukos*, white) make up a third category of plastids, so called because they are typically colorless. The most common leucoplasts store starch. You might remember from your biology class staining potato slices with iodine to look at leucoplasts under the microscope. Leucoplasts serve a variety of storage and synthesis functions (each one with a unique function has a different name), but storage of starch for future use by the plant is by far the most prevalent.

One of the more interesting features of plastids is their apparent history. Plastids, along with some other organelles in cells, contain their own DNA and multiply independently of the cells they inhabit. For some time it has been thought that they are descended from ancient, primitive bacteria-like cells that invaded their larger cousins early in the history of life on earth and became endosymbionts (Greek *endo*, within, *syn*, together and *bios*, life). As was discussed in the summer article, new bits of evidence from structure and function are coalescing to support the concept that plastids were once primitive photosynthesizing cells that invaded more complex cells about 1.5 billion years ago and formed an alliance beneficial to both, leading to the higher plants we observe and use today.

But back to rhododendrons! It has taken generations of dedicated researchers to determine what is going on in plant cells with their plastids. We can't see plastids without a microscope, but they are hard at work right now, helping plants grow, and we will appreciate their results when spring brings us beautiful rhododendron flowers again.

Bruce Palmer is a member of the Eureka ARS Chapter. He was a teacher of biology at Maui Community College in the University of Hawaii system for 25 years.



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Why do I Use Botanical Names?

Sandi Jensen
Noti, Oregon



(Reprinted from the May 2012
Macrophyllum, the newsletter of the
Siuslaw Chapter)

The question has been asked of me many times, “Why do you use botanical names?” Well, for me, it is the best way of insuring that the same plant they are selling on the east coast as ‘Trout Lily’ is the same plant we know on the west coast as ‘Lambs Tongue’, ‘Fawn Lily’, or ‘Dog Tooth Violet.’ If the nurseries want to sell me something that I can be certain of, they will label the plant by its botanical name, *Erythronium hendersonii*, as well as all the common names they can come up with. i.e., *E. californicum*, Fawn Lily; *E. dens-canis*, Dog-tooth Violet, etc.

In order to separate and identify the many hundreds of plants that are available, it is necessary for them to have names that are easily recognized. Plants have been given “common names” that are based on their appearance, fragrance, leaf shape, plant size, or point of origin. The problem lies in duplication of names, or the regional changes of “common names.” For this reason, all plants have been assigned botanical (or scientific) names made up of the genus and species names, plus the cultivar (cultivated variety) where necessary. In many cases these botanical names also describe the plant’s looks, fragrance, or point of origin. Descriptions include color, such as “alba” —meaning white, “aureus”—golden, “cyaneus”—blue, “lutescens”—yellow, and “niger or nigra”—black. Descriptions include size, as “arborea”—treelike or woody, “procerus”—tall, “nana”—dwarf, and “procumbens”— trailing or prostrate. Also plant names include points of origin. For instance, a plant native to Japan could have the species name of “japonica”; one from China “chinensis” or “formosum,” or from Canada “canadensis.” Some of the descriptions that we are familiar with include the leaf forms “quinquefolia” meaning five-leaved or “linearfolium” (notice the “**line**” in this species name).

There are so many others that are descriptive, but there are also some that are named for the people who discovered them, or the person who discovered them may have named the plant after someone else, such as “fuchsia.” This plant is named for Leonard Fuchs who as near as I can tell, never grew a fuchsia. He was, however, admired by one of the first discoverers, who named the plant for him.

I hope this isn’t too confusing, and if anyone wants to learn more, there are books that can help you understand botanical latin meanings.

Sandi Jensen is a member of the Siuslaw Chapter.

Historic Photograph



Theodore Van Veen, John Henny, and Brian Mulligan inspect rhododendron trusses at the 1948 University of Washington Arboretum Foundation's flower show in Seattle. The photograph ran in the *Seattle Times* May 16, 1948. The caption for the photo: "Washington's state flower went on exhibition yesterday at the University of Washington Arboretum Foundation's third annual rhododendron show in the University Arboretum. The show will continue from 10:30 o'clock this forenoon to 9:30 tonight. Three judges are shown examining white hybrid rhododendrons. Left to right—Theodore Van Veen of Portland, Or., John Henny, president of the American Rhododendron Society, Portland, and Brian Mulligan, director of the Arboretum." Photo courtesy of Kathy Van Veen.

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On Some Poorly Known Hybrids of *Rhododendron herzogii* (Ericaceae) in New Guinea

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(Reprint from the *Australian Rhododendron Journal*, The Rhododendron 51:11-21.)

Abstract

Putative natural hybrids between *Rhododendron herzogii* Warb. and sympatric species are presented based on herbarium specimens and field observations. Four hybrids were until now recognized as species: *R. ×psammogenes* Sleumer (pro sp.) = *R. herzogii* × *R. macgregoriae* F.Muell.; *R. ×oreadum* Wernham (pro sp.) = *R. herzogii* × *R. zoelleri* Warb.; *R. ×kawir* Danet (pro sp.) = *R. gardenia* Schltr. × *R. herzogii*; *R. ×psammogenes* Sleumer var. *inundatum* (Sleumer) Danet, stat. nov. is proposed; this variety appears to have resulted due to back-crossing. *R. ×diversiflorum* Danet, nothosp. nov. is described; putatively this has resulted from hybridization between *R. herzogii* and *R. pachystigma* Sleumer.

Introduction

Rhododendron herzogii Warb. is extremely widespread throughout New Guinea, occurring in all of the major mountain ranges, between 1400-3050 m altitude (van Royen & Kores 1982). This species is a terrestrial or epiphytic shrub in primary forests and an effective colonizer of disturbed habitats where different *Rhododendron* species are found growing in sympatry. Evidence for interspecific hybridization is present in the form of morphological intermediates in sporadic populations in anthropogenic and swampy habitats throughout the Baliem valley. At these sites, *Rhododendron* species have overlapping flowering periods but have flower types associated with different classes of pollinators. Although its flowers are adapted to moth pollination, *R. herzogii* crossed with *R. macgregoriae* F.Muell. and *R. zoelleri* Warb. whose privileged visitors are butterflies or other diurnal insects and with *R. gardenia* Schltr. and *R. pachystigma*



Fig. 1A



Fig. 1B



Fig. 1C



Fig. 1D



Fig. 1E



Fig. 1F

Fig. 1. **A.** *Rhododendron herzogii*, short-flowered ecotype; **B.** *Rhododendron herzogii* (Danet 4715); **C.** *Rhododendron xpsammogenes* (Danet 4641); **D.** *Rhododendron xoreadum* (Danet 4473); **E.** *Rhododendron macgregoriae*; and **F.** *Rhododendron zoelleri* (Danet 4355). Photos F. Danet.

Sleumer which are speculated to be adapted to bat pollination (Stevens 1976, 1985; Cruttwell 1988).

In New Guinea, differences of distribution, altitudinal rank, habitat, blooming period and pollinator provide the main hybridization barriers between *Rhododendron*

species. The latter have developed characteristics requiring a match between the pollinator and the floral morphology, such as bilateral floral symmetry, tubular corolla, and specific floral attractants and rewards. These characteristics limit the number of pollinating species that can manipulate the flower successfully. However, changes in habitat structure, light and temperature, resource availability, and plant community composition are accompanied usually by strong changes in the composition of pollinator faunas. In many instances, anthropogenic disturbance increases the dominance of one or a few pollinator species which deposit proportionally more heterospecific pollen grains (Aizen & Vasquez 2006). Primary pollinators are largely responsible for assortative mating in contact zones, whereas other flower-visiting animals, such as pollen-collecting bees (fig. 3C) or herbivorous beetles (fig. 3B), cause much of the illegitimate pollen flow (Johnson 2006).

Many New Guinean rhododendrons seem interfertile as assessed by the numerous cultivars obtained by horticulturalists, showing the weakness of genetic barriers in sect. *Schistanthe* Schltr. subsect. *Euwireya* H.F.Copel. (*sensu* Craven *et al.* 2011). Any *Euwireya* species is likely to be cross-fertile with almost any other, provided the lengths of their styles are reasonably similar (Rouse & Williams 1989; Williams & Rouse 1988, 1990).

The resultant hybrids of these crossings traditionally have mostly been recognized as species (Sleumer 1966; Argent 2006). In spite of the absence of molecular proof, it is appropriate, by reliance on herbarium specimens and field observations, to recognise the hybrid nature of these taxa. A comparable entity, a new natural hybrid, is described below.

Systematics

Rhododendron *xpsammogenes* Sleumer (= *R. herzogii* Warb. \times *R. macgregoriae* F.Muell.),

Reinwardtia 5: 150 (1960); *Flora Malesiana* ser. I, 6(4): 591 (1966); Argent, *Rhododendrons of subgenus Vireya*. 222 (2006); pro sp.—Typus: Indonesia, Prov. Papua, Balim River, 2100 m, XII.1938, fl., *Brass 11759* (holo-, A15770; iso-, L0007688!).

