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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

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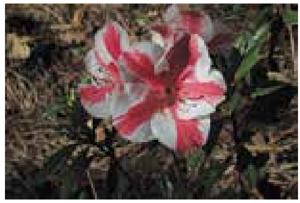


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Satsuki azalea “Reiko’. Photo by Joe Coleman.

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From the President

Ann Mangels
Baltimore, Maryland

Our Annual ARS Meeting held in Eureka, CA, in April was another event showing how the cooperating chapters of a District can put on one of these many faceted meetings, seemingly flawlessly and with such ease. Flying in to our various airports was a simple task—the challenge of which highway might be open into Eureka came later. Those of us from the East are not accustomed to landslides and round-the-clock road crews clearing highways. Our adventures became the starting point for many conversations and discussions.

As a result of recent changes to Society personnel functions, the By-Laws and Policies of the Board have been updated and are available for you to print from our webpage. By replacing the Executive Director with an Office Administrator and some duties of the JARS personnel and treasurer into volunteer activities, savings have increased bottom line numbers. Another important message to deliver is that the balanced budget for 2017-18 was accepted and adopted at the BOD Meeting.

Although we continue to lose members, the general attitude is supportive for continuing activities being offered by individual chapters, especially plants-4-members, new initiatives for propagating and expanding the value of eastern/western cultivars beyond their usual boundaries. Buying plants from Lowes and Home Depot are always possible, but learning how to raise adaptable plants from cuttings or seeds is an activity where the need for members guidance is essential. The ARS Seed Exchange as well as local chapters are popular sources for many unusual starts for wonderful garden material.

The 2018 International ARS meeting in Breman, Germany, will be a "wow" opportunity of a lifetime (as trite as that may sound). The pre- and post-tour packages have been planned to show off some of the finest public and private gardens, nurseries and parks in Northern Europe. We were there a few years ago and the memory lives on! We highly recommend your investing into at least part of the exciting cultural tours.

We missed Bob MacIntyre at his last meeting as President. I just spoke with him earlier this week, and he sounds enthusiastic and has spent some time in his yard doing some gardening. He's hoping that he may be able to travel again to see his rhodie friends.

Have a pleasant summer and I hope you will try to come to Richmond, VA, during the weekend of October 20-22, 2017 for an Eastern Regional Meeting featuring many fine speakers from a variety of backgrounds. See the information on pages that follow.

From the Editor

Glen Jamieson
Parksville, BC
Canada

One of the great opportunities presented by ARS conferences is to see parts of North America, even areas closer to home, in greater detail than might normally be possible. The recent ARS conference in Eureka was the first time my wife Dorothy and I spent any time in northern coastal California. We had previously driven up Hwy 101 a number of years ago, but had only stopped briefly to eat as both times we needed to reach central Oregon so we could get home to Vancouver Island the next day! What a wonderful delight it was, then, to be able to spend some time in the Eureka area and both to find out how beautiful it is and how friendly and hospitable Eureka chapter members are!

So what were my favourite memories from Eureka! There were many but here are a few, not in any particular order, with respect to conference organisation, the tour gardens and the people:

1. The great food at the banquets, and the many interesting speakers.
2. The garden selection had an interesting mix of both smaller private gardens and larger public/commercial gardens. We were very impressed with the Humbolt Botanical Garden and all the volunteer work Eureka Chapter members are putting into it! It's still young, but has the bones of a really spectacular garden. We had heard a lot about Stagecoach Hill, and it was great to see the Western Azaleas in flower in their natural habitat. It's a very interesting species, and well worth the work to maintain its habitat!
3. It's always nice to see how people landscape with plants that are too tender, or at least not readily available, to grow in our home area of Vancouver Island, BC. Northern California with its milder climate has such a wide variety of plants that cannot be grown in BC, and us northerners were very envious! Granted, we can grow the temperate rhodos better, but as someone particularly interested in plant species in general, the mix of interesting plant types available there greatly exceeded that available to us!
4. The hospitality shown was impressive. We met lots of interesting people, learnt a great deal about the Eureka area and its history, have made many new friends, and had the opportunity to reconnect with existing friends.

In summary, I encourage members to attend ARS conferences when-ever possible, as they are great experiences!

'Choeiraku'.

'Daishuhai'.

Satsuki Azaleas

Ken Gohring
Marietta, Georgia

Photos by Joe Coleman

The Satsuki azaleas are versatile evergreen plants that can be used in many ways. The plants are a part of many southern gardeners' plantings partly because they grow well there and have attractive features. They are hardy in USDA zones 7 to 9. They will survive in areas with temperatures as low as 0° F (-18° C) and some cultivars are hardy to -10° F (-23° C). However, gardeners in the northeast have to provide some protection when temperatures decline. Their usage includes being used as specimen plants, borders, containers, ground covers and topiaries. They are used extensively for bonsai because they are able to withstand extensive pruning and their flowers are quite attractive. In practice Satsukis are planted around pools and streams, in rock gardens and under trees. Some of the small leaved cultivars are pruned into round bushes to replicate stones and other pleasing shapes. They are used in many Asian public gardens. They are compact plants ranging from six inches to about four feet (0.15-1.2 m) in height and have a spread up to five to six feet (1.5-1.8 m). The Satsuki plant form is dense and is sometimes described as twiggy, and some forms are upright while others are hanging.

The origin of the Satsuki azaleas is in southern Japan. It is not clear how they were developed but it is believed that they first developed naturally as hybrids of *R. indicum* and *R. tamurae,* now known as *R. eriocarpum. R. indicum* at one time was called *R.*

‘Edward W. Collins’.

‘Geisha Girl’*.

‘Gumpo Fancy’*.

macranthrum, and ‘Macrantha’ is a name that is still used for some Satsuki cultivars. These species are found in the islands of southern Japan, with *R. indicum* found in three of the main islands of Japan, and both are found in some of the smaller islands to the south as well. However, the two species generally do not grow in the same areas. *R. eriocarpum* is quite unusual in that it lives in harsh environments close to the seashore, where it survives in locales that include constant winds, bright sunshine, a hot climate and poor soil that is usually sandy and contains gravel. Another unusual feature of *R. eriocarpum* is the occurrence of broad elliptical leaves in the spring and thick obovate (ovate with the narrow end at the base) leaves in the summer. Its flowers have eight to ten stamens, which vary in color from white, red or purple. This contrasts with *R. indicum* and most other azaleas, which have only five stamens, and the leaves on *R. indicum* are narrow and elliptical. However, both species are found on the island of Yakushima where it is thought the two naturally cross- pollinate, producing the first of what are presently called Satsuki azaleas. Over a long period of time, the Japanese have duplicated the natural hybridization and a large population of beautiful azaleas has resulted. The Japanese have repeated this process over several centuries, with some estimates suggesting 500 years of Satsuki azalea development.

The Satsukis are highly variable in their characteristics. While the usual plant form is small, the range of bloom types is quite large and they have a tendency to sport, resulting in even more forms. The word Satsuki means "fifth month" and describes the usual bloom time for them. In the Atlanta area, most Satsukis set blooms in May. The bloom season does extend into June and July and is variable to some degree, depending on geographical location. Fred Galle's (1987) book *Azaleas* includes significant information about Satsukis. It includes illustrations of 24 different bloom patterns that have been recognized, including blooms with solid color, various picotee forms, different stripped combinations, specked forms, variable petal coloration and random dispersion of coloration. The size of Satsuki blooms ranges from 0.5-5 inches (1.3-12.7 cm). Colors range from white to pink with some cultivars having purple, red or reddish orange color. Some Satsuki cultivars will exhibit variable color forms on the same plant, changing from one year to the next. Some will have blooms of different colors and color patterns the same year. While the majority of Satsuki

'Gunrei'.

'Hosei'.

'Kusadama'.

‘Mansaku’*.

‘Matsu-no-hikari’*.

‘Myuno-no-tsuki’*.

blooms are single flowers, some have hose-in-hose, semi-double or fully double form. In some cases the petals have lacy, frilly edging. The flower shape is also variable, ranging from narrow to wide. Their leaves range from 0.5-2 inches (1.3-5 cm) with variable shapes.

The various Satsukis that originated in Japan have Japanese names that frequently present difficulty when translated into another language. This results in variable names for the same plant. For example one of the most popular Satsukis is translated as both ‘Gumpo’ and ‘Gunpo’. The cultivar commonly known as ‘Eikan’ is also designated as ‘Eikwan’.

The first Satsuki azaleas were brought to the United States in the beginning of the 20th century, but the first major introductions were in 1938-9 by the Plant Introduction Section of the U.S. Department of Agriculture. B.Y. Morrison, famous for the breeding the Glenn Dale and Back Acres azaleas, selected the plants at random from the inventory of the Chugai Nursery of Japan. Originally these were called Chugai azaleas but later were designated as Satsuki azaleas. In the 1950s, Dr. John Creech, who served as Director of the National Arboretum, arranged the importation of a set of 168 Satsuki cultivars that were superior to many of the earlier introductions. In 1978 and 1979, Barry Yinger, a respected plant explorer working for the National Arboretum, arranged for the acquisition of 387 named Satsuki cultivars.

The Satsukis have been used in numerous plant breeding efforts. Morrison used them in 150 of the Glenn Dale azaleas and 46 of the Back Acres hybrids. Robert Gartrell used 47 of the Satsukis acquired by Creech and 37 acquired elsewhere in the development of his hybrids known as Robin Hill azaleas. James Harris used Satsukis in his hybridization work. The famous 'Pink Cascade'* is a cross of *R. nakaharai* and the Satsuki 'Bunka'. He also used two other popular Satsuki cultivars, 'Amagasa' and 'Wakaebisu'. Many of the breeding efforts were oriented toward developing hybrids that would do well in northern climates and retain the bloom and other qualities of the Satsukis. In the early 1980s, the Azalea Society of America conducted a poll to determine the most popular Glenn Dale azaleas. Several of the most popular included 'Martha Hitchcock', 'Boldface' and 'Delos', all which have a Satsuki parent.

One of the earliest Satsukis to become popular is 'Gumpo', which is planted frequently as a border plant. It reaches a height of

'Nishiki-no-hikari'.

'Reiko'.

'Shugetsu'*.

‘Wakaebisu’.

three feet (0.9 m), allowing it to be planted in front of larger plants. It has large, bright, three inch (7.6 cm), white fluffy blooms with reddish flecks. Like many other Satsukis, it sports, occasionally producing desirable forms that have been propagated. Several of these are ‘Gumpo Pink’, ‘Gumpo Fancy’*, ‘Gumpo Red’ and ‘Gumpo White’. Nuccio’s California nursery has done a lot of work with Satsukis. They acquired Satsukis directly from Japan and made crosses that have produced several select cultivars. Examples are ‘Nuccio’s Blue Moon’* with its lavender blooms and ‘Nuccio’s Voodoo’*, a bicolor with white center and a light purple border.

The cultural requirements for Satsuki azaleas are similar to that of most evergreen azaleas. They should be planted in areas with partial sunlight and shade. Full sun locations will present problems and full shade will result in an inferior bloom set. The best advice is to locate them where the plants will get morning sun and afternoon shade, but one has to live with the limitations of any gardening site. The author has a group of the cultivar ‘Wakaebisu’ that set beautiful “baby” pink blooms each year. However, being located in a site where they get afternoon sun results in the blooms fading and losing their attractiveness after a few days. They do best when planted in soil with a ph of 4.5 to 6, and the addition of mulch helps keep the soil moist, along with watering during dry periods.

To get a better insight into Satsuki appreciation and culture, two evergreen azalea authorities were contacted to discuss their experiences with Satsuki azaleas. These two are Joe Coleman, who has a large rhododendron and azalea garden east of Atlanta, and Ronnie Palmer, who operates a nursery in White Hall, Arkansas. Both have had several years experience with Satsukis and other azaleas. Ronnie grows 250 different Satsuki cultivars and offers 20 to 30 in his catalog.

‘Zuishi’*.

1. How well do the Satsukis do for you?

Joe indicated that they do well for him. He has had several hundred cultivars but has lost several over the last few years to the drought conditions that have been experienced in Georgia. Ronnie indicated that they do reasonably well for him but he does experience problems with bloom set if the temperature falls below 20° F (-6° C) in the winter.

2. What problems have you encountered with them?

Joe has not had any significant problems with diseases but he must monitor the blooms for petal blight that can happen when temperatures rise. He states that the plants must have a moist environment and watering is a necessity in dry weather. Ronnie has also not experienced any disease problems, but he does have some difficulties because of the nature of the soil in areas where he grows them.

3. What are your feelings about the variability of bloom with some cultivars?

Joe experiences three to four different bloom forms on a single plant and frequent sporting. He says that at times the variable blooms can be spectacular. Ronnie, who sells plants locally and by mail order, says that the variable forms do not sell well in the local market. Most of those sold by mail order are to azalea specialists and to those who use them for bonsai.

4. What are your experiences in propagating them?

Both indicated that propagation was easy with stem cuttings. Ronnie made an interesting comment. In his experience when propagating those with variable form, that if he takes a cutting from a branch with a solid colored bloom, the resulting plant will have all have solid colored blooms. To create a clone of the variable form plant, he has to take a cutting from a branch with blooms of variable color.

5. What are your favorite Satsukis? Note: The following descriptions are from Galle (1987).

Joe's favorites:

'Wakaebisu' - yellowish pink with deep pink dots in blotch, hose-in-hose, rounded lobes, 2-2½' (0.6-0.8 m)

'Higasa' - purplish pink, prominent reddish purple blotch; large, wide, overlapping laid-back lobes, 3' (0.9 m)

'Matsu-no-hikari'* - white with deep yellowish pink variations, ruffled overlapping lobes, 3' (0.9 m)

'Gumpo' (Several forms, Original) - white with occasional small flakes of purplish pink, blotch area light green; lobes equal, overlapping and ruffled, 2½-3' (0.8-0.9 m)

'Jindai' - white to light pink, many dots and flakes of strong purplish pink large flakes darker, many variations, 4-4½' (1.2-1.4 m)

Ronnie's favorites:

'Yomato'* - white with pale yellow green blotch, some flecks and stripes to solid selfs of deep pink; wide round overlapping lobes, 3½-4' (1.1-1.2 m)

'Eikan' - extremely variable, white with many variations of stripes and selfs of strong to deep pink to yellowish pink, large round often six to nine ruffled lobes, 3-4' (0.9-1.2 m)

'Gunrei' - pale pink with light pink flakes and small sectors, lobes over lapping, frilled, 2-2½' (0.6-0.8 m)

'Mansaku'* - strong pink with occasional white and deep pink stripes, wavy round lobes, 2½-3' (0.8-0.9 m)

'Chiyo-no-homare'* - white with stripes of strong to vivid purplish pink, many variations to purplish pink self; broad rounded notched lobes, 3-4' (0.9-1.2 m)

* = not registered.

Reference

Galle, F.C. 1987. *Azaleas.* Timber Press, Portland, OR: 519 pp.

A Brief Description of Rhododendron Myths from Around the World

Elizabeth Georgian
Vilnius, Lithuania

The species of the widespread genus *Rhododendron* are used around the world for medicine, food and drink and handicrafts (e.g., Georgian and Emshwiller 2013, 2016). Additionally, there are numerous examples of rhododendrons being included in the local mythology of cultures around the world, not just in the Himalayas where *Rhododendron* species are most diverse. Here, I take a closer look at previously recorded myths as well as other myths that I collected during my field research from 2010 through 2012.

China's long history has led to records of writing about rhododendrons since the Liang Dynasty in AD 482. The poet Cheng Yanxiong wrote, "Rhododendrons and cuckoos, what's the relation between them? Perhaps the bleeding mouths of cuckoos have dropped blood onto the rhododendron branches and it then turned into red flowers" (Feng 1988). In China, many of the recorded myths about rhododendrons also include cuckoo birds and it is important to note that in Mandarin, rhododendron and cuckoo have the same name, "*du juan.*"

In the published literature, I have found several stories that surround rhododendron lore with the overall theme of sadness and loss. The following Chinese story about two brothers is paraphrased from Ferguson (1996):

> Two young brothers lived in the countryside with their widowed mother. The younger son was favored by his mother, while the eldest son, her stepson, was treated as a slave. The stepson was starved, beaten, and sent to work in the fields every day. Despite this unfair treatment, the brothers had a strong bond and the younger brother would help his elder brother by giving him extra food and taking the blame for any mistake.

