JOURNAL

American Rhododendron Society

Vol. 69 Number 4 Fall 2015

Rhododendron 'Bob Furman's Big Yellow'
pages 76 and 92

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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.**

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Journal American Rhododendron Society (ISSN 0745-7839). Published quarterly (Jan. 15, April 15, July 15, Oct. 15) by the American Rhododendron Society, P.O. Box 525, Niagara Falls, NY 14304-0525 USA. Membership in the Society includes a subscription to the *Journal American Rhododendron Society*. Annual membership dues are $40.00 per year. Copyright 2015 by the American Rhododendron Society. Permission to reprint any portion of this volume must be granted in writing by the Editor. The Society assumes no responsibility for its advertisers. International Standard Serial Number of Journal ARS 0745-7839. Periodicals postage paid at Niagara Falls, NY and at additional mailing offices.

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Cover Photo

‘Bob Furman’s Big Yellow’.
Photo by Donna Delano.

Society News

Publications

ARS Digital

Website: http://www.rhododendron.org

Office: http://www.arsoffice.org

***JARS* online:** http://www.arsoffice.org/protect/login.asp

***JARS* back issues**: http://scholar.lib.vt.edu/ejournals/JARS [to Vol. 54, 2000]

Archives: http://www.lib.virginia.edu/small

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Blog: http://www.rhododendron.org/blog/default.asp

Plant Name Registration: http://www.rhododendron.org/plantregistry.htm

Rhododendron & Azalea News: http://www.rhododendron.org/news/newsindex.htm

From the President

Bob MacIntyre
Bandon, Oregon

I will annually remind all of the ARS members that I'm not a writer, never have been and never will be. That said, I would like to try to explain briefly how the ARS is governed and how it functions. This may help our members understand why we ask for help, both by asking you to serve at various levels and often ask for donations to help support the organization.

The ARS is classified as a 501c3 non-profit organization registered in the State of Oregon. The ARS is a business and needs to be operated as such, even though we are a non-profit business. Therefore, we fall under the rules for non-profits of the State of Oregon and the IRS (Internal Revenue Service, NOT the International Rhododendron Society). Oregon has a manual, Oregon Revised Statutes, that contains information/rules governing non-profits registered in Oregon. If you can't fall asleep at night, this might make good night-time reading to help cure insomnia.

Using the guidelines from Oregon and the IRS, the ARS has established it's own By-Laws and Policies of the Board, which is available to every ARS member on the OARS website (http://www.arsoffice.org/). The By-Laws include information regarding who we are, what is our purpose, the establishment of a Board of Directors (BOD), and the Executive Committee. The Policies of the Board provide guidance and clarification to many of the actions and functions of the BOD and the Executive Committee.

The ARS BOD meets twice a year. The meetings are a full day in order to cover the business of the organization and activities requested by our membership. The main source of income of the ARS is membership dues, but we also benefit from donations from individual members. As I have said before and will repeat again here, due to recent declining membership, our present declining income thus requires an adjustment in our expenses. We do have funds to draw from to make up some deficit, but those funds are not bottomless. Operating changes thus have to be made to keep the organization viable. The ARS has three paid staff: Executive Director, Journal Editor and Assistant Journal Editor, working as independent contractors. Everyone else is a volunteer. The cost of printing and distributing the journal is our largest expense. Membership renewal is also an expense to the chapter. The change in the renewal procedure this past year was an effort to reduce costs to the organization, now a necessity. My hope is that you will now have gained some insight into how the ARS operates and why operating changes are now being required. Of course, these changes can be minimized if ARS membership can be increased, so I also encourage all ARS members to not only renew their membership but to encourage others to also become members. ARS membership can make a great gift to gardening friends and family members that might otherwise be unaware of the benefits (camaraderie with other gardeners and of course *JARS*) available from our great society!

Thank you!

From the Editor

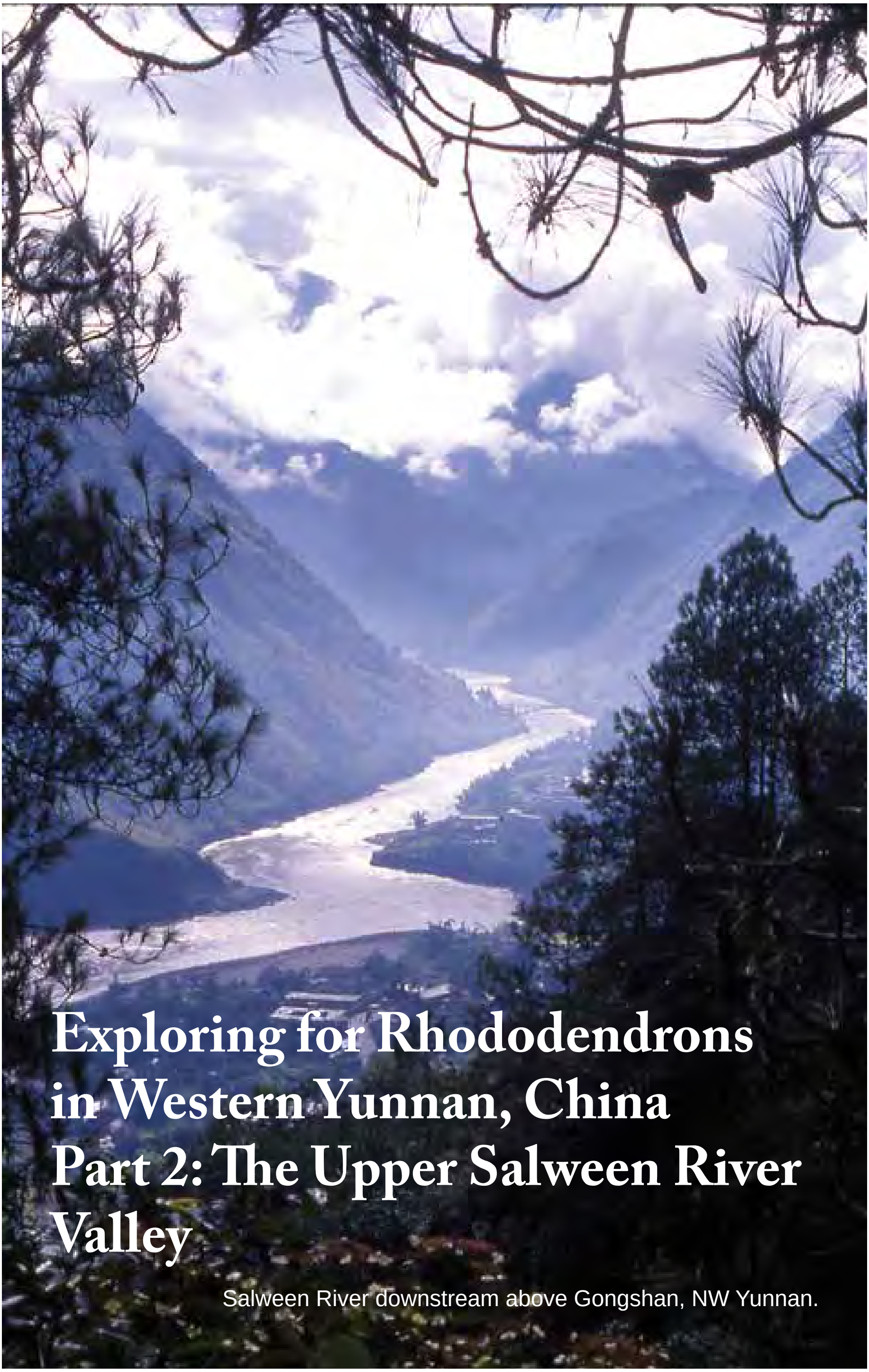
Glen Jamieson
Parksville, BC
Canada

Wow, what a summer on the northwest coast of North America! Here on southeastern Vancouver Island, we have had one of the driest seasons ever. Our winter snow pack in the mountains was only 15% of normal, meaning relatively little spring and summer river runoff, and from May 1 to Aug 28, we've had only 34 mm (1.3 in) of rain, mostly in little sprinkles that didn't penetrate the soil. The result has been severe drought and consequent garden watering restrictions, and what we experienced was also the case right down through California. Rhodos, with their relatively shallow root systems, particularly suffered, and many needed supplementary watering, often by hand!

In the spring, I travelled with Steve Hootman and some other rhodoholics to Sikkim, India, where we spent an amazing three weeks in the mountains searching for the 38 rhododendron species occurring there (we found 35!). We were there just before the start of the monsoon, and in the whole time, only trekked through one hour of rain, although there were some rainy days while travelling in vehicles and some night rains. This was nothing compared to what happens during the moonsoons (June through August, 2015, 184 mm (7.3 in) in Gangtok, Sikkim), which again made me realise that our rhodo culture conditions in the Pacific Northwest (mild, wet winters and very dry (and this year record hot!) summers) are the exact opposite of rhodo culture conditions in the native Asian habitats of many of the species and their hybrids that we culture (dryer winters and cool, wet summers). If our climate conditions (milder, wet winters and hotter, drier summers) continue to become more extreme as is suggested by climate change modelling, then growing rhodos in the rain shadows of western North American coastal mountain ranges north of California may become increasingly difficult. I can foresee that more northern and inland areas (these are presently colder) that have periodic thunderstorms and are more in the path of jetstream storms may become the best future rhodo habitats in the Pacific Northwest.

With one of the strongest El Nino's forecast for this winter, it looks like weather extremes will continue for many parts of North America for at least the next year or so. All we can really do is batten down the hatches though, as weather is something none of us can change, at least in the short term.

With respect to *JARS*, I would like to again thank all those ARS members that send me material to publish. While I solicit some articles from speakers and show garden owners at conventions, the majority of *JARS* material is simply submitted by members to showcase their geographical areas or discuss hybridization or culture issues. Your support is all very much appreciated!"



Exploring for Rhododendrons in Western Yunnan, China Part 2: The Upper Salween River Valley

Salween River downstream above Gongshan, NW Yunnan.

Steve Hootman
Seattle, Washington

Photos by the author

(*Modified from an article in the* Rhododendron Species 2007, Vol. 2*, the yearbook from the Rhododendron Species Foundation, Federal Way, WA*)

[**Editor's note:** Although the expedition described here was undertaken 14 years ago and occurred soon after the attacks in the USA on Sept 11, 2001, it is unfamiliar to most ARS members as it has not previously been published in *JARS*. This is the second part on a rhodo hunting trip into the northern portion of the Salween/Irrawaddy region (see Hootman 2015 for Part 1), and it also describes the challenges of exploration into one of the least travelled rhododendron habitats.]

Getting back to Gongshan

From the Dulong Gorge (Hootman 2015), we made it back to Kongdan in three days. We were at first relieved to hear that the road east from the Irrawaddy River watershed to Gongshan on the Salween River was open as it had been closed for the past several days due to landslides from the constant rain. Unfortunately, but not surprisingly, there were no vehicles for hire to drive us back to Gongshan. A message was sent to our drivers who were, of course, still in Gongshan, not realizing that we had returned early to Kongdan because of impassable trekking to the mountain ridges above the Dulong Gorge (Hootman 2015). At around five in the afternoon, we conceded that we were stuck for the night and we unpacked our gear, only to hear during dinner that the road had once again been closed due to a landslide. The next day things were not looking better. It had rained hard all night and continued through the morning. The road was obviously still blocked and so we began planning for the next day when we would start our trek out of the valley up and over the Irrawaddy/Salween divide on the footpath that served as the old trader's route between Gongshan and Kongdan and back to Gongshan. This was not a very positive development because it would take us five to six days just to hike out, most of that time in similar conditions to what we had experienced along the Dulong—mud, heat and many, many leeches.

At dinner, Dr. Zhou presented us with another option. In order to maximize our shrinking schedule and to cover as much territory as possible, we could split into two groups, the first leaving in the morning on foot for Gongshan while the second group would hole up in Kongdan and wait for the road to open. This could be a few days.

In this way, the first group would be able to botanize the pass and forests along the footpath. The Kongdan group would catch the first ride available and camp their way out along the new road back to Gongshan. However, just as this was being sorted out, Dr. Zhou informed me that the governor of the prefecture had been stuck on the Dulong road for the past two days, and so because of this, the road had been opened sooner than anticipated! It was obvious that we should change plans again and take the entire group back to Gongshan as soon as the first vehicles arrived in the morning. We celebrated with more beer but every time I went to see the Chinese, there was a new report. The road was open, the road was closed, the road was open, and so on. We had no idea what the real situation was until late that night when we heard some trucks drive into town. We would drive out first thing in the morning—unless the road washed out again. In the morning, we quickly loaded most of our ten-man group into the first available truck. They drove off with smiles, leaving most of the baggage, George, Mr. Yang and myself to await another vehicle. Around an hour later, a second truck was hired and we quickly loaded our gear and ourselves. The vehicle was what we called a "mini-lorry," being one of the small logging/all-purpose trucks able to squeeze through the tunnel on the pass. George and I were crammed into the front with our packs on our laps, virtually sitting upon one another. It was an uncomfortable and very rough seven hours back to Gongshan, diesel fumes spewing into the open window the entire journey. We focused on the road, happy to be leaving the Dulong and headed for "home" in Gongshan. I had been involved in many expeditions and so knew the feeling of "coming out" of the mountains. I told the other members of the party that the small town of Gongshan, a quaint backwater on the edge of nowhere, would look like New York City when we returned. I was not proven wrong. We were lucky to have a decent day of weather and the road remained passable all the way out. Perhaps our luck was changing for the better.

Exploring on the Dulong Pass Road

Back in Gongshan, we had our first shower in over a week, a feast and plenty of beer, enjoying our return and the clean clothes that we had left behind. We sorted out the plans for the next several days, weighing our options now that we were free of the Dulong and with only a little over a week left in which to accomplish something. It was decided that most of our group would leave in the morning for a four to five day round-trip trek up to a high pass near the Forest Station known as Qiqi, the same mountain pass that we would have crossed had we walked out of the Dulong. I with two of our Chinese hosts would drive back up the Dulong road to explore that region. In this way, twice as much territory would be covered in the same amount of time. We would spend two nights on the pass before returning to Gongshan to explore some of the surrounding high valleys that were accessible via old logging roads while we waited for the walking party to return. All of the ponies had been left behind in Kongdan when we departed in our hired trucks but fortunately Dr. Zhou had arranged for them to start over the pass to meet us in Gongshan. Amazingly, they actually made it to Gongshan to meet us the morning of our departure for Qiqi, only two days after leaving Kongdan. This journey would have taken us at least five days to walk, so it again demonstrated the incredible endurance the pony men had.

After quick goodbyes, we all left and after a few hours, my group reached the lower slopes of the pass and we began to look for a place to set up our camp. We stopped at a small valley intersecting the road but it was still raining on and off, and although there were flat areas where we could set up camp on the floor of the valley, the ground was like a giant sponge, the numerous small surface ponds indicative of the high water table. Dwarf rhododendrons and other interesting plants grew in profusion in the peaty, spongy soil but it was much too wet for a camp. As is typical for this part of China, there were no flat areas away from the valley floor and the surrounding slopes were much too steep for tents. The edge of the primitive, narrow road dropped precipitously off into deep canyons, but we eventually found a wider spot in the road where we set up our camp, placing large rocks between ourselves and the main track in an effort to prevent being run over in the night. I watched in amazement as our Chinese hosts quickly assembled a shelter out of bamboo and tarps and we soon had a warming fire, but spent the evening choking down smoke as the rain poured down around us.

It rained all night and throughout the next day as we hiked back up the road to the little valley we had first considered as a campsite. The road crossed the valley at about 10,600 ft (3250 m) and we were thoroughly soaked by the time we reached the ridgeline that ran to the pass at around 12,000 ft (3630 m). We spent a very successful day exploring the valley and ridgeline, making many collections of some outstanding plants, including *Rhododendron mekongense*, *citriniflorum*, *stewartianum*, *calostrotum* subsp. *keleticum*, *forrestii*, *chamaethomsonii*, *temenium*, *cinnabarinum*, *campylocarpum* subsp. *caloxanthum* and *saluenense* subsp. *saluenense*. Seeing *cinnabarinum* here really brought home the point of how incredibly vast and so little known the Sino-Himalaya remains. Although this area of northwestern Yunnan had been explored by several of the early plant hunters, including Kingdon Ward, Forrest, Rock and Handel Mazzetti, none of them had ever documented *cinnabarinum*, a species previously only recorded from much further west in the Himalayas. I had first seen it in this region in 2000 on the pass above Qiqi, the destination of the other party, and was amazed at how common and widespread it was in this part of the world.

R. citriniflorum was the most common among these rhododendrons, and by far the most variable species in the area. One could have easily named several species of subsection *Neriiflora* from among the many permutations on display. The *forrestii*, in its "*repens*" form, grew under and amongst the larger species. It was also quite common on large mossy boulders that had been exposed in the numerous small streams. Besides the disjunct *cinnabarinum*, my rhododendron highlight was seeing large colonies of

R. forrestii with *Cassiope* on top of a boulder*.*

R. cinnabarinum, 3235m.

temenium, a little-known and little-grown species in subsection *Neriiflora*. The plants formed upright but compact small bushes up to two feet (61 cm) or so in height. They were beautiful plants and quite distinct, probably representing the variety *dealbatum* which is distinguished by its tomentose shoots, glabrous lower leaf surface and rose-pink to white flowers. This is a real treasure and was quite a notable find.

Among the other plant highlights was the tremendous variety of alpine Ericaceae. These rhododendron relatives grew interspersed with the dwarf rhododendrons and included members of the following genera: *Vaccinium* (incl. both *sikkimense* and the rare *modestum*), *Gaultheria* (several species including *praticola*, *trichophylla*, *fragrantissima*, *hookeri*, *hypochlora*, etc.), *Cassiope* species and *Diplarche*. Among the other treasures were several species of *Primula* (*agleniana* being the most desirable and rare), *Dysosma* species, and many members of the lily family (*sensu lato*) including species of *Maianthemum* (formerly *Smilacina*), *Polygonatum*, *Veratrum* and *Streptopus*.

It was an exhilarating day scrambling up and down cliffs, sliding up and down stream banks and pushing through the ever-present bamboo thickets so common at higher elevations in this part of the world. It felt great to be out among the plants we had come to see and finally make a decent number of collections. That evening, back in our roadside camp, we dried our clothes and boots, and after dinner, a passing truck stopped and we all shared a bowl of homebrew rice wine.

The next morning we walked down the road with the plan of being picked up by our jeeps and then driving back over the pass into the upper forests of the Du-

R. temenium var. *dealbatum* (real thing!), 3500m.

Gaultheria *forrestii*, 2630m.

Gaultheria hypachlora, 3625m.

long, where we hoped to collect *Rhododendron hylaeum*, which we had seen there but not collected. We also planned to collect more of both *R. martinianum* and *sanguineum* subsp. *didymum*. As we walked the road we found *R. floccigerum*, *anthosphaerum*, *rubiginosum*, *megeratum*, *brachyanthum* subsp. *hypolepidotum*, and the unusual fall-blooming *monanthum*. This last-named species is a dwarf little bush with small olive green leaves and smooth mahogany bark with bell-shaped yellow flowers. It was in full flower in early October, its normal blooming season both in the wild and in cultivation.

That evening, we were back in Gongshan. In our hotel, we once again started the process of drying our gear and sorting our collections as we waited for dinner. It was another feast, with lots of beer and firewater. Sautéed lily bulbs were on the menu as well as one of my very favorites, stir-fried hornet larvae. As we relaxed with our Chinese friends, I thought of the other group, hoping they were having good luck with the weather, and enjoying an outstanding trek through what I knew to be one of the finests forests in all of china.