REMARKS

Several specimens recently collected near the type locality of *R. xpsammogenes* are morphologically intermediate between *R. herzogii* and *R. macgregoriae* and agree in all characters with those of nomenclatural types of *R. xpsammogenes*. They constitute probably first generation hybrids between both parental species. *R. xpsammogenes* (fig. 1C) is actually known only from the Baliem valley, in hybrid swarms (fig. 2A) comprising *R. macgregoriae* (fig. 1E), short-flowered *R. herzogii* (fig. 1A) and back-crosses (fig. 2B). Short-flowered individuals of *R. herzogii* (corolla 4-5 cm long) could be pollination ecotypes adapted to the local pollinator fauna. In the populations of *R.*



Fig. 2A



Fig. 2B



Fig. 2C



Fig. 2D



Fig. 2E



Fig. 2F

Fig. 2. **A.** From left to right, *Rhododendron xpsammogenes* (Danet 4599), *Rhododendron macgregoriae* (Danet 4597), *Rhododendron xpsammogenes* var. *inundatum* (Danet 4596) and *Rhododendron herzogii* (Danet 4598); **B.** *Rhododendron xpsammogenes* var. *inundatum* (Danet 4596); **C.** *Rhododendron xkawir* (Danet 4247); **D.** From left to right, *Rhododendron pachystigma*, *Rhododendron xdiversiflorum* and *Rhododendron herzogii*; **E.** *Rhododendron gardenia* (Danet 4626); and **F.** *Rhododendron xdiversiflorum*. Photos F. Danet.

herzogii with a longer corolla (fig. 1B), up to 9 cm long, a too much disparity with the size of *R. macgregoriae* styles could constitute a hybridization barrier.

ADDITIONAL MATERIAL EXAMINED. — Indonesia, Prov. Papua, Baliem valley: Ukagatu, 1724 m, 19.III.2006, bt., fl., *Danet 4462* (LYJB); Isiula, 1876 m, 22.III.2006, fl., fr., *Danet 4470* (LYJB); Tenogame, 1722 m, 28.III.2007, fl., *Danet 4595* (LYJB); Ilekma, 1680 m, 21.V.2008, fl., *Danet 4599* (LYJB); Napua, 1853 m, 21.V.2008, fl. *Danet 4600* (LYJB); Ugem, 1859 m, 23.II.2009, fl., fr., *Danet 4641* (LYJB); Sinatma, 1655 m, 8.IV.1973, fl., *Raynal 17003* (L).

Rhododendron xpsammogenes Sleumer var. ***inundatum*** (Sleumer) Danet, **stat. nov.** (fig. 2B),

Rhododendron xinundatum Sleumer, *Blumea* 12: 92 (1963), basionym; *Flora Malesiana* ser. I, 6(4): 499 (1966); Argent, *Rhododendrons of subgenus Vireya*: 64 (2006); pro sp.— Typus: Indonesia, Prov. Papua, Balim, Wiligimaan, c. 1650 m, 24.VI.1961, fl., *Versteegh BW 10454* (holo-, L0007517!).

REMARKS

This taxon has been rediscovered recently near its type locality in a mosaic of introgressive hybrids with *R. herzogii*, *R. macgregoriae* and *R. xpsammogenes*. It is morphologically very close to *R. herzogii* (fig. 1A) from which it differs by the presence of hairs on the ovary, a character inherited probably from *R. macgregoriae* (fig. 1E) as a result of back-crossing (fig. 2A).

According to article H. 4.1. of the Vienna Code (McNeill *et al.* 2006), this taxon could be considered as a synonym of *R. xpsammogenes*: “When all the parent taxa can be postulated or are known, a nothotaxon is circumscribed so as to include all individuals (as far as they can be recognized) derived from the crossing of representatives of the stated parent taxa (i.e., not only the F1 but subsequent filial generations and also back-crosses and combinations of these). There can thus be only one correct name corresponding to a particular hybrid formula; this is the earliest legitimate name (see Art. 6.3) in the appropriate rank (Art. H.5), and other names to which the same hybrid formula applies are synonyms of it.” However, variation within *R. xpsammogenes* (see Art. H.4.1. Note 1) may be treated according to Art. H.12.1: “Subordinate taxa within nothospecies may be recognized without an obligation to specify parent taxa at the subordinate rank. In this case non-hybrid infraspecific categories of the appropriate rank are used.”

For practical reasons, so that specimens that are very different morphologically are not gathered under the same name in herbaria and living collections, it is appropriate to propose a new status for this taxon.

ADDITIONAL MATERIAL EXAMINED. — Indonesia, Prov. Papua, Baliem valley, Ilekma, 1680 m, 21.V.2008, fl., jfr., *Danet 4596* (LYJB).

Rhododendron ×*oreadum* Wernham (= *R. herzogii* Warb. × *R. zoelleri* Warb.),

Transactions of the Linnean Society of London ser. II, Bot. 9: 98 (1916); Sleumer, *Reinwardtia* 5: 132 (1960); *Flora Malesiana* ser. I, 6(4): 560 (1966); Argent, *Rhododendrons of subgenus Vireya*: 174 (2006); pro sp.— Typus: Indonesia, Prov. Papua, Utkwa River to Mt Carstensz, Camp VII-VIII, I.1913, fl., *Kloss s.n.*, (holo-, BM000996766, photol.; iso-, L0007657!).

R. ×filamentosum Wernham, *Transactions of the Linnean Society of London* ser. II, Bot. 9: 97 (1916); pro sp.— Typus: Indonesia, Prov. Papua, Utkwa River to Mt Carstensz, Camp VI b, I.1913, fl., *Kloss s.n.*, (holo-, BM000996765, photol.).

REMARKS

R. ×oreadum (fig.1D) was known until now only from its nomenclatural types although Mt. Carstensz, its type locality, was the object of several botanical explorations (Utteridge *et al.* 2006; Frodin 2007). The recent rediscovery of this taxon in sympatry with *R. herzogii* (fig. 1B) and *R. zoelleri* (fig. 1F) between which it is morphologically intermediate allows one to infer its hybrid nature. Its relationship with *R. zoelleri* is particularly evident by the discoloured corolla:



Fig. 3A



Fig. 3B



Fig. 3C

Fig. 3. *Rhododendron pachystigma*: **A.** Scratches on corolla tube, possibly caused by a bat (*Danet 4540*); **B.** Cetonine beetle visiting a flower (*Danet 4697*); and **C.** Bee visiting a flower (*Danet 4540*). Photos F. Danet.



Fig. 4. Habitat of *Rhododendron herzogii*, *Rhododendron macgregoriae* and their hybrids at Ilekma.

whitish outside and deeply coloured inside.

ADDITIONAL MATERIAL EXAMINED. — Indonesia, Prov. Papua: Karubaga, Ukalo, 3°39'S, 138°31'E, 1640 m, 26.III.2006, bt., fl., *Danet 4471* (BO, L, LYJB, MAN, P); Karubaga, Longoboma, 3°39'S, 138°28'E, 1667 m, 27.III.2006, bt., fl., *Danet 4473* (BO, L, LYJB, MAN, P).

Rhododendron ×*kawir* Danet (= *R. gardenia* Schltr. × *R. herzogii* Warb.),

Adansonia, sér. 3, 27(2): 273 (2005); Argent, *Rhododendrons of subgenus Vireya*: 107 (2006); pro sp.— Typus: Indonesia, Prov. Papua, lieu-dit Nambulaga près du village de Dimba, 2280 m, 9.IV.2003, fl., *Danet 4247* (holo-, LYJB000599; iso-, L!, MAN!, P!).

REMARKS

The recent collection of *R. gardenia* (fig. 2E) in the type locality of *R. ×kawir* (fig. 2C) leads to recognition of the hybrid nature of the latter taxon. Characters of *R. ×kawir* are intermediate between those of its putative parents. The termination of the hair covering at the ovary tip (Danet 2005: 274, fig. 3H) is a characteristic shared with *R. gardenia* whereas the scales on the style are present as in *R. herzogii*.

Rhododendron ×*diversiflorum* Danet, **nothosp. nov.** (= *R. herzogii* Warb. × *R. pachystigma* Sleumer) (fig. 2F),

Planta hybrida naturalis inter Rhododendron herzogii Warb. et Rhododendron pachystigma Sleumer. Folia, corolla, antherae et stigma magnitudine intermedia inter parentes. Umbellae 4-7-florae. Corolla hypocrateriformis, 5-7-lobata. Stigma subpelatatum ut in

Rhododendro pachystigmate, *non breviter obconicum ut in Rhododendro herzogii. Stylus lepidotus in dimidio inferiore ut in Rhododendro herzogii, non glaber ut in Rhododendro pachystigmate.*

TYPE. —Indonesia, Prov. Papua, lieu-dit Ugem, entre Kurima et Hitugi, fourrés hygrophiles, 1884 m, 16.III.2007, fl., *Danet 4539* (holo-, LYJB!; iso-, BO!, E!, LI, MAN!, P!).

