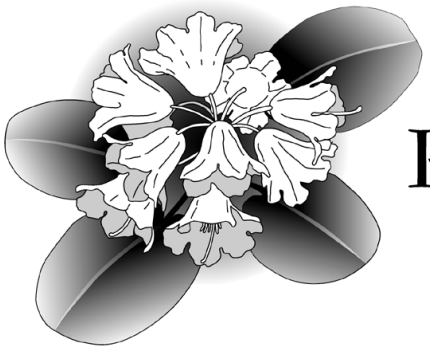
AtlanticRhodo

www.AtlanticRhodo.org

Volume 42: Number 4 February 2019



Atlantic Rhododendron & Horticultural Society

Our Mission

ARHS supports and promotes the development and exchange of expertise and material relating to the practice of creating and maintaining year-round garden landscapes featuring rhododendrons and other plants.

Inside this Issue

Photos in articles are by the authors, unless otherwise identified.

Membership

Atlantic Rhododendron & Horticultural Society.

The current membership period is September 1, 2018 to August 31, 2019. The membership fee is $20.00 if paid between September 1, 2018 and November 30, 2018, and $30.00 after Nov. 30, 2018. For benefits see ARHS website **www.atlanticrhodo.org**

American Rhododendron Society: ARHS is a chapter in District 12 of the American Rhododendron Society. Combined ARHS and ARS membership cost is $57.00 Canadian. For benefits see **www.rhododendron.org**

Cheques, made payable to Atlantic Rhododendron & Horticultural Society should be sent to **Rebecca Lancaster, 22 Walton Dr. Halifax, NS B3N 1E4**

AtlanticRhodo is the Newsletter of the Atlantic Rhododendron & Horticultural Society. We welcome your comments, suggestions, articles, photos and other material for publication. Send all material to the editor.

Published three times a year. February, May and November

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Cover Photo: An arresting woodland vista at Le Jardin du Vasterival, Haute-Normandie, France, October, 2018. .[Photo John Brett]

Calendar of Events

ARHS meetings are held on the first Tuesday of the month, from September to May, at 7:30 p.m. usually in the Nova Scotia Museum of Natural History Auditorium, 1747 Summer St., Halifax, unless otherwise noted. Paid parking is available in the Museum lot. We welcome anyone sharing our interest in plants and gardens.

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March 5 **The Himalayan Gardens of Western Scotland**, presented by John Brett. John is a long-time ARHS member and our current President. His presentation will take us on a tour of impressive garden landscapes in the west of Scotland. He will focus on the extraordinary plants to be found there, particularly the Asian rhododendrons collected by the great plant hunters of the late 19th and the 20th centuries.

March 7 **Five Seasons: The Gardens of Piet Oudolf** A terrific documentary film presentation on the celebrated Dutch garden designer in support of Hospice Halifax and sponsored by the ARHS, among others. Where: The Music Room, 6181 Lady Hammond Road, Halifax. When: Thursday, March 7, 7pm. Doors open at 6:30pm. Admission is by donation at the door.

April 2 **ARHS Panel Discussion: "Pests, Diseases and other challenges faced by Rhododendron Growers".** Four seasoned gardeners make up a panel that will discuss their experiences, and offer suggestions for dealing with challenges such as insect pests, adverse weather, and soil deficiencies. The participation of audience members is encouraged .

May 7 **Member to member plant sale.** An annual event at our May meeting. If you are a member and you have extra plants to sell, this is your chance to do so. Please arrive at 7pm to secure a table and get set up. And for other members, here's a chance to purchase some terrific plants at very reasonable prices.

Information on the June Garden Tour and Potluck to come at a later date.

Thank you for avoiding the use of perfumes and scented products when you come to ARHS events.

Are your dues paid up to date? Our records show that many members are not. Your plant orders for the upcoming members' plant sales will not be processed if your dues are in arrears. Please see page 2 for information on payment methods. Don't delay!

A very warm welcome to our new members who have joined ARHS since November .

Catherine Deveau-Abbass	**Dartmouth NS**
Dr. Joni Guptill	**Bedford NS**
Marian and Mike Little	**Fonthill ON**
Christopher Whittle	**Halifax NS**

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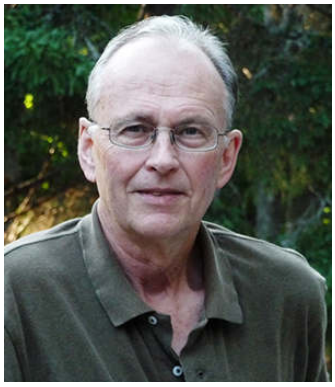
THE PRESIDENT'S COLUMN

by John Brett



This time around, we have a very full and diverse issue of Atlantic Rhodo to present to you - "something for everyone", as the extravagant claim goes, though in this case I believe it's as close to true as we're likely to get. So I will limit my column to this brief encouragement to all members to attend the Spring Convention of the American Rhododendron Society, held this year in Philadelphia, May 16-19.

I attended an ARS spring convention in Vancouver, Washington, some years ago, and found it both enjoyable and edifying. This is a big annual event, international in scope, attended by serious gardeners from all over North America and abroad. It certainly expanded my horizons, with well organized tours of extraordinary gardens and talks by world experts. I have a feeling the conference in Philadelphia will be just as memorable. This area refers to itself as America's Garden Capital; there are conference tours of Winterthur, Longwood, Chanticleer, the Morris and Tyler Arboretums, as well as a number of extraordinary private gardens. An additional benefit is experiencing spring along the mid-Atlantic seaboard, which can be very lovely indeed. For detailed information on the conference and for registration forms you can go to the ARS website: http://ars2019.org/.

In case some of you are unfamiliar with our peculiar two-tiered organisational structure, and are perhaps questioning why I am promoting the ARS conference with such enthusiasm, I will finish by explaining that the Atlantic Rhododendron and Horticultural Society is also the Atlantic chapter of district 12 of the American Rhododendron Society. Though all of you are members of the ARHS by virtue of paying your annual $20.00 fee, some of our members also opt to pay a small amount more (an additional $37.00 CDN this year) to become members of the ARS, Atlantic chapter. Included with membership is a very attractive and informative journal which comes out 4 times a year. This alone is worth the price of membership, so when renewing your dues, I encourage everyone to consider joining both the ARHS and the ARS. It's easy to do, because both options are on the ARHS renewal form. I don't think you'll be disappointed. ¤

Notices

Deadline extended to March 10 for ARHS 2019 Spring Sale for Members. All orders must be in by end of March 10. Send orders to arhsplantsale@gmail.com. Questions? Contact Lynn Rotin at lynnrotin@gmail.com.

Volunteer needed!

To take the lead on organizing the ARHS presence at the Halifax Garden Festival this coming June. Sheila Stevenson has done this in previous years and is willing to advise and help out on the day. If you're interested, please contact our volunteer coordinator, Lynn Rotin, lynnrotin@gmail.com.