Exploring on the Biluoxue Shan

We awoke to a fine sunny Saturday morning, which was to be our last day in the

R. *vaccinioides*, 2425m.

Pleione sp, 2700m.

field in the Gongshan area. The other group was scheduled to arrive back in town on Sunday and we would then be heading south to finish the expedition. After another fantastic breakfast of *jiaozi* (steamed dumplings or what some people call won-tons or pot-stickers), we got into our jeeps, hoping the dry weather would hold for our day trip into the Biluoxue Shan. This mountain range runs along the eastern bank of the Salween and contains a surprisingly different flora from that which we had been seeing on the river's western bank in the Gaoligong Shan. In 2000 we had spent a very productive day up a steep valley just to the south of Gongshan in the Biluoxue Shan. It was called Yi Niu Gu, and we had seen many interesting plants including the rare *R. hylaeum*, which until that time was not known to occur east of the Salween River. Higher up, we had also found *R. citriniflorum* var. *horeaum* and the big-leaf *R. praestans* in both white and wine-red flowered forms. I was anxious to return here, and hoped to collect seed of all three since we had not been able to find any the previous year. We were warned that the road had fallen into disrepair due to the government-imposed cessation of logging in the region. This was surprising because we had hiked through active logging camps the previous spring, the felling of the large hemlocks having provided easy access to all of the epiphytes growing in their tops. Apparently this was all illegal, and we were told that the officials who had allowed it to take place were now in jail.

After a few hours of driving, we reached a washed out bridge at around 7700 ft (2350 m), so unfortunately we had no recourse other than to head back down the way we had come up. It turned out to be a completely wasted day because all of the forest on the way up had been removed for agriculture. We could have walked up the road but due to the overall shallow grade of the valley, we would not have made it to anywhere near the elevation of around 9000 ft (2740 m) where the native forest would still be intact and the rhododendrons and related flora would be accessible or at least interesting. The shallow and relatively wide nature of the valley was of course the reason the road, and thus the people, were here to begin with. Most valleys along the Salween are nothing more than deep canyons with virtually perpendicular walls, so this was one of the few accessible places along the entire river. There was no way we could walk up and back in a single afternoon given the distance involved. Our Chinese friends informed us that all the other formerly accessible roads had been blown up to prevent illegal logging in the numerous national parks and preserves that had been set aside along both sides of the Salween. Disappointed, we thus turned the jeeps around and headed back to Gongshan.

We had a late lunch in Gongshan at a place "famous" for its "Fire Pot," also called hot pot. This turned into a two-hour long affair of feasting and drinking. The fire-pot is a large metal container with a burner beneath. Beer and seasoned broth are boiled in this and large plates of vegetables, tofu, mushrooms and freshly killed "shrapnel chicken" (whole chicken chopped up with the bones shattered) are brought forth and placed into the mixture a piece at a time. It is very spicy and quite delicious. The tables and floors are soon covered with liquids, grease and chicken bones. The final course consisted of several bowls of chicken blood that had been allowed to congeal as we ate the corpse. I cleaned seed for the rest of the afternoon, and had little appetite for the fine dinner later that evening.

Exploration from the Qiqi Pass

More seed cleaning and sorting the next morning after another fine breakfast of "*jiaozi.*" We looked forward to reuniting with the other members of our team, due to arrive back from Qiqi that afternoon. Around 2:30 PM they showed up, quite wet but very happy. There were grins and handshakes all around as we compared notes from our separate expeditions. They had had a tremendous trek and were overwhelmed with

View of old-growth *Taiwania* from Qiqi, 1900m.

the incredible flora they had seen. I well knew, from previous expeditions through the region, of the forests of massive and ancient *Taiwania flousiana*, a redwood relative that like its North American cousin, is now quite rare in the wild, especially as old-growth. Expedition member Don Selcer has kindly agreed to let us publish from his personal journal entries describing a portion of their expedition to the Qiqi pass:

10/10/01 Today, Jens, Peter, George and I along with Zhou, Li, Mr. Li the conservation officer and a couple of pony guys and seven ponies, hiked up to the forestry station at Qiqi. We left a bit late because the ponies didn't show up on time. We started hiking up the Pula River around 10 AM and followed its tributary all the way up to Qiqi. The trail was infinitely better than the Dulong. No leech bites, little standing water, no rain and one could walk along and get into a hiking rhythm, and once it started to climb—we gained 500 m—became a beautiful forest, with oak, lithocarpus with huge seedpods, *Magnolia* spp. *rostrata* and *campbellii* v. *mollicomata*, pine, hemlock, *Taiwania flousiana*, and *Rhododendorn* spp. *stenaulum, protistum*, and *nuttallii*. The *stenaulum* were huge with gorgeous purple smooth trunks.

The forest across the roaring river is untouched, mostly evergreen, with huge taiwania, 250 ft (76 m) tall with dark dense green crowns, and vertical grayish-brown bark. The forestry station looks over the river valley and is away from any settlements, without mud and we sleep on beds indoors.

Dinner, cooked by the Chinese on a fire in a little outbuilding was good—rice, taro soup with mustard greens, Chinese bacon and cabbage, along with preserved mushroom strips in oil, dried eggplant in a plastic bag, and the ever-present 2.9 % [alcohol] Dali beer.

Each day at around this elevation and a bit higher, here and in the Dulong, we've heard the nearly constant screeching hiss of the cicadas. They seem to take a deep breath and then blow into a reed with much intensity, [the sound is actually the vibrating of a diaphragm as I remember]. It's very loud and impressive and usually pleasing. The wagtails are numerous, with black bibs and top of head and white sides of face.

Tawania flousiana, 1800m.

10/11/01 We hiked out of Qiqi in a light rain at 9:30 AM. The rain tapered off and except for occasional drizzle, was not a real problem. The trail was sometimes slippery and rocky and wet but not muddy. We ascended through a spectacular, complete, amazing old growth pristine forest, with some taiwania early on, large oaks and lithocarpus, *Acer campbellii* and higher *A. pectinatum*. The river is now faster and very picturesque, and waterfalls come down from the side canyons. The plant life is very rich—vaccinium, gaultheria, paris, ferns including filmy ferns, selagenella with long spore stalks, many orchids including flowering pleiones on mossy cliffs, and wonderful rhododendrons. *R. protistum* are on very steep terrain, some 70–80 ft (21–24 m) tall with three foot (0.9 m) diameter trunks, still understory plants stretching for light, some with enormous seed capsules like a bunch of mini-bananas. Also *R. seingkuense* (sp?) with seed capsules growing on boulders, cliffs and epiphytically. They grow vertically up or down depending on the light and look like small-leafed edgeworthii, bullate with thick brown indumentum (which occurred in similar habitat a bit higher up) with excellent foliage, and have yellow flowers in spring. *R. monanthum*, on cliffs or trees, was flowering—yellow small bells. *R. vaccinioides*, with a beautiful low dense habit was often on tree trunks and up in branches also as were tiny-leafed vaccinium, blue-berried gaultheria, orchids and ferns. The entire scene was overwhelmingly beautiful, and we were the only ones around! We camped in a little-used site in the old growth forest. The ground was covered with a thick carpet of greenery—moss, logs, a white flowering little ranunculaceae ground cover and seedling rhododendrons, especially *rubiginosum* and *sinogrande*. Nice sinograndes are everywhere, to about 30ft/9m. Larger ones were lower down on the trail, especially dense along the river banks, where they created a memorable sight.

This is what we were all hoping to experience and we're very happy. After dinner (cooked on a fire under a tarp) of soy beans, sausage, rice and taro, we talk briefly and then head for our tents. It's chilly, the ground is soft. The primeval forest is all around, with huge *Abies ernestii* (over 200 ft (61 m) tall), picea, maples, and lithocarpus.

10/12/01 Today we hiked up from the campsite at 8900 ft (2713 m) to the pass at 11,900 ft (3627 m) and back, at least 10 mi (6 k). We left at 8:30 AM and returned at 5:00 PM except for Jens, who returned at 7:00 PM in the dark with a very sore foot. It was an exhausting but wonderful hike. There had been no rain overnight, and none in the morning as we ascended over a rocky trail (often "paved" with cobblestones and six foot (1.8 m) wide—this was the main route from Gongshan to Kongdang before the disastrous road was built). The forest continued with many acer, hemlock, fir and spruce, then *Larix speciosa*, and *Abies delavayi* with its blue cones higher up, and a rich understory of many kinds of sorbus, rhododendrons (spp. *rubiginosum, stewartianum, fulvum, citriniflorum, cinnabarinum, floccigerum, arizelum*, and higher up sprawling old specimens of *keleticum* crawling over boulders with *R. forrestii*. As we approached the distant pass, the route grew steep, and we ascended into the clouds. The temperature, previously in the 60s, fell to 45° F (7° C), with a wet cold wind and minimal visibility. At the pass were masses of *R. saluenense, forrestii*, and *xanthocodon* along with tiny cassiope, vaccinium, dwarf juniper and a magenta flowering *Diapensia*. It began to rain and we descended after a necessarily short stay at the top down a now slippery and treacherous rocky path, having to concentrate on every step. But it was one of the best hiking days ever. I went right into my tent, put on warm dry clothes, took Advil (knees), drank water, and lay down! Then dinner and twelve hours of fitful sleep before the descent to Xixi and the next day Gongshan. The relatively good conditions, the small group, and the fantastic scenery in an area where we saw no other people for three days made this the high point of the trip for us all. Zhou and Li have been great and are happy that we're happy.

Back in Gongshan that night after dinner, our entire group gathered together in the lobby of the hotel with our massive collection of specimens. We worked well into the night processing a large portion of our material. As I had hoped, we were quickly making up for the poor days in the Dulong.

The following day, we continued working on our collections until the early afternoon and had only a short time to do a final packing after a quick lunch. We had a 3:00 PM meeting scheduled with the local government officials and as very few people from the west visit this part of China, they were anxious to speak with us and gain some advice on tourism, etc., as well as to hear about the first "successful" foray into the Dulong. We were taken to the sixth floor of the government building and seated in a very official-looking room full of large wooden chairs covered with red velvet seats, where we were placed on one side of a long wooden table facing a long row of officials in their formal dress. It reminded me of something out of an old Soviet-era movie. It was all very formal and we were served tea as introductions were made all around. A long speech relating to their region and its preservation was presented through an interpreter. As group leader I was asked to speak about our experiences and to give my impressions of their district, especially pertaining to the promotion of local conservation, the attraction of international funding, and related issues. This all went on for quite some time and by the end, several of our party had given short speeches. Group photos followed on the roof, and we were all invited to a goodbye celebration at a local restaurant.

These "end of the trip" parties with local government officials were typical for such expeditions but this one was exceptional in my experience. A veritable feast of local delicacies was laid before us as we gathered around three large tables. It seemed as if every government official in Gongshan, including the Vice-Governor himself, had been invited, and we toasted each and every one of them. The party went on until quite late that evening as dish after dish and toast after toast was presented. It was a great and fun-filled send-off, full of laughter and friendship.

R. sinogrande, 2680m.

Exploring the Hpimaw Pass

The next morning we were all a bit shaky for the long drive back down the Salween. Fortunately, it was an uneventful day and we made it to the "metropolis" of Liuku by late afternoon. We would stay in Liuku for two nights with the day between, our very last in the field, spent on the nearby Hpimaw Pass into Myanmar. For dinner, I arranged for a chicken to be cooked whole instead of being chopped up into little bits from its beak to its feet as is customary in this part of the world. Dr. Zhou saw to my request and we all enjoyed the pleasant change from our daily, though tasty, fare of "shrapnel chicken."

We awoke to a beautiful sunny day, a nice change and a pleasant surprise for our

R. sinogrande with *R. sidereum* in lower left corner, Hpimaw pass, Burma side, 3035m.

last day. The three-hour drive up to the Hpimaw Pass at 11,150 ft (3400 m) was very scenic, with fantastic long views down the Salween River valley and the surrounding mountains. An expedition in which I participated in the autumn of 1997 had twice failed to reach this famous plant hunting location due to washed out roads. We tried again in the spring of 2000 with much better luck due to the improved road conditions. By then, the old dirt road had been completely paved to facilitate the constant stream of trucks weighed down with virgin timber coming non-stop out of northern Myanmar. On that expedition, we had finally found the elusive *R. mallotum* in the wild. This was the first time that it had been recorded by westerners since it was found by George Forrest in 1924. That spring of 2000 we also found many other exciting species of *Rhododendron*, including a deep orange-red form of *dichroanthum* subsp. *schyphocalyx*, the rare *basilicum*, *sinogrande*, *arizelum*, *sidereum*, *campylogynum*, *fulvum* subsp. *fulvum*, *edgeworthii* and *pseudociliipes,* to name but a few. It is an extremely rich area.

During this visit we stopped on the pass and split into two groups, the weather still cooperating. Everyone followed me up the ridgeline except for Jens, who comprised the other group of one, and who elected to bushwhack his way along the ridge on the other side of the road. We agreed to meet at 4:30 PM and head back down the mountain. My group started straight up the mountain, pushing through the all-encompassing bamboo. We soon reached the same area where I had seen the *mallotum* and other treasures the year before. It was a great day in the sun and you could not have placed us in a better location at that moment. We were all in high spirits as we climbed the tall trees of the big-leaf species *R. basilicum* for a view over the bamboo of the surrounding mountains—fantastic! We made many interesting collections which were topped off that afternoon when we picked up Jens along the road. In addition to the myriad of material we had seen, photographed and collected, he had found *heliolepis*, *caesium* and *euchroum*. The first named is not too unusual, though we had not found it up here before. *R. caesium* is a little-known member of subsection *Trichoclada* that had only been collected once before, in 1925 by George Forrest. It remains

The first flowering of *R. mallotum* from the Hpimaw Pass.

R. seinghkuense, 2030m.

R. euchroum.

rare in cultivation although it has attractive glaucous blue-green leaves and yellowish flowers in late spring. The third-named species, *R. euchroum*, is a member of subsection *Neriiflora* that has never been introduced into cultivation. It is closely related to *sperabile* and *albertsenianum*, differing in being more glandular with smaller leaves. It is a fine foliage plant with a deep red-brown furry indumentum. We congratulated Jens on his outstanding discoveries and headed back to Liuku. Our field work had come to an end.

For our final feast and celebration, we drove to a fine restaurant well outside of the large city of Liuku. Once again I made a special request for any large chunk of meat, cooked but not chopped up into little pieces. By this point in an expedition, most westerners are ready for a solid bite of meat, anything unencumbered by small slivers of bone. The others did not know what was coming and were thrilled when a roasted young pig was brought out as the first course. The whole pig was gone in a matter of minutes. Later that evening, we processed our day's collections on the floor of the hotel lobby and retired to bed, exhausted from the last several days travel and work.

Reflections

The long journey home began the next morning as we retraced our path—Liuku to Baoshan to Kunming to Hong Kong and then on to Seattle. It had been a very disappointing trip in many ways. My failure to penetrate significantly into the mountains of the Dulong Valley (Hootman 2015) overshadowed the fact that we were the first group to access that previously forbidden and remote valley. On the positive side, our later excursions made up for the first half of the expedition and we gained a great deal of knowledge, having processed multiple specimens of 428 individual collections, many of them new locations for rare species or even species that were completely new to science. Had we accomplished what we had set out to do? In many ways yes! To quote expedition member Peter Wharton, Curator of the Asian Garden at the University of British Columbia Botanical Garden, writing in the UBCBG journal *Davidsonia*, Vol. 13:1/2:

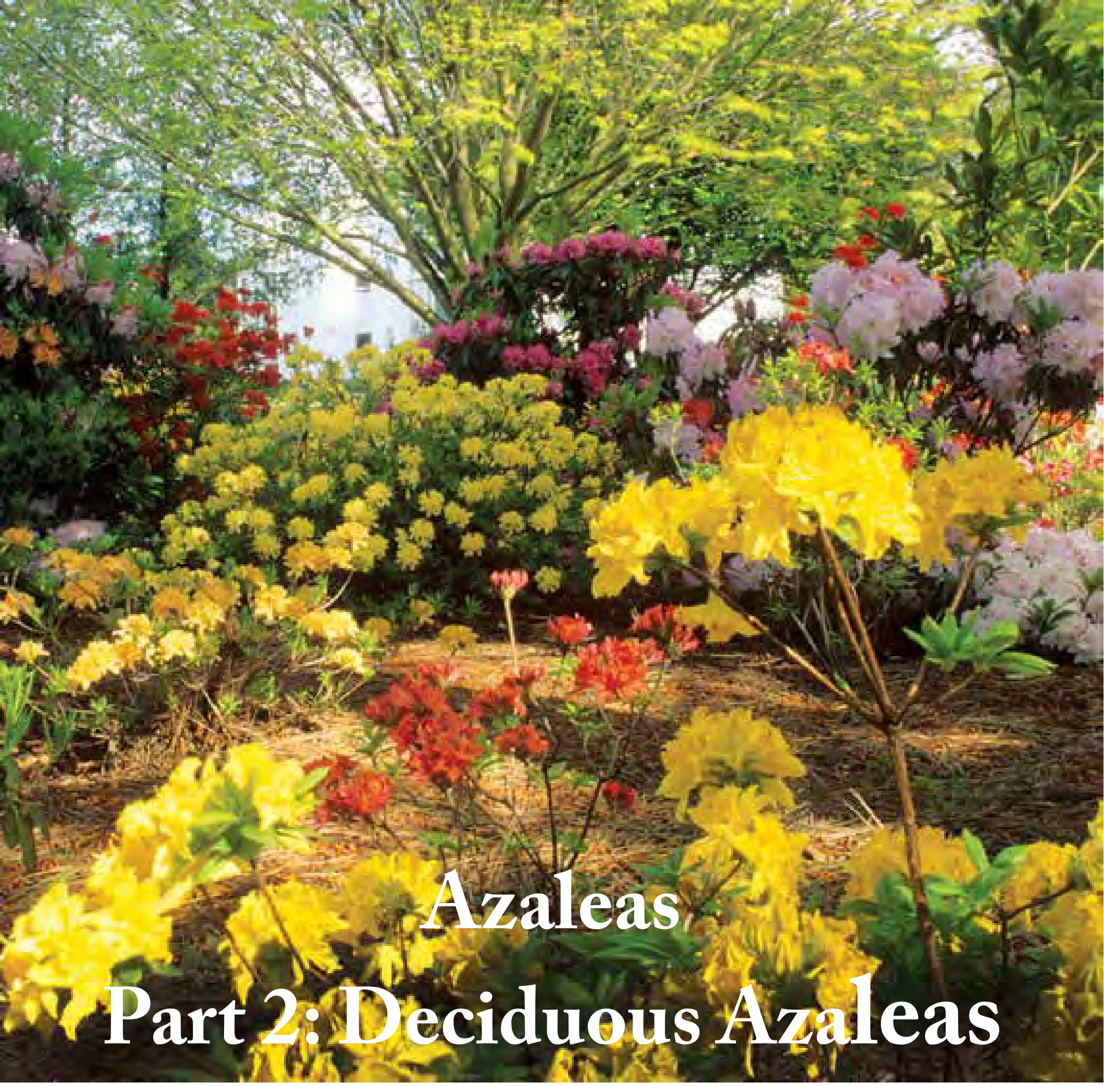
> This was a very successful exploration trip. The itinerary and field work were planned and executed in a thoroughly professional manner. Most of our collection and all of our exploration objectives were realized. We saw 87 rhododendron species in the field and collected seed of 55. We established an excellent personal and professional rapport with our hosts.

We were all excited and anxious to get home, although it had been strangely calming and even healing following the events of Sept. 11 to be so remote and living under such different, and often difficult, circumstances, our thoughts, like those of many of the people we had met, being largely absorbed with day to day survival and life itself.

Reference

Hootman, S. 2015. Exploring for Rhododendrons in Western Yunnan, China: Part 1: The Gorge of the Dulong. *J. Amer. Rhododendron Soc.* 69: 115-127.

Steve Hootman is a member of the Seattle Chapter, is the Executive Director and Curator of the Rhododendron Species Foundation in Federal Way, WA, and is a world-recognised expert on the genus Rhododendron.



Azaleas
Part 2: Deciduous Azaleas

Deciduous azaleas in the landscape.

Don Wallace
McKinleyville,
California

Photos by the author

(*Modified from the Singing Tree Gardens August 2013 newsletter*)

Some History

In the early 1700s, plant hunters like John Bartram and Andre Michaux began receiving money from some of the wealthy estate barons to collect, identify and bring back some of the deciduous azalea species found growing wild on the east coast of the United States. Somewhere around the early 1800s, hybridization of these collections with European, Chinese and Japanese deciduous azaleas started. The first recorded hybrids were done by a Belgium named Monsieur P. Mortier. Mr. Mortier was considered to be the first to be successful at crossing the American azaleas, *R. calendulaceum, nudiflorum, arborescens*, and *viscosum*, with the European *R. luteum*. Since he lived in the town of Ghent, Belgium, these creations took on the name "Ghent Azaleas." The first crosses bloomed around 1825, and by 1836 there were over 107 named hybrids.