Fig. 1. A gathering of the Nu, an ethnic minority in northwest Yunnan Province, China. http://www.chinatoday.com/people/china_ethnic_nu_family.htm

One day, the wicked mother gave each of her sons a bag of seeds, but the bag of seeds she had given the stepson were roasted and had no chance of growing. She told the boys that if a field did not grow, whoever had planted that field would be banished from the house. The younger brother, not knowing this, chose to switch bags of seeds with the older brother hoping this would protect him from being sent away. After the stepson's seeds had begun to sprout, the younger son, knowing his mother would be angry because his seeds were not growing, ran away from home. When the mother discovered what her younger son had done, she was furious and sent her stepson to look for his brother with the threat that if they did not return she would have him murdered.

The older brother searched for his younger brother to no avail. Witnessing his sadness, the gods took pity on the older brother and turned him into the first cuckoo bird so he could fly and thus find his brother faster. After many weeks searching for his brother by wing, the boy lost hope of ever finding his beloved younger brother. Helplessly, he perched on a tree branch and began to cry until his tears ran dry. His last two tears were made of blood and from the blood grew an azalea. The azalea is believed to be a memorial to the love between these brothers, and the sad call of the cuckoo is a reminder of the boy's endless search for his missing younger brother.

A variation on the naming story of both rhododendrons and cuckoos comes from Sichuan Province, China (Fang 1986):

> The beloved King of Sichuan Province, Du Yu, was known for taking care of his people. One day, the likelihood of a disastrous flood reached Du Yu's kingdom and threatened the lives of his people. In accordance with King Du Yu's kind reputation and despite the urges of his advisors to seek alternate shelter, King Du Yu sought shelter on the Cangping Mountain with his people. Rapidly, the flood made its way up the mountain and all were sure they would drown.
>
> When all was thought lost, the spirit of a soft-shelled turtle appeared and created a gorge, which allowed the floodwaters to retreat. While his people cheered, King Du Yu showed his gratitude to the spirit of the soft-shelled turtle by giving his crown to the spirit.
>
> Many years later, King Du Yu died a natural death. While cuckoo birds were calling, King Du Yu's spirit flew over the land to wish his beloved people "farewell." The people of Sichuan missed their loyal King Du Yu after his death and decided to call the cuckoo *Dujuan* in his memory. Rhododendrons bloom in the same season when cuckoos cry, so the people of Sichuan named the flowers after the bird, and this also their beloved king, to remind them of his everlasting presence.

In a variation on the above story, the beloved King Du Yu of Sichuan Province died after ruling his land for many years. After death, King Du Yu's spirit transformed into a cuckoo bird so he could fly over the land he once ruled. King Du Yu wished his people farewell and cried until he could not cry any longer at which point his mouth bled and he turned into a red azalea. Aware of this, Du Yu's loyal subjects named both the cuckoo and the azalea *Dujuan* after their beloved king. Now, the cuckoo cries only when rhododendrons are in bloom, and serves as a reminder of the beloved Du Yu (summarized from Fang 1986).

Fib. 2a. A Naxi woman in traditional dress. http://dance.jnu.edu.cn/DRESS-1/DRESS-24/naxi.jpg

Further south, in Yunnan Province, several myths emerged from smaller ethnic minorities, many of which remain unknown outside of China. One such small ethnic group, the Nu, consists of about 23,000 individuals scattered across rural northwest Yunnan Province, China (Van Driem 2001). Their homeland is a country of high mountains and deep

Fig. 2b. Naxi women in traditional dress dancing in Lijiang, Yunnan Province, China. Photo by the author.

ravines crossed by the Dulong, Irrawaddy (N'Mai River and Mali River), and Nujiang (Salween) Rivers. The Nu (Fig. 1) speak an unwritten language classified in the Tibeto-Burman language family (Bradley 1997), and although the Nu's traditional animist beliefs are slowly being forgotten, a major holiday is celebrated that reminds the Nu of their powerful past.

A previously published myth remembers a Nu woman named A-Rong, who was a major contributor to some engineering achievements in a Nu community:

> A-Rong, inspired by a spider web, created the first rope bridge that allowed the Nu people to cross the Nujiang River. Additionally, A-Rong created irrigation channels that transformed daily life. Impressed with A-Rong's inventions and dazzled by her beauty, the chief of the neighboring ethnic group planned to force A-Rong to be his bride. After learning of the chief's intentions, A-Rong ran away from her village and hid in a rhododendron forest. The chief followed her and on March 15 burned the rhododendron forest with A-Rong in it (All China Women's Federation and In Kunming).
>
> To honor A-Rong's bravery and intelligence, the Nu named A-Rong as a deity. Every year on March 15th through the 17^{th}, her memory is honored during the Fairy (Immortal) Festival. During this festival, Nu women gather azalea flowers and offer them to the deity A-Rong in the fairy cave as a sign of devotion and remembrance (All China Women's Federation and In Kunming). Immediately following the offering of azaleas, a feast is enjoyed.

During my own research, only two Nu people and one Lisu (another small ethnic minority living in Yunnan Province) person discussed the Flower Festival. However, it is possible that during my research, I missed seeing the specific area where people would know about this highly localized festival. It is also possible that fewer people today are practicing this festival.

The Naxi (Fig. 2) , another small ethnic minority of about 300,000 individuals found mostly in Yunnan Province, have a wide array of myths and sayings about rhododendrons (Yang et al. 2011). Perhaps the most predominant of these is the inclusion of rhododendron in the Naxi creation story. As it is told, rhododendron was the first tree to grow after the great flood, and therefore is considered sacred. Hence, Naxi sometimes use rhododendron in religious ceremonies.

Additionally, Naxi people recall stories, poems, and sayings that relate the beauty of rhododendrons to its actual toxicity. For example, Naxi interviewees associated the beauty and toxicity of rhododendrons with the outer but not inner beauty of women. If a Naxi girl is called a rhododendron, it means she is pretty on the outside but bad on the inside (because rhododendrons are toxic, Georgian and Emshwiller 2016). A variation on this saying equates rhododendrons with the short-lived beauty of women.

A previously published Naxi story further describes the relationship of the beauty of rhododendrons with the actual toxicity of some *Rhododendron* species. The story below is paraphrased from a Naxi story published by Han (1997):

Fig. 3. Eastern Pequot. http://www.indianz.com/News/2015/018337.asp

Rhododendron and several flowers and trees were invited to a large party held by the Flower Queen. Rhododendron, who wanted to take extra time to fawn over herself, decided to come late to the party because she knew she was the most beautiful of all the flowers. She knew that no matter how late she was, she would be awarded the seat of honor beside the Flower Queen because of her untouched beauty. However, upon Rhododendron's arrival, she was surprised to find the seat next to the Flower Queen had not been reserved for her.

This story further highlights the association of rhododendron beauty with inner toxicity, thus encouraging the value of inner beauty.

Moving now to Nepal, this is another center of diversity for *Rhododendron* and another location where you can find previously published myths surrounding rhododendrons. The following Nepalese story explains why plants no longer marry and is paraphrased from Ferguson (1996):

The Goddess of the Forest wished for a husband for rhododendron and chose the alder. After searching for an appropriate match, the matchmaking fig decided to pair the rhododendron with the alder, and urged the alder to visit the rhododendron. The alder was too busy fawning over his own good looks to travel immediately but he agreed to travel to see the rhododendron when he was ready. Finally, in the stark of winter, the alder set out to visit the rhododendron and was shocked when he saw her lack of flowers and curled winter leaves. He left immediately, thinking that the rhododendron was not beautiful enough for him. Urged by the fig to visit a second time, the alder was impressed by the springtime beauty of the rhododendron and requested a swift marriage. The rhododendron refused the alder's proposal, thus he hid away in mountain crags and ravines where alders are found today. The disaster of this match caused the Goddess of the Forest to put an end to marriage between flowers and trees (Ferguson 1996).

Stories about rhododendron span a vast distance, from Asia to North America. Despite the more recent arrival of humans to the North American continent, myths still surround species of the genus *Rhododendron* there. In Ledyard, Connecticut, there is a large swamp, called Mast Swamp, which is known for producing straight tree trunks historically used to make ship masts. Mast Swamp is also known for an abundance of wild rhododendrons that once had yellow flowers, but now bloom with "bloody-hearts" every spring (Skinner 1903). The Pequot Indians (Fig. 3) often used Mast Swamp to hide from enemies because only those who knew the paths could get through its tangle of rhododendrons.

In June 1637, after barely surviving a lost battle with British soldiers in Mystic, Connecticut, some remaining Pequots, including the chief, fled to Mast Swamp in nearby Ledyard (Citro 2004). The British soldiers waited at the outlets of the swamp and ambushed the Pequots when they tried to escape. Thinking their lives would be spared, the Pequots surrendered and became prisoners of the British (New York Times 1883). The women and children were taken onto a British ship as slaves and all of the men, except the chief, were thrown overboard and drowned. The Pequot chief was spared in the hopes that he would reveal the location of the remainder of his people hiding deeper in the swamp. However, the Pequot chief refused to give the location of his people.

Angry with the chief's silence, the British soldiers threw him onto the ground beneath a yellow-flowered rhododendron and shot him through his heart. The chief's dying words were a curse that changed the originally yellow rhododendron flowers to blood red. Every spring, the blood-red blooming rhododendron flowers act as a reminder of the brutal killing of the Pequot people. To this day, the rhododendrons there are red, but it's said that if they are transplanted outside of Mast Swamp, they have their original yellow colored flowers (Skinner 1903).

Every culture mentioned in the above paragraphs explains the existence of rhododendrons with similar themes. The themes seen throughout these varied myths and legends have the common thread of death, rebirth, hurt, and remembrance. I'd bet that additional interviews and research would uncover other myths surrounding *Rhododendron*.

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Vireyas from West and East: Distribution and Conservation of *Rhododendron* section Schistanthe

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(Modified from The Rhododendron *4, 2016: 26-27, a publication of the NZRA and the Pukeiti Rhododendron Trust)*

Vireya rhododendrons, *Rhododendron* section Schistanthe Schltr. (previously known as *Rhododendron* subgenus Vireya (Blume) H.F. Copel)), are native to the Asian mainland, South East Asia, the top of Australia, and as far eastwards as Bougainville and the Solomon Islands. The approximately 400 taxa in the section are not evenly spread across that range, with high concentrations being found in some geographical areas. What is the nature of the distribution and how does it relate to diversity and conservation of this group of plants? This article gives an overview of the distribution of section Schistanthe and highlights some of the interesting features.

The "centre" of vireya distribution is South East Asia and *Rhododendron* is one of the largest plant genera found in that region (Webb and Ree 2012). This region is of considerable biogeographical interest because of its complex geology (where at least three tectonic plates meet), with the flora being derived from eastern, western and gondwana sources—creating a significant biodiversity hotspot with a high level of endemism (van Welzen et al. 2005, Webb and Ree 2012). Such hotspots are of inherent conservation interest (Bickford et al. 2012); however, the vireya group is highlighted by recent conservation assessments (Argent 2015, Gibbs et al. 2011) which revealed that 201 of the 400 taxa assessed were under threat or were Data Deficient (the latter indicating there is a conservation issue but there is insufficient data to quantify the assessment) (MacKay and Gardiner 2016). Thus 50% of vireya taxa are of conservation concern, and the problem is more acute than some other recently assessed genera (MacKay et al. 2010). A conservation assessment considers factors such as wild population size, extent

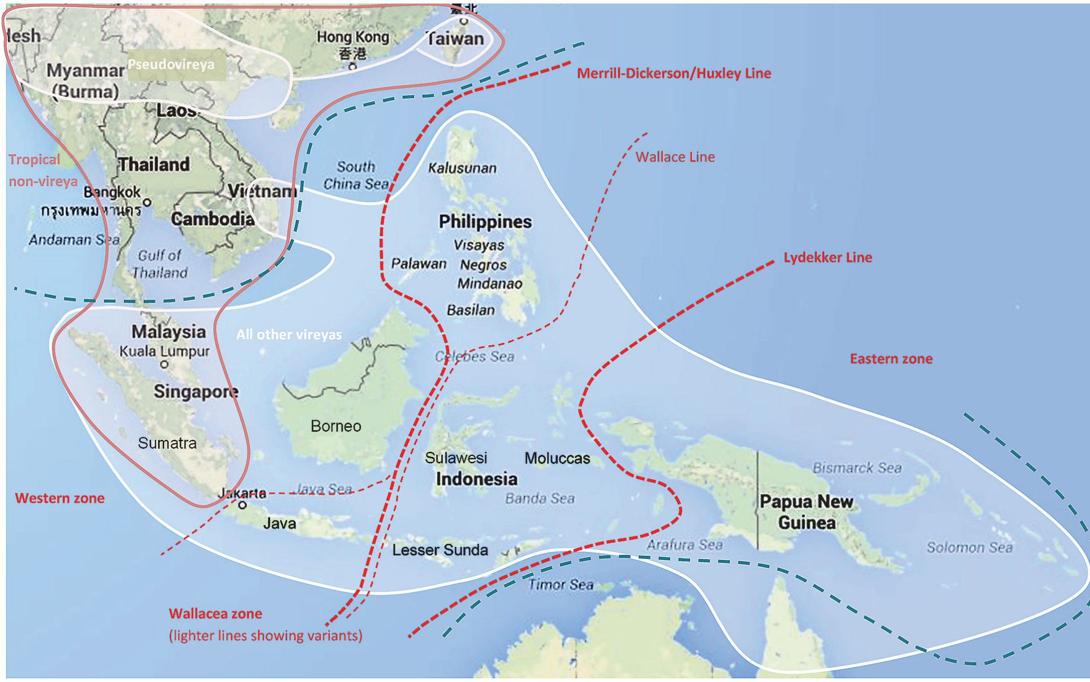

Fig. 1. Area of distribution of vireya (white bubbles) and tropical non-vireya (orange bubble), with the van Steenis boundaries of the SE Asian floristic zone (aqua lines) and biogeographical boundaries within the SE Asian zone (red lines). Boundaries from Van Welzen and Raes (2011), vireya distribution from Argent (2015). Map from Google maps.

of distribution, and a range of threat factors; taxa assessed as having a conservation issue are referred to as Red List taxa. The Red List categories, with decreasing level of threat, are: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, Data Deficient and finally, Least Concern for taxa with no conservation issue. Criteria for the assessment can be found in Gibbs et al. (2011).

Furthermore, conservation action in *Rhododendron* is confounded by taxonomic complexity (Ennos et al. 2005) where species boundaries are often uncertain, and common species are not always clearly distinguished from Red List species. For example, a Red List taxon that is distinct would have a higher conservation priority than one that is not clearly distinguished from a common taxon. Indeed *Rhododendron* is a “big genus” (Frodin 2004), typified by a large number of taxa (more than 500) which are divided into groups, a large number of taxonomic queries, on-going active speciation, and frequent occurrence of natural hybrids (Argent 2015, Chamberlain 2003, Crutwell 1998, Danet 2011, Ennos et al. 2005, Milne et al. 2010). In “big genera,” conservation decisions should be based on an understanding of the relationships between conservation taxa and their near relatives (Frodin 2004), an approach that has been employed in the New Zealand research programme (Fayaz 2012, MacKay et al. 2010, MacKay et al. 2012, MacKay and Gardiner 2016). In addition, recent molecular studies indicate geographical factors in species relationships in vireyas (Brown et al. 2006, Craven et al. 2011, Fayaz 2012, Goetsch et al. 2011), so examining the spatial distribution of the section Schistanthe will inform the understanding of this group of taxa.

One interesting aspect of spatial distribution is the biogeographical boundaries in the SE Asian region (see Fig. 1), which indicate locations where many species distributions stop or start and allow floristic regions to be defined (Raes and van Welzen 2009, van Welzen and Raes 2011, van Welzen et al. 2005, Webb and Ree 2012). The Van Steenis boundaries define the SE Asian floristic region, and this region covers most but not all of the vireya distribution. Within the SE Asian region other boundaries have been proposed such as the Merrill-Dickerson/Huxley, Wallace and Lydekker Lines. These boundaries divide the region into a western zone (Malayan Peninsula, Sumatra, Java, Borneo), a middle zone that is often called Wallacea (Sulawesi, Moluccas, Lesser Sunda), and an eastern zone (New Guinea and eastwards). The placement of the Philippines varies; the Wallace definition puts it in the western zone while the Merrill-Dickerson/Huxley definition puts it in the central zone. Other recent work on flora places Java and Philippines in the central zone rather than the western zone (van Welzen and Slik 2009, van Welzen and Raes 2011). Given that *Rhododendron* is one of the biggest plant genera in the region, how does its distribution relate to these zones?