The "Rehabbing" of Bayport Plant Farm. An interview with Chris and Joe Cooper, by John Brett, editor, Atlantic Rhodo Newsletter.

Editor's note – As many of our long-time members know, Dick Steele was a much celebrated founder of the ARHS, and it was through the society that many of us first came under his spell. He was generous, charismatic, and if he sensed you had a genuine interest, he would soon invite you down to Bayport Plant Farm, just south of Lunenburg. There, he developed an elaborate plant breeding program, grew on a display garden of rare and unusual plants, and operated a commercial nursery managed by his daughter, Diana. For some of us, Bayport Plant Farm was a Mecca, where we awakened to the wondrous diversity of ornamental plants to be grown in Atlantic Canada, and to their potential role in the future gardens of the region. After Dick's death in 2010, the farm sat idle, unoccupied, and became increasingly derelict over a number of years until it was purchased in 2017. Fortunately, the new owners, Chris Cooper, his wife, Diane Chisholm, and son, Joe, were able to see past the accumulated decay and started on an ambitious program of rehabilitation, or "rehabbing" as they call it. Recently, I met up with Chris and Joe at a much refreshed Bayport Plant Farm, where we talked about their commitment to this very special property, and about their plans for its future.

The Cape-style house showing a newly restored exterior façade, January 2019. [Photo John Brett]

John: I'd like to start out by asking: How did Bayport Plant Farm come to your attention?

Chris: It was midwinter 2017 and we were shopping around for something on the South Shore, and our original notion was to maybe pick something up in Lunenburg. But we also added this place to the list and came by and did a little walk-through and look-see.

John: So tell me about that first time you got to see the property and got into the house.

Chris: Well, you know, rooms were closed off, the heating ducts were all up through the chimney. It was a congested little house and the barn was in the same kind of condition. Everything was pointing to a lot of work - falling down buildings and collapsed poly-tunnels. But there was something about the fact that the original Cape (house) hadn't been really interfered with too much. It had a lot of its original bones and feel and, being 1785, it had the chimney and it had the fireplaces and the old boards, and the wainscoting was still in place. We saw that once you'd cleaned up the surface of things you could actually find that feeling and aesthetic.

Joe: I think it's safe to say that my mother spurred him on.

Chris: I would say it happened for Diane when she was actually walking out to the barn and past the Magnolia and when she came up to the other side of the magnolia tree just where…

The collapsed poly-tunnel before removal. It was used for propagation by cuttings. [Photo Chris Cooper]

Joe (R) and Chris Cooper (L) where the poly-tunnel once stood. [Photo John Brett]

Joe: And it was winter…

Chris: …the depth of winter with snow up to her knees and she said, “This place could be really good, I have such a great feeling here.”

Joe: She really pushed for this place.

Chris: I was more reticent.

Joe: She said, “Joe, it has that real enchanted forest kind of vibe. It's really good.”

John: Describe the property to me.

Chris: It's the original grant. It's 46 Acres. We took possession in May, 2017. The Magnolias were really popping, the place was pretty spectacular.

John: Once you'd purchased it, how did you proceed from there? What repairs and renovations did you tackle first: the house, the barn there, the greenhouse?

Chris: We cleared out the Cape (house) and then lived with it for a while before we really made a hard decision as to how to renovate. Probably the first thing was picking up pots.

Joe: Yeah, basic garbage.

Chris: Thousands of pots left strewn all over the entire property, enormous numbers of pots.

Joe: It also started with clearing back, exposing the trails through the property. So all the roads: over the dam, and the roads up into the forest.

Chris: The first place we cleared was the front of the house. And the next big job, we decommissioned the poly-tunnel, tore it down and brought in three tons of pea gravel to cover that area. And then the old furnaces, the recycled steel. The back road was full of soil mixtures, broken rotors, tillers, fertilizers, and so we took some big dumpsters back there with backhoes and just really loaded up. Literally dumpsters and dumpsters of broken metal and wiring and plastic and wooden frames. And it was also trying as best we could to identify what to keep, what to clear. There were a lot of wild roses, alders, all that kind of brush, and in amongst it were beautiful amazing things that had to be parsed out and protected as you go through that process.

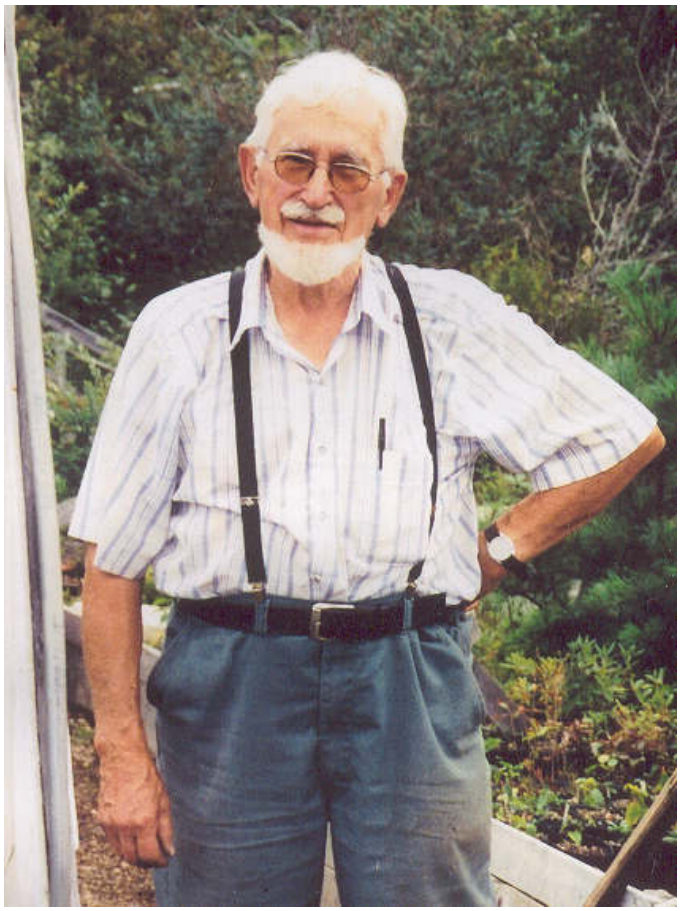
John: At the same time were you working on the house?

Chris: Well, we lived with it as an old farmhouse, in its original state, and then in mid-December 2017 we started the renovations. So basically the whole winter of 2018 up until about March we gutted it, took out walls, took out the ceilings, exposed the beams, put down all new floors.

Joe: We actually recycled some of the old trim, the wainscoting, we used some of these historic boards as countertops.

Chris: That's like basically two hundred and fifty year old hemlock.

John: Many of us, who knew Dick when he was active, we have strong memories of what he called “the Heather House”, which was that poly-tunnel greenhouse and that little building attached to the barn. Tell me what you did over there.