PARATYPES. —Indonesia, Prov. Papua, lieu-dit Tenogame près de Wamena, 1750 m, 28.III.2007, fl., *Danet 4594* (LYJB!); Biuk, 1909 m, 6.III.2009, fl., *Danet 4672* (LYJB!).

DESCRIPTION

Terrestrial shrub, erect, ramose, up to 3 m tall; twigs terete, 1-12 × *c.* 0.3 cm, laxly lepidote, soon glabrescent. Leaves spreading to suberect, in 4-7-merous pseudowhorls at the upper 1-3 sympodial units. Petiole flattened and canaliculate above, rounded below, 4-12 mm long, laxly lepidote, soon glabrescent. Blade obovate or elliptic, sometimes broadly elliptic, (2.4-)3.4-7.7 × (1.3-)1.9-4.8 cm, coriaceous; base obtuse or rounded, sometimes acute or very shortly attenuate, sometimes obliquely; margin entire, flat or recurved; apex obtuse or rounded; upper surface dark green, matt, laxly lepidote initially, soon glabrescent; lower surface light yellowish green, laxly lepidote initially (scales rusty at first, then colourless, suborbicular, sessile or shortly stipitate, centre generally broad, not impressed, marginal zone narrow or broad, entire, crenulate or lobed), soon glabrescent; midrib immersed and canaliculate above, very prominent beneath except at tip where levelled; secondary nerves (5-9 pairs) impressed to obscure above, obscure beneath; intersecondary nerves, tertiary nerves and reticulation invisible on both faces. Umbels 4-7-flowered. Umbel buds ellipsoid. Flowers spreading to suberect, fragrant, zygomorphous. Outer bracts very broadly triangular to very broadly ovate, apiculate at the apex, laxly lepidote and very densely puberulent except the glabrous marginal part outside, glabrous at the margin, very densely puberulent inside; inner bracts very broadly obovate to spatulate, up to 3.2 cm long, notched at the apex, bearing a similar indumentum to that in outer bracts except for the irregularly lepidofimbriate margin. Bracteoles linear to linear-spatulate, *c.* 2.9 cm long, covered by a similar indumentum, but less dense, to that in the inner bracts. Pedicel 0.7-2.2 × *c.* 0.2 cm, densely lepidote. Calyx obliquely discoid, *c.* 5 mm diam., subentire, densely to very densely lepidote outside; margin glabrous, lepidote or ciliolate. Corolla pinkish white to yellowish white, hypocrateriform, 4.9-7.1 cm long; base circular-pentagonal to circular-heptagonal in cross section; tube straight, 2.8-4.3 cm long, 4-6 mm diam. at the base, regularly widened up to 9-12 mm diam. at the throat, laxly lepidote outside, densely pubescent inside; throat oblique to 4-5 mm; lobes 5-7, spreading to erect-spreading, el-

lentic or obovate, sometimes oblong or broadly elliptic, 1.9-2.8 × 1.3-2.1 cm, rounded or sometimes retuse at the apex, laxly lepidote outside at a broad midline, glabrous inside. Stamens 10-14, subequal, exerted to 5-16 mm outside tube; filaments white, relatively fine, densely pubescent at the base, the hairs gradually fewer, then glabrous in the upper half; anthers unequally distributed or grouped in the dorsal part of the corolla, cream colored, narrowly oblong, *c.* 5 × 1.5 × 1 mm, thecae rounded at the base, pores antrorse-introrse or antrorse-latrorse. Disc light green, 10-14-lobed, very densely puberulent. Ovary whitish light green, ovoid, *c.* 7 × 3.5 mm, attenuate towards the style, very densely lepidote; style exerted up to 5-16 mm outside tube, whitish light green, densely lepidote at the base, the scales gradually fewer, then glabrous in the upper half; stigma in the central part of the corolla, light green, subpeltate, sometimes very broad (up to 6 mm diam.) and disproportionate to the style tip (*c.* 1.5 mm diam.), 5-7-lobed. Capsule not seen.

REMARKS

This hybrid is known on the sides of the Baliem valley between 1700-1900 m altitude, where it grows in hybrid swarms with its parents in swampy areas and disturbed open vegetation. The flowers have been collected in March.

The new hybrid is named *R. ×diversiflorum* to underline the variable number of corolla lobes in the same umbel. It is intermediate in many morphological characters between its putative parents (Fig. 2D). Some characters show clearly their paternity: the lepidote style from *R. herzogii*, the broad subpeltate stigma which contrasts strongly with the style from *R. pachystigma*.

Flowers of *R. pachystigma* and several New Guinean species (*R. gardenia*, *R. konori* Becc., etc.) have classic characteristics of flowers pollinated by large, nonhovering pteropodids (the 'chiropterophilous syndrome'): large, robust, drab colored, odoriferous and away from foliage (Baker 1961, Fleming *et al.* 2009). However, Fleming *et al.* (2009: 1042) do not include any *Rhododendron* in the list of bat-pollinated species. Until observations are made, demonstrating that bat pollination does occur in New Guinean *Rhododendron*, the hypothesis of Stevens (1985) and Cruttwell (1988) must be regarded as speculative but scratches observed on the corolla tube of *R. pachystigma* (fig. 3A) could be a new clue. An occasional mutual pollinator of *R. herzogii* and *R. pachystigma*, causing heterospecific pollen flow could be a bee which was observed visiting *R. pachystigma* (fig. 3C).

Conclusion

R. herzogii is one of the most common *Euvireya* in New Guinea among about 150 endemic species (Gibbs *et al.* 2011). Phylogenetic analysis of the DNA sequences show that all New Guinean *Euvireya* share a unique common ancestor, are the most derived of the subsection and are the sister group to a clade occurring in Borneo

and Sulawesi (Goetsch *et al.* 2011). This explosive speciation occurring in New Guinea, at a distribution limit of the genus, could be attributed to a combination of climatic fluctuations, geological uplifts, and opportunities for shifts between different pollinators. In this sense, natural hybridization should play an important evolutionary role in *Rhododendron*. Recent sequencing of nuclear genes had shown hybrid origins of *R. sarcodes* Argent & Madulid on Philippines, *R. arenicola* Sleumer and *R. pseudobuxifolium* Sleumer on Sulawesi and *R. stapfianum* Hemsl. ex Prain on Borneo (Goetsch *et al.* 2011). Natural hybrids are traditionally considered as evolutionary dead-ends or indicating a breakdown in reproductive isolation caused by disturbance, often attributed to human activity. However, evolutionary biologists now ascribe to hybrids a much wider range of evolutionary roles, including introgression of genes from another species, providing opportunities for the generation of novel floral diversity with potential consequences for adaptation to a particular environment and production of a new species (Campbell & Aldridge 2006: 326).

In Borneo, *R. ×coriifolium* Sleumer (*R. buxifolium* H.Low ex Hook.f. × *R. rugosum* H.Low ex Hook.f.) and *R. ×sheilae* Sleumer (*R. abietifolium* Sleumer × *R. buxifolium*) have ornithophilous flowers very similar to those of their respective parents and form large populations, unlike the very rare *R. ×fuchsii* Sleumer (*R. buxifolium* × *R. lowii* Hook.f.) the parents of which have ornithophilous and entomophilous flowers respectively (Argent 1985; Argent *et al.* 2007). Crossing is more common between species with similar phenotype and, in principle, if differences in floral traits impose strong ethological isolation, hybrids intermediate for those traits will receive few pollinator visits (Campbell & Aldridge 2006). As with *R. ×fuchsii*, hybrids of *R. herzogii* are sporadic and do not seem to be as well adapted to their environment as their respective parents; in particular they are confronted with floral isolation, their flowers being intermediate between two flower types and not finding effective pollinators.

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ARS SEED EXCHANGE

The 2013 Seed List will be available electronically after January 1st
at the ARS Web site

<http://www.rhododendron.org/seedexchange.htm>
and/or the Danish web site at
www.rhododendron.dk/ARS_seed.htm.

A printed hard copy seed list and order form will be published before January 15th. It will be mailed only to seed donors without an email address and to all others by request.

Seed purchases are open to "ARS members and seed donors only" until March 15th, 2013 and to everyone after March 15th. The price of seed this year will be \$3.00 per pkg. and \$4.00 per pkg. (plus shipping) for seed collected in China.