Ghent Azalea.

Improvement with the Addition of Chinese and Japanese Azaleas

The Mollis Azaleas

Even though the Ghent azaleas were colorful, large and slightly fragrant, hybridizers of the day knew improvements could be made. In the late 1800s, Anthony Koster in Belgium crossed the recently introduced Chinese azalea, *R. molle*, with the Japanese azalea, *R. japonicum*. These hybrids were then crossed with the Ghent azaleas resulting in larger, brighter colored flowers with flat faces. These became known as the Mollis Azaleas, and can still be found today.

Mollis Azalea.

R. occidentale.

'Homebush', a Knaphill Azalea.

The Knaphill Azaleas

Anthony Waterer and Sons set out on a mission to use the Western American Azalea, *R. occidentale*, to create a new class of deciduous azaleas that outperformed any of the other available azaleas of the day. They were successful in achieving many improvements to the Mollis Azaleas. They called their new strain the "Knaphill Azaleas." The resulting Knaphill azaleas seemed to have everything: size, scent, glorious autumn tints, and a scheme of flower colors ranging from flame, orange-red, pinks and yellows to pale cream and white with gold or orange blotches.

The Exbury Azaleas

To many people today, all deciduous azaleas are "Exbury Azaleas." So, we have to ask the question, "What are Exbury Azaleas?"

Around 1920, Lionel de Rothschild, a banker by profession, purchased Exbury and began planting rhododendrons and azaleas on a larger scale than anyone before him had. He planted over one million rhododendrons, and just about as many azaleas. His hybridizing efforts gained his brand, Exbury Azaleas, more recognition than the Ghent, Mollis, or Knaphill azaleas received. This was mainly because Mr. Rothschild made his azaleas available in large numbers to the general public. In the beginning, he acquired a few of the Knaphill azaleas, which he used as parents. His goal was to create azaleas with stronger, clearer colors than his predecessors. To accomplish this, pinks were crossed

Exbury Azalea.

'Cecile', an Exbury Azalea.

'Klondyke', an Exbury Azalea.

'Washington State Centennial'.

‘Arneson Gem’.

‘Arneson Ruby Princess’.

with pinks, yellows with yellows, and oranges with oranges (Berrisford 1964). It wasn’t until the early 1930s that the Exbury Azaleas began going out to the public for sale, but gained the most acclaim when they were shown at the 1937 Chelsea Flower Show. From that point on, Exbury Azaleas gained more and more notoriety and praise, winning awards throughout Europe and abroad. After World War II, Exbury Azaleas became very popular in the United States, and “It is probably true to say that in 1956, the Exbury strain of Knaphill azaleas was better known in the United Sates than it was in England” (Street 1959).

An interesting development was that in order to produce enough plants of these exciting azaleas, nurserymen of the day grew huge numbers from open pollinated seed. They were mostly all good plants, but not the same as the original hybrids created by Lionel de Rothschild.

‘Arneson Golden Solitaire’.

> They are a group of plants with superior flowering qualities that have been developed by some very dedicated people. They are continually being improved on in order to develop new plants that are wonderful and different. Species and hybrid azaleas from around the world have contributed to the development of these hybrids and resulting plants are providing our gardens with unmatched color, fragrance, and beauty (Christian Cash 1986).

Some Newer Creations - The Arneson Azaleas

Some years after the Exbury Azaleas were the rage in American and English gardens, other hybridizers were busy creating even more exciting plants. Here are a few of our favorites, with a little about those who created them.

Arneson Azaleas

Ivan and Robertha, a husband and wife team from Portland, Oregon, began hybridizing deciduous azaleas in 1959. They were very prolific, making over 100 crosses per year, resulting in some very fine cultivars that are available today.

R. 'Arneson Gem': This deciduous azalea is probably the best that they have produced, displaying bright yellow flowers with orange edges in early May. A vigorous plant with attractive bronzegreen leaves.

R. 'Arneson Ruby Princess': Bright, rich-red flowers adorn this low growing azalea in late May. The foliage is a bright green with red tips in June when it emerges, later turning a nice red-bronze color that contrasts with other plants. Stays low.

R. 'Arneson Golden Solitare': Lovely yellow flowers with orange highlights sparkle in the sun in early June. The foliage is a bright jade-green and looks good behind the flowers.

R. 'Washington State Centennial'

This spectacular deciduous azalea was chosen to be Washington State's Centennial Celebration flower, and if you have one, you will know why. It was created by the late Frank Mossman, who spent many years trekking amongst the natural habitat of *R. occidentale* looking for the best and most unusual forms. The hybrid is a cross between the Western Azalea and the East Coast native *R. cumberlandense*, then crossed again with the Oregon hybrid 'Santiam'. The flowers are like the Western Azalea, *R. occidentale*, on steroids. The cream, pink, yellow and orange flowers are huge and showy. Also, the foliage is very dark green and textured, offering interest. The plant grows slow to four feet (1.2 m) tall and wide. Stunning!

Don Wallace is a member of the Eureka Chapter and owner of the Singing Tree Gardens Nursery.

Water Rationing in Rio Dell, California

Marilyn Martino
Rio Dell, California

(From the Sept 2014 Eureka Chapter newsletter)

[Editor's note: The prolonged drought in western North America has continued in 2015, which is proving to be perhaps the driest spring and summer ever. Even in coastal southern British Columbia, we are experiencing an unprecedented lack of rain, so the experiences described by Marilyn have become widespread.]

This summer for a short time we in Rio Dell were denied the freedom to use any water for our yards or anything outside. It was a little scary. I found myself hauling out buckets of bathwater and all wash water for the rhodies. A friend helped me connect a hose to the washing machine that goes outside into an empty garbage can. All in all, everything needed a great deal of dipping buckets and carrying water everywhere. I'm on a third of an acre (0.14 ha), with some 60 rhodies plus everything else. And I discovered that even the mature rhodies may wilt in the summer if spring rains are sparse.

I began making a list of plants that could be sacrificed if necessary, and am giving away some hydrangeas and *Rhododendron sinogrande*, which are very thirsty.

The moratorium on watering was rescinded, but we still can water only two days a week, never on weekends, and are limited in our water units. Now conditioned to save water, I continue to reuse every last bit, and am still hauling buckets, though with less pressure now.

It is possible to have bathwater flow out into a kind of pond with a pump in it to create pressure for a hose. That would be an option if things worsen. We're into drought years now, so it needs some thinking about how to conserve.

The very best side of this is that with all the individual attention via hauling buckets of water, I paid very close attention to my rhodies and everything else, and still do, and really enjoy the resulting intimacy. Also, it's amazing how you can actually water so many plants just by recycling one person's indoor wash water. Oh, and my water bill went way down!

Viva Vireya

Dee Daneri
Fortuna, California

In 1822 a new plant was discovered in Sumatra. It appeared to be a rhododendron, but grew happily as an epiphyte. Until that time rhododendrons had been unknown in the tropics. The plant was named *Rhododendron malayanum*, and was the first species described in what became the "Vireya" group, named after Julian Joseph Virey, a French pharmacist.

In 1929, gold was discovered in New Guinea, and with it many new vireyas began to appear. By 1961, 122 new species had been discovered.

Dr. George Argent of Edinburgh Botanic Garden has devoted his life to the study, collection, promotion, and cultivation of vireyas and other tropical plants. In 2006, he published *Rhododendrons of subgenus Vireya*, which recognized 313 cultivars. In his just published second edition (see P 200), the number has increased to 323; this new edition is available through the ARSStore.org. Today we acknowledge that over one-third of the genus *Rhododendron* are vireyas.

Native vireyas are found at moderate to high elevations in Southeast Asia from Papua New Guinea, Malaysia, Indonesia, the Philippines, Taiwan and for a few species, on the mainland as far west as India. The plants have now been introduced to many semi-tropical areas of the world, including New Zealand, Tasmania, the Hawaiian Islands, Florida, and California, and some have been spotted growing in Mexico. Shortly after the Vallarta Botanical Garden (VBG) opened its gates in Puerto Vallarta, Mexico, in 2005, it was discovered that its latitude of 20° N was the same as the Pana'wea Rainforest Zoo and Gardens in Hilo, Hawai'i. Its elevation was also ideal for growing these remarkable plants.

An overwhelming majority of the world's biodiversity, both discovered and likely undiscovered, is in tropical areas, and that all life on earth benefits from this biodiversity. Vireya species exhibit a fragment of this extraordinary diversity.

In less than 200 years after the first discovery of vireyas in Sumatra, and only two years after Dr. Argent's first book, a vireya trial planting was initiated at the Vallarta Botanical Garden. The following vireya experts have guided us in this initiative at the VBG: Dr. George Argent, Royal Botanic Garden Edinburgh; Sherla Bertelmann, Hawai'i Chapter; Tim Walsh, District 5 Director; Dennis Bottemiller, Rhododendron Species Foundation; George Klump, Southern California Chapter; and E. White Smith, Bovees Nursery and the *VIREYA VINE*.

The tenth anniversary celebration will take place at the Vallarta Botanical Garden on November 14-15, 2015, when some members of the American Rhododendron Society will be there to welcome garden members and guests to the new Daneri Vireya Rhododendron House. The VBG has been named by the Canadian Garden Tourism Council as one of the "Top ten gardens in North America worth travelling for".

Tips for Beginners:
Dead does not Always Mean Dead!

Ian Efford
Duncan, BC,
Canada

(*Modified from the Sept 2014* The Rhodoholic*, the Cowichan Valley newsletter)*

This long summer without rain and with very high temperatures has meant that a number of us have lost rhododendrons. Lack of water for long periods can come from neglect or from a blocked irrigation system in a particular bed. I have lost five

Fig. 1. The “dead” plant in a bowl of water.

Fig. 2. New leaves erupting from the cutback trunk of the "dead" rhodo after a few weeks of soaking.

plants where they were shielded from the sprinkler by the unfortunate location of a tree or bush. Some of them were expendable but one or two were my favorites.

After digging up the dead plants, I decided to experiment with two in my "hospital." I cut the dead branches off and then put the roots into a bowl with shallow water (Fig. 1). I kept the water shallow so that oxygen could pass through the relatively large surface area and prevent stagnation. I kept the plants for some weeks, adding a small amount of water regularly to compensate for evaporation loss. Success! Small leaves (Fig. 2) later erupted from the main stem of a *Rhododendron schlippenbachii* after a couple of weeks and these eventually grew to small branches about six inches (15 cm) long. I then kept this plant in a pot for a few months before putting it back into the ground in a damper spot.

Many of my special plants are located where they avoid the sun most of the day but the late afternoon sun catches them. Recently, we had a very hot day and some of the plants suffered leaf burn, in particular *R. edgeworthii, R. albrectii,* and *R. sanctum.* My recovering *R. schlipennbachii* had particularly young delicate leaves and suffered the most. The others have damaged leaves but they are still alive as they were full size plants, but I many now have lost my plant that was recovering from its near death experience.

Ian Efford is a member of the Cowichan Valley Chapter.

Rhododendron dissilistellatum

Maurie and Pam Kupsch
Burnie, Australia

Photos by the authors

Maurie Kupsch

(Modified from the Rhodo News *June 2015, the newsletter from Emu Valley Rhododendron Garden Inc.)*

The story of this plant is interesting as we received it at the Emu Valley Rhododendron Garden in Burnie, Tasmania, Australia, back in 2005 as part of a collection of vireya species collected by the late, and much missed, Lyn Craven. This plant was collected on Gunung Sojol in Sulawesi and came to us as *R. radians*. It grew and flourished under that name and many cuttings were also successfully rooted, all we now realize growing under a mistaken identity!

Ten years later, we learn that the plant we knew as *R. radians* is in fact *R. dissilitellatum*! Under its new name it is still an unusual vireya with interesting flowers that are long

R. dissilistellatum leaves and flowers.

R. radians flowers.

R. radians leaves.

thin tubes flared at the end, white in colour with orange anthers on the stamens.

We now also grow *R. radians* from another collection and although the flowers are very similar, the leaf shape and general shape of the bushes, when viewed side by side, make the difference quite noticeable. Both of these species can be seen near the path leading to the Bob Malone Drive just past *R. tuba*.

It just goes to show that life in the world of plants is never boring, as similar name changes are continually being discovered or corrected by visiting experts—keeping up with it all is another story!

An Update on the Diversity and Function of Foliar Scales using Data from *Rhododendron* in section *Schistanthe* (Ericaceae)

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Erik Nilsen

Dedicated to the Memory of R.A. "Mitch" Mitchell

Layman Summary

Leaf scales (scarious trichomes) are common in many species of *Rhododendron*, yet the functional significance of scales to leaves is poorly defined. All members of *Rhododendron* subgenus *Rhododendron* have leaf scales, and the diversity of scale morphologies reaches its maximum in section *Schistanthe*. Possibilities for putative functional significance of leaf scales include leaf water conservation, reduction of solar energy load, stimulation of photosynthesis and defense against herbivores. The likelihood of functional significances are discussed in this article. Also, a survey of leaf scales, stomata, and leaf morphology across 83 species of *Rhododendron* in section *Schistanthe*, was used to probe the possibility that scales function to conserve water. The most important functional significance of scales was found to be a mechanism of water conservation, particularly for species with a native range at mid elevations on tropical mountains. Plants with cushion scales and stomata in crypts have the greatest potential for water conservation.

Background

Foliar trichomes (leaf hairs) are a very common occurrence in plants. Species with a wide elevation range often have denser leaf hairs at higher elevation. There are many shapes and sizes of hairs on plant leaves and many *Rhododendron* species have abundant trichomes on the underside of the leaf, which are commonly called the "indumentum." The indumentum can have a dramatic effect on the appearance of leaves, which can be a prized trait for breeders. This article provides an introduction about leaf hairs and summarizes a more technical article on the functional significance of leaf scales to leaf water conservation (Nilsen et al 2014).

Among the many types of hairs, glandular secreting trichomes (hairs with secreting glands at their tips) have been shown to function in defense against pathogens and herbivores as well as in pollinator attraction. Glandular trichomes are less common than other types of trichomes on *Rhododendron* leaves. Immature leaves of many species (e.g., *R. maximum*) can have glandular trichomes even though none are found on mature leaves. Glandular trichomes are more frequent on the fruiting bodies of *Rhododendron* species than on their leaves. The higher frequency of glandular trichomes on immature leaves and fruits exemplify the importance of gland tipped hairs for defense against herbivores because destruction of immature leaves and fruits by herbivores has a greater significance to plant fitness than partial destruction of mature leaves by herbivores.

Foliar, simple trichomes (ST) are structurally distinct from glandular secreting trichomes (GST) because they have no secreting gland associated with the hair. The ST are morphologically diverse and are very common among plant genera including *Rhododendron*. Some ST are long and thin, constructed from individual epidermal cells while others are thick and constructed from many cells.

The functional significances of ST are not well known and many possibilities have been posed. Foliar ST have been thought to influence leaf physiological processes, particularly transpiration by altering the relationship between the leaf blade and the turbulent air near the leaf surface. Moreover, adaxial (top leaf surface) foliar ST have been suggested to increase leaf reflectance, which results in reduced leaf temperature, reduced photosynthesis and decreased water loss for plants growing in hot climates. Furthermore, foliar ST could regulate leaf surface wetness by changing the physical-chemical nature of the leaf surface. Some researchers have suggested that foliar ST located on the abaxial (bottom) leaf surface may increase leaf boundary layer thickness which may decrease transpiration due to the longer diffusion pathway for water vapor from mesophyll cells to the turbulent air. The effect of ST on leaf boundary layer remains controversial. However, the quantity of pubescence (hairs) on leaves can be highly, negatively associated with regional precipitation and positively associated with drought tolerance.

Within the broad category of foliar ST, scales are defined as scarious trichomes that are characterized by relatively low height/width ratio. Leaf scales have a column of cells in the center (stalk) supporting a wing that has a greater circumference than the stalk cells. This definition contrasts with that for a hair, which is a long unicellular or multicellular appendage that tapers to a small tip. The cellular composition, sizes, shapes and orientation of the wing vary considerably among scale types, as does the density of scales per leaf area. Therefore, it is likely that the functional significance of scales and their relationship with other leaf surface features will vary depending on the scale wing morphology and scale density. Although, the functional significances of scales on Bromeliad leaves have been studied, the functional significance of either different types of scale morphology or different scale densities to leaf physiological processes is unknown.

Within the genus *Rhododendron* subgenera are partially defined by the presence or absence of foliar scales (Chamberlain *et al.* 1996). In fact, one of the main defining characters of subgenus *Rhododendron* is the presence of foliar scales and this group is often commonly referred to as the Lepidote Rhododendrons. There are several morphological types of leaf scales on *Rhododendron* species (Fig. 1) that can be found in one layer (uniseriate), two layers (biseriate) or in combination with leaf hairs (e.g., *R. stamfianum*).

The morphological types of scales have been defined several ways over the years. For example, Sleumer (1966) defined five types of scales, Davidian (1982) also defined five types using different terminology, Argent (2006) defined five types again using different terminology, and I expanded the number of types to seven (See Table 1). My

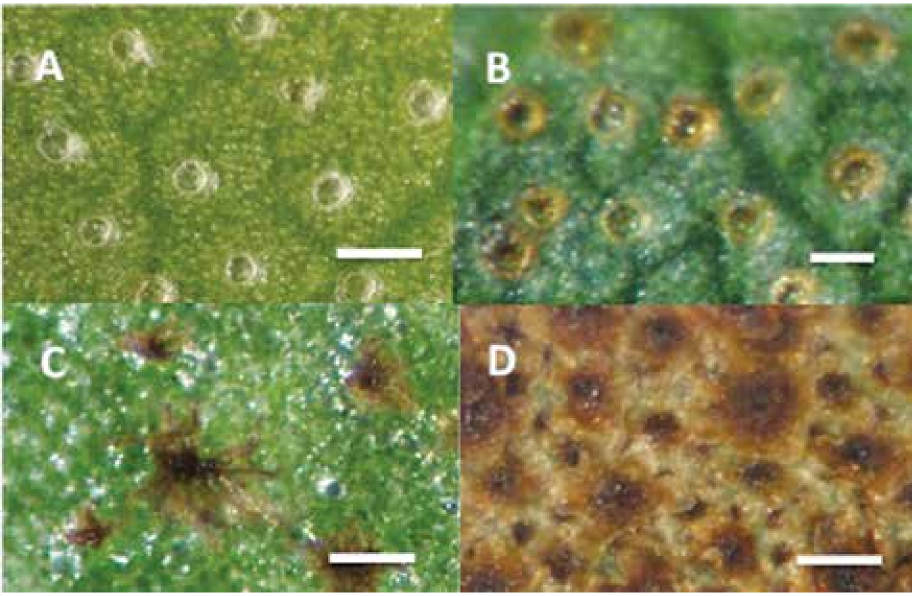

Fig. 1. Representative images of scales on the bottom side of several *Rhododendron* species. A.= *R. keiskei* with small peltate scales, B. = *R. spinuliferum* with large peltate scales, C. = *R. bryophyllum* with dendroid scales, and D. = *R. himantodes* with cushion scales. The white line on each image is approximately 0.1 mm.