Dick Steele at Bayport Plant Farm [Photo Wendy LeBlanc]

Chris: It was in complete chaos. I think there were at least three full furnaces in there and oil tanks and wood burning stoves…

Joe: … all the plant tables with all the heating runs, the copper lines, all of the propagation tables, side tables, all sorts of pots. So the problem was it had all collapsed from the snow loads. So we had to strip the plastic off (the poly-tunnel), first step, unroll the whole thing. Then we started decommissioning the tables, then we decommissioned the rungs (poly tunnel hoops), we had to use a tractor for that…

Chris: We had to pull all the footings up that had been put down for the hoops…

Joe: All the plants that had survived, we tried to isolate, and we actually transplanted those with the help of Walter Ostrom.

Chris: He showed us what was important.

Joe: And in the meantime we had the office cleaned out and my wife and I and my brother, we would use that as sort of a hang-out space. So during that time, I went through all the files and pulled the papers and we found some interesting documents.

Chris: They're sitting in filing cabinets right now.

John: So you have, in a sort of a way, a Dick Steele archive.

Chris: Yeah. It's a voluminous amount of material.

Joe: And we actually have a couple documents where it looks like somebody, towards the end, did a whole accounting of all the plants that are on the farm – there are a couple of documents that list all the Rhododendron varieties by name. But to answer your question about what was there when we arrived, I think exactly what Dick left, because I'll point you to Dad's glasses. Those are actually Dick's glasses.

Chris: I found these glasses!

Joe: In the office!

Chris: And I put my own prescription in them and now I'm seeing the world through Dick's eyes.

Joe: There were old seed collections. Boxes and boxes of seeds - labeled seeds - of all different types. A huge amount of plant tags, and just the workings of someone who was a real serious plantsman.

John: So once you've cleared it all out, what happened next? I notice it is different over there (by the Heather House). You've got a different kind of set up. Tell me about that.

Chris: I'd like to have a summer kitchen in that location, showers and bath. And we'd like to set up an arbor, a large table that sits 20 people and have outdoor meals, smokers and cookers. A commercial-size kitchen would be nice in that space, and then in time that would support the notion of some bunkies or small buildings up on the property. So you have two or three buildings that people can come and stay and then they come down and they have access to the kitchen and bathrooms, showers and that sort of stuff. For weddings maybe, create a little facility for that.

John: So that would help with the expenses.

Chris: Exactly. I'd like it also to be a place that helps create community, you know. These are aspirations.

Joe: I think we realized that this place, there's just such an undeniable magic. It's really wanting to share that with people.

Chris: That gives us purpose for the clearing and opening things up and making what's here accessible so that people can enjoy it. And I had other ideas like, for example, the renting or Airbnb could be exclusively to cultural groups within North America. So if you're a member of a Horticultural Society, then you qualify for the rental.

The heather house before work began in 2018. [Photo Chris Cooper]

John: I liked your choice of the word “rehabbing”. I was thinking, what is this? Is it a renovation, a restoration, what is it? I like “rehabilitation” because it suggests that you're bringing the place back, but not necessarily to function as it did when Dick was here.

Chris: We're going to do something *with* what Dick did. This is something he never saw because it was never this mature, and continuing to grow into something that he's never seen.

Joe: But I think he would enjoy.

John: And it was certainly something he envisioned.

Joe: That’s an interesting point, John. As we come to these different areas and originally what seems chaotic, I can start to see order, this layering effect. You’ll have low-growing Japanese Azalea's, then you’ll have some mid-size growing type of Rhododendron, then you’ll have something larger. So these tiered effects where he’s filling the different zones with plants, and it's all premeditated.

Chris: It feels like he's created climates, with windbreaks, little microclimates. There’s a deep design going on all the time.

Joe: There’s so many different zones within this, maybe say 30 acres are planted and maybe 20 are planted heavily. There's just so many different feelings and zones depending on the plants and the light and conditions.

Chris: There's a whole stream valley with Japanese maples and it has a lot of azaleas, and there's a whole different sort of treatment there versus up on the knoll where you have the Larches. There are very distinct places all across the property.

John: Okay. So if I'm correct, you're a bit like a sculptor who works with subtractive methods. You start with a big piece of marble and you take away all the parts that don't fit.

Joe: And when we’re doing that subtracting, we always know we've done a correct job when you cannot even tell that you've taken something away, but it just looks lighter. There's an airiness, or it just looks instantly better, because it is so heavily planted you could do a lot of different types of subtraction.

Chris: It's become a joke with us because we'll go and we'll do some work and I'll say, "Hey Joey, come up and take a look at what I did.", and you'll look and say, "Well, wasn't it always like this?".

Joe: And that comes from my mother, because we'd be up there for two days and she'd come up, and she wasn't part of the process, and she'd say, "what did you really do?". But what she will see is the 20 foot high brush piles. And our big rule is if we don't know what it is, we leave it, we come back to it. So to rush in to clear things too vigorously is, I think, a big mistake. There was a grouping of Stewartias up there, a couple different varieties that Walter (Ostrum) pointed out in an area that I wanted to whipper-snipper. It turns out it's just packed with seedlings so we've marked them all so now we can transplant them.

John: Well, coming off of that, I'll circle back to asking you both, starting with Chris, tell me a little bit about your background.

Chris: Well, before this, we lived a pretty urban existence. I always had small backyards, Toronto and Halifax, but I worked as a picture editor for 35 years for film and television. And so I would transform the backyard. I like the idea of creating something through gardening and building in the backyard. But I think in this case, perhaps, my editorial prowess seems to be an important part of what we've got here on the property, keeping the good and getting rid of the bad, just another subtractive process.

John: So from what you're saying, gardening wasn't a big part of your world.

Chris: No, it wasn't a big part of my world.

Joe: I've been interested in vegetables, mainly, really no interest in horticultural plantings. But I ended up living in Cologne (Germany) and worked on an organic vegetable farm for a while. So I actually saw the process of how you grow plants, how you treat them, and what you start to realize is there's rules that apply to plants that apply across the board. And then the interest in horticulture was really spurred when we took this property on, and realizing that this might have a special place in that world - this property specifically – that got me really excited about horticulture. And meeting Walter Ostrum and joining the Atlantic Rhododendron and Horticultural Society has really spurred that on.

Chris: I'm afraid he's hooked…

Joe: … but the great thing is there's that much more to learn. That's the exciting thing.

John: It wasn't a total shock to you when, after you bought the property, all these people come out of the woodwork and they're saying, "Oh, you bought Bayport Plant Farm!".

Chris: The number of visitors the first summer here, every day, people walking up the driveway saying, "Who are you people?".
Joe: Or, "I've worked here since I was a child!". He (Dick) was a huge employer for years and a lot of people would say - the local boys - that this was the type of place you'd show up before it was light and you would leave when it was dark.

Chris: There's a real affection from those generations of people that came here and worked as kids.