Norman Beaudry, Chairman
ARS Seed Exchange

Rhododendrons: Then, Now and in Your Future

ARS Annual Convention, SeaTac, Washington, May 1-5, 2013

A Journey of Discovery

Fred Whitney
Kent, Washington



Connie Klein
Olympia,
Washington



When forming the committee for hosting the next ARS convention, so many decisions/factors came to the fore. Where in the District 3 geographic area to center the activities? What hotel accommodations are important for attendees? What price range for hotel and meals should we strive for? What program events should be offered to “entice attendance”? Should speakers focus on rhododendrons primarily or should we have a variety of sessions for broad appeal? How extensive should the plant sale, truss show, photo show and book sales be?

But probably the over-riding focus has to be on what should we offer attendees in the way of gardens for visiting/revisiting and how can we organize the offerings economically and yet deal with such mundane things as TRAFFIC, FERRY SCHEDULES and WEATHER! Fortunately, the Pacific Northwest provides many opportunities to explore/showcase some of the best rhododendron growing environments in the country. It is also strategically located near the Pacific Ocean with ready access to Asian countries, which has resulted in many gardens having Asian themes. This influence provides many opportunities both for convention activities as well as before and after convention attractions.

The selected gardens included in the convention tours will encompass significant geographic as well as diverse scope/plant mixes. The details/pictures of these tour gardens will be the subject of the convention website (available after November 1, 2012) and will be further discussed in the forth-coming Winter *JARS* issue. So, here we'll explore some of the nearby gardens/features.

Probably the most extensive Asian-themed garden is the Japanese Garden in the Washington Park Arboretum. This beautifully designed and maintained historic garden is located near Lake Washington and thus benefits from the lake's moderated climate. The month of May is the prime time for viewing flowering cherries, azaleas and of course, rhododendrons.

The newly established Chinese Garden on the campus of South Seattle Community College presents an enticing visual of a new, yet very authentic, display of Chinese gardening and its incorporation of plant materials.

The small, family-originated (but now public) Kubota Garden, again with a different orientation to Lake Washington, reflects the maturity and manifest vision of one Japanese family's endeavors and benevolence to the community.

The highly maintained Elizabeth Miller Garden takes horticulture to a new level. The complex plantings and select plant materials are intended to encourage others to look beyond the ordinary and to challenge their skills as gardeners. Visiting the garden is normally only possible by booking a tour, but should be available to a limited number of visitors by special arrangement by some of our ARS members. The garden is sited facing Puget Sound and again a "water influence" has created a wide diversity of environments for plants to thrive in. Betty Miller was noted for her "obsessive collection and introduction of new and rare plants," and has been characterized in gardening circles as the progenitor of the contest of "the one with the most plants when they die wins"!

In a completely different vein of gardens to see, the Chase Botanical Garden is the "poster child" for moving a garden from private development/maintenance to the public via the Plant Conservancy approach. This fifty-year-old Northwest style garden features a panoramic view to Mt. Rainier. Paths meander through a native wildflower woodland, across a sunny ground cover meadow, and between rhododendron, perennial and shrub-filled garden segments within 4.5 harmonious acres (1.8 ha).

This is just a sampling of some significant local gardens and as you can see, there is "much to do and see" in our area in addition to that which is to be included in the convention program. We urge you to consider the opportunity to explore some of these "garden related" sites as well as other "less planted" attractions which will also be featured in the more detailed convention program article coming in the winter edition of *JARS*.

Fred Whitney and Connie Klein are Co-Chairs of the 2013 Spring ARS Convention in Federal Way, WA.

Response to Argent and Twyford: Classification Should be Based on Scientific Evidence, Not Personal Preference

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Argent and Twyford (2012) reiterate Argent's previous proposal (Argent 2006) that the vireya group of *Rhododendron* species be classified at subgeneric rank, as subg. *Vireya*. Their basis for such classification is that it is practical and that the vireya group of species is well defined morphologically. Argent (2006: 3) states that the "reintroduction of the status of subgenus may be somewhat controversial. This is essentially practical in allowing better subdivisions below this rank." Neither Argent (2006) nor Argent and Twyford (2012) follow this up by giving reasons as to why Argent's subdivisions are "better" than those advocated by other botanists such as Sleumer (1966) and Craven et al. (2011). Argent (2006: 5) acknowledges his classification is not attempting to represent evolutionary relationships but is intending to "present a practical way of dividing this large group of species into subunits so that species can be identified." This naturally is a very worthy aim and it is also achieved in the classifications of Sleumer (1966) and Craven et al. (2011).

The Craven et al. (2011) classification is equally as practical as that proposed by Argent (2006) in that it permits the subdivisions within the vireyas to be readily

distinguished but is an improvement on Argent's schema in that the monophyletic groups *Discovireya*, *Euvireya*, *Malayovireya* and *Pseudovireya* are treated in a formal taxonomic framework. Within the very large subsection *Euvireya*, informal groups are recognised for the purposes of species identification and discussion because the data needed for a formal classification are not yet in hand. In Argent's schema, monophyletic groups are treated at the same level as non-monophyletic groups which conflicts with the widely held contemporary view that only monophyletic groups should be recognised for constructing classifications. Additionally, the Craven et al. (2011) classification is based upon the detailed DNA sequence studies conducted by Goetsch et al. (2011) on a large sampling of vireya species and thus reflects their phylogenetic findings.

Argent and Twyford's (2012) proposal that the vireyas be treated as a subgenus is not supported on several fronts. Firstly, classifications of very large genera function best if they are hierarchical. To construct a classification of *Rhododendron* with all the sections recognised at subgenus level simply will not work. The three lepidote groups, *Pogonanthum*, *Rhododendron* and *Schistanthe* (the last name being the correct name for the vireyas at section level), are more closely related to each other than they are to any other section of the genus and should be positioned close together in classification so that this relationship is clearly evident. Historically, the close connection between *Pogonanthum*, *Rhododendron* and *Schistanthe* has long been recognised and the three sections conventionally are classified in subgenus *Rhododendron* (e.g., Chamberlain et al. 1996). If they were to be raised to subgenus rank with all the other sections of the genus also raised to subgenus rank, there would be no way of drawing the three lepidote taxa together because the International Code of Botanical Nomenclature (ICBN, McNeill et al. 2006) has no rank between genus and subgenus and such a rank would be required to indicate that *Pogonanthum*, *Rhododendron* and *Schistanthe* should be grouped together. The only ranks recognised by the ICBN below the rank of genus are: subgenus, section, subsection, series, subseries, species, subspecies, variety, subvariety, forma, subforma. [The ICBN uses the Latin form of these names but in this article the more familiar English equivalent is used; in most cases the spelling is the same as in the Latin.] No other ranks below the genus have any standing under the ICBN. To arbitrarily raise the vireyas to the same rank of the taxon in which they are appropriately placed, i.e., subg. *Rhododendron*, cannot be justified.

Secondly, the fact that the group is well defined morphologically has no bearing on its placement in a classification. Classification is not determined by ease of recognition. Argent and Twyford (2012) draw in some anatomical, embryological, secondary metabolite and biogeographical evidence in support of the distinctness of the vireyas but these attributes can be also viewed in reverse to point out the relative distinctness of the other groups of the genus. There is a well-established botanical dictum that the ability to distinguish a group does not mean that it should therefore be given taxonomic recognition.

Thirdly, and perhaps most importantly, Argent and Twyford's (2012) position is in conflict with the almost universally accepted practice of basing classification upon evolutionary relatedness. For over two hundred years, botanists have been attempting to devise natural classifications. The term "natural classification" is what many evolutionary botanists today might phrase as a "classification based upon evolutionary relationships." Until recent decades, plant classification necessarily was based primarily on analysis of morphological features supplemented where available with evidence from anatomy, cytology, secondary metabolites, etc. Advances in laboratory techniques for studying the structure of DNA, coupled with computational methods for analysing the data and interpreting the results, have greatly advanced and deepened our understanding of how different plants are related to one another. The principle that taxonomic groups should be monophyletic is widely accepted by contemporary botanists. Consequently, as taxonomists bring DNA-based systematic methods to bear on certain plant groups for the first time, the resultant classifications are increasingly based upon the principle of monophyly. (A monophyletic group has a unique origin in a single ancestral species, and includes that ancestor and all of its descendants. Subg. *Rhododendron* is a monophyletic group that contains sections *Pogonanthum*, *Schistanthe* and *Rhododendron*.) As Argent and Twyford (2012: 142) state: "The use of DNA sequencing and molecular phylogenetics has revolutionised plant systematics." Twyford et al. (cited in Argent & Twyford 2012) have data suggesting the vireyas are a distinct group nested within the other scaly (lepidote) rhododendrons (i.e., subg. *Rhododendron*). Why then are they advocating a taxonomic position for the vireyas that renders subg. *Rhododendron* non-monophyletic?