ID #	Nilsen (2014)	Argent (2006)	Davidian (1982)	Sleumer (1962)	Diameter (mm)	Height (mm)
1	Sunken-Peltate	NI	NI	NI	0.06 ± 0.020	-0.01 ± 0.002
2	Small-Peltate	NI	NI	NI	0.06 ± 0.012	0.01 ± 0.006
3	Large-Peltate	Round	Entire, undulate	Broad center-wide wing	0.09 ± 0.038	0.01 ± 0.005
4	Cushion	Round	Vesicular	Cushion center-thin wing	0.10 ± 0.023	0. 15 ± 0.012
5	Crenate	Lobed	Crenulate	Narrow center-wide wing	0.11 ± 0.022	0. 12 ± 0.012
6	Stellate	Stellate	Lacerate	Stellate	0.10 ± 0.022	0.123 ± 0.024
7	Dendroid	Dendroid	NI	Dendroid	0.10 ± 0.022	0.36*

Table 1. The definitions for scale types used in this study compared with the definitions provided by other authors. Terminology for scale types in this study is based on Payne (1978). Mean ± one standard deviation of scale height and scale diameter are presented. Mean and standard deviation cannot be provided for stellate scales because only one accession had this scale type. *The presented height of dendroid scales is the sum of the means for crown, stalk and epidermal mound. NI = Not identified.

classification system splits the first type of scale, which was defined by other authors as round or entire, into three types of peltate scales. My expansion of the types only refers to the peltate (round, entire) scale type. The split of round scales into three peltate scale types is because peltate scales can have a large difference in diameter and height among plants. In addition, peltate scales can be imbedded in an epidermal crypt or extended above the leaf surface like other scale types. My expanded definition is for two reasons. 1) Peltate scales are the most frequent type of scales among lepidotes and these scales have the greatest variation in size among all types of scales, 2) My definition considers height, which influences the relative impact of the scales on the boundary layer of the leaf surface. It is important to note here that many lepidotes only have one type of scale; however, in several cases (particularly when there are biseriate scale layers) there is more than one type of scale on the leaf surface and the different types can have dramatically different densities on the leaf surface (Nilsen *et al.* 2014). For example, species with peltate scales commonly also have a low density of cuneate scales. Cuneate scales are larger than peltate scales and are cup shaped rather than flat topped.

Scales are not the only feature on leaf surfaces. Scales on upper surfaces tend to exfoliate (fall off) before leaf maturity. However, scales on the bottom leaf surface are retained throughout the life of the leaf. Normally, the bottom epidermal surface of lepidote leaves is composed of basal epidermal cells, scales and stomata. The most important features of the bottom leaf surface are stomata, which are openings in the leaf surface, surrounded by guard cells that regulate the movement of carbon dioxide into the leaf (photosynthesis) and water out of the leaf (transpiration). The regulation of gas exchange into and out of leaves makes these structures extremely important for leaf function and plant fitness. Stomata can sometimes be found on both leaf surfaces (amphistomatous), a trait which has been found for *R. saxifragoides* and hybrids of *R. saxifragoide*. However, the lions-share of *Rhododendron* species only have stomata on the bottom leaf surface, a feature called hypostomatous. The co-location of both scales and stomata on the bottom leaf surface of most *Rhododendron* species suggests a potential interaction between the two leaf surface structures that may impact plant processes such as photosynthesis and transpiration.

A negative relationship between scale density and stomatal pore index is one possibility. Stomatal pore index (SPI) is defined as stomatal density times the square of mean stomatal pore length. Stomatal pore index is highly, positively associated with maximum leaf transpiration rate. Therefore, plants with a small mean SPI will loose less water by transpiration and may be more effective at water conservation than plants with a large SPI. A decrease in SPI could occur in one of three ways because SPI is a product of stomatal density and stomatal pore size: 1) stomatal density could decreases while pore size remains unchanged, 2) stomatal density could remain unchanged while pore size could decrease or 3) both stomatal density and pore size could decrease. For example, scales could occupy space normally occupied by stomata, which would reduce the space available for stomata and result in water conservation. In fact, there is likely to be direct competition between the cell developmental processes that determine if cells differentiate into epidermal cells, stomata or scales. Consequently, stomatal density could decrease with an increase in scale density. Stomatal pore size characteristically decreases as the stomatal density increases for plants in general. Thus, stomatal density and stomatal size may counteract each other in relation to SPI. However, stomatal pore size may have an overriding influence on SPI because stomatal pore size is squared in the calculation of SPI. We identify this negative association as "spatial interference" between scales and SPI.

A positive relationship between scale density and stomatal pore index is a second possibility. Scales could increase leaf boundary layer and reduce vapor pressure deficit at the stomatal surface if the scales are dense and tall enough. Transpiration is the product of leaf conductance (due to SPI) and the vapor pressure difference (VPD) between the air at the stomatal surface and the turbulent air near the leaf surface. Between the stomatal surface and the turbulent air near the leaf surface is a layer of air called the boundary layer. Vapor leaving the stomatal surface must traverse the boundary layer by diffusion before being removed by the turbulent air. Therefore, the thicker the boundary layer the greater the resistance to water vapor movement from the leaf to the turbulent air. Thus, a thick boundary layer reduces the rate of transpiration and causes water conservation. The thickness of the boundary layer depends on the size of the leaf (larger leaves have thicker boundary layers) and appendages on the leaf surface that slow down the turbulent air (such as leaf hairs and scales). At a constant SPI, any increase in boundary layer thickness will decrease the transpiration rate. Consequently, transpiration could decrease if leaf scales caused an increase in the thickness of the boundary layer.

Also, there is a strong correlation between vein density in the leaf and stomatal density on the leaf surface. Thus, in leaves that have higher SPI, a greater number of veins are needed in the leaf to supply the water that will be lost out of the stomata. Given this correlation, there are two possible positive relationships between scale density and stomatal pore index that will allow for a balance between water vapor flow through veins and out stomata (transpiration) and evaporative demand (VPD): 1) Stomatal density remains constant and pore size increases causing SPI to increase in response to the thicker boundary layer created by scales allowing higher maximum leaf transpiration. 2) Both pore size and stomatal density increase with an increase in scale density and its effect on leaf boundary layer. We identify these positive associations as "morphological enhancement" of maximum leaf water loss by scales.

No relationship between scale density and stomatal pore index is a third possibility that we identify as the "neutral association." The neutral association between scale density and SPI could occur when pore size and stomatal density counteract each other. The neutral association would result in water conservation if the boundary layer increased with an increase in scale density even though SPI remained constant. Thus, even though SPI remains constant as scale density increases, the effect of scales could result in water conservation if the scales induce a larger boundary layer. Alternatively, a neutral association could occur because scale density has no influence on SPI or boundary layer and thereby has no affect on water conservation. In this case, the variation in stomatal traits would be independent of the variation in scale traits.

Summary of our published research (Nilsen et al. 2014):

One of the methods that can be used to understand the relationships between scales, stomata and water conservation is to examine the sizes and densities and distributions of stomata and scales on bottom leaf surfaces of many different lepidote species. This type of correlation study can identify possible relationships between the two major surface features and be used to interpret the result in relation to water conservation. We performed this analysis using one major section of *Rhododendron* (*Schistanthe*), and this article summarizes our results.

Schistanthe is a large section in *Rhododendron* (Ericaceae) subgenus *Rhododendron* (commonly called vireyas) that is characterized by tropical, montane, evergreen, epiphytes, shrubs and trees that have scales on the bottom sides of their leaves (Argent 2006). Within *Rhododendron*, foliar scales have their widest diversity among species of *Schistanthe*, formerly known as subgenus *Vireya* (Craven, Danet *et al.* 2010). Approximately 310 species of *Schistanthe* inhabit a wide elevation range in southeast Asia from sea level to 5000 m (Argent 2006; Sleumer 1966). Scale size, morphology, and density vary widely among species, but leaf shape (entire, lanceolate, evergreen) is relatively consistent. The uniformity of leaf shape combined with a wide diversity of scale morphologies and a broad elevation range among species make *Schistanthe* an ideal model system for studying the relationships among foliar scale traits, stomatal traits and habitat.

The overall objective of this research was to explore the diversity of scales and their relationships with stomatal density, stomatal dispersion and stomatal dimensions among species of *Schistanthe.* All plants were grown in a common garden to minimize the influence of environmental variation on the relationships between bottom leaf scales and stomata among species. In addition, we examined the relationship between scales and stomata in comparison with characteristics of the species' native range such as elevation and habitat type. The following hypotheses were posed about the relationships between these scales and stomata: 1) SPI will be inversely related to scale density because both stomatal density and stomatal pore size decrease, supporting the spatial interference theory; and 2) elevation of the native range on mountains will be the most important parameter of the natural habitat associated with leaf scale traits, even though precipitation and temperature change in a complex manner with elevation among different mountains.

Site description:

The common garden used for this study belonged to Mitch and Sandy Mitchell and was located in Volcano Village, Hawai'i, at 1207 m elevation on the flank side of Moana Loa. All accessions of *Schistanthe* were planted in well-drained soil of volcanic origin. There was a sparse canopy of *Metrosidorus polymorpha* Gaudich. (ōhi'a lehua) above the *Schistanthe* plants. Annual precipitation averaged 2500-3200 mm and was distributed equally throughout the year. Average monthly maximum air temperature varied between 19-22° C and the average monthly minimum varied between 14-16° C throughout the year. The annual variation in maximum and minimum air temperature (3° C) was less than the average daily variation in temperature (10.2° C). Relative humidity at dawn was 100% throughout the year and decreased to 75% on sunny days during the winter and to 60% on sunny days during the summer. Photosynthetic photon flux density (PPFD), a measure of light intensity, ranged between 250 μmol m^{-2} s^{-1} and 50 μmol m^{-2} s^{-1} over all plants in the common garden depending on the time, day and season. Therefore, the common garden was characterized as a mild mountain climate, with seasonally constant maximum and minimum air temperature, high relative humidity, low light intensity, and a well-drained volcanic soil.

Species Selected in the Common Garden:

Accessions representing 79 species and four natural hybrids of subgenus *Schistanthe* were used for this study. All species of *Schistanthe* (vireyas) are evergreen shrubs or small trees, and most species occur as either epiphytes or terrestrial shrubs. The native ranges of the species represented by these accessions extends from southern Thailand, through the Indonesian and Philippine Archipelagos to Queensland, Australia. In general, the native habitats of the species represented by the sampled accessions were mixed mountain forest, sub-alpine thin-forest, and alpine shrublands. Utilizing available data in Argent 2006, we found that the accessions we used represented species that have native ranges with average mean elevation from 500 to 3600 m. Minimal seasonal variation of mean daily air temperature with a large daily variation in air temperature, and high humidity are characteristic of the tropical mountain habitats in this elevation range. Therefore, the environment of the common garden used in this study is representative of the natural habitats of the species used in this study.

Hypothesis (1) Inverse relationship between scales and stomata:

Initially, we postulated that there would be spatial interference between scales and stomata on the bottom leaf surface, which would result in a negative relationship between the density of scales and the density of stomata. This hypothesis was based on the concept that space occupied by scales would constrain epidermal space available for stomata. Also, cell lines that develop into scales may preclude the same cell lines from developing into stomata.

There are four basic stomatal dispersion patterns on rhododendron leaves. In type 1 and 2 dispersion patterns (80% of all species) each scale is found in the center of a much larger (10x) circular area of epidermis that is stomata free. Therefore, the area of the epidermis influenced by the scale is much larger than the diameter of the scale itself. Only the remaining area of the bottom surface (that which is scale free) is available for stomata. We found that stomatal density on a total leaf area basis was not correlated with scale density. However, there was a significant, negative correlation between scale density and SPI. Therefore, as scale density increased, stomatal density on a total leaf area basis remained the same, but stomatal pore size decreased, which caused a reduction in SPI. This result is counterintuitive because it is generally known that if the density of stomata is constant among species then stomatal size is constant as well. Stomatal size only becomes smaller if the density of stomata increases.

Our explanation for this counterintuitive observation is based on the difference between total leaf area and the smaller portion of leaf area available for stomata when scales are present. In our study the density of stomata stayed the same on a leaf area basis when scale density increased. However, if you calculate stomatal density based on the smaller portion of leaf area available for stomata (only the scale free area), then stomatal density increases when the scale density increases (Fig. 2). We will define functional stomatal density as the density of stomata based on the smaller portion of leaf area available for stomata when scales are present. Thus, allocating a portion of total leaf area to scales increases functional stomatal density in the remaining portion of leaf area. Thus, in our study, when scales are abundant, the stomata were smaller because the functional stomatal density was higher. The net result of abundant scales is a decrease in SPI because stomata are smaller. The scale spatial interference model is supported

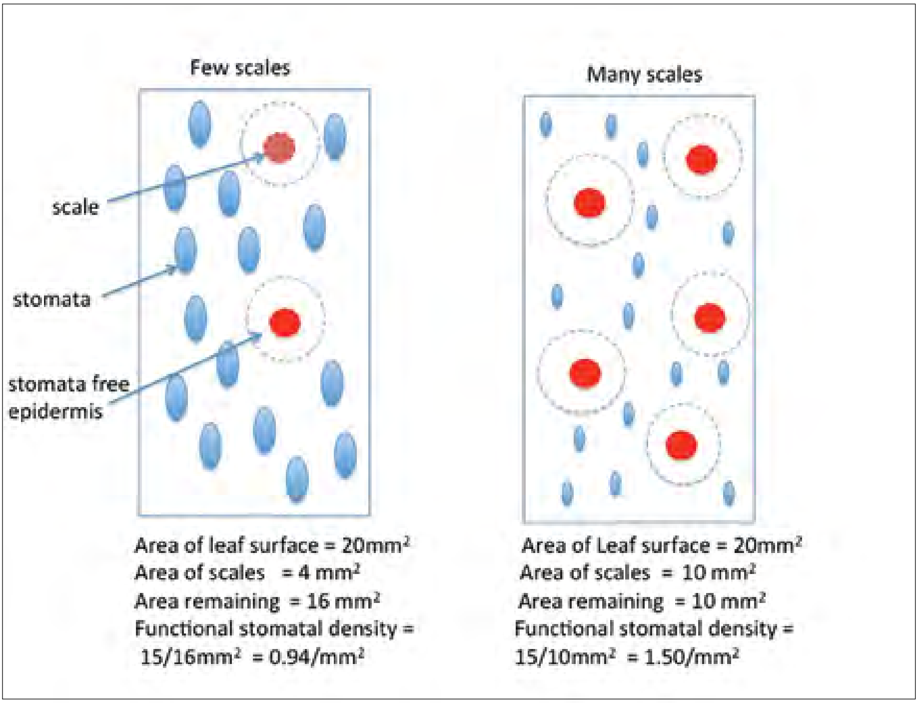

Fig. 2. Each large rectangle in this figure depicts the image seen if looking up at a rectangular area of the bottom surface of a lepidote *Rhododendron* leaf. The red circles represent scales. The wider blue dashed circles enclose the areas of the epidermis that are devoid of stomata around each peltate scale. The blue ovals represent stomata. Note that the total number of stomata (15) are the same in each large rectangle. However, the functional density of stomata is higher when there are more scales on the bottom leaf surface. Also, note that the stomata are smaller when the functional density of scales on the leaf surface is higher.

by our results, which infers that transpiration (water loss) decreases with an increase in scale density.

Previous research has shown that stomatal pore length decreases with an increase in the density of stomata. This negative relationship between stomatal length and stomatal density has been identified as a constraint on total stomatal area per leaf area and maximum transpiration. Our results agree with this relationship because we found a significant, negative linear relationship between stomatal pore length and stomatal density. Stomatal pore lengths of species in our study tended to be short across the range of stomatal density we measured compared with the curve that defines equal stomatal conductance with variable stomatal density. This distortion was due to the difference between stomatal density and functional stomatal density, which caused our stomata to be smaller than expected when compared to stomatal pore size predicted based on the normal stomatal density curve. However, the relationship between functional stomatal density and stomatal size falls on the expected relationship between stomatal density and stomatal size found for other species. Also, our measurements of stomatal density and stomatal pore length are comparable to the density and size range for stomata of tropical, shrubs and trees.

Based on the density and size of stomata we measured for *Schistanthe*, we would expect that stomatal conductance of species in subgenus *Schistanthe* should be low compared to many other species. Measurements of stomatal conductance for *Schistanthe* species in our common garden ranged from 75-150 mmol m^{-2} s^{-1}, which is low compared to the 200-400 mmol m^{-2} s^{-1} expected for species in moist habitats. These low stomatal conductance values supports the concept that stomata size limits maximum transpiration in *Schistanthe* species. In addition, previous measures of montane, tropical *Rhododendron* species showed low conductance compared with other shrubs at the same elevation. However, stomatal conductance of *Rhododendron* species in other subgenera than *Schistanthe* also is characteristically low. Low maximum stomatal conductance within *Rhododendron* may be associated with protection against xylem embolism because several species of *Rhododendron* have been shown to be sensitive to drought induced embolism.

The negative relation between the presence of scales and stomatal pore index was dependent upon stomatal dispersion patterns. We found that stomatal density increased as the stomata became progressively more randomly dispersed on the leaf surface. However, In contrast to this general observation, stomata located in crypts (deep indentation in the epidermis) were relegated to the smallest proportional area of epidermal space (approximately 30% of total epidermal space) among dispersion types, and yet had the highest stomatal density on a whole leaf basis.

The encrypted stomata trait is generally thought to be a xeromorphic trait that results in reduced transpiration from stomata, due to the long diffusion path for water vapor from stomata to turbulent air. Recent evidence suggests that crypts may only have a significant effect on maximum leaf conductance if they are relatively deep crypts in thick leaves. Based on another study in our lab utilizing a smaller number of accessions, the species in our study that had encrypted stomata did not have thicker leaves than those with other stomatal dispersion types. All species with stomata in crypts also had cushion scales in our study. The presence of the cushion scale over the crypt may change the influence of the crypt depth on the environment around stomata. In particular, the cushion scale could seal the crypt from turbulent air during periods of dry air or drought resulting in extreme water conservation.

Significance of habitat:

The second part of the main goal was to determine the relationship between habitat characteristics of the native mountain range and leaf surface features of representative accessions in the common garden. Stomatal pore index significantly increased with increasing mean elevation of the native range. Therefore, maximum potential transpiration per leaf area in these tropical evergreen species should increase with an increase in elevation of the native range.

Higher stomatal conductance often results in lower water use efficiency. Water use efficiency is defined as the amount of photosynthesis divided by the amount of transpiration and high water use efficiency is associated with plants that are found in drought prone habitats. Therefore, we predict a decrease in water use efficiency for plants with evergreen leaves as elevation increases. A similar relationship has been found in other research on *Rhododendron* species.

These results complement the observation that stomatal density characteristically increases with an increase in elevation. Stomatal density is thought to increase with increasing elevation because ambient partial pressure of carbon dioxide (CO_2) decreases as elevation increases. In contrast, changes in light availability with elevation may counteract the influence of low CO_2 on stomatal density resulting in no or an opposite relationship between elevation and stomatal density. Taken together our data suggest that native range elevation is the most important habitat characteristic regulating both stomatal pore index and scale importance factor for tropical, montane *Rhododendron* species. Other habitat traits such as latitude and habitat type of the native range had lesser significance to scales or stomata.

Scale importance factor had a quadratic relationship with elevation of the native range because the highest scale importance factors were found for species with a mean native range at mid-elevation. If the presence of scales on the bottom leaf surface is a water conservation mechanism, this would suggest the highest water conservation occurs at mid-elevations in tropical mountains. Species with cushion scales and encrypted stomata frequently had native ranges at mid elevation, which further supports highest water conservation occurring at mid-elevation. The hyperbolic relationship between SIF and elevation may be due to the counteracting influences of radiation (effect decreases with increasing elevation) and CO_2 concentration (effect increases with increasing elevation). All of the relationships between stomatal or scale traits with elevation of the native range are relatively weak. The differences among individual mountain systems often causes climatic characteristics to have different relationships with elevation. A weak signal with elevation would be expected because the species represented by accessions in this study are from several different mountain ranges in Indonesia, Malaysia, the Philippines, Papua, and New Guinea.