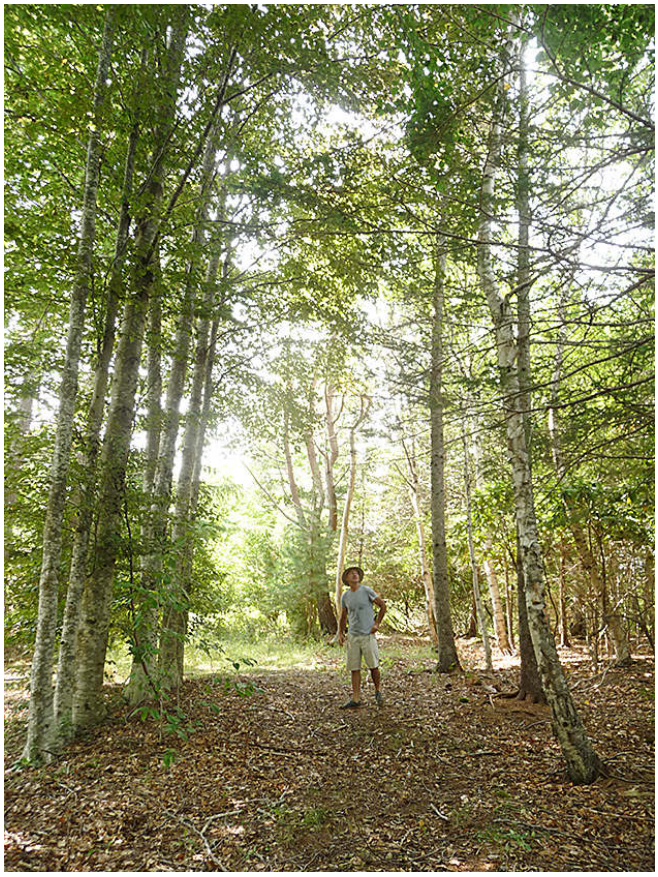
John: Bayport Plant Farm, in a sense, contains a botanical and horticultural legacy, particularly for Nova Scotia. And I'm just wondering how you see that legacy evolving?

Chris: What comes from the clearing and from the rehabbing - having as much identified as possible increases the wealth in terms of people's experience. They can actually go and have an idea what they're actually looking at. There's a good story here. And keeping the story of what's here alive, I think that would be my goal.

Joe: I think the next step for this place is really to share the undeniable magic of the place with the people of Nova Scotia and beyond. I think people who have no interest in Horticulture will have a great time here. I think there's a Japanese term "tree bathing" where they found that people actually relax with the sort of chemicals that are in the woods. And there's a real mixture going on here. It's a special place.

Joe and Chris, with dramatic rhodo trunks revealed after clearing. [Photo John Brett]

John: Yeah, my wife used to jokingly say - this is when I came under Dick's spell - my wife would say to me, "It's like this guy cast a spell on you.", and it wasn't just me. Many



Chris beneath a line of beech trees (*Fagus sylvatica*) after clearing underbrush. [Photo John Brett]

people came under the spell and somehow the spell survived his death. And somehow that magic dust is still on the property, infecting people.

Joe: The spores are there!

Chris: He is so present here, it's remarkable.

John: We've looked at some of your long-term plans. What's your immediate plan? What's the next thing you've got to do?

Joe: The buildings!

Chris: Yeah, the buildings. It's the fallen down building and the clearing out of the barn and working towards what we're talking about: the kitchens and the facilities. The barn, by the way, is in amazing shape. There's no leaking in the roof, almost no rot, and the footings are all in good shape.

Joe: He (Dick) sistered up a lot of the beams, they've all been sistered up with support wood.

Chris: When I was talking to different carpenters and contractors to do the work, one guy that came, his first job as an apprentice carpenter was this job. We were downstairs and he says, "I remember, we put all these in.". He was 17 or 18, just out of high school, and then he said, "You know, the captain, he spent most of his money on the barn.". He did a real number on that barn back in the 70's. You've got a barn that has its own septic, electrical panel - it's got a great well.

John: You've had the place since May of 2017. Are there any particular highlights or particular tribulations that stand out in your mind?

Chris: We had a wedding reception here, a party for my son.

Joe: Yeah, I got married this past August.

Chris: Yeah, we did a big event here and it was fantastic.

Joe: And I think for me from about mid-April until about the end of July, every time I came here was a highlight, and I'd say, "My new favorite plant is this one, today!".

Chris: The whites and then the purples and the different waves of color, as they all kick in.

Joe: There's so many forms to be enjoyed even at this time of year. I really enjoy plants from Japan and there seems to be a lot of material with origins in Asia.

Chris: It's almost like an Oriental garden.

Joe: I don't know what you call it. An arboretum? A collection of special, rare and unusual plants?

John: Dick just called it a plant farm.

Chris: Yeah, very unpretentious, downplay it. (Lots of laughter from all of us)

JB: Well, thank you for taking the time, guys. That was really wonderful.

Editor's note – Following the interview, Chris and Joe kindly gave me a tour, where I was able to see the extensive work they are putting into restoring the grounds. They have already done so much! And it's clear they have saved many special plants from being swallowed up by the bush. I think Dick and Diana would be pleased to know that these new owners are continuing what they started, and doing so with such passion and dedication. ¤

William and Margaret McCalla: Western Pioneers in Plant Photography and Collections, in the early 20th Century

by Peggy and Robert McCalla (grandson of Will and Margaret McCalla)

(editor's note: The following article is adapted from a fascinating presentation given to the society by the McCalla's on January 2, 2019.)

William (Will) Copeland McCalla was born in St. Catharines, Ontario, Canada in 1872. He was a prosperous market gardener in the St. Catharines area until selling the farm in the winter of 1912-13 and taking up residence in Edmonton, Alberta. From an early age Will was interested in plants, flowers and photography. In 1920 he published an illustrated book, *Wild Flowers of Western Canada* (Toronto: Musson Book Co.) which was distributed to all public schools in Alberta. In 1925 he took up a teaching position at the Calgary Normal School where he remained until his retirement in 1938. Each summer, he and Margaret, his wife, would travel to collect and photograph wildflowers. Both kept journals: Will's was a photographic record and a specimen record of his collecting; Margaret's was a daily log.

Travels and Record Keeping

Much of their travel for collecting and photography was in the western Canadian Prairie Provinces, especially in the Rocky Mountains. In both 1923 and 1937, however, they travelled back east to St. Catharines, Ontario; in 1925 and 1935 they journeyed to California; in 1922 Will travelled to Vancouver and Victoria; and in 1938 they made an extensive trip to the National Parks in the Northwest United States. Will's photography was not confined to wildflowers. Nor was it confined to the outdoors. He took many photos of house plants, often in the winter, and fruits, vegetables and even weeds, in the summer. He kept meticulous records of both the plants collected and the photographs taken. Beginning in 1922 he began numbering his photography journals alphabetically, A=1922, B=1923, etc. Each photo taken in any year was prefaced with the applicable alphabetical letter and numbered consecutively. For example, in 1932, letter M, his first recorded photograph was on January 23; his last on November 4, numbered M403. For each plant he would record the name, often in Latin, and some details about its location, size and description. For many, he made detailed notes on the colouring of the plant and its parts, information he later used to produce coloured lantern slides. He also recorded the exposure time, the aperture (F stop) setting and the type of black and white film stock used.