Distribution data for 404 taxa (species, subspecies and botanical varieties) in *Rhododendron* section Schistanthe was examined using the geographic range information in Argent (2015) and each taxon was attributed to one or more mainland countries (e.g., *R. rushforthii* originates in both China and Vietnam), or one or more islands in the SE Asian region (e.g., *R. bagobonum* originates in Borneo, Philippines, Sulawesi and the Moluccas). As this examination of taxa considers the biogeographical distribution, the SE Asia taxa were organised according to island, or group of islands; countries were not used as these do not align with the biogeographical zones. The group of islands that constitute the Philippines were combined as these islands are in the same biogeographical zone; the islands in the Moluccas were combined in the same fashion.

To gauge the extent of overlap between vireya and non-vireya taxa, the distribution of "tropical" non-vireya taxa listed by Valder (1983) was also considered, with taxa cross-checked to Chamberlain et al. (1996), Cox and Cox (1997), and McGuire and Robinson (2009). Data were organised in a chart where each taxon was listed for the relevant origin (mainland country, or SE Asian island or group of islands) and then taxa for each origin were organised according to taxonomic groupings (Argent 2015) within section Schistanthe (detail not shown). These data were summarised to show numbers

Table 1. Geographic origins of 404 taxa (species, subspecies, varieties) from *Rhododendron* subgenus *Vireya* (Argent 2015) showing number of endemic taxa and total number of taxa from each origin, as well as the total number of taxa and number of endemic taxa from each biogeographical zone. Aqua bars show the van Steenis boundaries to the Southeast Asian biogeographical region, while Red bars show the Merrill-Dickerson/Huxley, Wallace and Lydekker boundaries within the SE Asian region (Raes and van Welzen 2009; van Welzen and Raes 2011; van Welzen et al. 2005; Webb and Ree 2012). "Tropical" non-vireya taxa (Chamberlain et al. 1996; Cox and Cox 1997; McQuire and Robinson 2009; Valder 1983) are listed for areas within the SE Asian region. Total number of taxa is 404 but the numbers of taxa from each area will not sum to this number as several taxa have more than one origin. Similarly, the total for each zone is not the sum of the totals for the countries in each zone, as some taxa have more than one origin. (Zoom in to view the Table.)

Geographic origins moving from west (left side of the table) to east (right side of the table)																		
	North-west of the SE Asian floristic region							SE Asian floristic region: western zone				SE Asian floristic region: central or western zone depending on definition	SE Asian floristic region: central zone (Wallacea)			SE Asian floristic region: eastern zone		South of the SE Asian floristic region
	India	Nepal	Bhutan	China	Burma	Taiwan	Vietnam	Malayan Peninsula and southern Thailand	Sumatra	Java and Bali	Borneo	Philippines (all islands combined)	Sulawesi	Lesser Sunda	Moluccas (all islands)	New Guinea	further east	Australia
No. of endemic taxa	1	0	0	5	0	1	4	9	22	4	73	29	30	1	6	184	7	2
Total no. of taxa	3	1	1	12	3	1	8	12	27	9	79	32	37	2	12	190	12	2
Taxa found in this zone	18 total 18 confined to this zone							118 total 113 confined to this zone 5 not confined to this zone: *R. bagobonum*, *R. malayanum var. malayanum*, *R. malayanum var. pilosifilum*, *R. orbiculatum*, *R. zollingeri*				32 total 29 confined to this zone 3 not confined to this zone: *R. bagobonum*, *R. javanicum ssp. schadenbergii*, *R. zollingeri*	46 total 39 confined to this zone 7 not confined to this zone: *R. bagobonum*, *R. javanicum ssp. schadenbergii*, *R. malayanum var. malayanum*, *R. malayanum var. pilosifilum*, *R. orbiculatum*, *R. zoelleri*, *R. zollingeri*			197 total 196 confined to this zone 1 not confined to this zone: *R. zoelleri*		2 total 2 confined to this zone
"Tropical" non-vireya taxa	Many "tropical" non-vireya in this zone.							*R. moulmainense* *R. wrayii*	*R. irroratum ssp. kontumense* *R. korthalsii* *R. vanderbiltianum*			*R. subsessile*						
							van Steenis				Merrill- Dickerson/ Huxley	Wallace			Lydekker		van Steenis	

of taxa and endemic taxa for each origin, and for each biogeographical zone in relation to the Southeast Asian floristic region (Table 1). Data were also mapped onto a map of the region, whereby each taxon was marked on each mainland country or SE Asian island of origin for that taxon (detail not shown) and those data were summarised on a map that shows the boundaries and the distribution range (Fig. 1). Figure 1 shows the extent of the distribution of section Schistanthe (white bubbles), the extent of the "tropical" non-vireya taxa (orange bubble), the boundaries of the SE Asian floristic region (aqua lines), and the boundaries within the region (red lines). Some fascinating patterns are revealed.

The map shows that the vireya distribution is disjunct with a large physical gap between subsection Pseudovireya and the other subsections. Subsection Pseudovireya is the western-most group of vireya and is spread from Himalaya (India, Bhutan, Nepal), China, north Vietnam, north Burma, north Thailand and Taiwan—well outside the SE Asian floristic region. The next nearest vireya taxa are found about 900 km (560 miles) south in southern Vietnam; *R. triumphans* and *R. chevalleri*. These two taxa are

R. acrophilium.

R. apiense.

R. apoanum.

R. praetervissum.

spatial outliers; there is another gap of approximately 700 km (435 miles) to the south before the outer edge of the main distribution is encountered. Why are there such large gaps? How can one subsection of Schistanthe be so remote from the rest? This pattern could fit with a mode of speciation where there was once a widespread ancestor, and over time various influences result in speciation in some parts of the range and extinction in other parts, leaving a gap in the distribution (Heads 2014). If this theory is accepted, which part represents the widespread ancestor and which part represents the later speciation? Some recent research suggests that *Rhododendron* is of laurasian origin and has radiated eastward from mainland Asia to SE Asia (Landis et al. 2013,

R. lamrialianum subsp. *gunsalamianum.*

R. leytense.

R. lanceolatum.

R. maxwellii.

Schwery et al. 2014, Webb and Ree 2012). If this is so, is subsection Pseudovireya the ancestor of the rest of the vireyas and is it the link between vireya and non-vireya? Some molecular studies indicate that Pseudovireya is "most different" from the rest of the vireyas and, of all the vireya subsections, is "most like" non-vireya taxa (Brown et al. 2006, Fayaz 2012), but the analyses show difference, not lines of ancestry, so the nature of any evolutionary link remains unknown.

Curiosity about the link between vireya and non-vireya is further prompted by the fact that the geographical gap in the vireya distribution does not lack rhododendrons (Chamberlain et al. 1996, Cox and Cox 1997, McGuire and Robinson 2009, Valder

R. leytense.

R. retivenium.

1983); there are non-vireya taxa in the gap which come from a range of sections (e.g., 62 taxa, from 14 sections or subsections (Valder 1983)). In southern Vietnam are nine taxa from a mix of subsections Maddenia, Irrorata, and Taliensia, and sections Tsutsusi, and Choniastrum. Along the southern coastal parts of China are several taxa from subsections Maddenia and Argyrophylla, as well as nine taxa from subgenus Azaleastrum and six from subgenus Tsutsusi. Two taxa from subgenus Azaleastrum, eleven from subgenus Tsutsusi, and several others from subsections Maculifera, Pontica and Arborea are found in Taiwan. All of these are still outside the SE Asian floristic region, but six non-vireya taxa are found inside the region and within the main vireya distribution. One section Chionastrum taxon *R. leiopodum* (syn. *R. moulmainense*) and one from subsection Irrorata (*R. wrayii*) are found on the Malayan Peninsula, and two from subsection Irrorata (*R. korthalsii* and *R. irroratum* subsp. *kontumense*) and one from subsection Maddenia (*R. vanderbiltianum*) are found further south-east on Sumatra. *R. subsessile* (section Tsutsusi) is found on Luzon in the Philippines.

What is the relationship between non-vireya and vireya in these areas where they overlap? While it is tempting to think that the geographical proximity would make them more likely to be related, this is not necessarily so, as the work on temperate subsection Pontica shows (Milne 2004). Milne found that, because of relict distributions, certain taxa were more closely related to those some distance away than those nearby. It is also interesting that the non-vireya taxa listed by Valder (1983) are from 14 different sections and subsections of the genus, although about a third are from sections Chionastrum and Tsutsusi and subsection Irrorata, although this pattern may change as new species are still being discovered in this region (Cox 2013, Robinson 2008). Molecular research has the capacity to investigate relationships between vireya and "tropical" non-vireya rhododendrons but there has been limited comparison between these two groups. A study that included *R. subsessile* found that it was not closely related to the vireya group (Brown et al. 2006b). Another study which included *R. vanderbiltianum* (Goetsch et al. 2011) concluded it was intermediate between section Schistanthe and subgenus Rhododendron, which is intriguing as it was initially placed in subsection Pseudovireya (Chamberlain et al. 1996) but later changed to subsection Maddenia (Argent et al. 2008). This is a fascinating clue about relationships and more research is needed, but as yet nobody has examined a set of taxa that would answer the question of the connection between the two groups and so it remains unknown.

Returning to the vireya distribution, the main area of the distribution starts in southern Thailand (within the SE Asian floristic region) where *R. longiflorum* and *R. malayanum* are found. These taxa occur further up the Peninsula than any others, but both are also found on other islands in the region. In total, twelve taxa are found on the Malayan Peninsula including *R. jasminiflorum,* a well-known taxon which is common in cultivation and a parent of many garden hybrids, and the less common and Red Listed *R. jasminiflorum* subsp. *oblongifolium*. In fact there are five subspecies of *R. jasminiflorum* and four were Red Listed: the previously mentioned *R. jasminiflorum* subsp. *oblongifolium, R. jasminiflorum* subsp. *chamaepitys* from Borneo, *R. jasminiflorum* subsp. *copelandii* from the Philippines, and *R. jasminiflorum* subsp. *heusseri* from Sumatra (Argent 2015). Are the subspecies distinct enough to warrant a high priority for conservation? Only *R. jasminflorum* subsp. *oblongifolium* has thus far been included in a molecular study (Fayaz 2012) where it was found to be distinct, so might the others also be distinct? Again one's curiosity is prompted.

The Malayan Peninsula is in the biogeographical western zone (west of the Merrill-Dickerson/Huxley Line) along with Sumatra and Borneo. The island of Borneo is the origin of the greatest number of taxa in this zone (79, with 73 endemic), particularly in the northern part (Sabah and Sarawak) which is geologically younger and more active than the other parts of the island (Hall 2012). Some of the more common taxa from Borneo that are in cultivation are *R. fallacinum, R. praetervissum, R. suaveolens* and *R. javanicum* subsp. *brookeanum*. Borneo is also the origin of the greatest number of Red List taxa in the western zone, including taxa such as *R. alborugosum*, *R. maxwellii, R. ericoides* and *R. baconii* (MacKay et al. 2016). A critical issue with many Red List taxa is that they are also scarce in cultivation. Effective *ex situ* conservation, where taxa are conserved in living collections on sites such as botanic gardens, relies on the presence of "enough" accessions of different wild sources, not vegetative clones, to genetically represent the taxon (Blackmore et al. 2011, Rae 2011, Maunder et al. 2001), although opinion varies on how many is "enough." For many *Rhododendron* taxa, there are insufficient holdings in world collections to achieve that representation. For example, the average number of records on the plant database at Botanic Gardens Conservation International for Red List vireya taxa in world collections was 0.9 (MacKay and Gardiner 2016), with origins varying from an average of 0 records for Red List taxa from the Moluccas to an average of 10 records for the one Red List taxon from Australia (MacKay et al. 2016). Any average number below three indicates that the taxon is not secure in cultivation (Lowe 1988). The only geographic origin for Red

List vireya taxa that was above this level was Australia (*R. lochiae*), indicating that most Red List vireya taxa are poorly represented in cultivation (MacKay et al. 2016).

Red List taxa are also found in the middle biogeographical zone (Wallacea): on the islands of Sulawesi, the Lesser Sundas and the Moluccas. The total number of taxa found in this zone (46 with 39 endemic to this zone) is lower than the other zones, possibly because the islands are of variable geological origin and the zone is geologically younger than the other two zones (Hall 2012). A common taxon from this zone is *R. meliphagidum,* which is found on both Sulawesi and in the Moluccas, while *R. arenicola* is a Red List taxon from Sulawesi. The latter was Red List assessed as Vulnerable (Argent 2015) indicating a relatively high priority for conservation. However, Fayaz (2012) found a close relationship with the common taxon *R. lagunculicarpum* which might lessen the priority. If Java (nine taxa) and the Philippines (32 taxa) are allocated to the middle zone, some additional rare taxa are *R. album*, *R. javanicum* subsp. *teysmannii*, *R. taxifolium* and *R. acrophilum*.

Further east, and in the eastern biogeographical zone, is the island of New Guinea and several smaller islands further east again. New Guinea is a centre of diversity for vireyas with 190 taxa native to that island and 184 of those taxa endemic to the island. New Guinea is built from more than 30 plate fragments (Heads 2006), and some biogeographers believe the high level of geological activity is responsible for stimulating speciation on this island. Of the taxa found there, some are common and are found in several locations across the island (e.g., *R. macgregoriae, R. culminicola, R. commonae, R. rarum, R. christii*) and these taxa are also relatively common in cultivation. Conversely, some taxa are of limited distribution and 91 have been Red Listed (Argent 2015; Gibbs et al. 2011). *R. archboldianum* is one such Red List taxon from Papua New Guinea, while three well-known and more common taxa from that country are *R. gardenia*, *R. hellwigii* and *R. hyacinthosmum*.

The New Guinea taxa highlight two further conservation problems. Firstly, of the 91 Red List taxa from New Guinea, 67 (74%) are not in cultivation (MacKay et al. 2016) so *ex situ* approaches to conservation cannot presently be used. Overall 60% of Red List vireya taxa are not in cultivation (MacKay and Gardiner 2016). Should resources be spent on field work to obtain a genetically representative sample of each taxon, or should resources be used on those taxa that are already in cultivation? Secondly, of the 91 Red List taxa from New Guinea, 69 were assessed as Data Deficient (most of these, 49, are not in cultivation either), indicating a considerable deficit of knowledge about this group of taxa (MacKay et al. 2016). This trend is repeated for the whole section, since of the 201 vireya taxa Red Listed, 113 were assessed as Data Deficient and 87 of those are not in cultivation (MacKay and Gardiner 2016). To what extent should resources be spent to undertake research on Data Deficient taxa? These unanswered questions illustrate the problem of priority setting in conservation (Oldfield 2010), which is a matter of on-going debate.

The vireya distribution continues east of New Guinea and twelve taxa are found on islands as far east as Bougainville and the Solomon Islands. The distribution of vireyas then ceases and does not extend any further south-east, a pattern that is also observed in other Ericaceae (Heads 2014). Five of the eastern-most taxa are found on both New Guinea and the islands further east; and three of these (*R. armitii, R. superbum* and *R. konori)* are in cultivation. Another seven taxa are found only on the smaller eastern-most islands, with four of the seven present in cultivation. *R. loranthiflorum* is one of the more common taxa from this area (New Britain and Solomon Islands) while two Red List taxa are *R. goodenoughii* from Goodenough Island and *R. luraluense* from Bougainville.