Argent and Twyford's (2012) quote from Cullen (2005) is taken out of context and misconstrued. Rather than explaining the "the openness and choice available to all users of taxonomy" as given by Argent and Twyford (2012: 142), Cullen is discussing the classification of plants as a *process*, which is a very different thing. Cullen's concise account of the processes involved in the development of classifications is well worth reading and because it is relevant to the topic with which we are concerned, i.e., the classification of rhododendrons, the full passage (Cullen 2005: 11) is here quoted:

The classification of plants is a process rather than an object. It exists in history and is constantly modified as new discoveries are made or new interpretations of old facts are accepted. The process is entirely open: anyone with the interest or knowledge can make a contribution by publishing a paper which has classificatory content, and this content then becomes available for acceptance or rejection. Of course, to be published in a reputable scientific journal, such a contribution would have to be peer reviewed; any efforts that are not serious or properly informed would be cut out. Furthermore, even after publication there is no official stamp of approval which states that the work is accepted. It remains there, in publication, for others to pick up and use as they think fit. Thus, at any moment, classification is

like a snapshot of what taxonomists currently accept; it is a changing, unmoderated consensus. Contributions may lie fallow for 10, 20, 30 years or more and then be picked up and incorporated into the current consensus, while others which have been accepted as important for years may be dropped. The fact that this process is entirely unmoderated (I am not thinking here of nomenclature, which is governed by regularly altered [improved?] international rules) comes as a great surprise to most gardeners who tend to think there is some authority which rules that ‘this plant belongs to species A, which is distinguished from species B, C, D, and so forth in particular ways, and which belongs to genus X and family Y’—and that’s what is accepted. The realisation that this is not the case is often a shock at first, though most find it ultimately liberating.

A good example of this process is the following. In his important classification of *Rhododendron*, a work that set the stage for the contemporary classification of the genus, Sleumer (1949) associated the deciduous azaleas, the *Pentanthera* group, with the evergreen rhododendrons, the *Hymenanthes* group, on the basis of morphological features. Other workers subsequently came to the view that these two groups were not so closely related and the two were recognised as separate subgenera (e.g. Chamberlain et al. 1996, Kron 1997). Using DNA sequence data, Goetsch et al. (2005) found that the species of subgenus *Pentanthera* are closely related to subgenus *Hymenanthes* rhododendrons and they proposed the inclusion of the *Pentantheras* in *Hymenanthes* at section level. Thus results obtained from the cutting edge techniques of contemporary DNA research did not support the classifications of the 1980s and 1990s but instead supported research that had been conducted in the 1930s and 1940s (due to the disruption caused by the Second World War, Sleumer’s work was not published until 1949).

Increasingly botanists are adopting monophyletic classifications and the examples cited by Argent and Twyford (2012) of *Agapetes* and *Diplycosia* that nest within *Vaccinium* and *Gaultheria*, respectively, and yet are still recognised as valid genera, are red herrings. Rather than these representing examples of valid taxonomies, these are examples of taxonomic groups that have not yet received a full evaluation using contemporary research methods. The sorry reality is that there are far more plant groups that need in-depth, comprehensive study than there are botanists available to do the necessary work.

The issue of classification and names is relevant also to amateur growers of rhododendrons; it is not just an academic exercise. *Rhododendron* is a large genus and due to its size it is useful for those with interests in particular groups of species and their hybrids to refer to them by the ranks and names used in the classification of the genus. In this vein, Jane Adams recently queried the monthly meeting of the Hawai’i ARS Chapter as to their views of changes in scientific botanical nomenclature. When told that the name *Vireya* as the scientific name for our beloved subtropical rhododendron

was now to be *Schistanthe*, the members had a good laugh. Comments in the order of “how do you pronounce that again?” and “I’ll never change!” were heard. The sentiment, not unexpectedly, remained with the familiar and easy to pronounce “vireya” as the common language of communication among rhododendron aficionados. After several requests for spelling and pronunciation, and after the laughs died down, Jane pointed out that this is a very real change. The name change from section *Vireya* to section *Schistanthe* is based on the provisions of the Botanical Code and cannot be ignored. The change from subgenus to section rank is based on new scientific insight into *Schistanthe* genetics and DNA. Quite heartening was the interest displayed in the science, which led to a brief discussion of botany and its involvement with genetics in the modern world. After assuring the members that scientists themselves were also still using the term “vireya” as the common name for these plants, Jane felt that some foundations had been laid for further discussions of scientific advances as they relate to *Schistanthe* among the chapter members.

In summary, taxonomists who work in the area of infrageneric classification and interact with user groups have a responsibility to promote classifications based upon scientific evidence and evolutionary relationships, not upon vague “practical” reasons and morphological distinctness *per se*. The thrust of Argent and Twyford’s (2012) paper is that they simply wish to use the name *Vireya* for the group in question and subgeneric rank is the only level at which that name is available. Based upon the sum of the available evidence, we find that there is only one taxonomic status for the vireyas that is defensible on the basis of logic and scientific evidence and that is as section *Schistanthe* within subgenus *Rhododendron*.

Acknowledgment

We thank Don Voss and Frédéric Danet for reading the manuscript and for their suggestions for its improvement.

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Lyn Craven is an Emeritus Principal Research Scientist at the herbarium in Canberra. He has extensive field experience and has published many scientific papers on the taxonomy of plants from Australia and the southwest Pacific, including Rhododendron. His major research focus is on the myrtle and hibiscus families. He has had a keen interest in cultivating and studying vireyas since the early 1960s.

*Benjamin Hall is Professor Emeritus of Biology and Genome Sciences at the University of Washington. Research he did at UW on the functioning of genes in yeast led to patented inventions for producing vaccines against HBV and HPV as well as other biopharmaceuticals in yeast cells. Licensing income from this work has supported research by many UW faculty and graduate students. Since 1995, much of his research has been directed toward understanding the evolutionary relationships between different subgenera, sections and species of rhododendrons. Dr. Hall's current research is focused primarily on decoding the genome of *R. williamsianum*.*

*Pete Adams, with his wife Jane, opted to surf one of the last economic waves out of the Silicon Valley and established the White Cloud Nursery on the Big Island of Hawai'i devoted to the collection and conservation of *Schistanthe rhododendrons*.*

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PL 002 Garden Walks 2006

Several Gardens visited during the Joint Convention of the American Rhododendron and the Azalea Society of America in Rockville, Maryland, May 2006. Includes Ed and Mary Reiley Garden. Running time 37 minutes.

PL 003 Frank Fujioka's Program May 2006 Societe Bretonne Du rhododendron

Program presented to the Societe Bretonne Du Rhododendron in France. The program is about Frank's garden, hybrids, his hybridizing program, and more. Modified with English translation, as needed Running time 37 minutes.

PL 004 Elepidote Hybrids in central New Jersey selected by the Princeton Chapter Study Group

This DVD program is about elepidote rhododendron hybrids that are proven good-doers in Central New Jersey selected by the Princeton chapter Study Group. Descriptions written by members of the Study Group and narrated by Jerry van de Sande. Photography by members of the group. Hands-on information. Printout text including supplement data for meeting handouts. Running time 52 minutes.

PL 005 India, Ron's Trip, Arunachal Pradesh

Program based on Ron Rabideau's experiences when he joined an outstanding international group of plant explorers to Arunachal Pradesh in search of rhododendron species. The program consists of photos and videos from members of the expedition and also personal observations of the people and the culture there. Narration by Ron Rabideau. Running time 52 minutes.

PL 006 The Zurich Garden

This DVD program was created by ARSPL with Dr. William M. Zurich, Jr., who also did the narration. Bill shared his personal thoughts and design approach in the development of his rhododendron garden Kenneth Cox, after viewing the Zurich garden, rated this as one of the finest private gardens on the East Coast. DVD record of a superb garden. Running time 30 minutes.

>

PI 007 Rhododendrons at the golden Gate (2007) ARS Annual Convention, SF, CA)

Here are rhododendrons growing amidst palms with cycads, orchids, oranges! Rhododendrons grow amongst contemporary art, metal sculptures and pagodas. This DVD features 1 San Francisco's famed Golden Gate Park, Conservatory of Flowers, Japanese Tea Garden, and the S.F. Botanical Garden at Strybing Arboretum. 2. Filoli House and Garden. 3. Bee and Paul Brown's garden. 4. The Tim Durant garden. 5. Dr. Burt and Belinda Brent's Scottish country garden. 6. Tom Jackson and Kathy Grant garden. 7. The Webber-Kessler garden. 8. Sonoma Horticultural Nursery. 9. The Chateau St. Jean Vineyard. With narration. Running time 39 minutes.