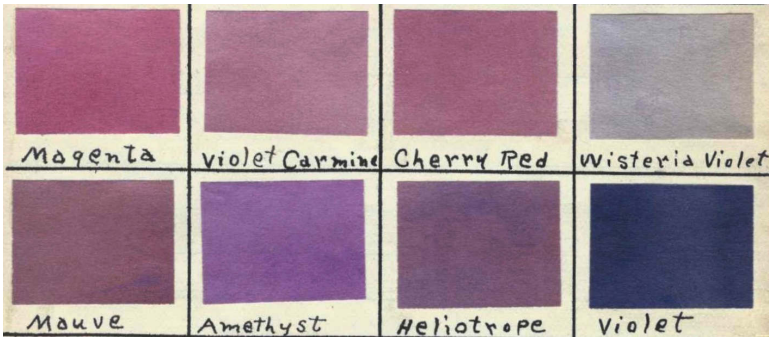
As an example of the record keeping journals kept by Will and Margaret, see Figure 1. Each entry has been transcribed from the original handwritten entry.

Figure 1: Journal Entries from 30 July 1938 at Mt. Rainier National Park, Washington

Margaret's entry	Another fine bright morning. We drove to Paradise Valley and walked up to the Nisqually glacier. The flowers are again a source of wonder and delight… ***Got some photographs of plants and collected quite a number.*** Part of the time the mountain was clear but part time it was covered with white clouds. It is a magnificent sight. I am glad to see it again.
Will's entry	**U158** *Aster alpingenus (T&G) Gray.* 1/5 Sec. F11. Plants shaded. Superpan. **U159** Another plant of the same group from a slightly different position. 1/25 Sec. F 12.5. Full sunlight. **U160** Another plant of the same kind. 1/25 sec. F14. Bright sun. 6cm x 9cm Superpan. The leaves are rather dark blue green slightly greyed, stems often more or less dull brown, the rays might be called violet purple, between "Mauve" and "Wisteria Violet".

The references to the colours "Mauve" and "Wisteria Violet" in Will's journal entry refer to a colour palette that he reproduced in the back of his journal (see fig. 2) where the colours "Mauve" and "Wisteria Violet" can be seen.

Figure 2: A portion of the colour palette found in the 1938 journal



Will would later use these colour references to produce coloured lantern slides of his photographs, usually in a 4" by 3.25" format. See figure 3 for photo U160 referenced in his diary entry above.

Coloured Lantern Slides

Before the advent of colour film, the only way to produce coloured images to be projected onto a screen was to create a hand coloured lantern slide. The process[1] to create a lantern slide included:

- Development of black/white film to produce a negative
- Transfer of the negative to a light sensitive glass slide through either a contact or optical reduction process to produce a positive image
- Colouration of the image through manual painting with watercolour or tempera and fine brushes
- Addition of a second piece of glass on top of the painted image to protect it

As can be seen in Figure 3, a dark grey leaf becomes a shaded green leaf and a white petal becomes a light purple one. The actual purple colour is a mix of "Mauve" and "Wisteria Violet". In many cases, this meticulous process of colouration has produced images of exquisite beauty. The Public Archives of Alberta has approximately 500 of Will's lantern slides in its possession.

Figure 3. *Aster Alpingenus*, 30 July 1938, Mt. Rainier National Park

Black & White

Coloured Lantern Slide

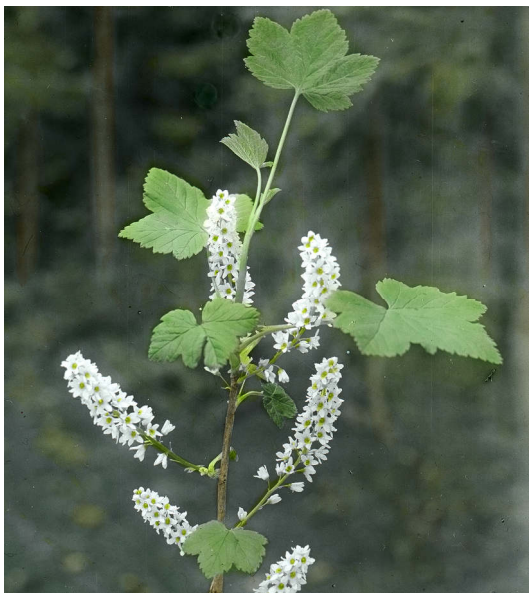
[1] "About Lantern Slides", available at https://www.lib.usf.edu/special-collections/about-lantern-slides/ , accessed 9 January 2019

Three other examples of photographs converted to coloured lantern slides from the 1938 trip are shown in Figures 4, 5 and 6. Each has excerpts from the daily journals of Margaret and William describing, in the first instance, some of their activities that day and, in the latter, comments about the plants and the photograph.

Figure 4: Photograph **U184.** *Monotropa hypopitys* L. 5 August 1938. Mt. Rainer National Park.

Margaret's entry	Gas at 3874 mls just outside the park gate as we went to Ashford for food. Found a poor specimen of the "Barber's Pole" saprophyte plant Will is so anxious to find, in the woods along the west road starting up the trail to Indian Henry's. Shall hope to find better later.
Will's entry	**U184** *Monotropa hypopitys* L. Many flowered Indian Pipes [also called Barbers Pole] … 1 Sec. F11 superpan… The stem on the right is the freshest and most beautiful in color. The floral leaves are a delicate cream. In texture they are soft and beautifully fringed with short hairs. The large stigma is yellow of medium tone. It is the pink bracts that give to the flower cluster its chief beauty, a dilute "Cardinal Red" would come nearest. The bracts on the stem, which is a little browner than the flowers are also slightly duller than those among the flowers…

Figure 5: **U67.** *Ribes petiolare* Doug. 28 June 1938. Grand Teton National Park.



Margaret's entry	This was a beautiful day, bright, rather hot in spots, but fine for us. Dried all the felts in the morning, changed the presses. About 11:30 took a few biscuits etc. and went across to the Canyon again. Went across in the motor boat but after walking and scrambling over rocks and through thickets we walked back to camp along the trail along the west side around the south end of the lake. 3 mls. **Will got six photographs**.
Will's entry	**U67** *Ribes petiolare* Doug. *B* A twig from Cascade Canyon set up at the camp… The leaves are a rich green, the new stem and the uppermost leaves a brighter yellow green, the old stem grey brown. The sepals and the very small petals are white, ovary pale green, anthers cream colored. The plant has a strong, not pleasant, currant odor. 1/10 sec. F14. Cloudy. Super pan.