Two taxa also "went south" and are found in Australia—*R. viriosum* Craven *sp. nov*. and *R. lochiae* F. Muell. These two are a classic case of taxonomic complexity and conservation—two closely related taxa where *R. lochiae* F. Muell. (syn. *R. notiale* Craven) was Red Listed while *R. viriosum* Craven. *sp. nov*. was not. At first glance these two taxa look similar but *R. viriosum* has a straight corolla tube and the ovary and style have hairs and scales, whereas *R. lochiae* has a curved corolla tube and the ovary and style have only scales (no hairs). Due to a most unfortunate taxonomic confusion (described in Craven 2002, 2003), much material in cultivation that is labelled as *R. lochiae* is actually the straight tubed *R. viriosum* Craven *sp. nov*. and not the curved tubed *R. lochiae* F. Muell. This highlights the importance of correct identification and labelling in collections—conservation is not achieved if accessions labelled *R. lochiae* turn out to be the wrong taxon—so each accession should be verified and labelled (Blackmore et al. 2011, Rae 2011). It also highlights the importance of using an integrated approach where morphological study is combined with molecular approaches (Blackmore et al. 2011, Coleman et al. 2000, Goodall-Copestake et al. 2005, Kozlowski et al. 2012, Leadlay et al. 2006). For example, Fayaz (2012) found that four accessions of *R. viriosum* did not group together in his study of DNA sequence data (suggesting variation among those accessions) and this was mirrored by morphological variation in the samples, even though they all keyed to *R. viriosum*. More research is needed to explain these results.

The same need for research is evident for many vireya taxa, from throughout the geographic range. Is Pseudovireya the link between vireya and non-vireya groups? Are there any close relationships between vireya and non-vireya from the same area? What should be done to find out more about the Data Deficient taxa? What of those rare taxa that are thought to be closely related to a more common taxon—could some conservation assessments be altered if more was known about relationships? Molecular research is very useful, but can also generate many new questions. For example, although some molecular studies show Pseudovireya to be the nearest group to non-vireya rhododendron (Brown 2006a, 2006b; Fayaz 2012), others put Discovireya in that position (Craven et al. 2011, Goetsch et al. 2011). How can the differences in these results be explained? What additional data is needed? More research, of all kinds, (field studies, molecular lab studies, analysis of collections) is needed to better understand this group of taxa and their relationships.

Vireya rhododendrons are found from the Himalayas to the Solomon Islands and from Taiwan to Australia, and there are Red List taxa throughout that range. *Rhododendron* is a complex genus, and its conservation is made more challenging by the web of relationships between taxa and groups of taxa. There is so much more to learn about this group of plants!

Acknowledgements

This paper is part of a wider New Zealand project on Rhododendron Conservation. Current participants include Marion MacKay of Massey University, Susan Gardiner and Claudia Wiedow of The New Zealand Institute of Plant & Food Research Ltd, Graham Smith of Pukeiti Rhododendron Trust, Doug Thomson of Dunedin Botanic Garden, Sara Oldfield of the IUCN/SSC Global Tree Specialist Group (Cambridge, UK), staff at Pukeiti Gardens (Taranaki, New Zealand), members of the Pukeiti Rhododendron Trust (Taranaki, New Zealand) and New Zealand Rhododendron Association. The Rhododendron Conservation project has been supported by Pukeiti Rhododendron Trust and Taranaki Regional Council, Sir Victor Davies Foundation, New Zealand Rhododendron Association, George Mason Charitable Trust, Peter Skellerup Plant Conservation Award, American Rhododendron Society, Sibbald Trust (UK), Botanic Gardens Conservation International, The New Zealand Institute of Plant & Food Research Limited and Massey University.

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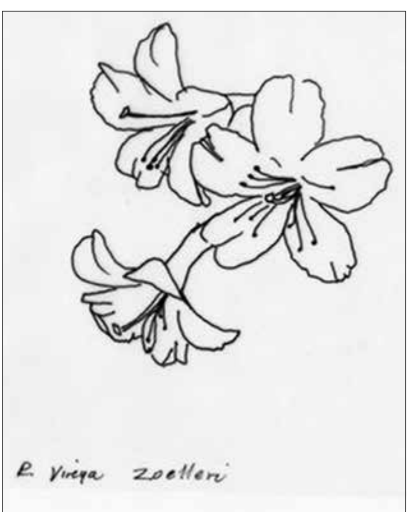
Vireya illustrations



The illustrations of vireyas *R. zoelleri* and *R. phaeochitum* by Marilee Mannon appeared on the Gold Medal Award citation for Dee Daneri (see page 136). Merilee has done the caligraphy for the ARS citations for many years.

Ellie Sather and the Whitney Nursery - A Garden That Feels Like Home

Emily Weissman
Seattle, Washington

Photos by the author
except where noted

Ellie Sather's first recollection of gardening is not what you would expect. "What I remember most is picking up rocks," she tells me. Growing up on a 40 acre (16.2 ha) dairy farm, she would follow the tractor and pull out stones stuck in the crop fields.

Ellie didn't immediately follow in her parents' agricultural footsteps. Instead, she chose to pursue art and photography in Minneapolis. However, in 1980, Ellie's father's health began declining, and her mother requested she come home to help run the family's nursery. Ellie, always up for a new adventure, packed her bags and relocated to Brinnon, Washington.

The entrance sign at Whitney Gardens & Nursery.

Ellie Sather. Photo by Candice Nagel.

"I told myself, how hard can it be? I was from the city and I had a college degree!" Ellie admits her mother let her learn the intricacies of gardening through trial and error —even at the expense of several dead azaleas. "Practical experience will rule the day," she shares. "I learned on the job."

Anne and Ellie Sather. Photo courtesy of Whitney Gardens & Nursery.

Ellie's agricultural classroom was the Whitney Nursery, a seven acre (2.8 ha) garden in Brinnon, WA, at the foot of the Olympic Mountains. Its founders, Bill and Faye Whitney, started their gardens with camellias in Camas, WA, during the late 1930s. Through their friendship with Ted Van Veen Sr., they learned about the growing of rhododendrons, hybridizing, and propagation. After World War II there was a concerted effort to exchange information from all over the world regarding how to propagate rhododendrons and the sharing of cuttings. Growers did not have to graft, which made rhododendron far more accessible to the average homeowner. Much of this information and research went through Van Veen and other interested horticulturists, including Bill Whitney. Bill and Faye purchased the property in Brinnon in 1955. Much of their collection was brought up to Brinnon from their Camas property, and from Ted Van Veen Sr.'s nursery in Portland. It was a true feat to bring so many plants up Hwy 99 during the 1950s, a trek that would have taken a full day of travel up and the following day back down.

Ellie's family, the Sathers, purchased the property in 1970, inheriting much of Whitney's tremendous collection. From there it was an obvious entree into the ARS's

The nursery.

The garden.

Shelton Rhododendron Chapter, where Ellie herself served as president for several years. Today she continues to share new varieties with customers, and keeps tabs on local hybridizers' work. "We still evaluate additional Whitney seedlings as well as other hybridizers' creations," she mentions.

The Sather family have done a beautiful job of preserving Whitney's legacy at the nursery. In fact, you can find an indepth history of Whitney's contributions (written by Ellie and her mother) in the 1984 Summer edition of JARS.

Welcoming sign.

Ellie speaks admiringly of her mother Anne, who ran the Whitney Nursery at a time when there were few solo women business owners. After her father's passing, she remembers one business presentation where her mother was so nervous she refused to eat for two days. "She rose to the occasion beautifully," says Ellie. Anne remained in charge of the nursery until she was nearly a hundred years old, when she handed the reins to Ellie "Her life was a really a wonderful thing to watch," says Ellie, as "without my father, I saw her learn that she could do almost anything."

Today, Whitney Gardens & Nursery's success is as much a testament to Ellie's own love as it is to its long family history. It is a much beloved tourist attraction as well as a store. Tea and coffee are always on hand. The employees are smiling, and the air of hospitality is instantaneous. Despite greeting more than 15,000 customers each year, all are treated as old friends. At the entrance of the Whitney Gardens & Nursery is a green, hand painted sign that reads :"*Whosoever enters this garden is for the moment home*."

Teaching is the most rewarding part of running the nursery for Ellie. "I can diagnose most plant issues when folks send me photos. I'm learning along with them. I love that!" Ellie lends her own charm to her interactions with customers, which is likely why they return year after year. "Recently I had to tell a guy that he was being too good to his plants," she tells me. "Essentially he was over-watering and they had root rot. But his intentions were good."

The field of horticulture is ever changing, so Ellie never stops researching. "When I first started I was taught all the chemicals you needed to use to run a nursery. Now we're learning how not to use chemicals!" She's also pleased to see that there are more and more women in the industry.

Ellie's biggest worry for the future of gardening is the cost. With rising land prices and

‘Alice de Stelurs.’

‘George’s Delight’.

‘Whitney‘s Orange’.

‘Heavenly Scent’.

‘Whitney’s Tiger Lilly’.

‘Sunny Day’.

The nursery. Photo by Candice Nagel.

Creekside.

shrinking back yards, she predicts the gardens of the future will look very different from the multi-acre plots of generations past. She insists that Whitney Gardens play its part in keeping the love of nature alive. The nursery gives academic scholarships to children each year in hopes they will continue into the field of horticulture. In 2016, the scholarship went to Jacob Pleines to help him attend Central Washington University. He subsequently made the honor roll!

Ellie plans to continue running Whitney Gardens, and eventually pass it on to family. She can't imagine doing anything else. "What's nice about running a nursery is that you never get a bad customer," she shares with tears in her eyes. "It's not like a grocery store or a bank. People come because they want to, not because they have to. Gardeners are truly lovely people."

Emily Weissman has become a regular contributor to JARS, and her submissions are much appreciated.

Society News

Awards

ARS Gold Medal: Deanna Daneri

Bob Weissman presents the Gold Medal to Deanna Daneri. Photo by Glen Jamieson.

You helped bring the American Rhododendron Society into the modern age with your advocacy for communicating with chapters, members and the public through the World Wide Web. In 2000 the ARS became accessible to the world through your gentle yet persuasive guidance and your choice of key members who were able to bring the vision to fruition.

Your interest in the American Rhododendron Society has not waned since you retired as Executive Director; you served as the Honors Committee Chair for many years. You are also the Rhodo enthusiast who has brought vireya rhododendrons to Vallarta Botanical Garden in Puerto Vallarta, Mexico. Your tireless work for the American Rhododendron Society and your ongoing enthusiasm has earned the appreciation of many ARS members.

For these significant and lasting contributions the American Rhododendron Society is proud to award the Gold Medal to Deanna Daneri. April 29, 2017, Eureka, California.

ARS Gold Medal: E. White Smith

Ann Mangels and Glen Jamieson present the Gold Medal to E. White Smith. Photo by Bob Ramik.

For decades you have been a recognized authority on vireyas in the genus *Rhododendron*. Your volunteer efforts and willingness to share your specialized knowledge as editor of the *Vireya Vine* newsletter, with its worldwide membership, have benefitted botanists and horticulturalists in all parts of the world. Your efforts will have an impact for years to come.

Through your vireya nursery production and your perseverance in advocating for vireya awareness and culture, you have made it possible for people around the world to grow vireya species and varieties they would not have been able to grow without your support.

For these and your many lasting contributions toward the Society's goals, the American Rhododendron Society is pleased to award the Gold Medal to E. White Smith. April 29, 2017, Eureka, California.

Society News

ARS Gold Medal: Fred Whitney

Ann Mangels and Walter Scott present the Gold Medal to Fred Whitney. Photo by Glen Jamieson.

You have been an active leader at the highest levels and provided the Society with exemplary, decisive and congenial leadership. At the national level you have served as District 3 Director, Western Vice-President and President, and as the Bylaws and Policies Committee Chair. You also were Co-Chair of the 2003 and 2013 National Conventions.

As an international ambassador, you have travelled to New Zealand and Australia and elsewhere on numerous occasions to promote personal relationships between these distant centers of rhododendron interest. These relationships greatly benefit the American Rhododendron Society.

You have also served as president of two other important rhododendron organizations: the Pacific Rhododendron Society and the Rhododendron Species Foundation. Your love of rhododendrons and all aspects of your influential activities have profoundly enhanced the American Rhododendron Society.

For your outstanding service, the American Rhododendron Society is proud to award the Gold Medal to Fred Whitney. April 29, 2017. Eureka, California.

ARS Silver Medal: Don Wallace

Tim Walsh, right, presents the Silver Medal to Don Wallace. Photo by Glen Jamieson.

Over the past 27 years you have planted, propagated, and grown from seed many rhododendrons. You have hybridized rhododendrons with emphasis on fragrance and on new and exciting flower colors. Your hybrids are plants for all seasons as you have chosen plants that hold their leaves more than one year, creating fuller, more attractive plants when not in bloom.

You have been invited to give your excellent programs with beautiful photography of gardens, flowers and plants to chapters from Washington to Central California. You generously share your knowledge with all who are interested. Your articles have also been featured in the *Journal of the American Rhododendron Society.*

For these significant and lasting contributions the American Rhododendron Society is proud to award the Silver Medal to Don Wallace. Eureka, California, April 29, 2017.

Society News

ARS Silver Medal: Ken Webb

Linda Derkach presents the Silver Medal to Ken Webb. Photo by Glen Jamieson.

For more than two decades you have been a leading force in District 1, promoting the genus *Rhododendron*. You have spent countless hours propagating cuttings with your wife Madeleine in your home-based facility, and then freely distributing rooted plants to every chapter.

As District Director, you are respected for carefully thought out constructive comments and for your ability to attain cooperation between chapters. With your affable nature and your generosity you succeeded in increasing relationships between chapters. In revitalizing District 1, you succeeded in making chapters more aware of their connection to the American Rhododendron Society.

In recognition of your outstanding contributions, the American Rhododendron Society is pleased to award the Silver Medal to Ken Webb. April 29, 2017, Eureka, California.

ARS Silver Medal: Nicholas Yarmoshuk

Bob Ramik presents the Silver Medal to Lisa Yarmoshuk who received it for her father Nicholas Yarmoshuk (see inset) who was unable to attend the convention. Photos by Glen Jamieson.

You set the bar high as co-chair of the enormously successful 1998 American Rhododendron Society Convention. More recently, you were a presenter at the 2012 Convention. As current Chair, ARS Test and Display Garden Committee, you launched a high-profile five-year multi-site test project. Your passion for the genus *Rhododendron* motivates you as a mentor and educator.

As a stalwart champion of the Niagara Chapter for the past 25 years, you have ensured its robust future while preserving its heritage. Your dynamic leadership has secured exceptional partnerships, attracted distinguished speakers, and spearheaded many initiatives. Fellow Board and Chapter members are inspired and encouraged by your acumen, vision and collaborative spirit. Further, you and your wife Wanda have nurtured an atmosphere of warm fellowship at Chapter events.

For your extraordinary contributions the American Rhododendron Society is proud to award the Silver Medal to Nicholas Yarmoshuk. April 29, 2017, Eureka, California.

Awards continued

WHIDBEY ISLAND CHAPTER

Bronze Medal: Arlee Anderson

The Whidbey island Chapter is pleased to present Arlee Anderson its highest honor, the Bronze Medal, for her outstanding service to our Chapter. She cheerfully stepped in and volunteered to be President. Not once, but for four years. Her leadership maintained the Chapter during lean times. She led Chapter excursions to ARS conventions and especially to our dear friends in Canada. Her good humor and upbeat personality are appreciated by all in the Chapter. We are honored to have her as a member and to award her the Bronze Medal.Thank you,

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ARS BOD Meeting, Red Lion Hotel, Eureka, California, Thursday, April 27, 2017, Meeting Highlights

Following are highlights of discussions and decisions taken at the ARS Board of Directors Meeting. For greater clarification and detail, please see the complete minutes of the meeting that are posted on the OARS Website.

Update: May 16

There were 22 Board Members and Committee Chairs present. Guests included John Hammond, President of the Scottish Chapter, and Julianna Medeiros of the Holden Arboretum. Eastern Vice-President Ann Mangels welcomed us all and expressed regret that President Bob McIntyre was unable to be present for his last meeting. We wish him improving health.

ARS Bylaws and Policies

Gordon Wylie introduced proposed amendments to ARS Policies of the Board that had previously been circulated. The proposed amendments were approved along with a number of incidental amendments that would not affect the intent of the policy or amendment.

Following board approval, a complete set of revised and consolidated policies will be available on the website.

In addition, we approved the deletion of Article V of the Bylaws, *Society Officers and Their Duties, Subsection 1, Office Administrator*. A second reading of this motion and approval is required at the next meeting to complete the process.

Amendments to policies included the following:

- Re-alignment of Board and Staff Duties
- Review of Committees of the Society
- Review of Policies Governing Annual and Regional Meetings.