PI 008 Rhododendrons in the Wild West (2008 ARS Annual Convention, Tulsa, OK)

All narration recorded live on location, resulting in a spontaneous convention tour DVD. Gilcrease Museum Gardens and Rock Garden. Len Miller narrates at Lendonwood Garden, Elk Ridge, and the Tulsa Garden Center. Barry Fugatt, Director of Horticulture, guided the tour at Linnaeus Teaching Center. Breniss O'Neal talks about her "Forest Hollow Estate." Jim Baily narrates as the tour visited his garden. The Philbrook Museum of Art with its 16th century Italian Renaissance gardens. Two adjacent gardens of Jim and Madeline Osborne and Ronald and Annette Williams at the water's edge of Grand Lake. Running time 58 minutes.

PL 009 A Spring Walk in Walters' Wood is a personal tour with Spike and Kay Walters in their natural woodland garden in Western Pennsylvania. This DVD is spiked with humor and interesting observations by Spike, who narrated and conducted the tour with Kay. The Walters are members of the Great Lakes Chapter. Running time 29 minutes.

PL 010 Nepal: Our Ultimate Rhodo Flowering Experience!




This DVD was developed via the internet with Ian Chalk from down under. Ian is a member of the Emu Valley Rhododendron Society and the Emu Valley Rhododendron Garden, Burnie, Tasmania, Australia. Ian and his wife Jenny share their experiences while trekking through the world's largest rhododendron forest in Nepal. Ian narrates with insight and personal impressions. Summing this up is WOW! Running time 21 minutes.

PL 011 Oban, Scotland ARS 1996 Convention Revisited.

Win and Anne Howe, of the Valley Forge Chapter, take us back to an extraordinary convention which attracted hundreds of attendees from all over the world. One of the best photo-documented garden tours: Stone field Castle, Achamore House, Ardkinglas Woodland Garden, Mount Stuart House, Stirling Castle. After the convention Win takes us on a tour of Glendoick Gardens and Nursery, home of Peter and Kenneth Cox. All this in one DVD. Running time 36 minutes.

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American Rhododendron Society Register of Plant Names and Checklist — Autumn 2012 Supplement

Jay W Murray

North American Registrar of Plant Names

Colts Neck, New Jersey

Questions from **North Americans** concerning name registration, the availability of particular names, and requests for forms (no fee) should be directed to the Regional Registrar, **Jay W. Murray**. Forms also may be downloaded from the ARS web site: <http://www.rhododendron.org> or completed on-line for automatic emailing to J.W. Murray. **Non-North Americans** should direct questions to the International Rhododendron Registrar **Dr A.C. Leslie**.

Introduction: The following rhododendron and azalea names were approved and added to the International Rhododendron Register prior to August 24, 2012 by

the Royal Horticultural Society, International Cultivar Registration Authority for the genus *Rhododendron*. The North American Registrar assisted the RHS by providing data for plants originating in North America.

References: Names conform to the rules and recommendations of the *International Code of Nomenclature for Cultivated Plants – 8th Edition* (2009). Color numbers refer to the RHS Colour Chart unless noted otherwise. Accompanying color names are taken from *A Contribution toward Standardization of Color Names in Horticulture*, R. D. Huse and K.L. Kelly, edited by D. H. Voss (ARS, 1984).

Format: Parentage lists the seed parent first, followed by an “(s)” if the direction of the cross is known; this is followed by an upper case “X” and then the name of the pollen parent. If either parent is itself a cross, the individual components within that cross are separated by a lower case “x”. Parentheses are used only in describing the more complex crosses. Abbreviations are used where appropriate: (a) = azalea, (r) = rhododendron, (v) = vireya rhododendron, (z) = azaleodendron; H = hybridized by, G = grown to first flower by, R = raised by, S = selected by, N = named by, I = introduced commercially by, REG = registered by; dates are enclosed in parentheses immediately following the activity. Metric conversions of dimensions are reported in 5mm (0.2”) increments for dimensions greater than 1” (25mm).

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may be preprocessed locally and then forwarded to the IRR. ARS members living outside North America must register directly with the IRR, or through the Regional Registrar for their region. These registrations may be published by the ARS if the registrant notifies the North American Regional Registrar of the plant name and the official registration date. The entry will appear in an early Supplement in the JARS.

(r) 'Austin's Gold'

Elepidote rhododendron. 'Jawndice'* X 'Early Light'. H (2000), G (2004), N (2005) and REG (2012): John Doppel. Lenhartsville, PA. Flowers 10/conical truss, openly funnel-shaped, 1.6" (40mm) long x 2.5" (65mm) wide, with 5 wavy-edged lobes. Color moderate red (181A) in bud, opening inside vivid red (44A) at base, shading to brilliant greenish yellow (6A), with moderate orange (173C) dorsal spots; outside similar without spotting. Truss 4" (100mm) high x 5" (125mm) wide. Leaves held 2 years, 3.6" x 1.3" (90x32mm); elliptic, broadly acute apex, cuneate to rounded base, flat margins; dull and medium green above; hairless. Shrub 2.6' (0.8m) high x 3' (0.9m) wide in 12 years; intermediate habit. Plant and bud hardy to at least -10°F (-23°C). Flowering early May.

* 'Jawndice': Not registered. H: John Doppel; Parentage: ('Flash Dance' x unknown), selfed

r) 'Catherine Josephine'

Elepidote rhododendron: Gable's 41-64*(s) X *R. glischrum*, RSF 66/656. H (2004), G (2012), N (2012), and REG (2012): Howard B Kline, Newmanstown, PA.

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Flowers 12-15/ ball shaped truss, openly funnel shaped to broadly funnel shaped, 2.3" long x 2.8" wide (55x70 mm), with 5-6 wavy lobes. Color deep rose pink in bud, opening inside slightly off white to very pale purple, close to (75D), with a very dark purple basal blotch, lobe edges are close to light purple(75A) giving a picotee effect; outside similar, shading lighter toward center.. Calyx lobes <0.3" (6 mm) long, light red-purple. Truss 5-6" (125-150mm) high x 5.5-6" (140-150mm) wide, Leaves somewhat leathery, distinct veining above & below, held 2 years; 4.5-6"(115-150mm) x 1.3-2"(30-50mm). elliptic/lanceolate, broadly acute apex, oblique base, downcurved margins semiglossy and medium to dark green above. Shrub 32" high x 26" wide (0.8 x 0.7 m) in 7 years; intermediate habit. Plant hardy to -20 °F (- 29 °C), buds to -5 °F (-21° C). Flowering late April-early May.

***Gable's 41-64'** not registered; no data available.

(r) 'Charming Pink'

Elepidote rhododendron. 'Pink Flourish' X 'Cape White'. H (2004), G (2008), N (2011) and REG (2012): John Doppel. Lenhartsville, PA. Flowers 10/ball truss, funnel-shaped, 1.8" (45mm) long x 2.3" (57mm) wide, with 5 frilly edged lobes. Color deep pink (52B) in bud, opening inside moderate purplish pink (68C) at margins blending to pale purplish pink (56C) towards center, with a light yellow (15D) dorsal blotch; outside moderate purplish pink (68C) with pale purplish pink (56C) mid ribs. Truss 4" (100mm) high x 4.6" (115mm) wide. Leaves held 2 years, 4" x 1.8" (100x46mm); elliptic, broadly acute apex, rounded base, downcurved margins; glossy and medium

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green above; hairless. Shrub 2.6' (0.8m) high x 3' (0.9m) wide in 8 years; intermediate habit. Plant and bud hardy to at least -10°F (-23°C). Flowering mid May.

(r) 'Don's Blue Start'

Lepidote rhododendron: *R. augustinii* (s) X *R. chasmanthum*. G: Ann Meerkerk Greenbank, Wa; S: (2005), N (2012), I (2012), REG (2012): Meerkerk Gardens : Greenbank, Wa. Flowers 3/ lax truss, broadly funnel shaped, 1.6"(40mm) long x 2.5"(65mm) wide, with 5 wavy edged lobes. Color strong purple (84A) in bud, opening inside with 0.3"(6mm) band of light purple (85A) at the margin, changing to very pale purple (84D) extending to center, and with moderate yellow (162B) spots on dorsal lobe; outside, light purple (84C) at edge changing to light purple (84D) extending to center. Truss 2"(50mm) high x 3" (75mm) wide. Leaves held 1 year, 3" (75mm) x 0.8" (20m), ovate, acute apex, rounded base, flat margins, semi glossy and moderate olive green (147A) above, with scaly indumentum. Shrub intermediate habit, 9' (2.8m) high x 6.2' (1.9m) in 30 plus years. Plant and bud hardy to at least 10°F (-12°C). Flowering early.