Figure 6: **U131** *Penstemon rupicola* Howell 15 July 1938. Crater Lake National Park.

Margaret's entry	Another bright hot morning. The mosquitoes were bad in the cabin this morning waking us soon after five. For some stupid reason there are no screens on these cabins… we set out around the rim. Photographed the Lake – a magnificent sight this morning with fleecy clouds reflected in the intense deep blue. Around the north end Penstemon, tiny Mimulus, senecio. A little farther around at 7100 ft alt. tiny daisy and a white flower...
Will's entry	**U131.** *Penstemon rupicola* Howell. On a vertical cliff, red brown in tone, grew a lovely mat of this splendid beardtongue. Probably on account of the shape the stems were longer and more graceful the foliage a little less grey than in full sunlight and the flowers a lighter and pinker, a most lovely tone. To the "Old Rose" which approximates the usual color should be added a little "Wild Rose Pink" and some "Royal Crimson". We carried away a sample of the reddish rock. ½ sec F11 dull light with thunder and rather heavy shade. Super pan press.

As previously noted, not all of Will's photography was of wildflowers, nor was it strictly taken 'in the field'. Note the black mat background used in Figure 4 which hides the field vegetation of the site. With permission of the park administrators, he would often dig up the plants and remove them to an indoors facility. This was the case for Figure 4. Working under controlled conditions also was the case for the many household or garden flowers which he photographed. The photographs of an amaryllis shown in Figure 7 are an example.

Figure 7: **T1, T2 and T3.** *Amaryllis* sp. January 1937. Calgary home.

T2 T1 T3

Will's entry	**T1**. Three flowers in a stem. **T2**. The larger pot of Amaryllis, 3 bulbs, two of them with three flowers each and the other just sending up a flowering stem. The plant is standing in front of dining room window. **T3**. A single flower. Above taken in January on cut Isopan film.

Much of Will's photography and plant collecting was done for teaching purposes. He would sometimes take flowers and dissect them to show their botanical parts and development. Two examples of these teaching aides are given to illustrate this technique. In the first, Figure 8, he is focussed on a *Lavatera* to show the stamens and pistils; Figure 9 shows the fruit of Love-in-the-Mist (*Nigella damascene*).

Figure 8**: LZ 340**. *Lavatera* from the garden, 14 August, 1931. Calgary home.

Will"s entry	**LZ340.** Calyx and most of the corolla cut away to show stamens and pistil. It will be seen the stamens develop first, that they spring from the base of the corolla their united filaments forming a sheath around the compact bunch of straight stigmas. These latter push up through the stamens as the flower ages. In two instances the corolla was entirely removed to show the attachment of pistils which are wholly free from the corolla. One cluster of the stamens is split, the better to show this. Fragment of petals shown are like "arbutus pink" with a touch of Magenta added. The lines are some lighter and some darker than this. Stigmas almost as dark as the petals. Anthers almost white. The very base inside of corolla & base of column of stamens purple blue. Cut parts almost white. Where the corolla is completely removed the base of the styles forming a cap over the carpels is pale green. The carpels themselves are almost white. 6 Sec. F22.

Figure 9: **LZ 339.** Fruits. Love-in-the-mist. 14 August, 1931. Calgary house.

Will's entry	**LZ339.** The cut pod shows very pale green on the inside almost white, indeed. The seeds being at present a rich green of a rather yellow tone. The very delicate membrane covering the seeds is shown in one of the sections. 6 sec. F22.

Conclusion. In his own words and others'

It is often difficult to perceive that the lantern slides are hand-coloured black and white, not colour photography. They are as much works of art as more conventional photography and botanical representations. William McCalla was dedicated to discovering and presenting the natural world of plants. His life work may be summarized in his letter written when he donated his twenty-five black and white photographic albums to the then National Museum of Science (now, Museum of Nature) in 1959:

> The work was fascinating, challenging, sometimes disappointing,
> often rewarding – a grand avocation adding to the interest and joy of life.[2]

Recognized as a pioneer in the discovery and recording of wild plants of the prairie provinces [3], Will was awarded an Honorary Doctorate from the University of Alberta in 1956. To mark his passing in 1964, A. E. Porsild, the Head of Botany at the then Canadian Museum of Natural Science, now the Museum of Nature, wrote:

> In his teaching, and not least in his private herbarium, now in the University at Edmonton … and in the truly unique collection of photographs presented to the National Museum of Canada, McCalla has left an invaluable heritage to the botanical science, and a great monument to one of the ablest and yet most modest of Canadian botanists.[4]

William McCalla's life work of collecting and photography may be found in various depositories, including :

- At the University of Alberta, Department of Biology Vascular Plant Herbarium Museum, Edmonton, Alberta http://www.biology.museums.ualberta.ca/VascularPlantHerbarium.aspx
  - Over 14,000 sheets of pressed wildflowers.
  - Yearly journals from 1936 to 1947 of plant collecting detailing date, location, type and description of plants collected that year.
  - Almost 1000 negatives, positives and glass plates of wildflower and landscape photographs.
- Public Archives of Alberta, Edmonton, Alberta http://provincialarchives.alberta.ca/
  - Over 500 hand coloured glass lantern slides of wildflowers and landscapes. Copyright protected.
- Museum of Nature Archives in Gatineau, Quebec http://www.nature.ca/en/home
  - Twenty five albums of over 1400 black and white photographs of wildflowers and landscapes, of which only 14 albums can be found.

- University of Calgary, Department of Biology Herbarium http://www.ucalgary.ca/herbarium/
    - Seven volumes of black and white wildflower and landscape photographs, plus about 350 sheets of pressed flowers.
- Whyte Museum of the Canadian Rockies, Banff, Alberta http://www.whyte.org/
    - Approximately 50 black and white glass slide negatives of landscapes.

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[2] Quoted from A.E. Porsild, "William Copeland McCalla – An Appreciation", *The Canadian Field-Naturalist*, Vol. 78, No. 3, July-September 1964, pp. 131-138

[3]Mary-Beth Laviolette, *A Delicate Art: Artists, Wildflowers and Native Plants of the West* (Victoria: Rocky Mountain Books) 2012, p. 60.

[4]Porsild, *Op cit*, p. 134.

[5]Coloured images in this article are reproduced with the permission of the Public Archives of Alberta.

Touring the Gardens of Varengeville-sur-mer, Normandy, France

by Bob Howard

The house and gardens off the entryway at Le Bois des Moutiers. [Photo John Brett]

This past October I was one of a small group of keen gardeners and landscape professionals taking part in a very special garden tour in Normandy, France. The tour was organised by the Atlantic Association of Landscape Designers (AALD). Some members of our own Atlantic Rhododendron and Horticultural Society were also fortunate enough to take part. The tour's main focus was a collection of extraordinary gardens in the area of Varengeville-sur-mer, situated near Dieppe, on what the French call "the alabaster coast". In this article, I will give a brief account of the trip: of traveling to, and staying in, the village of Varengeville, and of my impressions of the various outstanding gardens visited, highlighting trees and shrubs we might try here in Nova Scotia.