A draft policy on the acceptance and disposition of donations and gifts will be presented at the next board meeting.

Move to Digital JARS

Following considerable study and discussion, a motion was put forward to offer a reduction of $5 to the membership fee for members requesting to receive the digital JARS only. We reviewed the financial benefits of this proposal. We were reminded that very few members would likely take advantage of this reduction, thus making the benefit quite small in comparison to the associated work and costs to make the change. **The motion was defeated.**

Research Foundation

Mike Stewart was appointed for a term ending May 2020 and Karel Bernady to Chairman for a term ending May 2020.

Proposal to Establish a Rhododendron Research Coordination Network Between Rhododendron Researchers World-wide and the ARS

Juliana Medeiros, a scientist at the Holden Arboretum, outlined the benefits of this proposal.

The three goals for this collaboration are:

- The promotion of *Rhododendron* as a model woody system for research
- The promotion of ARS and botanical garden memberships
- The creation of opportunities for collaboration and communication between the research community and ARS members

The ARS Board approved, in principle, that we enter into this coordination network.

Endowment Fund Report

We approved the following grants recom-mended by the Research Foundation:

- Friends of the Laurelwood Arboretum - $2,580
- Planting Fields Arboretum - $1,000 each year for three years, with subsequent years funded subject to the required report being submitted
- Brueckner Hybrid Test Project - $1,010 CA to fund the report and database; travel and meal expenses will not be funded.

Treasurer's Report

Dave Banks reported that our financial health has improved although membership is down. Chapters are reminded of the importance of completing the requirements of the IRS to maintain their tax status. The budget for 2017-2018 was approved, including funds for staff salary increases and bonuses.

Reports from Executive, District Directors and Committee Chairs

Note: Very extensive reports from Board Members and Committee chairs are included in the detailed agenda and form part of the minutes of the meeting.

Briefly….

- Ann Mangels is the new President of the ARS; she is replaced as Eastern Vice-President by Steve Krebs.
- Cost estimates for the convention in Germany 2018 are almost done; registration deadline for ARS members only will be October 31, 2017; after that, non-members may register.
- Concern was expressed that District 3 has had no board representation for several years; the Western VP will contact District 3 Chapters with a proposal to resolve.
- District Directors Anne Gross (District 4), Robert Ramik (District 12) and Marianne Feller (District 7 Alternate) are retiring from the BOD; Brenda Ziegler will be the new DD for District 4.
- John Hammond, President of the Scottish Chapter, invited us to join a 14-garden tour of Wales in April, 2018.

Linda Derkach, ARS Secretary

Some Like it Hot

Steve Krebs and Jing Wang
Madison, Ohio


Steve Krebs


Jing Wang

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At the Leach Research Station of The Holden Arboretum, we have been hybridizing rhododendrons that are resistant to root rot disease, the most common cause of failure (mortality) in gardens and nurseries. This disease is caused by a fungus-like pathogen, *Phytophthora cinnamomi*, which resides in soil and invades the roots of susceptible plants in its quest for carbohydrate food sources. Leaf drooping and wilting is an indication that the root system has been extensively colonized (Fig 1). The plants appear drought stressed because the vascular system that conducts water to the shoots has been destroyed. The pathogen is not only a problem for rhododendrons, but is a global invasive that is impacting over 1000 plant species in agricultural and natural settings.


Fig.1. Typical leaf drooping and wilting symptoms on a rhododendron with advanced *Phytophthora* root rot disease.

The rationale and preliminary work for this project were described previously (Krebs, 2010). Plant breeding via cross pollination involves recombining genetic variability that derives from species in the wild. Our resistance breeding program is based on a *Rhododendron* species from Taiwan, *R. hyperythrum*, that is highly resistant to root rot and readily transmits that trait to its offspring (Fig 2). Importantly, *R. hyperythrum* is also heat tolerant and capable of growing in the Gulf

South (USDA hardiness Zone 9), a climate that is too hot for most rhododendrons. Because *R. hyperythrum* is less cold hardy than desired and also white flowered, it has been hybridized with hardier and more colorful cultivars in order to produce progeny that combine hardiness, resistance, and ornamental value.

Fig. 2. Resistance genes at work in hybrid populations. Symptomatic rhododendron seedlings in the middle and right-hand rows have disease susceptible parents. Healthy seedlings in the left row are from a cross between a susceptible rhododendron and *R. hyperythrum*, the root rot resistant species from Taiwan. Picture taken at the Leach Research Station.

For consumers, root rot resistance is a useful trait that would lead to greater success growing rhododendrons in the landscape. Heat tolerance interests commercial nurseries because it opens up a new, southern market for rhododendrons. The presence of both features in *R. hyperythrum* is a desirable combination that can be co-transferred to hybrids because the traits may be functionally related. We hypothesize that resistance is necessary for plant survival in warm, wet climates where disease pressure from *P. cinnamomi* increases. To test this in breeding populations, we employ a protocol where *R. hyperythrum*-derived hybrids are first evaluated in NE Ohio for field performance, ornamental traits, and cold hardiness (USDA hardiness zone 5). Selections from this stage of the program are then clonally replicated (by rooting stem cuttings) and planted in a field trial in southern Louisiana. Plant Development Services, Inc. (PDSI), the plant introduction and marketing division of Flowerwood Nursery in Alabama, is the commercial partner assisting with these evaluations.

Over 160 selections were made from 2500 hybrid seedlings first evaluated at the Leach Station. Four to five replicates of each selection were planted in the spring 2012 at the southern site (Independence, LA) using a randomized field design. Over the past four years we have compared performance among selections at both locations. Most of the original (source) plants continue to do well at the Leach Station, although many did not prove flower bud hardy at -24°F (-31°C) during the winter of 2015. In contrast, a majority of the 160 selected clones died during the Louisiana trial, many within one or two years of planting. Based on symptoms, the cause of mortality appears to be root rot disease, and the presence of *P. cinnamomi* on site is inferred from the fact that other susceptible and resistant control plants included in the trial performed as expected. A

high level of disease pressure at that location is probably due to the climate there as well as its former use by a nursery to grow camellias, which are also host plants for *P. cinnamomi*. Additional research is needed to confirm that the pathogen is the primary factor determining survivorship in our hybrid populations and that the best performing individuals in this southern environment are also the most root rot resistant.

On the positive side, a group of 30 individuals (18% of the starting selections) has performed well in spite of high temperatures and considerable precipitation, conditions that favor the pathogen. Some of these top performers are very attractive plants that could be introduced commercially in the near future (Fig 3). One of them (Fig 4) will be commercially available in 2018 as an offering in PDSI's Southgate® series of rhododendrons, for sale under the trade name Splendor™. The promotional copy on Flowerwood's website states that "the exciting new Southgate® rhododendrons are heat tolerant and thrive in the South while performing equally well in traditional [northern] rhododendron areas." The first rhododendrons distributed under the Southgate® brand

Fig. 4. Rhododendron Splendor™, the first Southgate® introduction from the Leach Station breeding program. Top – plant in bloom at the southern Louisiana test site. Bottom – a finished two gallon (7.6 l) production plant grown from tissue culture.

were created by Dr. John Thornton, who pioneered the use of *R. hyperythrum* for developing heat tolerant hybrids.

Form and function are equally important in ornamental plant development. The rhododendron hybridizing project started by David G. Leach combined beauty and cold hardiness in new hybrids. We are extending the Leach legacy by adding adaptive traits such as disease resistance and heat tolerance that will make large leafed rhododendrons easier to grow and expand their horticultural use into warmer regions. These additional traits may also reduce the need for fungicide drenches commonly used by production nurseries to control *P. cinnamomi*. Furthermore, the southern trial provides a preview of plant performance under the warmer and wetter conditions predicted by climate change models for more northern latitudes. Rhododendron adaptation to that environment is largely dependent on root rot resistance, and this finding illustrates a broader concern. Disease resistance will become increasingly important for plant health if, as predicted by epidemiologists, the geographic range and activity of plant pathogens are increased by climate change.

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Steve Krebs, Director, and Jing Wang, Field Station Specialist, both work at the David G. Leach Research Station of The Holden Arboretum in Madison, OH. Steve and Jing are members of the Great Lakes Chapter.

A weed is but an unloved flower~

Ella Wheeler Wilcox

The 2018 ARS Pre-Convention Tour of The Netherlands

Rinus Manders
Herpen,
The Netherlands

Photos by the author

The Dutch Rhododendron Society and the Dutch ARS Chapter are both participating in the organisation of a five-day pre-convention tour before the ARS Convention in Bremen, Germany, in May 2018 and are inviting ARS members to visit Dutch gardens, parks and arboreta. The Netherlands is a densely populated country located in Western Europe with four island territories (Bonaire, Sint Eustatius, Sint Maarten and Saba) in the Caribbean. The European part of the Netherlands borders Germany to the east, Belgium to the south, and the North Sea to the northwest, sharing maritime borders with Belgium, the United Kingdom, and Germany. The three largest cities in the Netherlands are Amsterdam, Rotterdam and The Hague. Amsterdam is the

Zaanse Schans Village.

Map of The Netherlands showing garden tour locations. (Zoom in to read text.)

country's capital, while The Hague holds the Dutch seat of parliament and government. The port of Rotterdam is the world's largest port outside southeastern Asia, and the largest port in Europe.

The name Holland is used informally to refer to the whole of the country of The Netherlands. "Netherlands" literally means "lower countries," influenced by its low land and flat geography, with only about 50% of its land exceeding one metre (39 inches) above sea level. Most of the areas below sea level are artificial, as since the late 16th century, large areas (polders) have been reclaimed from the sea and lakes, amounting to nearly 17% of the country's current land mass. With a population density of 412 people per km^2 (1067 per mile^2) in January, 2017—507 (1313) if water is excluded—the Netherlands is classified as a very densely populated country.

Gardening has been very popular in Holland at least since the renaissance and today Holland is the centre of Europe's horticultural industry. There are many Dutch gardens from the Baroque period, though they tend to be on a smaller scale then equivalent

Zaanse Schans Village.

French gardens, which makes them closer together and much easier to visit. Holland produces a high proportion of Europe's plant stock but these plants are not as evident in gardens as one might expect.

Zaanse Schans Village, Zaandam

The tour will start at the Zaanse Schans Village, a neighbourhood of Zaandam fairly close to Amsterdam that has a collection of well-preserved historic windmills and houses from the 17th century, and the Zaans Museum, established in 1994. From 1961 to 1974, old buildings from all over the Zaanstreek were relocated using lowboy trailers to the area. The Zaanse Schans is one of the popular tourist attractions of the Netherlands and is an anchor point on the European Route of Industrial Heritage. The neighbourhood attracted approximately 1.6 million visitors in 2014. The village houses seven museums, including he Weavers House, the Cooperage, the Jisper House, the Zaan Time Museum, the Albert Heijn Museumshop, and the Bakery Museum.

It is an open air conservation area on the east bank of the Zaan River, and displays the traditional architecture of the area (green wooden houses). It has several functioning windmills and craftsman's workshops, which are open to visitors. It is a fairly large site, but it does not feel very crowded, even in the high season. The buildings have all been meticulously restored, making it a very pretty site and an idealized recreation of a Dutch village from the late 19th century.

The Keukenhof, Lisse

In the afternoon, the tour will visit the Keukenhof, or "kitchen garden," also known as the Garden of Europe, which is one of the world's largest flower gardens. It is situated in Lisse, and approximately seven million flower bulbs are planted annually in the park, which covers an area of 32 hectares (79 acres). There are over 800 tulip cultivars and many daffodils, hyacinths and other kind of bulbs. This famous bulb garden is one of the most beautiful spring gardens, and is located in the former kitchen garden of Keukenhof Castle, which is surrounded by fields of flower bulbs in a wonderful park setting. The Keukenhof is located in South Holland in the small town of Lisse, south of Haarlem and southwest of Amsterdam. The Keukenhof is open annually from mid-March to mid-May, and while the best time to view the tulips is around mid-April, depending on the weather, the gardens are carefully planned so bulbs bloom early to late in the season. This means there is no time when all the flowers are in bloom at once, and so whenever you visit throughout the season, there will be plenty of tulips to enjoy.

Lisse is a town in the Dutch Bulb Region of South Holland. The village of Lisse was first described in 1198; consecutive wars caused wide spread poverty there in the middle ages, and peat harvesting and agricultural activities were the region's main source of income. This changed when the production of flower bulbs gained popularity in the region. The local sandy soils proved very suited for the growth of tulips and other bulbous flowers, bringing economic growth and wealth to Lisse and the surrounding

Keukenhof Garden.

regions. In late medieval times, the area of Lisse belonged to the gardens and hunting grounds of Slot Teylingen, a castle in nearby Teylingen of which now only ruins remain. Among that castle's most prominent inhabitants was Jacqueline, Countess of Hainaut, who lived there in the 15th century. Legend has it that herbs for her kitchen ("keuken," in Dutch) were gathered where the Keukenhof is now, and hence the name of the park.

The current Keukenhof Castle (opposite the Keukenhof Park) was build around 1642 by Adriaen Maertensz Block, successively captain, commander, and governor of Ambon, part of the Maluku Islands of Indonesia between 1614-1617. He was administrator of the Raad van Indië for the Kamer of the Dutch East India Company in Amsterdam (VOC) in Batavia (now Jakarta). In 1627, two of his ships were wrecked on the island of Wight in a storm, where he probably intended to go to buy secretly and trade privately. He was suspended, declared unsuitable for other similar offices, and retired in a country house at Lisse that he built in 1641. In 1840, the castle's park was re-designed by the landscape architect Jan David Zocher and his son Louis Paul Zocher, who also designed the famous Vondelpark in Amsterdam, and this design laid the foundations for the current park. The castle was extended in 1865 and has been thoroughly renovated in recent years. The Keukenhof tulip gardens were created in 1949, as a flower exposition initiated by Lisse's mayor and some prominent local flower bulb growers. Since its opening in 1950, visitor numbers have rapidly increased.

PlantenTuin Esveld, Boskoop.

PlantenTuin Esveld, Boskoop.

PlantenTuin Esveld, Boskoop

The tour on the second day will first visit PlantenTuin Esveld, which has had as its philosophy since 1865 "Plants are the soul of a garden." The enormous variety of plants available there makes it a highly unusual nursery, as nowhere else in Europe can be found as many different garden plants! Its plant catalogue has over 10,443 different plants. The PlantenTuin Esveld has been a family owned business since 1865, and for more than half a century, it has specialized in rare and unusual plants. Knowledge accumulated is shared in many ways, such as through advice on plantings, and during special events in its nursery, workshops. Gardening knowledge and its history is also visible in the nursery and the Japanese maple garden, which not only contains about 700 different maple species and cultivars, but also ten other Dutch Plant Collections, including one for rhododendrons and azaleas, for a total size of about one hectare (2.5 acres). In a watery surrounding, the nursery is situated amid channels for transport and for maintaining the water level of Boskoop.

Arboretum Trompenburg, Rotterdam.

The second site to be visited will be the Arboretum Trompenburg, which is a botanical garden in Rotterdam that hosts a large collection of woody as well as herbaceous plants. It occupies an area of seven ha (17.3 acres) and is situated four metres (13.2 ft) below sea level, so a system of canals is used to drain the land. The history of the garden dates

Arboretum Trompenburg, Rotterdam.

Arboretum Trompenburg, Rotterdam.

back to the 19th century. Arboretum Trompenburg holds national plant collections of conifers, *Quercus*, *Fagus*, *Rhododendron*, *Ligustrum*, *Rodgersia* and *Hosta*.

Arboretum Trompenburg is more than a vast collection of plants. At this amazing botanical site, there are thousands of perennials and also the national collection of *Rodgersia*, *Hosta*, bulbs, succulents and other plant types. The perennials are located throughout the garden premises, and include the national reference collection of beech, privet, dwarf conifers, holly, oak and rhododendron. You will be able to recognize each specimen and its origin, thanks to their nameplates, making it a treasure trove for nature lovers and horticultures.

The Hoey Smith family founded the eight hectare (19.7 acres) green oasis "Trompenburg" in the harbour city of Rotterdam in 1820, where they assembled a collection of trees. In 1950, Dick (J.P.R.) Hoey Smith specialised in rhododendrons, oak and beech trees, but he also had an active interest in succulents. From then on the collection has showed an explosive development. Trompenburg is not only an arboretum but is a collection of beautiful gardens on elongated parcels of land surrounded by water, as is so typical for Dutch "polders".