(r) 'Inner Glow'

Elepidote rhododendron. Parentage unknown. H (1996), G (2000), N (2012) and REG (2012): John Doppel. Lenhartsville, PA. Flowers 9/conical shaped truss, funnel-shaped, 1.9" (48mm) long x 3" (75mm) wide, with 5 flat edged lobes. Color vivid red (44A) in bud, opening inside pale yellow green (4D) at base, shading to strong

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purplish red (58B) at margins, with brilliant yellow (20A) dorsal spotting; outside strong purplish red (58B). Truss 4" (100mm) high x 6" (150mm) wide. Leaves held 2 years, 4" x 1.6" (100x40mm); elliptic, obtuse apex, rounded base, flat margins; dull and medium green above; hairless. Shrub 3.3' (1 m) high x 3.9' (1.2 m) wide in 16 years; intermediate habit. Plant and bud hardy to at least -10°F (-23°C). Flowering mid May.

(r) 'Joe's Moon Glow'

Elepidote rhododendron. 'Capistrano' X 'Early Light'. H (2001), G (2005), N (2012), and REG (2012): John Doppel. Lenhartsville, PA. Flowers 10-12 / domed truss, 1.6" (40mm) long x 2.9" (72mm) wide, with 6 wavy edged lobes. Color strong yellowish pink (37A) in bud, opening throughout light greenish yellow (8C); unmarked. Truss 1.6" (40mm) high x 5" (125mm) wide. Leaves held 2 years, 5" x 2" (125x50mm); elliptic, obtuse apex, rounded base, flat margins; semi glossy and med green above; hairless. Shrub 2.5' (.75 m) high x 3.9' (1.2 m) wide in 11 years; intermediate habit. Plant and bud hardy to at least -10°F (-23°C). Flowering early May.

(v) 'Lab Retriever Webster'

Vireya (lepidote) rhododendron: *R. hellwigii* hybrid (s) X [('Dr Sax'* x *R. aurigeranum*) X *R. leugogigas*]. H and G: Peter Sullivan, San Francisco, CA; N (2009) and REG (2012): Richard Kruppa, Volcano, HI; to be introduced in 2015 by Pacific Island Nursery, Kea'au, HI. Fls 7-9 / conical truss, tubular funnel-shaped, with 7 wavy-edged lobes. Color purple in bud, opening inside vivid red (46C), with a dark red narrow vein

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on each lobe extending from base to tip; outside color vivid red (46C); anther red with yellow end, filament red; stigma dark purple, style pink. Truss 4" (100mm) high x 8" (200mm) wide. Lvs 5.3"-5.6" x 2.2"-2.4" (135-140 x 55-60mm), elliptic, broadly acute apex, rounded base, upcurved margins; No indumentum visible. Shrub 42" (1.1m) high x 32" (0.8) wide in 9 years; open, Intermediate habit; Plant and bud hardy to at least 44°F (7°C). Flowering May-June and Nov-Dec.

* 'Dr Sax' not registered.

(r) 'Lil Darlin'

Elepidote rhododendron. 'Capistrano' X 'September Song'. H (2005), G (2007), N (2012), and REG (2012): John Doppel. Lenhartsville, PA. Flowers 10/ domed truss, broadly funnel shaped, 1.9" (48mm) long x 2" (50mm) wide, with 5 flat edged lobes. Color strong red (41B) in bud, opening inside light orange yellow (23C), with dark greenish yellow (152D) speckles on dorsal lobe; outside deep yellowish pink (39B), changing to light yellowish pink (26D) at base. Truss 3" (75mm) high x 4" (100mm) wide. Leaves held 1 year, 4" x 2.2" (100x55mm); elliptic, broadly acute apex, rounded base, upcurved margins; semi glossy and olive green above; hairless. Shrub 1.3' (.4 m) high x 2.5' (.75 m) wide in 7 years; dense habit. Plant and bud hardy to at least -10°F (-23°C). Flowering early May.

(a) 'Mary Jane Cummings'

Evergreen azalea. 'Brenda Marie' x ('Festive' x 'Satellite*'). H:(2005), G(2007),

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N(2012), REG(2012): Joseph Klimavicz, Vienna, VA. Fls 2/terminal, saucer shaped, double; corolla 1.4" (35mm) long x 2.6" (65mm) wide with 10 wavy edged lobes. Color strong reddish purple (78B) in bud; opening inside white with strong reddish purple (78B) and light purple(78C) stripes, sectors and occasional solids, with slight vivid reddish purple (78A) blotch; outside strong reddish purple (78B) and light purple (78C) fading toward white at base. Calyx lobes 0.4"(10mm) long, light yellow green(145A). Leaves 1.8"(45mm) x 0.8"(20mm); elliptic, broadly acute apex, cuneate base, flat margins, glossy and moderate olive green (146A) above; no indumentum. Shrub 2' (0.6m) high x 1.5' (0.5m) wide in 5 years, upright dense habit. Plant and bud hardy to 10F(-12C). Flowering early April.

***'Satellite'** -not registered; Evergreen azalea: (double pink florist's azalea x 'Treasure').

(r) 'Mary S Phipps'

Elepidote rhododendron: ('Scintillation' x ('Pink Petticoats' x *R. yakushimann*)) X (('Dumper's Yellow' * x Phipps Yellow') x 'One Thousand Butterflies'). H (2003), G(2005), N(2012), and REG(2012): George Woodard, Old Westbury, NY. Flowers 23/conical truss, broadly funnel-shaped, 4" (100mm) long x 6" (150mm) wide, with 7 frilly edged lobes. Color strong purplish pink (63C) in bud, opening throughout light purplish pink (62C) with a light yellow basal blotch. Truss 8" (205mm) high x 7" (175mm) wide. Leaves held 3 years; 7" x 2.5" (175 x 5mm), elliptic, obtuse apex, rounded base, flat margins, dull and light green above. Shrub 5'(1.5m) high x 5' (1.5m) wide in 9 years; dense habit. Plant hardy to at least -10°F (-23°C); buds, -5°F (-21°C). Flowering mid May.

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***'Dumper's Yellow'** not registered; no data available.

(r) 'Pink Pirouette'

Elepidote rhododendron. 'Pink Flourish' X 'Princess Mary of Cambridge'. H (2003), G (2007), N (2011), and REG (2012): John Doppel. Lenhartsville, PA. Flowers 12/ ball truss, broadly funnel shaped, 2" (50mm) long x 2.6" (65mm) wide, with 5 wavy edged lobes. Color moderate purplish red (57A) in bud, opening inside deep purplish pink (68A), with a light yellowish brown (199C) dorsal blotch, central area of each lobe moderate purplish pink (68C), giving a star like appearance; outside deep purplish pink (68A), Truss 5" (125mm) high x 5.6" (140mm) wide. Leaves held 1 year, 4.6" x 1.9" (115x48mm); elliptic, broadly acute apex, rounded base, downcurved margins; semi glossy and medium green above; hairless. Shrub 2' (.6 m) high x 3' (.9 m) wide in 9 years; intermediate habit. Plant and bud hardy to at least -10°F (-23°C). Flowering early May.

(r) 'Purple Cape'

Elepidote rhododendron. 'Sefton' X open pollinated. H (2000), G (2004), N (2008), and REG (2012): John Doppel. Lenhartsville, PA. Flowers 15/ conical truss, broadly funnel shaped, 2" (50mm) long x 3" (75mm) wide, with 5 flat edged lobes. Color strong reddish purple(72B) in bud, opening inside strong purple(77B) with strong reddish orange (34B) dorsal spotting, outside, strong purple(77B) with vivid reddish purple (74B) mid ribs. Truss 6" (150mm) high x 6" (150mm) wide. Leaves held 2 years, 4" x 1.6" (100x40mm); elliptic, broadly acute apex, rounded base, downcurved margins; semi glossy and medium green above; hairless. Shrub 5.9' (1.8 m) high x 5.9' (1.8 m) wide in 9 years; intermediate habit. Plant and bud hardy to at least -10°F (-23°C). Flowering mid May.

(a) 'Rebecca Taffet'

Evergreen azalea. 'Elsie Lee' (s) X 'Satellite'*, H (1996), G (1992), N (2012), REG (2012): Joseph Klimavicz, Vienna, VA. Fls 2-3/ terminal, saucer shaped double, corolla 2.8"(70mm) long x 1.6"(40mm) wide with 13-16 frilly lobes. Flower color white shading to light yellow green (142C) at base in bud, opening white throughout with faint spotted blotch (142C) at center. Blotch can be more pronounced or none at all. Calyx lobes 0.4"(10mm) long, strong yellow

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green(141A). Lvs 2”(50mm) x 0.8”(20mm); elliptic, broadly acute apex, cuneate base, flat margins, glossy and moderate olive green (137A) above; no indumentum. Shrub 1.6’ (0.5m) high x 1.6’ (0.5m) wide in 5 years, dense habit. Plant and bud hardy to 0°F (-18°C). Mid May.