First, let's mention the garden that sparked my interest in the Varengeville area and eventually resulted in this trip. Le Bois des Moutiers is a country manor and garden built by Guillaume Mallet, starting in 1898, with the Arts and Crafts design team of Gertrude Jekyll and Edwin Lutyens. I first visited this place in 2013. In addition to the beautiful house, I discovered a sublime collection of trees, rhododendrons, hydrangeas, and other woodland plants. I also learned about Guillaume Mallet's grandson, Robert Mallet, who, together with his wife, Corinne, has brought together the largest collection of species and varieties of hydrangeas in the world. Their hydrangea collection garden, known as the Shamrock Association, is also located in Varengeville.

Our AALD-ARS travel group arrived by air to Paris then by train to Dieppe and finally by bus to Varengeville. The bus let us off at the "Place des Canadiens", a short walk to our lodging.

During the week we were there, the owner of the houses we stayed in, Mme Constance Kargère, showed us around her delightful, exuberant garden, which is featured in books by both Penelope Hobhouse and Rosemary Verey.

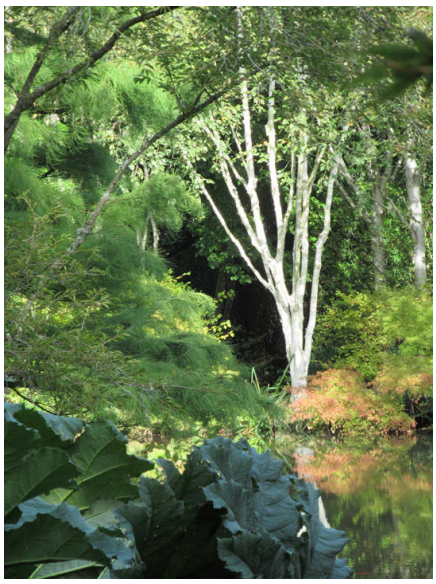
Arresting effects created by foliage and stems at L'Ètang de Launay. [Photo John Brett]

If you decide to travel in France and visit gardens in this area, I have a couple of suggestions. First, strike up conversations with gardeners. Mme Kargère, for example, was knowledgeable, fun, and generous with her time. In fact, most of the gardeners we met shared their knowledge with enthusiasm. This is the main attraction of garden travel for me—meeting other gardeners and hearing about what they are doing in their gardens. Second, take advantage of public transportation in France. It's not as inexpensive as it was twenty years ago, but the trains and buses are very comfortable, a good bargain, easier to manage than an automobile, and will take you almost anywhere. In our case, the bus from Dieppe took us nearly to our front door in the small village of Varengeville at a cost of only two euros each. Third, for a hotel in Varengeville, I loved staying at La Terrasse (http://www.hotel-restaurant-la-terrasse.com). It overlooks the ocean. You can walk to all the gardens in Varengeville. The stay there is a "demi-pension", which means that for a moderate price you get not only lodging but also breakfast and your choice of lunch or dinner each day. And the owners are gracious, kind people.

In 2013 I had joined the Shamrock Association and met Robert Mallet. For the 2018 AALD trip, he agreed to be our guide for much of the visit in Varengeville, and even suggested that we might stay in two manor houses owned by his sister (that same Mme Kargère). He also recruited Brian Woy, the president of the Shamrock Association, as our second driver for two days visiting areas beyond walking distance. We had the best guide-companions for this trip. Robert Mallet was key. Expert, well-connected and unfailingly helpful to us, he made our trip a success.

The day following our arrival, after a perfect lunch in a restaurant-artist's studio called Le Piment Bleu, Robert took us around the Shamrock hydrangea collection. The garden is in Zone 8, so lots of things were still blooming in October, especially mopheads. Robert's wife, Corinne, has been to Japan several times, and has brought back many plants. The extensive display of hydrangea species at the Shamrock collection provokes me to want to find the hardy ones to bring in and test in our Nova Scotia climate.

A woodland garden, L'Ètang de Launay, was within easy walking distance of our lodging. It featured many special trees and shrubs that displayed striking bark textures and colours in the woodland light. Birches, Japanese maples, Bamboos, *Prunus* spp., *Rhododendron* spp., *Hydrangea* spp., and many other choice plants are featured. In addition to the photo of the garden, I've included one of *Betula utilis* 'Jacquemontii' with its dramatic white bark. Images like this have put me in the hunt for things like *Betula utilis* 'Bhutan Sienna', *Betula utilis* subsp. *utilis* 'Chris Lane', and *Prunus serrula*, the



The striking trunks of *Betula utilis* 'jaquemontii' are a highlight at L'Ètang de Launay.

Prunus serrula showing off colourful trunks at L'Ètang de Launay. [Photo John Brett]

Another species with great visual appeal, may be *Prunus maackii* or *Betula albosinensis.* [Photo John Brett]

Foliage textures at Le Bois des Moutiers.

"Birchbark" or Tibetan cherry. *Betula albosinensis*, the Chinese red birch, is another striking species I hope to test here. I hope the small sample of colourful barked trees you see in this article encourages at least some of you to try more of these in coming years.

The last garden we visited is probably the most celebrated: Le Vasterival, as it is known, was also within walking distance of our lodging. Created by Princess Greta Sturdza beginning in 1955, the website https://www.vasterival.fr/en presents an extensive photo album of rhododendrons and azaleas as well as many seasonal photos of the garden. I've included a photo of the bark of *Clethra barbinervis* and one of a *Cyclamen* sp. (see Pg. 26} on the woodland floor to suggest the botanical riches to be found here. Like the other gardens visited, Le Vasterival grows a remarkable collection of plants.

During our week in Normandy, we also took time to visit some notable cultural sites including L'Èglise St. Valéry, with stained glass windows by Georges Braque, and the Rouen Cathedral, which was painted many times by Monet. Traveling to our various destinations, we also had lots of opportunities to take in the beautiful and dramatic seaside views of this "Alabaster Coast".

Speaking for myself, this was a most enjoyable tour, and I can wholeheartedly recommend this area of Normandy to any of you who are seeking out a nice place to go that includes some very memorable gardens. ¤

Clethera barbinervis showing attractive mottled trunks and dramatic foliage.

Robert Mallet with the AALD tour at Shamrock Garden Hydrangea collection. [Photo John Brett]

Thugs and Paragons

by Nina Newington

Gillenia trifoliata at Nina Newington's garden.

Gillenia trifoliata is not a show-stopper but it was the most asked-about plant in my old garden. I'd planted three of them in a triangle about a foot and a half apart just inside an old stone barn foundation. They took a couple of years to settle in then, every June, produced a froth of white blossoms on delicate red stems, each calyx red too, the leaves an always healthy olive green. Flowers were followed by lacy brown seeds that persisted into winter. The plants grew tall – two to three feet – and slender and never fell down. Ten years later they were doing the exact same thing, the clumps just a little larger.