Prof. Lou Traas' Garden, Blaricum

On day 3, we will first visit the private garden of Prof. Lou Traas, Blaricum. His garden, with an area of 4000 m^2 (one acre) surrounds the Traas family home. Professor Traas has been a member of the ARS for many years and has attended conferences in the USA, Scotland and Sikkim. He is an ardent collector of both conifers and rhododendrons, especially of large-leaved rhododendron species, as well as striking cultivars. It is this unusual selection in this relatively small garden that astonishes and amazes many visitors. A small stream meanders through his woodland garden, where camellias can also be found among the masses of rhododendrons.

Private Garden of Prof. Lou Traas, Blaricum.

Private Garden of Prof. Lou Traas, Blaricum.

Fort Hoofddijk Botanical Garden, Utrecht

Utrecht is a lively, but intimate city with a helter-skelter street pattern and much unique architecture, attesting to its long and rich history. Its picturesque canals, particularly De Oude Gracht, where the water is bordered by wide quays below the level of the city streets above, have shops and cafes, which give the city center a unique character. The Botanical Gardens of Utrecht University, a unique natural treasure, are situated at Fort Hoofddijk in the very heart of the province of Utrecht. More than 6000 plant species from around the globe have been painstakingly cultivated here over a period of more than 350 years. Some examples are extremely rare and have even become extinct in nature. The ten metre (33 ft) high rock garden complete with waterfall is one of the largest of its kind in Europe and visitors can view over 1600 species of alpine plants here that were able to adapt to this simulated mountain climate. The rock garden is at its most spectacular at the end of April and beginning of May when most of the plants are in bloom.

The Utrecht University Botanic Gardens has had two locations since 1987: the main garden at Fort Hoofddijk in Uithof and the Von Gimborn Arboretum in Doorn. However, the history of the living plant collections of Utrecht University dates back to the 17th century. The first botanical garden of the university was founded in Utrecht

City center Utrecht.

Cathedral of Utrecht, Utrecht.

in 1639, three years after the establishment of the university itself. Around 1723, the collection was moved to another location within the old city, which still exists as the museum garden of the University Museum, known as Oude Hortus (old garden). It is the place where around 1730, *Ginkgo biloba* was planted for the first time in Europe. In 1920, Cantonspark in Baarn became another part of

Fort Hoofddijk Botanical Garden, Utrecht.

the university gardens, with a rock garden and thematic beds. In 1963, Utrecht University acquired the land at Fort Hoofddijk, one of the forts of the New Dutch Waterline (a defense measure, started in in the early 17th century that consisted of a line of floodable land, to a level deep enough to make an advance on foot precarious and shallow enough to rule out effective use of boats, protected by fortresses, which would transform Holland almost into an island and so make invasion more difficult) and the modern campus of the university on the eastern outskirts of the city of Utrecht. In 1964, the university bought the Sandwijck buitenplaats in De Bilt, where greenhouses and a nursery were organized, and in 1966 it acquired the Von Gimborn Arboretum in Doorn. From 1964-1974, the rocks from the old rock garden in Cantonspark and an additional 2100 tons of rocks from the Ardennes were laid on the top of Fort Hoofddijk in order to build the new rock garden, which has become one of the largest in Europe. In the 1970s, systematic beds were laid down there as well, and in the 1980s the new complex of greenhouses was constructed. In 1987, the plant collections of Oude Hortus, Cantonspark and Sandwijck were transferred to

Fort Hoofddijk Botanical Garden, Utrecht.

Fort Hoofddijk Botanical Garden, Utrecht.

Fort Hoofddijk, which thus became the main location of the botanical gardens.

The Botanic Gardens are located at the heart of Utrecht Science Park. This extraordinary stretch of green space, covering nine hectares (22.2 acres), has as its primary function the support of education and research, although there is an increasing focus on a role to the public role, including nature conservation, especially in an international context. On and around Fort Hoofddijk, the garden consists of six components, each with its own distinctive character: the Rock Garden, the Evolution Garden, the Discovery Garden (Theme Garden), Tropical Greenhouses, the Birders Den, and the Bee Hotel.

Von Gimborn Arboretum, Doorn.

Von Gimborn Arboretum, Doorn

Day 4 begins with a visit to Von Gimborn Arboretum, and then on to the Appeltern Gardens and Belmonte Arboretum. The Von Gimborn Arboretum is a large living collection of woody plants. The arboretum is situated in Doorn, about 25 km (16 miles) east of the city of Utrecht, and together with its nursery currently occupies an area of 27 ha (66.7 acres). It is named after its founder, German ink manufacturer Max Th. Von Gimborn (1872–1964), which started it in 1924 as a private collection of conifers and ericaceous plants. The collection was laid down as a 23 ha (56.8 acres) landscape

Von Gimborn Arboretum, Doorn.

garden designed by Gerard Bleeker. It is still one of the largest conifer collections in Western Europe, though now it contains many other trees and shrubs as well. It holds national plant collections of conifers (particularly *Tsuga*), Ericaceae (and *Rhododendron* in particular), Aceraceae, Betulaceae, *Euonymus*, *Fraxinus*, *Laburnum*, *Magnolia* and *Syringa*. A number of cultivars of woody plants originate there. In 1989 the unique collection in Gimborn won an award from the International Dendrological Society.

Appeltern Gardens, Appeltern

The spectacular Gardens of Appeltern (De Tuinen van Appeltern) are located in the Gelderland region, deep in the countryside and about an hour and a half southeast of Utrecht. A garden should be one of the pleasures that make life more enjoyable, a necessity in life where you will be happy to spend the time. The Appeltern Garden have been laid out in a way that will give inspiration and information in a manner to help in the design of a garden. Appeltern Gardens are situated on 23 hectares (56.8 acres) between two rivers, the Maas and the Waal. These gardens offer visitors the chance to see the largest collection of plants in the Netherlands, as well as over 200 model gardens and about 2000 different kind of plants. Each model garden has a specific theme, which will be explained as you wander round the park or which will be

Appeltern Gardens.

Appeltern Gardens.

discussed on the free audio guide that is available from reception. This garden park will help to give visitors real inspiration about what to do with their own gardens. The garden is the brainchild of Ben van Ooijen, a residential garden designer, who originally simply wanted to display his own work to potential customers, finding it more effective to walk them through a completed garden rather than trying to convey a concept in words or renderings.

Garden themes include:

1) The Living Garden: The Living Garden area is one of the newest sections of the park. It aims to bring together many of the aspects of sustainability and "the garden as a natural environment" which are discussed around the rest of the park. The Living Garden is divided into five thematic areas, called "good for small animals," "a second life," "taste and smell," "a longer life" and "better for all of us." These spaces help to show visitors what it is possible to achieve if you put conscious thought into your gardening. They also show that it is possible to make your garden work in harmony with the rest of the world.

2) Designer Gardens: Many of the gardens in the park have been designed by special garden designers. Some of the most famous contemporary garden designers in the Netherlands and Europe have created gardens for visitors to see. Whilst some of these designer/architectural gardens are permanent, others are only temporary displays that are changed each year.

3) Lounge Gardens: These fantastic gardens are designed to show that garden spaces can alternatively be used for relaxation and wellness, as well as aesthetic beauty. These spaces show how gardens can incorporate fitness, healthy lifestyle choices, cooking, eating and relaxation into an outdoor space.

Appeltern Gardens is a self-avowed display garden for the products of the commercial enterprises that support it. Nothing is for sale, but there are careful records of the contributions that are made, and these are published each year in a handsomely illustrated yearbook, which serves as an idea book and a source list of contacts for designers. The materials, plants and hard goods, are meticulously and tastefully labeled, but the enormous value of the site, and its essentially unique characteristic, is that the whole 13 ha (about 32 acres) is laid out in a changing display of gardens of various sizes. The gardens intertwine (picture the way that a golf course winds back on itself as hole after hole follows a clearly defined sequence), giving a succession of self-contained set pieces, ranging from balcony plantings to town gardens large and small, patios, seating areas, city and farmscapes. Water is everywhere, as formal water gardens, as tiny cascades, as fountains, and it is shown to be a feature to adorn any site.

Arboretum Belmonte, Wageningen

Belmonte Arboretum used to be part of the Botanical Gardens of Wageningen University, and plants from the gardens were initially mainly used for scientific education and research purposes. The gardens' collections also served the botanical world outside the university, e.g., commercial growers. Parts of the collections are part of the National Plant Collection, but since 2009, Wageningen University has ceased scientific management of the gardens. The future of the Belmonte arboretum in Wageningen was secured in 2011, when Wageningen University, Geldersch Landschap (the Gelderland foundation for landscape and castles), and the Wageningen Arboretum Foundation agreed to manage the gardens between them.

The Belmonte collection is well known for its ornamental cherries, rhododendrons, magnolias and (ornamental) apple trees. Other noteworthy species are witch-hazel, viburnum, dwarf quince, catalpa, the dove tree *Davidia involucrata*, silverbells (*Halesia* spp.), cotoneaster and mistletoe.

In the last part of the 18th century, Belmonte (beautiful hill) belonged to a well-to-do family. A lovely country house was situated on the lateral moraine overlooking the river Rijn with a beautiful view over the orchards of the Betuwe, the low land between the rivers Rijn and Waal. During World War II, the house was bombed, and after the war, the family donated the property via an intermediary to the Wageningen University, which started an arboretum on the property. In 2003, the Dutch Rhododendron Society and the Dutch Chapter of the ARS together donated a large collection of rhododendrons, which were planted according to the latest taxonomic classification. About 250 different species and more than 500 cultivars, together representing about 1500 plants, were donated, giving Belmonte Arboretum the largest collection of rhododendrons in the Benelux. In the rhododendron collection of Belmonte are 93 species that according to the IUCN (International Union for the Conservation of Nature), are considered threatened or endangered.

Het Loo Palace-Garden, Apeldoorn

The tour on Day 5 will first visit the Het Loo Palace (meaning "The Woods Palace") in Apeldoorn. The symmetrical Dutch Baroque building was designed by Jacob Roman and Johan van Swieten and was built between 1684 and 1686 for King Willem III (1650-1702) and Mary II of England, with the garden designed by Claude Desgotz. When Willem III purchased the medieval hunting lodge Het Oude Loo together with the surrounding buildings, woods, estates and water courses, he initially wanted to build a new hunting lodge on this site, one which would compete with the country estates of other European royalty. He and his wife Mary Stuart (later Queen Mary II) were lovers of architecture and garden art, and the "new" Loo was envisaged as a magnificent summer residence where the king could hunt and entertain his noble guests in royal splendour.

In 1686, the palace and the gardens were completed, but in 1689, Willem, the Dutch Prince of Orange, and Mary became coregents of the Kingdoms of England, Scotland and Ireland, and this international status was felt to deserve a larger palace.

Het Loo Palace Garden, Apeldoorn.

The gardens were extended and four pavilions were added to the palace, connecting the middle section with the East and West wings. The palace remained a residence of the House of Orange-Nassau from the 17th century until the death of Queen Wilhelmina in 1962. The building was renovated between 1976 and 1982 and since 1984, the palace has been a state museum open for the general public, showing interiors with original furniture, objects and paintings of the House of Orange-Nassau.

From 1977 to 1984, a drastic restoration of the gardens took place in order to restore them to their original state in the 17th century. The garden at present is a Dutch-classicist one with French influences (a division of plots with hedges of Japanese holly). It is a garden in the formal style of 17th century baroque as in the renaissance gardens of Andre le Notre at the Castle of Versailles (France), but in comparison with Versailles is of course much more modest in size. One side of the garden in the mirror image of the other, and you can enjoy the spouting fountains that are fed by a water table high above you. The result is that the fountains, thanks to the high level of the water table, surpass the French ones in water height! The Koningssprong (King's Leap) is, with its 13 metres (43 ft) spouting height, the highest spouting fountain in Europe.

The garden statues are gods and goddesses from Greek mythology, have as theme, the growth and flowering of the gardens and emphasize the achievement of making a beautiful garden from an originally barren moor.

The White Loo: In 1795, Willem V, the last Orange king, fled to England, and the palace and the gardens subsequently fell into disrepair. In 1806, the palace became the property of Louis Napoleon, who was made King of Holland by his brother Napoleon Bonaparte. Louis Napoleon had the exterior of the palace radically changed, with the palace plastered in grey-white, creating "the White Loo." He then had a romantic-styled landscape park laid over the 17th century baroque gardens. However, in 1813, the son of the former king Willem V returned to the Netherlands after many years in exile. In 1815, he had himself inaugurated as King William I (Willem VI), king of the Low Countries and Belgium, and Grand Duke of Luxemburg. In that year, a decision was taken to make Het Loo Palace available to the head of state as summer residence.

Het Loo Palace Garden, Apeldoorn.

Het Loo Palace Garden, Apeldoorn.

The Last Residents: Princess Margriet and Professor Pieter van Vollenhoven were, together with their four sons, the last residents of the palace. They lived here from 1967 to 1975 in the East Wing. Each year at Christmas, the decorated table of Princess Margriet is on show at Paleis Het Loo.

This ends the ARS pre-conference tour of The Netherlands.

Rinus Manders is a member of the Dutch ARS Chapter as well as a member of both the Dutch Rhododendron Society and the German Rhododendron Society (Deutsche Rhododendron Gesellschaft).

A Layman's Summary of our Study on "The functional significance of leaf idioblasts in accessions of Schistanthe (Ericaceae): A focus on leaf water relations"

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Summary
Idioblasts are very large cells in a tissue with otherwise normal cell size. These large cells are found in plants from many different lineages. In *Rhododendron*, idioblasts are commonly found in leaves of plants in section Schistanthe (vireyas). A survey was performed to determine if there is significant variation in idioblast abundance among species and to determine what is the functional significance of idioblast cells to plant water relations. A highly significant difference in leaf idioblast abundance was found among accessions representing species in section Schistanthe. Idioblast cells occupied from 4 to 20% of the entire leaf volume among species. Thin leaves (less than 0.5 mm in thickness) tended to have a high idioblast abundance compared to thick leaves. In addition, idioblast abundance was significantly correlated with succulence of thin leaf types. Larger leaves that had fewer idioblasts had higher potential transpiration (water loss). Leaves with abundant idioblasts were able to maintain turgor pressure at

a greater water deficit (drought) than leaves with few idioblast cells. We conclude that idioblasts can have a significant influence on drought tolerance for plants with relatively thin leaves. Epiphytic plants may benefit from having a high abundance of idioblasts because of the potential for periods of drought in an epiphytic location.

Idioblast Cells and their Putative Functional Significance

The term idioblast refers to plant cells that are distinctly larger than the surrounding cells of a given tissue. Defined in the broadest sense, idioblast cells can be found in all plant tissues and are structurally diverse. Some idioblast cells are classified as sclerids (tough ridged cells similar to those in apple fruits), others are considered to be sites for secretion and others are thought to be storage cells for secondary compounds. Many idioblast cells contain a high concentration of substances such as oils, tannins, mucilage, or calcium oxalate crystals in their central vacuole (large water reservoir in the center of the cell). These differences in structure and content of idioblast cells have been used for taxonomic purposes for several plant systems. Foliar idioblasts are found in many plant families including the Alsteromeriace, Brassicaceae, Ericaceae, Lamiaceae, Papilionaceae, Polygonaceae, Scrophulariaceae, Sterculiaceae, and Solanaceae to name a few in alphabetical order. Thus, foliar idioblasts are diverse, widely distributed among plants and can be significant for taxonomic purposes. However, the association between foliar idioblast cells and leaf physiological properties has remained largely unexplored.

The predominant hypotheses for the functional significance of foliar (in the leaf) idioblast cells are: secretion, storage of cellular waste products or crystals, or defense against herbivores. Yet, a large quantity of foliar idioblast cells in a leaf could have several simultaneous different effects on leaf physiology. For example, a large proportion of leaf water contained in idioblast cells could affect bulk leaf water processes, including water retention and water flow. Also, sub-epidermal idioblast cells that extend into the palisade cell layer (top cell layer in the leaf that does most of the photosynthesis) could significantly alter the dynamics of light penetration into leaves and thereby influence leaf absorptivity of light and photosynthesis. Moreover, if idioblast cells increase the ratio of water to air in a leaf, then the thermal dynamics of the leaf will change. This could be by buffering the rate by which leaf temperature changes during and after a sun exposure because water has a greater heat capacity than air, i.e., it can absorb a lot more heat before changing temperature compared to air. In order to understand the broad significances of idioblast cells to leaf physiology, the relationships among foliar idioblast cell abundance, leaf anatomy, leaf morphology and leaf water relations should be determined.