Conclusion

This research supports the spatial interference relationship between scales and stomata. Our observations suggest that meristematic cells develop into basal cells, stomata, or scales (trichomes) during leaf maturation. Thus, if a greater number of meristematic cells differentiate into scales, fewer will differentiate into stomata. Stomata will be restricted to a smaller area of the epidermis when scales are present and as a result will have a higher density than they would if scales were absent. The higher density of stomata (we called this functional density) causes the stomata to be smaller and as a result the SPI is smaller than expected and transpiration is lower. Consequently, there is a general negative relationship between scale density and SPI. In contrast, we did detect a positive relationship between scales and SPI for leaves with stomata in crypts under cushion type scales. Therefore, scales can have a positive effect on stomatal density if stomata are in crypts. Stomatal pore index and by inference maximum leaf conductance increases as elevation of the native range increases; however, a similar opposite relationship was not found for scale importance factor or scale density. We propose that as the abundance of scales increases on leaf surfaces, the maximum stomatal conductance will decrease, unless stomata are exclusively located in crypts under cushion scale wings. Consequently, scales have a negative effect on maximum transpiration rate. Thus, the presence of scales on lower leaf surfaces may function in water conservation because maximum transpiration decreases and water use efficiency increases as the density of scales increases. We propose that the need for water conservation is most significant for plant fitness at mid-elevations (about 1500 m) of tropical mountains making the importance of scales to plant-water relations highest for species at mid-elevations.

Acknowledgements

The authors thank the Mitchell's for opening their garden and providing access to the diversity of taxa used in this study. Many thanks go to Glen Jamieson for revisions of earlier drafts of this document. This research was funded by a grant from the American Rhododendron Foundation Research Committee, a grant from the Walker Fund administered by the Rhododendron Species Foundation, and by the G.P. Wilder fund for distinguished Botanists at the University of Hawai'i.

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Society News

Awards

NANAIMO CHAPTER

Bronze Medal: Art and Susan Lightburn

The Nanaimo Chapter of the American Rhododendron Society takes great pleasure in awarding its highest honour, the Bronze Medal, to Art and Susan Lightburn for outstanding service. Together they have enthusiastically supported our club in virtually every possible way. Both have served on our executive: Art as president and past president; Susan as director. They have shared their knowledge, leadership and experience through presentations, committees and panel discussions. They have also promoted cooperation among the Vancouver Island chapters. Susan's outstanding photographs have been recognized both by our club and at ARS competitions. Art has also played a key role as an advisor to the Rhododendron Species Project at Milner Gardens & Woodland. Our annual truss show features many entries from their beautiful garden and they have generously donated many plants to plant sales and raffles. Art and Susan have graciously opened their garden to club members and hosted many meetings as well as our year end barbecue.

In Memoriam

Robert A. "Mitch" Mitchell

Robert "Mitch" Mitchell (June 21, 1917, to July 21, 2015) passed away at his home in Volcano on July 21, 2015. He was 98 years old.

Mitch was a successful business man in the printing business, but it was retirement, vireyas, and his dedication to "growing and passing them on" that made him an international treasure. He was instrumental in bringing together a group of vireya enthusiasts that became the HI Chapter ARS almost 20 years ago.

At Kimalia, his home in Volcano, he developed a beautiful garden filled with flowers of anthuriums, cymbidiums, camellia and both species and hybrid vireya all growing under a rainforest canopy of Ohia trees. From this garden he generously provided trusses, cuttings, plants and seedlings to be distributed at our HI Chapter-ARS meetings. Over the years thousands of trusses for meetings and cuttings were freely shared.

His generosity went far beyond the local residents. He cultivated many international contacts, often hosting them at his home. You could say he and Sandy were our Hawaii/Vireya ambassadors.

Mitch had a passion for growing vireya seeds obtained from other hybriders. Many of these he grew and registered. He then went on to try his own hand at hybridizing and produced over 60 of his own crosses, many of which are also registered

He was a strong supporter of the American Rhododendron Society, as well as, the Rhododendron Species Foundation. He received a Bronze and Silver award from ARS for all he did for the chapter and for vireyas.

Mitch made it clear, "It's all about the plant" and he did whatever he could to "pass the word". . . and the word was "VIREYA".

Mitch was a kind, sincere, honest, and generous gentleman who was passionate of vireyas and appreciated the "Wonders of Life." Perhaps that was his gift to all that knew and loved him.

Society News

In Memoriam continued

Al Muller

On Monday, August 3rd, 2015, the New York Chapter lost a much loved and respected member, a quiet and unassuming man who was always a welcoming figure at our meetings. He was a gentleman of the highest order. Born on November 20th, 1924, and raised on the Phipps Estate in Old Westbury, NY, Al went on to serve his country as a pilot in WW II and later spent his entire working career at Grumman Aviation.

His rhododendron garden impressed everyone who visited it, including the people at Scotts who featured him on the cover of their catalogue. Al was president of the New York Chapter from 1995 to 1997 and received its Bronze award in 2001 He has always helped out in any capacity that he was assigned and for years served as the chapter's nominating committee chairman.

We all have our memories of Al. One of mine was when he told me the first year I was a member that he thought I would make a great chapter president. I've laughingly told him many times over the years since then that he gave me "the kiss of death," for I now signed on for my third term as president! We'll all miss you, Al!

Jim Fry, NY Chapter President

Rhododendron Calendar

2015	ARS Fall Regional Conference, Long Island, NY, Oct. 16-18, Board Meeting
2015	New Zealand Rhododendron Association Annual Conference, Oct. 16-19, Wellington, New Zealand
2016	ARS/ASA Annual Convention, Williamsburg, VA, April 20-24, Board Meeting
2020	ARS 75th Anniversary Convention, Portland, Oregon. Dates to be announced.

Society News

ARS 2016 Grant Program - Invitation of Interest

At the annual meeting in May of this year, the Board elected to provide funding to the Endowment Grant Program. We are inviting applications for grants for 2016. With limited funds available there will be continued careful consideration of each request to assist the Society's purpose of encouragement of the culture of rhododendrons, including azaleas, and the increase of the general understanding of and interest in all aspects of these plants. Specifically the ARS welcomes application from committees, groups, chapters, etc., within or affiliated with the American Rhododendron Society. In the attempt to maximize use of available funds, the Society will be limiting its participation to funding 50 percent of a project's cost and will generally limit awards to under $3,000. A major consideration will be the range of potential impact or contact with the public resulting from the project. Educational publications may be included for consideration of a grant.

Applications for grant support can be made until February 29, 2016. The application must include a letter of support from the District Director in whose District the project/program is located or originates. The Endowment Fund Committee will assess each application and develop its recommendations for funding. The subsequent recommendation will be presented to the Board at its annual meeting April, 2016. Grantees will be announced immediately and money provided thereafter.

Application guidelines accompany this article. The guidelines may also be obtained from the ARS web site www.arsoffice.org. Questions regarding the program may be directed to either Co-Chair of the Endowment Fund Committee, Bill Mangels.

ARS Endowment Grant Program - Guidelines for 2016 Application

The purpose of the American Rhododendron Society (Society) is the encouragement of the culture of rhododendrons, including azaleas, and the increase in understanding of and interest in all aspects of these plants. In support of this mission the Society has established a grant program 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 29, 2016, and must be submitted to the Endowment Fund Committee. 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 and their recommendation will be acted upon by the board at the annual spring meeting.

(Continued on next page.)

ARS Endowment Grant Program - Guidelines for 2016 Application continued

Successful applicants will be supplied “Condition of Acceptance” letters and upon completion and return to the Society, funds will be sent to the applicant. Unsuccessful applicants 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.

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. Note: 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.

5) List of the group’s current sources of support and income.

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.

Index

Journal American Rhododendron Society, Volume 69, 2015.

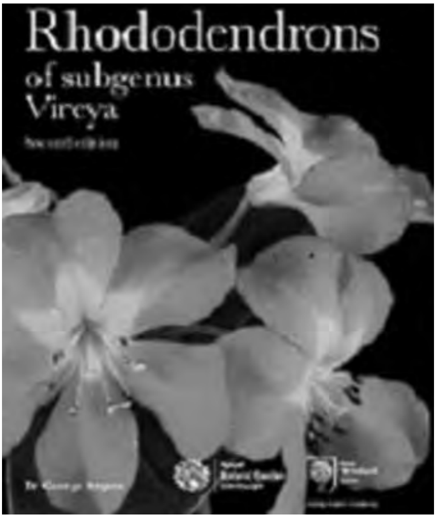
The names of species and hybrid rhododendrons and azaleas occurring within the text of articles are not listed in the index. Reference to plants with colour images is made for the following entries: (AZALEA HYBRIDS, AZALEA SPECIES, RHODODENDRON HYBRIDS, RHODODENDRON SPECIES, VIREYA HYBRIDS, VIREYA SPECIES,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

Rhododendron cultivar names not registered in the International Register of Plant names and Checklist are marked with an*. **Page numbers refer to the printed *JARS* not the online version.**

Book Review

Rhododendrons of Subgenus Vireya, Second Edition. Dr. George Argent, Royal Botanic Garden Edinburgh, with contributions by Tony Conlon, Louise Galloway, Stephan Helfer, James Richardson and Alex Twyford. Royal Botanic Garden Edinburgh, in association with the Royal Horticultural Society, 2015: 454 pp, £60, $US 93.78

Reviewer: Elaine Sedlack. Eugene, Oregon



For anyone with an interest in the group of rhododendrons collectively known as vireyas, Dr. George Argent's newly published *Rhododendrons of Subgenus Vireya, Second Edition* is clearly and carefully written, and the most comprehensive reference available. By virtue of this clarity, learning about the plants becomes an immediately absorbing pursuit—this is not merely a dry tabulation enumerating the hierarchy of taxa. The fundamental biology of vireyas is thoughtfully presented, and the scientific underpinnings of plant systematics, the study of classification, is sufficiently explained to help one better understand nomenclatural changes. A helpful list of symbols and Latin terms is conveniently placed at the beginning of the book. The species descriptions are based upon over 40 years of close, personal observation by Argent of living rhododendrons in their natural and diverse habitats, emphasized by the addition in this volume of even more, beautiful photographs of plants in the wilds of Malesia; one feels transported among the collectors. For those who always wanted to participate in a plant collecting expedition, examples of these areas' natural features are ultimately satisfying. In the artificial keys to the sections, subsections and species, the IUCN Red List conservation status for each of 323 species has been added. Annotations at the end of each listing describe the environment in which a plant is found, including the topography and soil type, crucial for those trying to replicate natural conditions in cultivation, along with copious notes regarding the taxon's history. A forward to the Second Edition by Simon Milne, Regius Keeper, Royal Botanic Garden Edinburgh, acknowledges the collaborative involvement of many with "wide-reaching" expertise, mentioning in particular the collections by Bill Burt and

Paddy Woods which formed the basis of RBGE's renowned living collection, and the "highly productive collaborations between scientists and horticulturists." This last point is one that I feel is what makes this book so special. Argent gives equal credit to growers and researchers: the "whole" of the international vireya community is represented here.

Another strength of the book is undoubtedly the thorough historic summary of the discovery and introduction of vireyas. One amusing anecdote is that when the first plant of *R. jasminiflorum* was shown at the Chiswick Gardens Exhibition in 1850, the *Gardeners' Chronicle* published the skeptical view that it was "probably no *Rhododendron* at all"! In tracing the long record of published names, it is shown that vireyas were first described and published as their own genus (Blume 1826), and that there is a taxonomic basis for listing them at the subgeneric level based on their morphology, and supported by pigment studies (Spethman 1980, 1987). The characteristics which distinguish them from other rhododendrons are that vireya seeds have long tails at each end; the flowers are in a true umbel, without a central rachis; there is a tapering junction between the ovary and the style with no abscission layer at this point; and there are idioblasts (relatively large cells) occurring in the leaves which are not found in any other rhododendrons. Sleumer based his use of subgeneric status on the twisting of the valves after opening, but Argent finds this character is not so useful because it is too variable. Besides the practicality of permitting further subdivisions in the hierarchy, subgenus *Vireya* also allows using the name vireya as both the common name and the scientific name, and for the type species *R. javanicum* to be maintained.

The hairs and different type of scales occurring on the bracts and elsewhere on vireyas are strongly diagnostic of their taxonomic placement. A nice touch in the book is photographs of these taken with a scanning electron microscope, which are included at each sectional level in the key; they are like fantastic small lunar landscapes. Beautifully drawn diagrammatic illustrations by Eve Benet show every anatomical aspect of the readily visible parts of vireyas, and also of the microscopic features as they pertain to the key.

This edition was produced in order to include recent taxonomic changes, primarily reflecting changes in "taxonomic judgement" as Argent writes, though some are due to the nomenclatural priority of earlier published names, as well as adding ten new species' descriptions. It entailed the task of gathering together an extensive body of previously published literature. *Rhododendrons of Subgenus Vireya, Second Edition* is based on Sleumer (1949, 1960, 1966), incorporates work by Copeland (1929, 1943), with nomenclatural corrections by Craven *et al.* (2010). Although Hermann Sleumer had limited access to living material, his work holds up well by today's more complex standards.

Besides aiming to accurately identify a plant, name changes basically honor the work of original authors; they are not made with the sole objective of making life difficult for gardeners, as some believe. For example, the sectional name *Schistanthe* Schltr. was published prior to that of the now synonymous *Euvireya* (H.F. Copel.) Argent (Craven *et al.* 2010). In the introduction Argent explains the choices facing taxonomists. The complexity of the concept of species is enlightening and helps one to appreciate how unnatural the constraints of the binomial system can be, and what a tangled web may develop over time. Accordingly, there need to be at least two distinguishing morphological characteristics to delimit taxa at the species level. At higher ranks the numbers of characters is weighed by different criteria– ecology and geography come into play. An artificial key, in addition to aiding in identification, can show the relationships of species to each other, based on their morphology and supported by molecular studies. Argent intends his treatment to be "a practical way of dividing the group so that species can be identified and named." He bases it on "what can be recognized morphologically and does not pretend to be a system of monophyletic groups."

A new chapter on the molecular phylogenetics and biogeography of vireyas has been contributed by James Richardson of RBGE, and David Twyford from the Institute of Evolutionary Biology at the University of Edinburgh. They explain the process by which prehistoric early vireyas are understood to have originated in the west of the archipelago and subsequently moved out to the different islands during the period of the Sunda Shelf, when there was more continuous landmass. Vireyas are estimated to have evolved relatively recently in geologic time, 13 Ma, as compared to the oldest known rhododendron fossil dated to approximately 60 Ma. The dispersal to eastern Malesia, across the Wallace Line, and the subsequent radiation of species in New Guinea is estimated to have occurred as recently as 5 Ma. This conclusion was reached by using a complex model involving Goetch's phylogenetic results (Goetsch *et al.* 2005) and the authors' research (Twyford 2008; Twyford and Richardson, unpublished results). It is likely that the vireyas remarkable speciation, especially in New Guinea, is a response and reflection of the dramatic geologic events related to plate tectonics and subsequent mountain development. An essay summarizes the recent work (Goetsch *et al.* 2011) shows vireyas indeed have a common ancestor, and that no other species of the genus *Rhododendron* are included within the subgenus *Vireya,* and that they are monophyletic (Craven *et al.* 2011). This chapter complements the primarily morphologically based classification presented by Argent.

What the genetic analyses haven't resolved as of yet, and what everyone in the scientific community studying vireyas would like to better understand, are questions about the interspecific relationships of vireyas at the molecular level. Work (Goetsch *et al.* 2011) does indicate "four well-supported clades within Vireya," which correspond to sect. *Discovireya*, sect. *Schistanthe* (formerly *Euvireya*), sect. *Malayovireya*, and sect. *Pseudovireya*" (Twyford, Richardson). This work, however, doesn't indicate a common ancestor for the remaining sections of *Albovireya*, *Hadranthe* (formerly *Phaeovireya*), and *Siphonovireya*. It may be that a genetically better represented analysis of these groups is still needed in order to clarify their relationships. The challenge of achieving this is complicated by the scarcity of many species, both in cultivation and in the wild. Likely there are more changes coming, and still more species awaiting discovery.

The chapter on collecting and conservation gives more enticing views of being in the field, albeit with the dismaying reality of habitat destruction and the subsequent increasing difficulty of finding undisturbed areas with previously undiscovered rhododendrons. Tony Conlon and Louise Galloway of RBGE have revised and expanded the earlier chapter on cultivation and propagation, increasing the utility of the book for growers; and Stephan Helfer's (RBGE) useful essay on pests, diseases and disorders is included from the earlier edition. Even if the vireyas are almost as vulnerable as other groups of rhododendrons to a multitude of pathogens, much of the information needed to mitigate problems is presented here. Fortunately, vireyas do not seem susceptible to *Phytophtora ramorum*, so for now, anyway, there is one less thing to worry about. In the introduction is a map showing the distribution and number of species in each locale and a phylogenetic chart of the entire genus. A list of herbaria precedes the key, and a comprehensive glossary and a greatly increased list of references provide for further study.

Rhododendrons of Subgenus Vireya, Second Edition is truly a remarkable accomplishment and a beautifully produced book. The thoroughness and meticulous care with which it was written gives one great pleasure to read, and I have no doubt that this book will stimulate increased interest in the already popular Vireya rhododendrons.

Rhododendrons of Subgenus Vireya, Second Edition, may be purchased from the Royal Botanic Garden Edinburgh's website. Go to www.rbge.org.uk Select "About Us", then "Publications", then "Latest Publications". £60 = currently $US 93.78

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[Editor's note: As pointed out by the reviewer, Argent's new book provides a wealth of relevant and useful information on vireyas. However, his suggested continued validation of "subgenus *Vireya*" is at odds with Chamberlain et al.'s (1996) designation of vireyas in subgenus *Rhododendron.* The policy of the ARS is to use Chamberlain's classification system, so as editor I need to point out this disagreement. The bigger issue for me, though, is that as Argent points out in his discussion of this point, there have been a number of studies over the past two decades on rhododendron morphology and molecular relationships that indicate that some revision of "accepted" rhododendron taxonomy is now needed and timely, especially for vireyas. I would hope that a comprehensive update of rhododendron taxonomy will be initiated soon, and that it can be accepted as the appropriate way to reference rhododendron species for the foreseeable future.

The changes suggested here for subgenus terminology by Argent need to be accepted by a broad scientific audience if they are to be used, and until this is done, vireyas will continue to be classified in subgenus *Rhododendron* in *JARS.* I appreciate that as Argent point out, use of "subgenus *Vireya*" has the "practical advantage of maintaining the traditional name as the same in both scientific and common parience," but this alone should not justify acceptance of a change in terminology.

The concern expressed by David Chamberlain (pers. comm.) is that if vireya is recognized as a subgenus, then several of the other groups of the non-lepidote subsections might also merit recognition as subgenera. He believes that the vireyas have evolved comparatively recently, and that several of the other subsectional groups split off much earlier. There is no doubt that all of the lepidote rhododendrons have a common origin, and that is the reason that he prefers not to recognise vireya as a subgenus.

Reference

Chamberlain, D.F., R. Hyam, G. Argent, G. Fairweather, and K.S. Walter. 1996. *The genus* Rhododendron: *its classification and synonymy.* Royal Botanic Gardens, Edinburgh: 181 pp.]

Elaine Sedlack was horticulturist and curator of the Asian collection at the University of California Botanical Garden for 31 years, and in addition to a strong interest in the vireyas, has some expertise in the subject matter.

Gardening is learning, learning, learning. That's the fun of them. You're always learning.

Helen Mirren

In the spring, at the end of the day, you should smell like dirt.

Margaret Atwood

Life begins the day you start a garden.

Chinese Proverb

Smooth and Sweet, Totally Delightful

Fig. 1. The Susquehanna River below the Holtwood Dam at a normal low water flow. Note flood-borne debris among the rocks.

Karel Bernady
Chester Springs,
Pennsylvania

Photos by the author

My fondness for the recurring seasons has grown with accumulating age spots and the reliving of previous joys. Among these are the songs of the first robin of spring and its cousin the wood thrush, the return of ruby-throated hummingbirds, savoring the first fully ripe tomato of your own planting and the explosive pop and sugary acidic flavor released upon biting a just-picked Macoun apple in September.

So too it is with my first encounter in June of a blooming sweet azalea, *Rhododendron arborescens.*

I travel a bit to enjoy the perfume of this wonderful native. Its preferred habitats are stream sides along moving waters, wet seeps and cool mountain tops. Several fruitful sites to enjoy the blooms and scent are recounted here.