***Satellite**’ -not registered; Evergreen azalea: (double pink florist’s azalea x ‘Treasure’)

(r) **‘Sparkling Stars’**

Elepidote rhododendron: [(‘Yaku Sunrise’ x ‘Hansel’)(s) X ‘Lem’s Cameo’]. H (1983), and G (1988); Frank Fujioka, Freeland, WA; N (2011) Don Wallace (Singing Tree Gardens), McKinleyville, WA; I (2011) and REG (2012), Singing Tree Gardens and Nursery. Flowers 9 per dome truss, openly funnel shaped, c1.0” (25mm) long x 2.5” (65mm) wide, with 6 lobes, more deeply separated from each other than usual. Color yellowish white (158D) in bud, opening white inside and out, with prominent deep purplish pink (55A) blotch on dorsal lobe. Truss 3” high x 4” wide (75 x 100mm). Leaves held 2 years; 6” x 2” (150 x 50mm), elliptic, broadly acute apex, cuneate base, downcurved margins; glossy and strong green (132C) above. No indumentum. Shrub 7’ (2.1m) high x 7’ (2.1m) wide in 27 years; intermeduete habit. Plant and bud hardy to at least 10°F (-12°C). Flowering mid May.

(r) **‘Spring Sprite’**

Elepidote rhododendron. ‘Capistrano’ X ‘September Song’. H (2005), G (2009), N (2011), and REG (2012): John Doppel. Lenhartsville, PA. Flowers 10/ dome truss, funnel shaped, 1.6” (40mm) long x 2” (50mm) wide, with 5 wavy edged lobes. Color strong red (41B) in bud, opening inside light yellow (20B) at center, shading outward to light yellow (20D) edged with moderate yellowish pink (31D), and with a strong red (41B) speckled dorsal blotch; outside, moderate yellowish pink (31D) shading to strong yellowish pink (37A) at edges. Truss 2.6” (65mm) high x 4” (100mm) wide. Leaves held 1 year, 2.6” x 1.3” (65x32mm); elliptic, broadly acute apex, rounded base, downcurved margins; semi glossy and medium green above; hairless. Shrub 1.3’ (.4 m) high x 2.5’ (.75 m) wide in 7 years; dense habit. Plant and bud hardy to at least -10°F (-23°C). Flowering mid May.

Corrections:

(r) **‘Leitmotif’**: cf *JARS*, 65;4, p231 (2011). Parentage has been corrected to “unknown”. Plant was grown from seed obtained from D. Hobbie.

(r) **‘Lavender Haze’**: cf *JARS*, 66;3, p173 (2012). The registered name should read **‘John’s Lavender Haze’**.

Register Photos on page 280

ARS/RHS Rhododendron Registration - Changing of the Guard

As most of you know Jay Murray has been the ARS rhododendron and azalea registrar and North American agent for the Royal Horticultural Society for the past 27 years. That is a long time to have spent the hours required and the keeping up with the paperwork and collection of data to fulfill that position. Her husband, Bob, has been a great help to her in developing a database and keeping all of these records of thousands of registered and unregistered plants. Their dedication has helped hybridizers and the rest of us rhodoholics enjoy many new and exciting rhododendrons and azaleas.

The ARS awarded them a Gold Medal for their efforts, but we owe them even more thanks for so many years of dedicated work.

Jay and Bob are finally retiring from this position and Michael Martin Mills from the Greater Philadelphia Chapter is taking on the reins as our new registrar. I want to thank him for volunteering to this job and thank Jay for getting him up to speed for this task.

Don Smart, President ARS

Note from Registrar Jay Murray

It is time for me to retire from the position of North American Regional Registrar of Rhododendron Names. I will miss performing this activity that is so valuable to the ARS and the horticultural community. I want to thank Dr. A.C. Leslie, the International Rhododendron Registrar, who guided me. Also, I am grateful to all of the hybridizers and others who provided the data required for registering rhododendron names for the *International Rhododendron Register and Checklist*. I hope you will give Michael Mills, your new Regional Registrar, as much help as you have given me.

Jay Murray

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Register of Plant Names - Newly Registered



'Sparkling Stars'. See description on page 233. Photo by Don Wallace.



'Austin's Gold'. See description on page 230. Photo by John Doppel.



'Catherine Josephine'. See description on page 230. Photo by Howard Kline.



'Mary S. Phipps'. See description on page 232. Photo by George Woodard.

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Alies' Pliers

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Fig. 1.

Mr. Alies' grafting pliers were invented at the end of the 19th century when the phylloxera disease raged everywhere in France. Grafting on American rhododendron root stock was a common solution but binding the scion to the rootstock was both delicate and tiresome.

Mr. Alies, a cutler by occupation [one who made, dealt, and sharpened knives, scissors, etc.], invented this efficient tool for binding rhododendron grafts. Its principle is after placing the scion on the root stock it covers the graft with a cork split length-wise and holds this in place, thus leaving one's hands free to bind the graft.

The tool is made of 32 pieces. Paul Alies made about 1000 pliers a year and he also created a machine capable to split 5000 corks per hour. The family's wireworks also sold the annealed wire necessary for binding the corks to the stalk.

Alies' pliers were made until 1986, and I wanted to test this tool myself, and so have written this article to show how it worked. You first need to position the two half-corks in the two-tooth jaws in order to hold them properly in place.



Fig. 2.



Fig. 3.

Then you fit them tightly around the grafting point; compression is maintained by the locking rack at the end of the handles. This frees your hands to position three annealed wires in the open parts of the jaws, which you then twist with your fingers to tighten them round the corks.

It was said that an experienced grafter could complete a graft in less than one minute.

The annealed wires naturally rusted and ultimately broke between six and eight months later, allowing the corks to drop away.



Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.

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Sonja Nelson, Assistant Editor
Journal American Rhododendron Society

Letter to the Editor

Sir:

I noted the article on lilacs in the Summer 2012 JARS issue. There is a cautionary note. David Leach (1961) notes in his tome on rhododendrons on P. 297 that lilacs and dogwoods are hosts for *Phytophthora cactorum* and he warns against planting rhododendrons planted in the shade near lilacs and dogwoods. Personally, I had a *R.* 'Scintillation' near lilacs suffering dieback I couldn't resolve. I moved the rhododendron to a much different location after reading Leach's book and the problem cleared up. It may have been coincidence, but it worked. (You might want to also note that once lilacs are established, nuclear bombs are required to get them out.)

Sincerely,
Don Brophy, Waltham, MA

Leach, D.G. 1961. *Rhododendrons of the World*. Charles Scribner's Sons. NY; 544 pp.

Editor's Note: David Leach, from Brookwood, Pennsylvania, stated that the rhodo dieback he observed was worse during summers that were exceptionally hot and humid, and that only plants growing in the shade were affected. He advises that to reduce dieback, rhodos should preferably be in more sunny locations to reduce humidity and improve air circulation. He stated that "lilacs and dogwoods are a source of infection," which I interpret as "can be a source," as in the perhaps cooler climate of the Pacific Northwest where I live. I have had no problems growing rhodos in the shade near both lilacs and dogwoods. However, as far as I am aware, I have no *P. cactorum* infections in any of my plants.

Have any ARS members experienced rhodo dieback possibly associated with lilacs or dogwoods in a manner that Leach described?

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Errata (Summer 2012 issue)

P 143: In the Acknowledgements, John McNeill should have been thanked; The correct 2010 Craven reference is "Craven, L., F. Danet, J. Veldkamp, L.A. Goetsch, and B.D. Hall. 2010. *Rhododendron* section *Schistanthe*, the scientific name for *Vireya rhododendrons* (Ericaceae). *J. American Rhododendron Soc.* 64 (3): 190-192.

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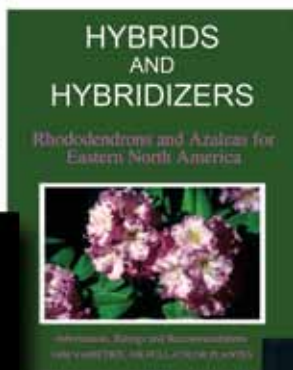
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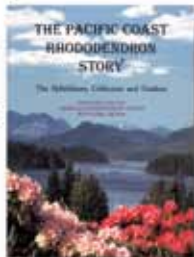
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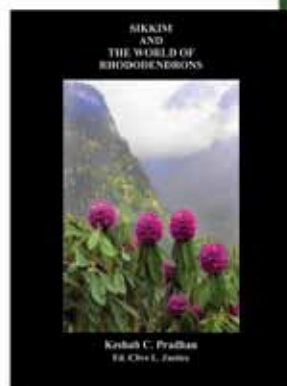
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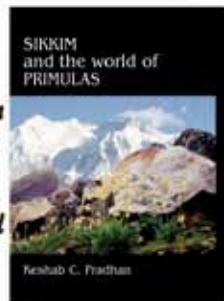
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