Foliar idioblast cells are important taxonomic signatures for *Rhododendron* section Schistanthe (vireyas). All previously surveyed species of *Rhododendron* in section Schistanthe have foliar idioblast cells (except for *R. saxifragoides*) and foliar idioblast cells have not been found in species in other sections of *Rhododendron* (Argent, 2015, Nilsen

& Scheckler, 2003). Sub-epidermal idioblast cells on the top-side of leaves are most abundant, but sub-epidermal idioblast cells can be found clustered around the base of scales for some species, such as *R. bryophilum*. The abundance, size and expression (percent of total leaf volume occupied by idioblast cells) of idioblasts vary greatly among species of Schistanthe. No crystalline structures have been found in foliar idioblast cells of *Rhododendron* species, but in some cases oil droplets (e.g., *R. javanicum*) or mucilage (e.g., *R. sororium*) is found. However, foliar *Rhododendron* idioblast cells mostly contain water and unidentified secondary compounds, which may be tannins. The large water content of these cells suggests that foliar idioblast cells may have an impact on leaf water relations in tropical *Rhododendron* species.

The overall goal of this study was to survey idioblast expression (proportion of leaf lamina occupied by idioblasts) among accessions of *Rhododendron* species in section Schistanthe and utilize a gradient in idioblast expression among a sub-set of the target accessions to evaluate the relationships between idioblast expression, leaf morphology, leaf anatomy, and leaf water relations traits. We addressed the following specific questions in our study. (1) Are there significant differences in idioblast expression among accessions of *Rhododendron* in section Schistanthe? Significant differences in idioblast expression among accessions need to be demonstrated before these plants can be used to address questions about functional significance of idioblast cells. (2) Does idioblast expression increase in accordance with an increase in leaf succulence among plants? We propose that idioblast expression is a main factor defining leaf succulence because of the large cells and their water content. We suggest that the greater the proportion of large water filled cells in the leaf lamina, the larger the amount of water in the lamina (leaf succulence) on an area basis. (3) Does stomatal pore index (SPI, stomatal pore length^2 × stomatal density), a proxy for maximum transpiration, increase in accordance with an increase in idioblast expression among plants? This third question is based on the idea that the larger the volume of total idioblast cells in the leaf lamina, the larger will be the water resource for transpiration. Also, if there is a large water resource in the leaf lamina, leaf transpiration can be higher, allowing stomatal pore index to be higher. (4) Does a high volume of idioblast cells per leaf area cause an increase of water content buffering? This fourth question is based on the concept that a large volume of total idioblast cells in the leaf lamina will allow the leaf lamina to be able to lose a large amount of water with only a moderate change in bulk leaf water potential. Water potential [water potential quantifies the tendency of water to move from one area to another due to osmosis, gravity, mechanical pressure, or matrix effects such as capillary action (which is caused by surface tension); within complex biological systems, many potential factors may be operating simultaneously. For example, the addition of solutes lowers the potential (negative vector), while an increase in pressure increases the potential (positive vector)] relates to the potential energy of water in a tissue, and thus the more negative the water potential, the greater the water stress. Therefore, we hypothesize that abundant idioblasts can minimize water stress in leaves. This study thus provides important information about the relationships between leaf idioblast expression, leaf anatomical traits, leaf morphological traits, and leaf water dynamics. This research documents significant differences in idioblast expression among vireya species and shows that idioblasts increase leaf succulence for thin leaves. Moreover, idioblast expression is positively related to leaf water buffering capacity for species with thinner leaves, an important trait for epiphytic plants.

Methods

All accessions representing *Rhododendron* species in section Schistanthe (vireyas) used to test hypothesis one and two were from a common garden (Kimalia, the late Mitch Mitchell's garden) located in Volcano, Hawai'i, at 1207 m elevation. All accessions were growing in the soil, which was well-drained soil of volcanic origin. There was a sparse canopy of *Metrosidorus polymorpha* (Ohia-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 and 22 °C and the average monthly minimum varied between 14 and 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 60% on sunny days during the summer. Light intensity ranged between 50 to 250 $\mu mol\ m^{-2}\ s^{-1}$ (low to moderate light intensity) over all plants in the common garden depending on the time, day and season. Therefore, the common garden climate was characterized as a mild mountain climate, with seasonally constant maximum and minimum air temperature, high relative humidity, low photosynthetically active radiation (PAR), and a well-drained volcanic soil. Many thanks go to the late Mitch and Sandy Mitchel for establishing this garden on their property.

Five fully mature leaves were collected from three major compass directions from outer canopy locations of each accession. The leaves were sealed in zip lock plastic bags and transported to the lab at the University of Hawaii in Manoa, for anatomical preparation. We measured leaf morphological traits: average leaf length, width and area. Also, we measured stomatal traits of the leaves: density, size of the pore, and stomatal pore index (SPI = density times pore length squared). The leaves were prepped for anatomical analyses with a focus on the mid-leaf location. We determined the density of idioblasts per mm of leaf length (ID = # idioblasts/length of the section), the area of each idioblast was calculated by using the geometric formula for the area of an ellipse (IA = pab), where a = length and b= width. The IAs were summed and divided by the total area of the leaf section to attain an index of idioblast expression (idioblast expression = (($\sum$ IA)/total section area) * 100). The idioblast expression represents the total volume of the leaf occupied by idioblast cells.

For research related to questions 3 and 4, the following culture methods apply. The growth medium used in the greenhouse experiment was a mixture of coconut chunks (70%) and perlite (30%). Plants were watered daily and fertilized every two to three weeks with a balanced liquid fertilizer (Miracle-Gro water soluble azalea, camellia, and rhododendron plant food: 30% N, 10% P, and 10% K). Air temperature in the greenhouse ranged from 22–32^0 C across the year and relative humidity ranged from 65 to100% on a daily basis. Only leaves produced in the BIOL/VBI Plant Growth Facility were used in this experiment to make sure that previous growth conditions for the plants did not affect our results. Three fully mature leaves were excised from the outer canopy branches from each plant for anatomical analyses. The same techniques as described above (Hawaiian survey) were used for leaf preparation and anatomical analyses.

Survey of Idioblast Cell Occurrence

Idioblast cells were found in all the accessions we sampled (35). Most idioblast cells were on the top leaf surfaces just below a single epidermal layer and extending into the palisades region (Fig. 1 A-C). In some cases, idioblast cells extended into the

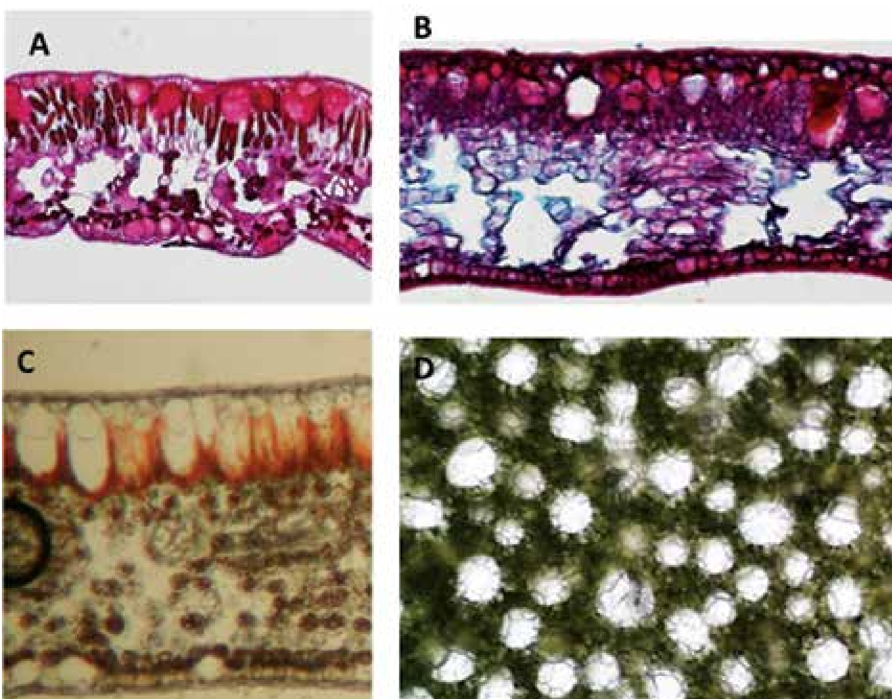

Fig. 1. A-C) Cross sections of the leaf lamina of A) *R. celebicum*; B) *R. crassifolium;* and C) *R. brookeanum* (unstained); D) A paradermal section (looking down onto the leaf top) of *R. zoelleri* (unstained).

epidermal layer on the top leaf surface which suggest a secretory function. Some of the leaves had idioblast cells on the bottom leaf surfaces clustered around the base of scales. When an image is made looking down on the top surface (Fig. 1 D), idioblast cells were identified by large clear areas in the matric of smaller green cells. In some cases (*R. brookeanum*), the layer of idioblast cells was continuous while in other cases the idioblast cells were broadly scattered (*R. crassifolium*). Idioblast cells did not extend into the spongy mesophyll even when the idioblast cells were the largest and had their highest expression (*R. bryophilum*). Also, leaf thickness, spongy mesophyll thickness and density of cells in the spongy mesophyll varied widely among accessions.

Statistical tests strongly indicated that there were significant differences in idioblast density, size and expression among accessions. Therefore, our first question was answered positively. Leaves of some species have very high idioblast expression (e.g., *R. bryophilum* and *R. celebicum* have 20% of the leaf area occupied by idioblast cells) while leaves of other species have relatively low idioblast expression (e.g., *R. crassifolium* and *R. yongii* have less that 4% of the leaf area occupied by idioblast cells). Moreover, we were able to continue our research to see what aspects of leaf morphology and anatomy were correlated with idioblast cell traits of the leaf. Leaves that are thinner and smaller have higher idioblast cell expression than leaves that are larger and thicker. Also, narrow leaf form is associated with higher idioblast expression than leaves that are more round in shape.

Idioblast Expression in Relation to an Increase in Leaf Succulence among Plants

Our second question of whether idioblast expression increases in accordance with an increase in leaf succulence among plants was not supported by our research because idioblast cell expression generally decreased as leaf thickness increased. Succulence was highly positively correlated with leaf thickness and the percentage of the leaf occupied by mesophyll cells. Therefore, plants that have very thick and succulent leaves, with a high proportion of mesophyll, have a low idioblast expression. Leaf thickness varied from 0.3 to 0.9 mm and about half of our accessions had a leaf thickness less than 0.5 mm. There was a significant positive correlation between idioblast cell expression and leaf thickness for leaves less than 0.5mm in thickness, but this correlation was only for relatively thin leaves. Consequently, idioblast expression can influence leaf succulence as long as there is a relatively small proportion of mesophyll cells. Otherwise, the proportion of mesophyll cells is a more important determinant of leaf succulence than is idioblast cell expression.

Idioblast Expression and Leaf Water Traits (stomatal transpiration rate and leaf water stress)**.**

This part of the study was to investigate the relationships between idioblast expression and leaf water traits (questions 3 and 4): does maximum transpiration rate increase in accordance with an increase in idioblast expression, and does abundant idioblast cells presence minimize water stress in leaves? In order to test these questions, a subsample of the survey species were grown in the BIOL/VBI plant growth facility at Virginia Tech. These accessions were obtained from either the Pacific Island Nursery in Kea'au, Hawaii, (derived from cuttings of species in the Hawaiian garden) or the Rhododendron Species Foundation and Botanical Garden (source of most accessions in the Hawaiian garden) in Federal Way, Washington (culture methods described above). W e measured SPI, a proxy for maximum transpiration, because we thought that an increase in idioblast expression would stabilize water content in a leaf and allow plants to have higher transpiration rates without suffering water stress.

Three recently mature leaves were excised from each plant in the greenhouse experiment in early morning (before 7:00 AM) and were immediately placed in a saturation chamber to become fully saturated with water. Following saturation, the petiole was trimmed, and the relationship between water deficit and equilibrium pressure was determined using a dehydration technique. A graphical procedure was used to determine osmotic potential relationships, water deficit at the turgor loss point, and leaf water capacitance. We assed these traits because: 1) a low osmotic potential (influenced by the amount of salts in the tissue) can help a leaf maintain turgor pressure at greater water deficit; 2) the larger the water deficit at the turgor loss point, the higher the tolerance of leaf water loss; and 3) leaf water capacitance is a measure of the amount of water the leaf can lose without suffering water stress. The larger this value, the larger the leaf is buffered against water stress.

Our third question was about the relationship between SPI and idioblast expression. We found only a few positive correlations between SPI and leaf morphology, anatomy or idioblast expression. Stomatal density was significantly negatively correlated with both idioblast size and idioblast expression; stomatal density decreased as idioblast expression increased. However, unlike stomatal density, both stomatal pore length and SPI were significantly positively correlated with leaf thickness and leaf succulence, but were negatively correlated with idioblast expression. Thus, SPI, a proxy for maximum leaf water conductance (transpiration), increased as leaf succulence increased and idioblast expression decreased, with the increase primarily due to increasing stomatal pore length. We thus concluded that an increase in idioblast expression does not allow for a greater transpiration rate from the leaf but rather that the thicker the leaf, the higher the leaf transpiration rate can be because of larger stomata.

Our fourth question concerned the relationship between idioblast expression and leaf water buffering capacity, i.e., the amount of water a leaf can lose without suffering water stress. There were no significant relationships between the osmotic aspects of leaf water and idioblast expression. Therefore, the water contained in idioblast cells does not contain a high proportion of osmotically active substances such as salts, sugars or amino acids. However, we did find a significant positive correlation between the water deficit at the turgor loss point and idioblast cell expression. Thus, as the idioblast cell expression increases in a leaf, the leaf is able to withstand a greater loss of water before losing turgor pressure. Since positive turgor pressure is required for appropriate metabolic processes, leaves with higher idioblast expression can maintain appropriate metabolic processes during greater drought episodes.

Leaf water buffering capacity (capa-citance) was most correlated with leaf thickness and leaf succulence. However, because idioblast expression was generally negatively correlated with leaf succulence, leaf water buffering was negatively correlated with idioblast cell expression. The answer to our fourth question is thus no—idioblast expression (relative proportion of idioblast cells in a leaf) does not necessarily lead to a greater water buffering capacity for the leaf.

Conclusion

We conclude that there are significant differences in idioblast expression (percent of total leaf volume occupied by idioblast cells) among species, as they account from 4 to 20% of total leaf volume, but all members of section Schistanthe*,* i.e., vireyas, have idioblasts in their leaves. Idioblast expression is positively correlated with leaf succulence only for relatively thin leaves. An increase in idioblast expression allows leaves to maintain a positivel turgor pressure under a greater water deficit, which can allow for a higher water stress tolerance. The significance and variation in idioblast expression may be associated with a trade off between an epiphytic habitat and leaf succulence. Water buffering and resistance to water stress is an important trait for epiphytic plants, which includes many vireyas. Many epiphytes have leaf succulence to survive, but if a leaf is naturally succulent (thick), there is only minimal advantage to having many idioblast cells. However, epiphytic plants with relatively thin leaves will benefit from a high abundance of idioblasts, which can buffer water loss and thereby allow a plant to be able to maintain metabolic activity during times of low water availability.

Acknowledgements.

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References

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Rhododendron stamineum, Subgenus Azaleastrum, Section Choniastrum

Ernest H. Wilson first introduced this species to western gardens in 1900 from the province of Hupeh (Hubei), China a part of the middle basin of the Yangtze River (Chang Jiang), flowering fourteen years later. He introduced it again from Sichuan in 1910, with other collectors finding it growing in Kweichow, Hunan Anhwei and Kwangsi. Depending on where it is grown, it can be a bush from one to three metres (3.2-9.8 ft) high, easily identified with its elliptic, glabrous, glossy and rather pendulous leaves, and its white flowers with a yellow blotch and extremely long stamens.

Cold Hardiness Temperature: 10°F (-12°C). Photo by Maurie Kupsch.