From Philadelphia, the nearest place to experience *arborescens* in the wild is along the Susquehanna River below Holtwood Dam. Lock Twelve of the Susquehanna and Tidewater Canal, which was completed in 1840 for barge traffic, is maintained as a recreational area and gives access to the riverbank. The river here is just above the lake formed behind Conowingo Dam in nearby Maryland. The land rises permitting the Susquehanna to reclaim its historic rocky bed where it cut through the mountains ages ago. *Arborescens* finds a home above the water in the outcroppings of the underlying bedrock along the river's edge (Fig. 1).

The plants here tend to be small, stunted from growing out of narrow cracks within the bedrock (Fig. 2). Root restriction makes natural bonsais of some. How seeds can germinate and grow in such a hostile environment is mysterious. Flowering in mid-June, the fragrance is present but not overwhelming because of the limited numbers

Fig. 2. *R. arborescens* in bloom on a 1.5 ft (0.5 m) plant growing among bedrock along the Susquehanna River.

of flowers on these small neat shrubs. The bushes exhibit the typical white flowers with red pistils and filaments. Occasionally pink will highlight corolla margins or the ribs of the expanding buds at the fingers stage. The new vegetative growth lacks hairs, botanically glabrous, and is smooth to the touch, giving the plant another useful name, the smooth azalea. Of our native azaleas, only *R. prunifolium* shares this characteristic with *R. arborescens*.

Elevated 10 to 15 feet (3-5 m) above the river bed during low summer flows, the bushes are occasionally inundated by floods, and are sometimes completely covered (Fig. 3a,b). Evidence of this is in the detritus captured by the branches: dead grasses and leaves, twigs and human debris, i.e., plastic bags and other snatchables. One might think the leaves and seed pods would be scoured off by the floating mass, but the plants survive intact and give their autumn bounty of colorful foliage and seed.

Fig. 3a. The Susquehanna River below Holtwood Dam at high water flow from large storms in the watershed.

Fig. 3b. Plastic debris, screening and something else that a previous flood deposited onto the rhodo, showing that these plants can get covered by flood waters.

Arborescens in this habitat can help stabilize river banks. Here, however, it clings to immoveable rock for dear life. In visiting this location one also needs to hold on dearly. Step carefully over rocks and the flood-borne trees and lumber jammed among them. Footing can be treacherous in places. The climb along the river bank is exhilarating and the views of the shrubs and river are well worth the effort.

Another location to see *arborescens* in this environment is picturesque Swallow Falls State Park in Garrett County, Mary-

Fig. 4. *R. arborescens* plants in the picnic grounds at Mount Davis.

land, 230 miles (370 km) west of Holtwood Dam. The Youghiogheny River flows through the much beloved park, in which Henry Ford, Thomas Edison and friends camped here in 1918 and 1921. Easier to walk to and approach are the azaleas along the river bank below Upper Swallow Falls. The bushes here are larger, more their expected size, mainly because most grow unimpeded in the sandy river embankment and not in some constraining rock fracture. They bloom in mid-June. Along the walk to the river one can observe the terrible devastation Superstorm Sandy inflicted upon the forest with its snowfall and high winds in October, 2012. The park is allowing the tree falls to remain as found to evaluate forest recovery from that catastrophic event. The azaleas were spared damage.

A gentle place to visit a large swarm of sweet azaleas is Mount Davis, the highest point (3213 feet; 979 m) in Pennsylvania. At the picnic grounds *arborescens* of all sizes may be observed among the conveniences provided (Fig. 4). Some of the bushes reach seven feet (2.1 m) tall and when in flower near the end of June, their fragrance is powerful; the entire area is perfumed with a pleasant heliotrope-like scent. The plants provide a textbook of *arborescens* variation to study in size, flower and foliage. Present are the smaller stature plants of variety *richardsonii*. White flowers with or without yellow blotches are found (Figs. 5, 6). One large bush bears pale pink flowers in great profusion.

Easy to travel to and walk among the plants, one feels the picnic ground was landscaped with the sweet azalea for your dining enjoyment. A stroll to the edge of the woods will disabuse you of this thought. Large bushes of the azalea extend into the forest leading downhill and across the county road. The plants surrounding the picnic tables are just the upper boundary of a sizeable natural population of *arborescens* in its montane preference. Mount Davis is the most convenient location to sense the sweet azaleas' magnificent bouquet with minimal effort. Caution though, as one visit during the flowering time may be highly addictive and have you seeking a return.

Much farther away near Franklin, North Carolina, are Wayah Bald and its neighbor Wine Spring Bald, both with large mountain top populations of the sweet azalea. These mile high (1.6 km) peaks are reached by the same unpaved but well maintained road. Sweet azaleas

Fig. 5. Light pink flowering *R. arborescens* at Mount Davis.

Fig. 6. *R. arborescens* flowers with yellow blotches at Mount Davis.

Fig. 7. View of flowering *R. arborescens* from the stone tower atop Wayah Bald.

flower from mid-June on. The bushes are everywhere in the parking area, surrounding the picnic tables, lining the paths to the mountain top and are beneath the stone tower atop the highest point (Fig. 7). The views of the distant mountains from the tower are stunning as are the white masses of the flowers immediately below. Careful observation may reward you with the sight of hummingbirds collecting nectar from the fragrant blossoms. Multitudes of bees also work the flowers, collecting pollen and often avoid pollenating their pistils, thus denying seed formation. Flowering simultaneously are mountain laurels, *Kalmia latifolia,* and flame azaleas, *R. calendulaceum,* so that your rewards for driving to the top are more than tripled.

Wine Spring Bald has its own treats of sweet azaleas, flames and laurels and is only a short drive from Wayah Bald. There is some variation in flower colors of the laurels at the peak. Flame azaleas line the road. A walk into the forest down towards the main road to Wayah leads you through a huge population of sweet azaleas, many up to eight feet (2.4 m) in height. In bloom the fragrance will swamp your senses.

While this bald lacks the beautiful views had from Wayah, the smooth azaleas (Fig. 8) on Wine Spring Bald greatly outnumber their members on the neighboring peak, if you are willing to bush whack into the woods to reach them, the fragrance is addictive.

If you have ventured to Franklin, NC, then you must travel the higher elevations of the Blue Ridge Parkway nearby and see its sweet azaleas, where they occur along the road at water seeps. Mount Pisgah Lodge is a focal point to view them. West of the

Fig. 8. *R. arborescens* flowers at Wine Spring Bald.

lodge you will see white flowers offset by dark green foliage along the rock faces of road cuts forming the parkway. Flame azaleas may be in bloom also.

The ghost *arborescens* was first encountered in the mountains of Georgia. My hiking companion Jim and I climbed the Appalachian Trail heading north from Neels Gap one June afternoon to continue our day of exploring for flames. As we approached the height of the hill, a hint of sweetness drifted passed us, the unmistakable fragrance of *arborescens*. The sweetness intensified as we ascended and then vaporized when we reached the peak of the trail. Nowhere in the direction of the warm winds blowing up from the gap could we see the sweet azaleas from the trail; from the trail, that is, because of the rattlesnake that spooked Jim earlier at lunch.

So here I must digress. Jim and I spent the morning climbing the Appalachian Trail southward at Neels Gap to Blood Mountain in search of flame azaleas, which many call both *R. calendulaceum* and *R. cumberlandense*. Well rewarded were we as we tramped through the woods away from the path and photographed some outstanding plants. We discussed the virtues of this bush over the next and the differences we could discern between the two native species. At noon we broke for lunch and since there were no obvious logs or boulders to rest upon, we literally sat down on the well-worn trail to dine, Jim with his sandwiches and bananas and me with my tin of kippered herring. Just as Jim took the last bite of banana, he reached about to gather his equipment and walking stick. Suddenly he shot up, grabbed his belongings and ran up the trail without saying a word. My mouth initially open to receive the final morsel of smoked fish dropped wider with astonishment at Jim's movements.

My thoughts screamed bear, this being bear country, their renowned sense of smell and my smelly tin of fish. I jumped up, scanned the surroundings and shouted "Jim! Jim! Is it a bear? IS IT A BEAR JIM?" Jim stopped a distance up the trail and yelled back "No. It's a snake." "Snake?" "Yes." "Where?" I beseeched. "Just off the trail where my walking stick was. A rattlesnake." "Oh!"

I looked into the woods where Jim had laid his walking stick perpendicular to the trail where we sat. About eight feet (2.4 m) off the path lay a coiled rattler, quietly warming itself in the dappled sunlight. It must have been there when we chose the spot to lunch. Obviously it didn't feel threatened even with the boot of the walking stick a yard (metre) away. It remained silent and shared its domain with us.

Greatly relieved it wasn't a bear, I packed up my belongings and prepared to join Jim. But then I thought, I should photograph our silent friend. After all, this was the first rattlesnake I had seen in the wild. And so I attached camera to tripod and took several photographs with the longest telephoto lens I had. The images record the snake that Jim and I shared a table with, so to speak, for lunch. That is the way it is with fright and flight and fright mitigated.

So, rattled by our lunchtime encounter, we dared not venture off the Appalachian Trail into the woods to locate the source of the wonderful fragrance carried by the warm winds. No more crashing through the underbrush that afternoon when you could not see clearly where to place your foot and what is lurking within.

On our return downhill, the sweet breath recurred, strengthened and vanished. This was a ghost sweet azalea and its perfume is burned deeply into my memory. It is immediately recallable unlike a vision or sound. Since then, we have learned that *arborescens* is unique among the azaleas in announcing its presence with its fragrance well before you can see or touch the plant. It is a wonderful quality of the species.

Autumn brings to close another flowering season of our natives. *Arborescens* has a final delight to share at that time. The foliage will turn a mixture of colors, yellow, red, orange, usually combined together. When the leaves further desiccate, they age to brown and become scented with the aroma of burnt sugar, somewhat like the odor of fallen leaves of the katsura tree, *Cercidiphyllum japonicum.* The sweet azalea gives a Halloween treat to beckon us to revisit it next season.

Karel Bernady is a member of the Greater Philadelphia chapter and is Chairman of the Board of the ARS Research Foundation. He has just received the ARS Gold Medal for his many contributions to the ARS.

The Furman Rhododendron Legacy: A Labor of Love

Donald W. Hyatt
McLean, Virginia

Photos by the author
unless
otherwise noted

Introduction

Those of us who knew and admired Bob and Audrey Furman were deeply saddened to lose such good friends. Bob passed away on April 14, 2011, and Audrey died four years later on April 11, 2015. The rhododendron world has lost two remarkable hybridizers.

Even though they never registered a single yellow hybrid, the Furmans will surely be remembered for the hardy yellow rhododendrons they developed. Bob was certain that

Fig. 1. Audrey Furman.

Fig. 2. Bob Furman.

Fig. 3. The Furman home and garden in Brewster, Massachusetts.

his "perfect yellow" would be in the next batch of seedlings but fate intervened. Since many of his seedlings have yet to flower, perhaps the prize is still out there. Fortunately, Bob and Audrey's daughter, Debbie Humphries, and her husband Jack will continue to live at the family home, maintain the garden, and evaluate those seedlings. They will see that her parents' finest hybrids are preserved and introduced.

Bob and Audrey Furman were a team. Yes, we refer to Bob as the hybridizer since he made the crosses, planted the seeds, transplanted the seedlings, and tended the garden. However, Audrey was always at his side discussing crosses and the merits of the seedlings. She knew his breeding strategies and the contributions each parent made. In formal presentations, Bob usually ran the projector while Audrey articulately explained the hybridizing details. They were one.

The Garden in Brewster

Bob and Audrey were both educators, and began their rhododendron adventure while living and teaching in Garden City, New York. Most people have a favorite place to visit, and for the two of them, "God's Country" was Cape Cod. In 1970, they purchased a 1-acre lot on the Cape near Brewster, MA, and eventually purchased an adjoining strip

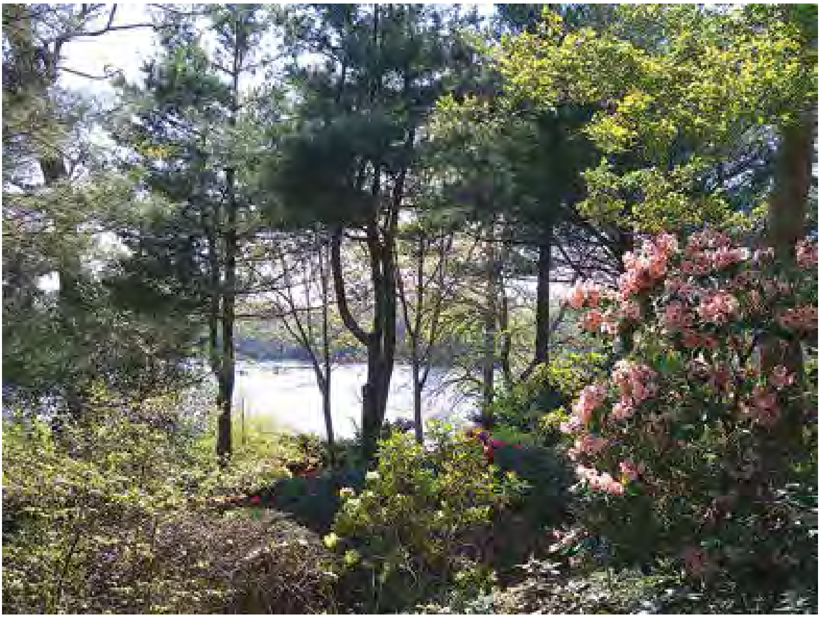


Fig. 4. Vista toward the pond.

Fig. 5. Mature plants and seedlings.

of land from a neighbor. For amateur hybridizers who live on modest sized tracts, it is amazing to see what the Furmans were able to accomplish with relatively limited space of only 1.38 acres.

The site bordered a 10-acre fresh water pond and was about 1 ½ miles from Cape

Cod Bay. They could visit on weekends during the school year, or have longer stays during school breaks and the summer, but they would have to wait for many years before they could build a home and move there permanently.

The property was originally a thicket of native vegetation, but Bob selected an area near the pond for his first seedling bed. He cleared the area, improved the sandy soil, and in the spring of 1971 he planted his first seedlings. Each year thereafter he planted out more seedlings.

What was impressive about the Furman garden was that it didn't look like a typical hybridizer's test plot. There were no straight rows of plants of varying size punctuated by holes where plants of a cross had died or were removed.

Bob rarely set seedlings in rows but planted them in small beds beside mature plants. The look was very natural, the same as one might see where rhododendrons grow in the wild. The garden had meandering paths among mature rhododendron specimens, with younger plants and smaller seedlings growing side by side.

The Furman garden was a lovely landscape with open areas, vistas, and both rhododendrons and companion plants growing under high dappled shade. The flower colors in the garden blended in perfect harmony, too. At the same time, the garden was one of the most intensive hybridizing centers that many of us have seen.

Hybridizing Goals

Bob had essentially three main hybridizing goals: superb plant habit, spectacular foliage, and stunning flowers. For his own hybrids, he was seeking plants that would get a "5," the highest of all ratings, in each one of those categories. Bob was a perfectionist, and he was looking for that elusive "5,5,5" . . . the perfect rhododendron.

Bob did have some rhododendrons that he considered ideal in plant habit and foliage. The species *R. degronianum* ssp. *yakushimanum* was perfect, especially his own form he had raised from seed that he called "Yak #1." He also admired a Cecil Smith hybrid he planted beside the house near the kitchen door. It was a hybrid of (*R. bureavii* AM form ✕ *R. degronianum* ssp. *yakushimanum* Wada's form).

Fig. 6. *R. degronianum* ssp. *yakushimanum*, Furman form.

Fig. 7. Smith's "Bur-yak" (*R. bureavii* X *R. degronianum* ssp. *yakushimanum)* beside the house.

The plant is rounded and symmetrical with gorgeous dark green leaves. Yes, that plant is certainly a "5" for plant habit and foliage, but it was not perfect. It has lovely white flowers but tends to be a shy bloomer. Bob felt that a rhododendron should set buds while still a young plant, and should be covered with flowers every year. Let's examine his criteria for a perfect rhododendron.

1. Plant Habit

Excellent plant habit was a high priority with Bob. Since rhododendrons are only in bloom a few weeks out of the year, he was looking for plants that would be spectacular landscape shrubs throughout the season. He wanted rhododendrons that were compact and dense, and disliked plants that were open or leggy, regardless of the flowers. The shrub should be well balanced and symmetrical by nature, and not require constant pruning to keep it within bounds. As a hybridizer, he started looking for seedlings with relatively short stems that branched well on their own since they would have a better chance of becoming the compact, well rounded plants he desired. A magnificent specimen in the garden of his 'Peach Cloud' was a testament to the flawless plant he wanted.

Of course, sometimes a plant does not show its true character until it gains some age, and that is often related to the quality of the root system. A vigorous plant will have strong roots, and that is essential for other important factors like drought tolerance and long term survival without constant pampering. However, vigorous plants can have precocious new growth that might interfere with the flower truss and that is certainly not desirable. He also knew that plants grown from cuttings may not match the vigor of the original seedlings. Therefore, any plants under evaluation should prove their worth after being propagated, too.

2. Foliage

Quality foliage was Bob's second major focus. He wanted sturdy leaves that were dark green and glossy. He preferred leaves that had indumentum, but since that is a recessive trait, the characteristic may not show up in primary crosses but can reappear in subsequent generations. Some plants can have attractive new growth which is a desirable trait, too. Leaves that tended to turn yellow or became spotted due to disease or adverse weather extremes were considered very undesirable.

Fig. 8. ‘Peach Cloud’.

Bob wanted plants that held their leaves for at least two years, preferably longer. When plants do not shed the prior season's foliage in the fall but retain leaves for multiple years, they usually appear dense and full which helps make the plant more attractive year round.

The Furmans regularly took top honors at area truss shows with their new hybrids. Aside from the flowers, part of that was the elegant staging of the truss because of its foliage. Bob wanted his hybrids to have a full, symmetrical collar of leaves as a proper base beneath the truss. Plants that produced deformed foliage or irregular whorls of leaves were undesirable, and candidates for elimination.

Fig. 9. ‘Peach Cloud’ in the Furman Garden.

3. Flowers

With respect to flowers, Bob wanted rounded to conical trusses with a high flower count. He considered lax trusses and flowers with weak pedicels unattractive. He also wanted the top-most flower bud to open with the rest of the blossoms so the truss would not have a “hole” at the top. He preferred large sized blossoms since they were more spectacular than small blooms, but the truss should be in proper proportion to the plant. The petals should also be heavy textured so that the blossoms would hold up well under adverse weather conditions.

Bob was definitely breeding for flower color, and his goals were similar to many Eastern hybridizers: hardy plants that have blossoms of yellow, orange, or clear red, as well as delicate blends of peach and apricot. Most rhododendrons in that color range simply do not survive for very long in the rigorous climates found in the Eastern United States.

Bob sought pure colors that were clean and luminous. Yellows should be strong and intense, and not pale shades or yellowish-green hues. He did not care for dull or muddy colors. Reds as well as pinks should be rich and clear without any bluish undertones.

During his 42 years of hybridizing, Bob raised many thousands of seedlings but he only registered 10 hybrids. Most of those had white to pink flowers, but they did meet Bob's stringent criteria for plant habit, foliage, and flower. He never registered any yellows or deep reds, but he did register a few in the apricot to peach range.

Despite the fact that a hardy yellow was probably Bob's primary hybridizing goal, he was never satisfied with his yellow hybrids. That only emphasizes how difficult it is to get yellow flowers without also having undesirable plant and foliage characteristics associated with the original parents. Those of us who have visited the Furman garden in bloom have been in awe of the spectacular yellow rhododendrons we have seen. Most are better than anything we can grow in our region, but Bob felt each one was flawed. He had not reached the ideal yellow rhododendron he desired, and was willing to grow another


Fig. 10. 'Angel Eyes'.


Fig. 11. 'Impression'.

generation to reach his goal.

A trip to the Furman garden was not just a visual treat but also an education. Bob enjoyed getting input from others, so he usually set up a flower show of lovely trusses from his hybrids. He would list the complex parentage of each cross and ask us to select our favorites. After the winners were chosen, we would follow Bob about the garden as he talked about the merits and shortcomings of various plants, the contributions of the parents, and other details.

The Evaluation Process

Bob knew that it took time to properly evaluate a rhododendron. Plants do not always show their true worth until they gain some age, and there are many characteristics to consider. To grow so many thousands of seedlings on such a small piece of land over 40 years, Bob had to ruthlessly remove inferior forms and keep only the best. When space is at a premium, one does not have the luxury of raising every seedling to maturity before starting the evaluation process.

Bob made innumerable crosses of his own and purchased many crosses from the ARS Seed Exchange. He kept detailed records and generously shared pollen and seed with many others including friends like John Delano, Norm Beaudry, and Jim Barlup. Sometimes they made crosses for Bob on their own plants and sent him back the seed.

With complex crosses, it is necessary to raise many seedlings to improve chances of finding the right combination of genes that might produce a desired result. Bob often started with 50 to 100 seedlings of a cross but would have to cut down to just a few that he could follow to maturity. Bob felt that over the long term, close to 99.9% of all seedlings will likely be inferior and should be discarded. Only those seedlings that moved his hybridizing program closer to desired goals were allowed to remain.

Bob started eliminating his rhododendrons in the young seedling stage. Plants that did not have quality foliage were discarded early. The rest were transplanted to seedling beds that were scattered about the landscape. He spaced plants 8 to 10 inches apart, and as the seedlings grew, he had a chance to observe them and see how they rated against his criteria. He studied each one carefully, and if it did not measured up to his standards, the seedling was promptly destroyed. When Bob decided that a seedling was inferior, he chopped up the plant and used it as mulch around remaining plants. He never dug up the root systems since he didn't want to disturb the roots of nearby seedlings. He just allowed those roots to decompose in place which added more organic matter to the soil.

By the time seedlings reached flowering size, plants were often competing for space and might have become leggy. Bob had already observed plant habit before that stage and had eliminated inferior forms. Now he just wanted to see the flowers.

Sometimes Bob would eliminate every plant from a cross but other times he might end up with several promising hybrids. Frequently, when a desired goal had not been reached, Bob would use those seedlings for pollen or seed sources for yet another generation. He sometimes would make "back crosses" where the best seedlings were crossed with one of the original parents. He also made F2 crosses where sister seedlings from the same cross were mated. That allowed genes of recessive characteristics like indumentum or yellow flower color that were not apparent in the primary cross to possibly pair up and become expressed in the next generation.

Bob registered and introduced a number of plants, but he was not finished with his breeding projects. When he passed away, he had many selections under evaluation, promising seedlings that were about to bloom for the first time, and hundreds of small seedlings he had planned to set out. Audrey supervised the garden activities until she passed away, and now with the assistance of friends like John and Donna Delano, Norman and Jean Beaudry, and others, Debbie Humphries will continue with the evaluation process. John and Norm are even making crosses to continue some of the breeding lines that Bob was pursuing but did not have a chance to complete.

The Furman Hybrids

Bob developed a number of hybrids that met his criteria but none were red or yellow. He did name 'Impression' which came from a cross for yellow, ['Golden Torch' × ('Goldfort' × 'Odee Wright')]. The flowers are pale pink and cream with some yellow in the throat. It has excellent glossy green foliage.

Bob registered 'Angel Eyes' from the cross of ('Anna' × *degronianum* ssp. *yakushimanum*). It has ruffled pure white flowers and each blossom is accented with a red eye. A symmetrical collar of dark green leaves makes the perfect setting for each ball shaped truss.

From the cross ('Mary Belle' × 'Dexter's Honedew'), Bob named two hybrids, 'Peach Cloud' which has large ruffled blossoms of pale peachy pink and 'Peach Monarch' which is very similar but is much deeper in color. It is hard to pick a favorite, but the two plants make great companions in the landscape.

Breeding for Red

Hybridizing for compact reds was also difficult to attain because some of the traits are linked. Bluish red shades tended to dominate when trying to breed for better winter hardiness. Also, Bob felt that a cross could not have more than one fourth *R. degronianum* ssp. *yakushimanum* if he wanted to avoid a tendency for fading colors. Many hybridizers refer to the inclination for flowers to fade as the "Yak Dance." Blossoms may have very deep color at the bud stage, but disappointingly fade to near white as they age.

Bob did like 'Vulcan', 'Vulcan's Flame', and 'The Honourable Jean Marie de Montague' as parents. The colors of the progeny were usually strong red without blue undertones. 'Vulcan' had to be a seed parent since it did not produce pollen, but

'Vulcan's Flame' could be used in either direction. 'The Honourable Jean Marie de Montague' performed better as a pollen source. A cross of ('Vulcan' ✕ 'Jean Marie') produced a hybrid with striking red ruffled flowers but Bob did not introduce the plant because other characteristics were not up to his standards.

Bob never reached his ideal red but he did introduce a plant from that breeding line he called 'Hey There'. It is a compact, symmetrical plant with glossy, indumented foliage. The red buds open to deep rose flowers that fade to pink as they age. The cross is [('Tally Ho' × *yakushimanum*) × (*yakushimanum* × 'Noyo Chief')] ✕ 'Jean Marie de Montague'. Bob used 'Hey There' in subsequent crosses due to its compact habit and excellent foliage. He had several good reds under evaluation.

The Elusive Yellow

Bob willingly shared the problems he encountered when trying to breed for yellow rhododendrons. Knowing what works and what doesn't can be helpful to other hybridizers. He pointed out that yellow seemed to be a recessive trait, and that the parents on both sides of a cross needed yellow genes if he expected to see strong yellows in the progeny. If one parent was yellow and the other was not, the seedlings would usually be pale colors rather than deep hues.

Another problem was that the yellow flower color seemed to be linked to some rather undesirable traits, such as cold tenderness and sensitivity to both heat and drought. Yellow hybrids often had poor quality foliage that was light yellowish green instead of deep green, and leaves seemed to be susceptible to spotting and discoloration. Yellow hybrids often had poor foliage retention, too, dropping their leaves after only one or two years. Even if he got a good yellow blossom, there were other undesirable characteristics, such as a lax truss, or open plant habit, or precocious new growth that would hide the truss. Bob did get some wonderful yellow flowers, but he wanted good plant habit and quality foliage, too.

There were some plants that seemed to produce better offspring than others. He was impressed with 'Percy Wiseman' (*degronianum* ssp. *yakushi-*

Fig. 12. 'Hey There'. Photo by John Delano.

manum × 'Fabia Tangerine') since it had compact plant habit, good foliage, and did produce some excellent yellows. One of those is a plant the family intends to register as 'Harbor Lights'. It is a compact golden yellow with a red eye.

Bob often used 'Golden Star' (*fortunei* × *wardii*) as a hardy yellow parent, and it is in the background of many crosses. He used pollen from ('Jalisco' × *degronianum* ssp. *yakushimanum*) for compact habit and yellow genes. He used 'Odee Wright' for yellow flowers and glossy foliage.

Looking at the long pedigrees of Bob's hybrids, it is easy to see that he continued to use the best of his own seedlings in crosses and back crosses, trying to get that perfect yellow. For many of us who visited the Furman garden, we felt he had already attained perfection, but none of them met his high standards.

Fig. 14. Bob Furman's Big Yellow—"BFBY."

'Bob Furman's Big Yellow'

Without a doubt, the yellow rhododendron that caught everyone's attention was one we called 'Bob Furman's Big Yellow', or "BFBY" for short. It has orange buds that open into huge trusses with deep yellow blossoms. Each flower can measure 4.5 inches (11 cm) across and they are fragrant. That plant was a hybridizer's dream since it was fertile both ways. Its anthers dripped pollen, much like *R. fortunei* does, and it set good seed pods, too. Hybrids like 'Hotei' or 'Nancy Evans' have sterile pollen so that does limit breeding potential. Bob made crosses with "BFBY" for the seed exchange and shared its pollen.

Although most of us were spellbound by the huge trusses of "BFBY ," Bob could objectively see its shortcomings. The plant has a slightly open habit and the foliage only held two years. The plant was very difficult to propagate by cuttings, which is not a good trait for a commercial plant.

Since "BFBY" was used in so many of Bob's crosses and was universally praised, Audrey had decided to register 'Bob Furman's Big Yellow' before she died. John Delano has completed the application for registration. When plants will become available is not clear, but since that plant has been used in many past crosses, it is important to identify the source.


Fig. 15. Bob Furman's Big Yellow flower—"BFBY."

Bob had many crosses on the way using "BFBY" and it was clear that he would have made additional crosses if he were still alive. Norm Beaudry and John Delano have been making additional crosses with it since Bob's passing. For instance, Norm crossed "BFBY" on a buff yellow seedling that had dark green, glossy leaves that seemed to stay on the plant for 5 years. The seedling had the outstanding foliage Bob desired, but not the clarity of color he wanted in the flower.

In the spring of 2015, a bed of seedlings of (*R. degronianum* ssp. *yakushimanum* × BFBY) that Bob had planted were blooming for the first time. Predictably, there were no deep yellows and all had flowers of cream to light yellow, but they were compact plants with good leaf retention. Norm backcrossed "BFBY" onto the seedling with best yellow color, and also onto an ivory flowered selection that had the best foliage and largest truss. Norm also made the obvious F2 hybrid by crossing the two best yellow seedlings. One of those crosses may produce a great hybrid.

There are many seedlings in the garden that are under evaluation, and new seedlings blooming every year. I feel sure that Bob's perfect yellow will be among them.

Conclusions

There are many wonderful treasures in the Furman garden, not just yellows, but reds, whites, pinks, apricots and multicolor blends. Debbie Humphries and her husband Jack are committed to seeing that the Furman rhododendron legacy will be preserved, and for that we can all be grateful.

Let the fine example set by the Furmans be an inspiration to every amateur hybridizer, and any others who have considered raising rhododendrons from seed. People can always make their own crosses, but also consider the many promising choices offered in the ARS Seed Exchange. Raising seedlings and seeing those first blooms is very exciting, but it will be important to be very critical when evaluating the progeny. Growers can become enamored by their own hybrids but without rigorous culling, a small garden can get quickly overrun with average plants. Bob maintained that only a tenth of a percent of the seedlings will likely be superior, so it is important to clear out the ordinary plants in order to have space for some truly outstanding rhododendrons.

In April of 2016, District 9 will be hosting a joint convention of the ARS and the Azalea Society of America in Williamsburg, VA. We have selected "Legends and Legacies" as our theme, and this article on the Furman legacy is just part of the inspiration. We invite you to join us as we pay tribute to the many hybridizers and plant collectors who have enriched our gardens with their wonderful rhododendron legacies over the years. For additional information, check out our website:
http://www.arsasaconvention2016.org/

Acknowledgements

I want to give special thanks Norman Beaudry for providing access to many years of personal correspondence with Bob Furman that helped fill in details relating to Bob's hybridizing strategies. I also appreciate his suggestions as well as those from his wife Jean while developing the article. I also want to thank John Delano and his wife Donna who provided similar advice and suggestions. I thank Donna for sharing her extensive image archive of the Furman hybrids. Of course, I am extremely be grateful to Bob and Audrey Furman for their kindness and friendship over so many years, and to their daughter Debbie Humphries and her husband Jack who will see that the Furman rhododendron legacy continues.

Don Hyatt is a member of the Potomac Valley Chapter and a frequent contributor to JARS.

See the Plant Name Register, page 89, for several of Bob Furman's newly registered names.

Newly Registered Cultivar Names

Michael Martin Mills
North American Registrar of Plant Names
Philadelphia, Pennsylvania

The following rhododendron and azalea names were approved and added to the International Rhododendron Register before Aug. 15, 2015, by the Royal Horticultural Society, which serves as the International Cultivar Registration Authority for the genus *Rhododendron*. (Information on the registration process follows the descriptions of cultivars.)

Key
(a) – deciduous or evergreen azalea
(r) – elepidote or lepidote rhododendron
(v) – vireya rhododendron
(z) – azaleodendron
X – primary cross
(s) – seed parent of cross, if known
x – cross of an unnamed parent
* – not registered
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
Royal Horticultural Society color numbers in parentheses, unless another system is noted

(r) 'Atlantic Gold'


'Atlantic Gold'. Photo by Donna Delano.

Elepidote rhododendron: 'Percy Wiseman' (s) X {('Golden Star' x *R. wardii* KW 4170) x [('Jalisco' x *R. degronianum* subsp. *yakushimanum*) x 'Odee Wright']}. H (1994), G (2002): Robert A. Furman, Brewster MA; N (2015): Audrey Furman, Brewster, MA; REG (2015): John Delano, Duxbury, MA. Flrs 13/dome truss, funnel, 2 inches (51mm) long x 3.5 inches (90mm) wide with 7 rounded, wavy lobes. Bud: pale purplish pink (56B-56C) becoming light yellow (10C) just before opening. Inside: brilliant greenish yellow (6C) to light greenish yellow (6D) with deep red (53A) basal flares corresponding to each lobe, longer on dorsal side, forming a seven-point basal star 20mm in diameter, with some green spotting beyond. Yellow filaments and style, with deep red (53A) stigma. Outside: light yellow (10C). Calyx: 8mm long, light yellow (10B). Truss 5 inches (127mm) high x 5.5 inches (140mm) wide. Lvs 5.5 x 2.25 inches (140 x 56mm), elliptic, oblique base, obtuse apex, flat margin, depressed center vein, moderate olive green (147A), semiglossy. Shrub 4 feet (1.2m) high x 5.5 feet (1.7m) wide in 20 years; intermediate habit, lvs held 2-3 years, floriferous. Plant hardy to -10°F (-23°C), buds to -5°F (-21°C). Flowering midseason (mid-May on Cape Cod). Note: The clonal designation of *R. wardii* in the parentage, KW 4170, is believed to refer to Frank Kingdon-Ward and may be for the clone imported from Exbury by Carl Phetteplace before 1977.

(r) 'Banana Cream'

Elepidote rhododendron: 'Bisque (s) X 'Capistrano'. H (2008), G (2011), N (2014), REG (2015): John Doppel, Lenhartsville, PA. Flrs 12/dome truss, broad funnel, 1.75 inches (44mm) long with 5 rounded, wavy lobes. Bud: deep yellowish pink (39B), becoming moderate yellowish pink (31D) just

'Banana Cream'. Photo by John Doppel.

before opening. Inside: pale yellow green (4D) with strong greenish yellow (153C) dorsal speckling. Outside: shading from dark greenish yellow (152D) at base to pale greenish yellow (2D) at margin. Calyx: 0.1 inch (3mm) long, deep yellowish pink (39B). Truss 4 inches (102mm) high x 6 inches (152mm) wide. Lvs 5 x 1.5 inches (127 x 38mm), elliptic, rounded base, broadly acute apex, flat margin, moderate olive green (137A), matte. Shrub 2.5 feet (0.8m) high x 3.5 feet (1.1m) wide in 7 years; dense habit, lvs held 1 year. Hardy to -10°F (-23°C). Flowering midseason (May in eastern Pennsylvania).

(r) 'Bob Furman'


'Bob Furman'. Photo by Don Hyatt.

Elepidote rhododendron: *R. degronianum* subsp. *yakushimanum* (s) X unknown. S (c. 2007), G (late 1990s): Robert A. Furman, Brewster, MA; N (2015): Karen Furman Humphries; I (2013): Van Veen Nursery, Portland, OR; REG (2015): Norman Beaudry, Bethesda, MD. Flrs 10-11/dome truss, campanulate, 1.7 inches (43mm) long x 1.9 inches (48mm) wide with 5 wavy lobes. Bud: deep purplish pink (54B). Inside: yellowish white (155D) with pale purplish pink (62D) in center of lobes on opening, fading to yellowish white (155D); moderate yellow green (146D) to strong yellow green (145A) spotting on upper lobe.

2016 ARS SEED EXCHANGE

The 2016 ARS Rhododendron seedlist and ordering form will be available in early January
at (www.rhododendron.org/seedexchange.htm)
or alternately at the Danish web page
www.rhododendron.dk/ARS-seed.html.
Printed hardcopy seedlists are available upon request.

Seed sales will be open to ARS members and seed donors at this time and to non-members after March 15th. Send your request to the seed exchange address below.

The price of domestic or donated seed is $3.00 per packet. Special seed collections $4.00 per package. A $3. (US) and $4. (outside US) shipping and handling fee will be added to each order. Seed Exchange users from outside the US are encouraged to use PayPal.

Norman Beaudry, Chairman
ARS Seed Exchange

Outside: pale purplish pink (62D) shading to yellowish white (155D). Truss 3 inches (76mm) high x 5 inches (127mm) wide. Lvs 3.6 x 1.4 inches (91 x 36mm), elliptic, rounded base, broadly acute apex, downcurved margins, moderate olive green (147A), glossy. Indumentum: hairs, leaf underside, pale yellow (161C-161D) maturing to moderate orange yellow (164B-165C); above, moderate orange yellow (164B), persisting 6-8 weeks. Shrub 5.5 feet (1.7m) high x 6 feet (1.8m) wide in 20 years; dense habit, lvs held 5 years. Hardy to -10°F (-23°C). Flowering late midseason (June on Cape Cod) Etymology: named for the grower. Note: limited propagation for trials as "Furman's R. yaku #1". The cultivar is believed to be a seedling of a noteworthy Cecil Smith plant.

(r) 'Bob Furman's Big Yellow'

Elepidote rhododendron: ['Golden Star' x ('Jalisco' x *R. degronianum* subsp. *yakushimanum*)] (s) X {['Dido' x ('Chlorops' x *R. lacteum*)] x 'Golden Star'}. H (1985), G (1992), N (1992): Robert A. Furman, Brewster, MA. REG (2015): John Delano, Duxbury, MA. Flrs 12/dome truss, borad funnel, 2.9 inches (74mm) long x 4.8 inches (120mm) wide with 7 emarginate, wavy lobes. Bud: moderate reddish orange (171A) fading to moderate orange yellow

'Bob Furman's Big Yellow'. Photo by Donna Delano.

(164B). Inside: light yellow (10B) with strong yellow green (144B-144C) spotting emanating from throat and extending into upper 3 lobes. Outside: light orange yellow (16C) to pale orange yellow (16D). Waxy with heavy substance; light fragrance. Truss 7 inches (178mm) high x 8.2 inches (210mm) wide. Lvs 5.6 x 2.1 inches (142 x 53mm), elliptic, rounded base, obtuse apex, slightly wavy margins, upangled from midvein, moderate olive green (147A), semiglossy. Shrub 9 x 9 feet (2.7 x 2.7m) in 29 years; intermediate habit, lvs held 2-3 years, floriferous. Plant hardy to -10°F (-23°C), buds to -5F (-21C). Flowering midseason (late May on Cape Cod). Etymology: named for the hybridizer.

(r) 'Bradley Hayman'


'Bradley Hayman'. Photo by Perc Moser.

Elepidote rhododendron: 'The General' (s) X *R. fortunei*. H (2007), G (2014), N (2015), REG (2015): Percival B. (Perc) Moser, Bryn Mawr, PA. Flrs 6-10/dome truss, funnel, 2 inches (51mm) long x 3 inches (76mm) wide with 6 rounded, wavy lobes. Bud: strong purplish red (61B). Inside: very pale pink (73D) shading to light purplish pink (73C) at margins; small area of deep purplish red (61A) at base. Outside: light purplish pink (73C). Calyx: 2mm long, strong yellow green (144C). Truss 4 inches (102mm) high x 6.5 inches

(165mm) wide. Lvs 5 x 2.4 inches (127 x 60mm), elliptic, rounded base, obtuse apex, slightly concave, flat margin, moderate olive green (146A). Shrub 3.5 feet (1.1m) high x 2.5 feet (0.8m) wide in 8 years; intermediate habit, lvs held 2 years. Hardy to 0°F (-18°C). Flowering midseason (May in Philadelphia area). Etymology: named for the hybridizer's deceased godson.

(r) 'Dawn Debonair'


'Dawn Debonair'. Photo by John Doppel.