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 May 20, 2017, 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) 'Autumn Orange'
Elepidote rhododendron: 'Sedona' (s) X ('Flaming Star'* x 'Bergie Larson'). H (1991), G (1997), N (2015), REG (2017): Jim Barlup, Bellevue, WA. Flrs 13/lax truss, open funnel, 2.25 inches (57mm) long x 3 inches (76mm) wide with 5-7 rounded lobes, wavy margins. Bud: moderate reddish orange (35A). Inside and outside: light yellowish pink


'Autumn Orange'. Photo by Jim Barlup.

(29C) shading to pale purplish pink (56A) at margins, with strong red (50A) nectar pouches. Calyx: 0.4 inch (9mm) long, light yellowish pink (29C) blending with strong red (50A). Truss 4 inches (102mm) high x 6 inches (152mm) wide. Lvs 5.25 x 2 inches (133 x 51mm), elliptic, rounded base, broadly acute apex, flat margins, moderate olive green (147A), glossy. Shrub 3 feet (0.9m) high x 4 feet (1.2m) wide in 10 years; intermediate habit, lvs held 2 growing seasons. Hardy to 5°F (-15°C). Flowering late season (early June in Seattle area).
[* 'Flaming Star' – not registered. 'Ring of Fire' X 'Lem's Cameo', hybridized pre-1995 by Willard and/or Margaret Thompson, Waldport, OR.]

(r) 'Bob Furman's Julianne'


'Bob Furman's Julianne'. Photo by Donna Delano.

Elepidote rhododendron: Parentage unknown. H (c. 2000), G (2008): Robert A. Furman, Brewster, MA; S (2015), N (2016), REG (2017): Karen Humphries, White Horse Beach, MA. Flrs 15/ball truss, funnel, 2 inches (51mm) long x 2.5 inches (64mm) wide with 5-6 rounded lobes, slightly wavy margins. Bud: strong red (53B-53C). Inside: pale purplish pink (65C) blending to vivid purplish red (57C) at margins, with deep red (60A) spots on dorsal lobe. Outside: vivid purplish red (57C), lighter between midveins. Whitish style and filaments; vivid purplish red (57C) stigma. Truss 5.1 x 5.1 inches (130 x 130mm). Lvs 4-5 x 1.75 inches

(100-125 x 45mm), oblanceolate, upangled from midvein, cuneate base, broadly acute apex, flat margins, moderate olive green (147A), semiglossy. Indumentum: dense, felt-like; underside; yellowish white (156D) maturing to moderate to pale orange yellow (165C-165D). Shrub 4.5 feet (1.4m) high x 6 feet (1.8m) wide in 16 years; intermediate habit, leaves held 3 growing seasons. Plant hardy to -10°F (-23°C), buds to -5F/-21C. Flowering early to mid season (mid-May on Cape Cod). Etymology of name: for Julianne Donahue, a granddaughter of the hybridizer.

(r) 'Bob Furman's Lady Luck'

'Bob Furman's Lady Luck'. Photo by Donna Delano.

Elepidote rhododendron: [('Tally Ho' x *R. degronianum* ssp. *yakushimanum*) x (*R. degronianum* ssp. *yakushimanum* x 'Noyo Chief')] (s) X 'The Honourable Jean Marie de Montague'. H (1986), G (1991): Robert A. Furman, Brewster, MA; S (2014), N (2014): Audrey Furman, Brewster, MA; REG (2017): Karen Humphries, White Horse Beach, MA. Flrs 13/ball truss, funnel, 1.75 inches (45mm) long x 2.75 inches (70mm) wide with 7 rounded lobes, wavy margins. Bud: strong red (53C-53D). Inside: pale purplish pink (56C) blending to moderate purplish pink (66D) at margins, with darker midvein on each lobe and deep orange yellow (163A) spotted blotch below dorsal lobe. Outside: moderate purplish pink (65A); strong purplish red (64C) along midveins. Whitish filaments and style; brown anthers; pale yellow stigma. Truss 5.1 x 5.1 inches (130 x 130mm). Lvs 3.5 x 1.5 inches (90 x

38mm), oblanceolate, upangled from midvein, rounded base, broadly acute apex, wavy to twisted margins, moderate olive green (147A), matte. Indumentum: dense, felt-like; underside; yellowish gray (156B) maturing to brownish orange (165B) to moderate orange yellow (165C). Shrub 6 feet (1.8m) high x 9 feet (2.7m) wide in 30 years; dense habit, leaves held 3 growing seasons. Plant hardy to -10°F (-23°C), buds to -5F/-21C. Flowering early to mid season (mid-May on Cape Cod). Etymology of name: incorporating the hybridizer's name and his nickname for his wife, Audrey Furman.

(a) 'Elisabeth Frances'

'Elisabeth Frances'. Photo by Harold Sweetman.

Evergreen azalea: 'Delicatissima' (s) X unknown (open pollinated). S (1999), G (1994), N (2016): Harold Sweetman, Devon, PA; REG (2017): Jenkins Arboretum and Gardens, Devon, PA. Flrs 3/terminal cluster, funnel, hose-in-hose, 1.5 inches (38mm) long x 1.5 inches (38mm) wide with 10 (5 + 5) rounded, occasionally notched lobes, flat margins. Bud: strong greenish yellow (151A). Inside and outside: white (NN155D) with strong reddish purple (NN74D) at most lobe tips. White filaments and style, green stigma. Lvs 1 x 0.5 inches (25 x 13mm), elliptic, cuneate base, broad acute to rounded apex, flat margins, moderate olive green (137B), semiglossy. Shrub 3 x 3 feet (0.9 x 0.9m) in 20 years; intermediate habit. Hardy to 0°F (-18°C). Flowering midseason (early May in Philadelphia area). Etymology of name: for Elisabeth Frances Haas, a granddaughter of a Jenkins Arboretum board member.

(r) 'Icicle Creek'

Elepidote rhododendron: 'Ingrid Mehlquist' (s) X 'Snow Candle'. H (1997), G (2002), N (2015), REG (2017): Jim Barlup, Bellevue, WA. Flrs 22/dome truss, funnel campanulate, 1.75 inches (44mm) long x 2.5 inches (64mm) wide with 7 rounded lobes, wavy margins. Bud: strong purplish red (63A). Inside: yellowish white (155D) with dark red (187A) basal blotch, 0.75 inch (19mm) long in dorsal area corresponding to upper 3 lobes, surmounted by dark red (187A) spots in upper lobe. Outside: yellowish white (155D) with pale purplish pink (62D) along midveins. Prominent pistil with white style and orange stigma. Truss 4 inches (102mm) high x 5 inches (127mm) wide. Lvs 5.5 x 2.1 inches (140 x 54mm), elliptic, rounded base, broadly acute apex, downcurved margins, moderate olive green (147A), matte. Shrub 1.5 feet (0.5m) high x 2.5 feet (0.8m) wide in 8 years; intermediate habit, leaves held 2 growing seasons. Hardy to 0°F (-18°C). Flowering midseason (late April in Seattle area).

'Icicle Creek'. Photo by Jim Barlup.

(a) 'Linda's Star'

'Linda's Star'. Photo by Kenneth Menke.

Evergreen azalea: sport of 'Dogwood'. S (2013), G (c. 2008), N (2016), REG (2017): Kenneth Menke, Tallahassee, FL. Flrs 3/terminal cluster, funnel, 1.75 inches (44mm) long x 2 inches (51mm) wide with 5 rounded lobes, slightly wavy margins. Bud: white, with pink (Pantone 190U). Inside and outside: white, with pink (Pantone 184U) central stripe from base to margin of each lobe, about one-third the width of the lobe; interior dorsal blotch (Pantone 192U) with spots (Pantone 220U). Calyx: 0.2 inch (5mm) long, green (Pantone 390U). Filaments pink, anthers brown, style and stigma red. Lvs 1.5 x 0.5 inches (37 x 13mm), oblanceolate, cuneate base, broadly acute apex, flat margins, dark green (Pantone 367C), semiglossy. Shrub 5 feet (1.5m) high x 3.25 feet (1m) wide in 8 years; intermediate habit, lvs held 2 growing seasons. Plant hardy to 10°F (-12°C), buds to 26F/-3C. Flowering early season (February in northern Florida). Etymology of name: for Linda Menke, wife of the registrant.

(r) 'Quiet Journey'

Elepidote rhododendron: ('Bambi' x *R. proteoides*) (s) X 'Christina Dee'. H (2006), G (2010), N (2015), REG (2017): Jim Barlup, Bellevue, WA. Flrs 15/ball truss, broad funnel, 1.5 inches (38mm) long x 2.6 inches (67mm) wide with 5 rounded lobes, wavy margins. Bud: strong red (53D). Inside and outside: pale yellow (11C) shading to pale yellow (11D) at margins, inside with faint nectar pouches and dorsal spotted blotch, both moderate reddish orange (41C). Reddish style with dark stigma. Truss 4 inches (102mm) high x 4.5 inches (114mm) wide. Lvs 3.25 x 1.5 inches (83 x 38mm), elliptic, rounded base, broadly acute apex, downcurved margins, moderate olive green (147A), semiglossy. Indumentum: sparse hairs, underside, yellowish white (155D) maturing to moderate orange yellow (165C). Shrub 2 feet (0.6m) high x 3 feet (0.9m) wide in 9 years; open habit, lvs held 3 growing seasons. Hardy to 0°F (-18°C). Flowering midseason (early May in Seattle area).


'Quiet Journey'. Photo by Jim Barlup.

(r) 'Silk Sunshine'
Elepidote rhododendron: 'Janet Blair' (s) X 'Tia'. H (2004), G (2009), N (2016), REG (2017): Jim Barlup, Bellevue, WA. Flrs 17/ball truss, broad funnel, 2.25 inches (57mm) long x 3.25 inches (83mm) wide with 5 rounded lobes, frilly margins. Bud: strong red (53C). Inside and outside: light yellow (11B) shading to


'Silk Sunshine'. Photo by Jim Barlup.

pale yellow (11D) at margins, with interior strong red (46A) dorsal blotch, 1 inch (25mm) tall, spreading to adjacent lobes. Truss 6 inches (152mm) high x 6.5 inches (165mm) wide. Lvs 5.5 x 2.25 inches (140 x 57mm), elliptic, rounded base, broadly acute apex, flat margins, moderate olive green (147A), semiglossy. Shrub 3 x 3 feet (0.9 x 0.9m) in 6 years; intermediate habit, lvs held 2 growing seasons. Hardy to 0°F (-18°C). Flowering midseason (early May in Seattle).

(r) 'Summer Dreams'
Elepidote rhododendron: 'Jonathan Shaw' (s) X ('Rosalie Hall' x 'Hill's Low Red'). H (2006), N (2015), REG (2017): Jim Barlup, Bellevue, WA; G (2011): John Winberg, Mount Vernon, WA. Flrs 15/ball truss, broad funnel, 2 inches (51mm) long x 3 inches (76mm) wide with 5 rounded lobes, wavy margins. Bud: strong purplish red (60B). Inside: pale purplish pink (65D) blending to moderate purplish pink (65A) at margins, with deep red (185A) nectar pouches, dorsal pouch notably larger, and deep red (185A) spotted blotch on dorsal lobe. Outside: pale purplish pink (65D) blending to moderate purplish pink (65A) with deep purplish pink (66C) midveins. Truss 4.5 inches (114mm) high x 5 inches (127mm) wide. Lvs 4.75 x 2 inches (121 x 51mm), elliptic, rounded base, broadly acute apex, downcurved margins, moderate olive green


'Summer Dreams'. Photo by Jim Barlup.

(147A), semiglossy. Shrub 2 x 2 feet (0.6 x 0.6m) in 5 years; intermeditae habit, lvs held 2 growing seasons. Hardy to 0°F (-18°C). Flowering midseason (early May in Seattle area).

(r) 'Sweet Talk'


'Sweet Talk'. Photo by Jim Barlup.

Elepidote rhododendron: {['Yellow Saucer' x 'Anna's Riplet'] x ['September Song' x ('Bambi' x *R. proteoides*)]} (s) X 'Grand Recital'. H (2007), G (2013), REG (2017): Jim Barlup, Bellevue, WA; N (2015) Lois Blackmore, Vancouver, BC. Flrs 12/dome truss, broad funnel, 1.75 inches (44mm) long x 2.25 inches (57mm) wide with 6 rounded lobes, wavy margins. Bud: deep red (60A). Inside: pale yellow green (4D) at base, then pale purplish pink (56C) blending through moderate purplish pink (54D) to deep purplish pink (54B) at margins, with moderate red (181C) dorsal throat blotch. Outside: pale purplish pink (56C) blending through moderate purplish pink (54D) to deep purplish pink (54B) at margins. Calyx: 0.6 inch (16mm) long, pale purplish pink (56C) with moderate red (181C) spotting. Whitish style and filaments, green stigma, brown anthers. Truss 4 inches (102mm) high x 4.5 inches (114mm) wide. Lvs 2.25 x 1 inches (57 x 25mm), elliptic, rounded base, broadly acute apex, flat margins, moderate olive green (147A), semiglossy. Shrub

2.5 feet (0.8m) high x 3.5 feet (1m) wide in 8 years; open habit, lvs held 2 growing seasons. Hardy to 5°F (-17°C). Flowering midseason (late April in Seattle area).

(r) 'Winding Road'
Elepidote rhododendron: 'Lois Blackmore' (s) X 'Plum Passion'. H (2009), G (2013), N (2015), REG (2017): Jim Barlup, Bellevue, WA. Flrs 16/ball truss, saucer, 1.9 inches (47mm) long x 3 inches (127mm) wide with 5 lobes, notably frilly margins. Bud:

dark red (59A). Inside: pale purplish pink (62D) in center, blending to strong reddish pink (70B), with blotch on upper lobes of light reddish brown (177B) spots over (4D) pale yellow green. Outside: pale purplish pink (62D), blending to strong reddish pink (70B), with strong purplish red (60B) midveins. Truss 5 x 5 inches (127 x 127mm). Lvs 5.4 x 2 inches (136 x 51mm), elliptic, rounded base, broadly acute apex, flat margins, moderate olive green (147A), matte. Shrub 2 feet (0.6m) high x 3 feet (0.9m) wide in 6 years; intermediate habit, lvs held 2 growing seasons. Hardy to 0°F (-18°C). Flowering midseason (mid-May in Seattle area).

'Winding Road'. Photo by Jim Barlup.

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).

To register a rhododendron or azalea name

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.

All others: Please direct inquiries to Alan C. Leslie, International Rhododendron Registrar.

Chapter/District/Special Donations from 2/16/2017 through 5/15/2017

Donor	Amount	Source
General Fund		
Tappan Zee Chapter	$100.00	In memory of Marvin Klibinoff
Tappan Zee Chapter	$50.00	In memory of Martin Winkler
Endowment Fund		
Siegert/Warf	$25.00	In memory of Kenneth McDonald
Gordon & Linda Wylie	$100.00	In memory of Kenneth McDonald
Paul W. Anderson MD	$100.00	Donation of Judging fee
Francis & Regina Duff, Jr.	$75.00	Speaking fee donated to ARS

Rhododendron Calendar

2017 ARS Fall Conference, Richmond, Virginia. Board Meeting. Oct.20-22.

2018 ARS Annual Convention, Bremen, Germany. Board Meeting on May 21st. Convention May 7–31 (including pre-convention and post-convention tours). Website: ars2018.org.

2018 ARS Fall Conference, Chattanooga, Tennesee. Board Meeting.Dates to be announced.

2019 ARS Annual Convention, Philadelphia, Pennsylvania. Board Meeting. Dates to be announced.

2019 ARS Fall Conference, Parksville, BC, Canada. Board Meeting. Sept. 27-29.

2020 ARS 75th Anniversary Convention, Portland, Oregon. Board Meeting. Dates to be announced.

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Sonja Nelson, Assistant Editor *Journal American Rhododendron Society.*

Errata

In the article "The ARS 2018 Convention Post-tour Gardens in Finland" in the Spring 2017 issue an error occurred on page 86. "*Picea omorica*" should be written as *Picea omorika.* (Author is (Pančić) Purk.) http://www.beanstreesandshrubs.org/browse/picea/picea-omorika-pancic-purkyn/

New Members from 2/16/2017 through 5/15/2017

AZALEA
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Patterson, Gerald
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Thomas, Paul
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