Elepidote rhododendron: 'Winning One' (s), open pollinated. H (1994): open pollination; G (1998), S (2014), N (2014), REG (2015): John Doppel, Lenhartsville, PA. Flrs 16/dome truss, broad funnel, 1.6 inches (41mm) long with 5 rounded, flat-margin, largely dissected lobes. Bud: deep purplish pink (N57C). Inside: light purplish pink (65B) with minor pale yellowish pink (29D) spotting on dorsal lobe; fading to pinkish white (N155B). Outside: deep purplish pink (64D). Truss 6 x 6 inches (152 x 152mm). Lvs 5 x 2 inches (127 x 51mm), elliptic, rounded base, broadly acute apex, flat margin, moderate yellow green (137C), semiglossy. Shrub 5 feet (1.5m) high x 4 feet (1.2m) wide in 21 years; intermediate habit, lvs held 2 years. Hardy to -15°F (-26°C). Flowering midseason (May in eastern Pennsylvania).

(r) 'Forrest Schoenberger'


'Forrest Schoenberger'. Photo by Perc Moser.

Elepidote rhododendron: unknown (s) X 'Kimberly' (Greer). H (2009), G (2015), N (2015), REG (2015): Percival B. (Perc) Moser, Bryn Mawr, PA. Flrs 5-7/dome truss, open funnel, 1.75 inches (44mm) long x 2.75 inches (70mm) wide with 7 emarginate, wavy lobes. Bud: light purplish pink (63D). Inside and outside: greenish white (155C) with very pale pink (69B) at margins. Calyx: 0.1 inch (2mm) long, strong yellow green (144C). Truss 3.5 inches (90mm) high x 5 inches (127mm) wide. Lvs 3 x 1.5 inches (76 x 38mm), elliptic, rounded base, broadly acute apex, upcurved margin, moderate yellow green (137C). Shrub 2.5 feet (0.7m) high x 1.75 feet (0.6m) wide in 6 years; dense habit, lvs held 2 years. Hardy to 0°F (-18°C). Flowering midseason (May in Philadelphia area). Etymology: named for a deceased nephew of the hybridizer. Note: the flower of the seed parent is described as light yellow with a tinge of red.

(r) 'Holly's Faith'


'Holly's Faith'. Photo by John Doppel.

Elepidote rhododendron: 'Christina Dee' (s) X 'My Jane'. H (2008), G (2011), N (2013), REG (2015): John Doppel, Lenhartsville, PA. Flrs 14/conical truss, broad funnel with 5 broadly acute, wavy lobes. Bud: pale yellow green (4D). Inside: light greenish yellow (8C) with moderate orange (167A) speckled blotch in upper lobe upon opening, blotch fading to green. Outside: pale yellow green (4D). Truss 4 x 4 inches (102 x 102mm). Lvs 5 x 1.5 inches (127 x 38mm), elliptic, rounded base, broadly acute apex, downcurved margin, moderate yellow green (137C), semiglossy. Shrub 2 feet (0.6m) high x 2.5 feet (0.8m) wide in 7 years; dense habit, lvs held 2 years. Hardy to -10°F (-23°C). Flowering midseason (May in eastern Pennsylvania). Etymology: Named for Holly Doppel, wife of the hybridizer.

(r) 'Lemon Lollipop'

Elepidote rhododendron: 'Austin's Gold' (s) X 'Capistrano'. H (2009), G (2012), N (2013), REG (2015): John Doppel, Lenhartsville, PA. Flrs 12/dome truss, funnel, 1.75 inches (44mm) long with 5 rounded, wavy lobes. Bud: moderate orange (167B) becoming brilliant greenish yellow (151D) just before opening. Inside: light greenish yellow (7D) with a strong red (53C) basal flare corresponding to each lobe, forming a small basal star. Outside: light greenish yellow (7D). Calyx: 0.25 inch (6mm) long, strong yellow green (141D) at base, brilliant yellow green (149A) at margin. Truss 3 inches (76mm) high x 7 inches (178mm) wide. Lvs elliptic, rounded base, broadly acute apex, flat margin, dark green (136A), matte. Shrub 1.7 feet (0.5m) high x 2.3 feet (0.7m) wide in 6 years; dense habit, lvs held 2 years. Hardy to -10°F (-23°C). Flowering early midseason (early May in eastern Pennsylvania).


'Lemon Lollipop'. Photo by John Doppel.

(r) 'Len's Pacific Foam'

Elepidote rhododendron: 'Golden Anniversary' (s) X 'Faggetter's Favourite'. H (1990s): Len Charvet, Fort Bragg, CA; G (2000): Ron & Sylvia Trujillo, Fort Bragg, CA; N (2014), I (2014), REG (2015): Forest Lane Nursery, Fort Bragg, CA. Flrs 24/conical truss, broad funnel, 2.4 inches (60mm) long x 3.8 inches (97mm) wide with 7 flat lobes. Bud: light pink (49C). Inside: pale yellow green (155A) with moderate red (180A) marking on upper lobe; light pink (49C) at lobe tips on opening, quickly fading out. Outside: pale yellow green (155A). Truss 7 inches (178mm) high x 8 inches (203mm) wide. Lvs 7 x 2.2 inches (178 x 55mm), elliptic, cuneate base, broadly acute

apex, flat margin, moderate olive green (137A), matte. Shrub 5.5 feet (1.7m) high x 4 feet (1.2m) wide in 4 years; intermediate habit, lvs held 2 years. Hardy to 20°F (-7°C). Flowering midseason (April-May in coastal northern California). Etymology: Named after the hybridizer.

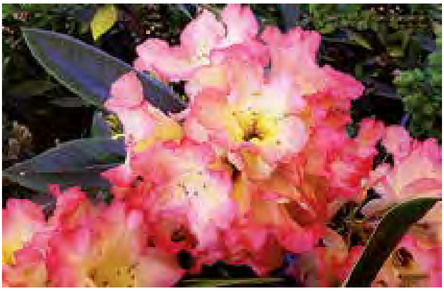
(r) 'Noyo Mist'

'Noyo Mist'. Photo by Phillip Johnson.

Lepidote rhododendron: 'Butterhorn' (s) X 'Ila Mae Allenby'*. H (2004), G (2009), N (2015), REG (2015): Phillip Johnson, Fort Bragg, CA. Flrs 5/lax truss, funnel, 2.6 inches (66mm) long x 2.6 inches (67mm) wide with 5 wavy lobes. Bud: moderate yellow (160A). Inside: pale yellow green (155A) with yellow in throat. Outside: brilliant yellow green (154C), fading to pale yellow green (155A). Calyx: 22mm long, strong yellow green (145A). Moderate fragrance. Truss 3.2 inches (82mm) high x 5.9 inches (150mm) wide. Lvs 2 x 1.1 inches (50 x 28mm), obovate, rounded base, obtuse apex, downcurved margins, moderate olive green (147A). Indumentum: hairs and scales extruding from leaf margin. Shrub 3 x 3 feet (0.9 x 0.9m) in 11 years; open habit with reddish peeling bark. Flowering midseason (April-May in coastal northern California).

* 'Ila Mae Allenby' – not registered. Possibly hybridized by the late Phil Cornell of California; fragrant white, funnel-shape flowers. No further information has been found.

(r) ‘Orange Taffy’

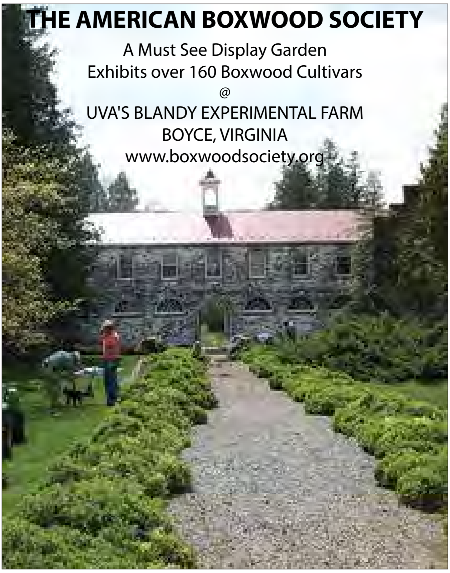

‘Orange Taffy’. Photo by Don Wallace.

Elepidote rhododendron: ‘Southern Skies’ (s) X (‘Percy Wiseman’ x ‘Orange Marmalade’). H (1999), G (2004), N (2015), REG (2015): Don S. Wallace, McKinleyville, CA; I (2015): Singing Tree Gardens Nursery, McKinleyville, CA. Flrs 13/dome truss, funnel, 2.5 inches (64mm) long x 3 inches (76mm) wide with 5 frilly lobes. Bud: strong purplish red (60D). Inside: light greenish yellow (6D), with strong purplish pink (62A) at margins, and deep purplish red (61A) at base shading 0.75 inch (19mm) from base to strong purplish red (63A). Outside: pale yellowish pink (27C) shading to moderate purplish pink (62B) 0.5 inch (13mm) from edge. Calyx: 1.75 inches (44mm) long, pale yellowish pink (27C) shading to moderate purplish pink (62B). Flowers appear orange at a distance. Truss 5 inches (127mm) high x 7 inches (178mm) wide. Lvs 5.5 x 1.5 inches (140 x 38mm), elliptic, rounded base, broadly acute apex, downcurved margin, doubly convex lateral curvature, moderate bluish green (127A), semiglossy. Shrub 4 feet (1.2m) high x 5 feet (1.5m) wide in 10 years; intermediate habit, lvs held 2 years. Plant hardy to 0°F (-18°C), buds to 5F (-15C). Flowering midseason (April in coastal northern California). Synonym: W9930 in hybridizer’s records.

(r) 'Radiant Pink Lady'

'Radiant Pink Lady'. Photo by Mary L. Reiley.

Elepidote rhododendron: ('Brookville' x 'Mary Garrison') (s) X ('Crest' seedling No. 2 x 'Crest' seedling No. 1). H (2006): H. Edward Reiley, Woodsboro, MD; N (2015): Michelle Lee Powell, Woodsboro, MD; G (2015), S (2015), REG (2015): Mary L. Reiley, Woodsboro, MD. Flrs 12-14/ball truss, broad funnel, 1.75 inches (44mm) long x 2.5 inches (64mm) wide with 5 emarginate, wavy lobes. Bud: light yellow green (2C) blending to light yellowish pink (36C). Inside: brilliant greenish yellow (3A) shading to pale yellowish pink (36D) at margins, with red dorsal spots. Outside: light greenish yellow (3C) at base, shading to light yellowish pink (36B-36C). Calyx: 0.1 inch (2mm) long, strong yellow green (145A). Truss 3.5 inches (90mm) high x 4.5 inches (114mm) wide. Lvs 3.5-3.75 x 1.25-1.5 inches (90-95 x 32-38mm), elliptic, rounded base, acute apex, flat margin, moderate olive green (137A), semiglossy. Shrub 4 feet (1.1m) high x 3 feet (0.9m) wide in 9 years; intermediate habit, lvs held 3 years. Plant hardy to -2°F (-19°C), buds to 0°F (-18°C). Flowering early season (early May in central Maryland). Note: The pollen parent is a cross of two seedlings the hybridizer grew from 'Crest'; it is not known if they were hand-pollinated or open-pollinated.



(r) 'Reiley's Cream Puff'

'Reiley's Cream Puff'. Photo by Mary L. Reiley.

Elepidote rhododendron: [('Brookville' x 'Mary Garrison') x (unnamed seedling x 'Tan')] (s) X [likely 'Golden Star' seedling x ('Jalisco' x *R. degronianum* subsp. *yakushimanum*)]. H (2005): H. Edward Reiley, Woodsboro, MD; G (2015), REG (2015): Mary L. Reiley, Woodsboro, MD; S (2015), N (2015): Sonny Coble, Gettysburg, PA. Flrs 12-15/ball truss, broad funnel, 2 inches (51mm) long x 3 inches (76mm) wide with 7 rounded, wavy lobes. Bud: light greenish yellow (3D). Inside: pale yellow (158B) edged with light yellowish pink (36C), with light yellowish pink (36B) spots in upper lobe. Outside: pale yellow (158B) edged with light yellowish pink (36C). Calyx: 3mm long, strong yellow green (145A). Light fragrance. Truss 5 inches (127mm) high x 6 inches (152mm) wide. Lvs 3-3.5 x 1.75 inches (76-90 x 44mm), oblong, rounded base, obtuse apex, flat margins, slightly concave, moderate olive green (147A), semiglossy. Shrub 4.5 feet (1.4m) high x 7 feet (2.1m) wide in 10 years; intermediate habit, lvs held 2 years. Plant hardy to -2°F (-19C°C), buds to 0F (-18C). Flowering early season (early May in central Maryland). Note: The unnamed seedling in the parentage of the seed parent was designated "yellow-9-59" on the hybridizer's label; no further information is available. The seedling in the parentage of the pollen parent was designated "BRB Golden Star" on the hybridizer's label, which likely indicates a seedling of 'Golden Star', according to the registrant, his widow.

(r) 'Spring Flare'


'Spring Flare'. Photo by John Doppel.

Elepidote rhododendron: 'Scintillation' (s) X 'Firestorm'. H (2000), G (2004), N (2014), REG (2015): John Doppel, Lenhartsville, PA. Flrs 11/dome truss, open funnel, 1.5 inches (38mm) long with 7 emarginate, wavy lobes. Bud: deep red (53A). Inside: strong purplish red (58B), with a pale purplish pink (56A) flare in upper lobe extending almost to base; at base, a small star of strong purplish red (71B). Outside: shading from strong purplish pink (55B) at base to vivid purplish red (N57A) at margins. Truss 3 inches (76mm) high x 5.5 inches (140mm) wide. Lvs 4 x 2 inches (102 x 51mm), elliptic, rounded base, broadly acute apex, downcurved margin, moderate yellow green (137C), matte. Shrub 3 feet (0.9m) high x 7 feet (2.1m) wide in 15 years; dense habit, lvs held 1 years. Hardy to -10°F (-23°C). Flowering early midseason (early May in eastern Pennsylvania).

(r) 'Steve's Sunrise'


'Steve's Sunrise'. Photo by Mary L. Reiley.

Elepidote rhododendron: ['Janet Blair' x ('Evening Glow' x 'Crest' seedling No. 2)] (s) X [yellow seedling x ('Evening Glow' x 'Crest' seedling No. 2)]. H (2004): H. Edward Reiley, Woodsboro, MD; N (2015): Steven E. Reiley, Highlands Ranch, CO; G (2015), S (2015), REG (2015): Mary L. Reiley, Woodsboro, MD. Flrs 8-11/ball truss, broad funnel, 2 inches (51mm) long x 3 inches (76mm) wide with 5-7 broadly acute, wavy lobes. Bud: moderate purplish red (186A) to dark purplish pink (186C). Inside: pale yellowish pink (36D), light orange yellow (16C) at base and moderate purplish red (186B) at margins; moderate reddish orange (35A) speckling on upper lobe. Outside: dark purplish pink (186C) with moderate purplish red (186A) midveins. Calyx: 0.1 inch (3mm) long, strong yellow green (145A). Truss 4.5 inches (114mm) high x 5.5 inches (140mm) wide. Lvs 2.5-3 x 1.25-1.5 inches (64-76 x 32-38mm), elliptic, rounded base, broadly acute apex, downcurved margin, moderate olive green (137A), matte. Shrub 4 x 4 feet (1.1 x 1.1m) in 11 years; intermediate habit, lvs held 4 years. Plant hardy to -2°F (-19°C), buds to 0°F (-18°C). Flowering early season (early May in central Maryland). Etymology: Named for a son of the hybridizer and the registrant. Note: No further information is available on the "yellow seedling" in the parentage of the pollen parent. The hybridizer also raised at least two seedlings of 'Crest'; it is not known if they were hand-pollinated or open-pollinated.

(r) 'Will Corey'


'Will Corey'. Photo by Perc Moser.

Elepidote rhododendron: unnamed Elmer Morris seedling (s) X *R. fortunei*. H (2007), G (2014), N (2014), REG (2015): Percival B. (Perc) Moser, Bryn Mawr, PA. Flrs 12-13/ball truss, open funnel, 2 inches (51mm) long x 3.5 inches (90mm) wide with 5-7 rounded lobes. Bud: strong purplish red (63B). Inside: strong purplish pink (68B) with small twin basal flares of strong greenish yellow (151B). Outside: deep purplish pink (68A). Calyx: 0.1 inch (2mm) long, strong yellow green (144C). Light fragrance. Truss 5 inches (127mm) high x 6 inches (152mm) wide. Lvs 5 x 1.7 inches (127 x 43mm), elliptic, rounded base, broadly acute apex, flat margin, slightly concave, moderate olive green (146A). Shrub 2.6 feet (0.8m) high x 3 feet (0.9m) wide in 8 years; intermediate habit, lvs held 2 years. Hardy to 0°F (-18°C). Flowering midseason (May in Philadelphia area). Etymology: named for a friend's deceased son. Note: The seed parent was grown by the late Elmer Morris of Manasquan, NJ. It is believed to be from seed from the ARS Seed Exchange, details unknown. The cultivar has been propagated and sold in limited quantity by ARS chapters in Pennsylvania under the designation "Morris 452".

References

Names conform to the rules and recommendations of the *International Code of Nomenclature for Cultivated Plants, Eighth Edition* (2009). Color names are from *A Contribution Toward Standardization of Color Names in Horticulture*, R.D. Huse and K. L. Kelly; D. H. Voss, editor (ARS, 1984).

(Continued on next page.)

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North Americans: Electronic registration may be submitted at www.rhododendron.org/plantregistry.htm. The site also provides instructions and forms for downloading and completing manually. Those submitting paper applications should use only the current form (revised 2015). The quickest way to obtain paper forms is to ask a friend with Internet access to go to the ARS website and print the form and instructions. Questions, completed paper forms, all photographs and requests for paper forms should be directed to Michael Martin Mills, North American Registrar. There is no fee.

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Errata

The images of Korean azaleas on both the cover and on P. 34 in *JARS* 69 were incorrectly labeled as *R. schlippenbachii* by the Korean sources, when in fact they are *R. yedoense* var. *poukhanense*. The article on page 34 also refers incorrectly to *R. schlippenbachii* when the reference should be to *R. yedoense* var. *poukhanense*.

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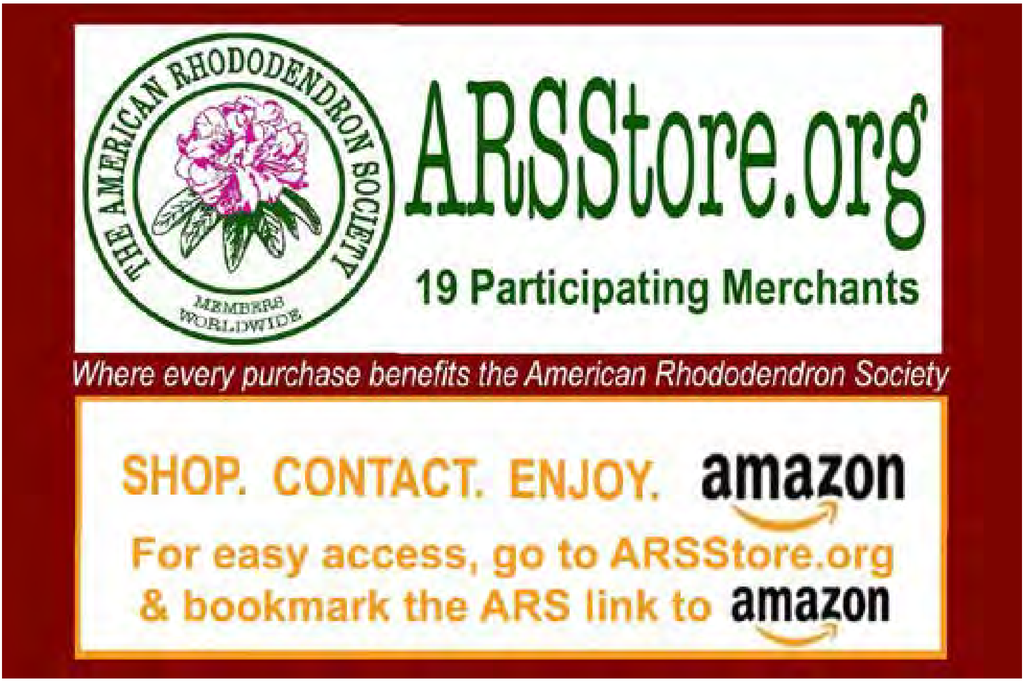

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