This paragon of horticultural virtue belongs, ecologically speaking, to a group of plants known as stress-tolerators. My last article, *In Praise of Self-Seeders*, touched on this useful system for classifying plants based on their ecological strategies. James Hitchmough's *Sowing Beauty: Designing Flowering Meadows from Seed* explores these ideas as they apply to gardening. The primary categories are ruderals, competitors and stress-tolerators. Ruderals live fast, die young and make lots of babies. They prefer disturbed soil. Competitors go for prime real estate: moist, well-drained soil in full sun to part shade. They settle in and spread quickly above or below ground, get quite tall or at least bulky, then sprawl over and smother their neighbours. They are much longer lived than ruderals but often need dividing if you want to keep them in one place. By contrast, stress-tolerators like *Gillenia trifoliata* grow slowly, live a long time once settled and prefer to be left alone. The reason they tolerate stress is that, in nature, it's the only way for a plant to get some breathing room. Live somewhere with ample resources and you have to have sharp elbows.

Stress comes in different forms. The most common are that the soil is too dry or too wet and/or there isn't much sunlight. Long-lived, slow growing shade plants such as assorted *Epimedium* spp., *Helleborus orientalis* and *Saruma henryi* belong to this group, as do many perennials that do well in partial shade.

"Species that grow very slowly but are very long lived are often associated with the edge of woodland," writes Hitchmough, "as the shade and root competition of the trees disadvantages grasses and other species that are most competitive in full sun. Species with these ecological characteristics occur in communities from southern Europe right through to north-eastern China, as in the case of *Paeonia lactiflora* and other members of the genus. Where soils are productive, slowly growing species in genera such as *Dictamnus* , *Delphinium*, and *Paeonia*, and other genera often cannot compete with neighbouring plants in full sun."(1)

In my laissez-faire garden, I have learned it is best to put thugs with thugs. In other words, let competitors like *Anemone vitifolia/tomentosa* duke it out with *Monarda didyma* and hardy *Geraniums* in the moistest, richest parts of the garden – the

'productive' soil Hitchmough refers to – while trying to make sure the stress-tolerators like peonies and sea hollies have more room and less competition. This is best done by taking them up on their willingness to accept less desirable real estate.

Many of the showiest stress-tolerators are adapted to summer dryness. They are slow to show much growth above ground the first year or two because they are putting their energy into building up substantial root systems which can store food and moisture for when the soil won't supply much of either. *Paeonia* and *Baptisia* of various species come under this heading as do *Eryngium* and *Dictamnus.* These plants are often excellent candidates for the garden, having tough, healthy foliage, large flowers and persistent seed heads. What they need from the gardener is not water and fertilizer but thoughtful siting and patience.

The healthiest peonies I've ever met grew in a line along the driveway of our first house in Nova Scotia. They faced south, the driveway was gravel, the wind blew, a lot. They flowered profusely on stout stems with never a drop of botrytis to blacken bud or leaf. I doubt that anyone had watered or fertilized them in years. I realize now that this setting was as close as one could get in the Maritimes to the rocky hillsides in Greece and north-west China where peonies grow wild.

When we moved down the road to our current place, I brought chunks of those peonies and they've done just as well along this driveway, joined by other plants with similar tastes: *Eryngium planum, Eryngium* 'Big Blue' and *Perovskia atriplicifolia.* As something of a buffer between this drier, windier edge and the moist mayhem at the foot of the slope, there are some of the larger stress-tolerators such as *Baptisia australis; Lespedza* 'Summer Beauty' and *Veronicastrum virginicum* 'Lavender Spires'. As long as they have room while they are getting established they seem able to hold their own.

It's not that most of these plants want to grow on pure sand. Many appreciate good soil below but they seem to do best when the top layer of soil is not the rich, brown, crumbly sort gardeners are encouraged to create. Nor do they appreciate a thick layer of organic mulch.

Which brings me back to *Gillenia trifoliata.* Roger Phillips and Martin Rix, in their volume on early perennials, describe it as a "Native of E. North America, from Ontario and New York east to Michigan and south to Georgia and Missouri, growing in rocky, open woods." They add: "A most valuable and attractive plant, but I have not found it easy to establish: the young shoots are eaten by slugs and it should be planted in a position that is neither too sunny and dry, nor too shady."(1) More by luck than knowledge, I put it in a good spot in my old garden. The barn foundation was partly shaded, the soil stony. Here on the North Mountain I planted several up slope from a bog in the outer root zone of a couple of old apple trees. That was in 2016. So far so good. Perhaps the slugs will stick to their diet of skunk cabbage down in the soup.

Slugs favour the same conditions competitors prefer: rich, moist, fertile soil with lots of plants growing close together. For this very reason the competitors are often adapted to slug pressure, either by having unpalatable leaves or by being able to bounce back from a good chewing. Many stress-tolerators, on the other hand, though they tolerate drought that would make a bee-balm shrivel, can't handle losing all their tiny shoots to the maw of a mollusc.

Slugs, in fact, may be the biggest reason many stress-tolerators fail to establish here, including my personal nemesis, *Dictamnus albus* or gas plant. I love this plant, from its elegantly etched pink or white flowers to it retsina scented leaves to the equally resinous star-shaped seed heads. In the wild it grows, according to Phillips and Rix, on steppes, in open woods and dry rocky places. Far from the sluggy crowd, I'd guess. The first *Dictamnus* I encountered was in an old walled garden on a country estate in Massachusetts. It was three feet tall and four feet wide and almost certainly over fifty years old. The soil was free draining and probably had been mulched occasionally but not much more in recent times.

Fast forward twenty-five years and many failed attempts to grow my own *Dictamnus.* There, in the botanical gardens in St. John's, Newfoundland, which must surely be the least steppe-like place in the world, grew an equally flourishing specimen. Their secret? 'Load 'er up with rotted manure.' I didn't think to ask about slugs. Now I wonder whether, in a slug-paradise like St John's, the botanical garden staff routinely distribute slug pellets. Perhaps sharp sand will work, or jagged little chips of rock.

I do now have five *Dictamnus* growing in different parts of my garden but they are mere teenagers. Time will tell. At least the *Gillenia* are settling in well. Knowing that *Briar Patch Nursery* had a good stock of them going into the winter I may just add a few more. Tree roots are not in short supply here.

Notes:

1. Hitchmough, James, *Sowing Beauty: Designing Flowering Meadows from Seed*, p. 99
2. Phillips, Roger and Martin Rix, *Perennials* Volume 1 Early Perennials, p.140

The Secret Life of *Rhododendron* Roots – a dramatic tale of diversity, divergence and disease resistance

Presented by Dr. Juliana S. Medeiros

November 11, 2018, American Rhododendron Society (ARS) - Niagara Chapter Fall Meeting

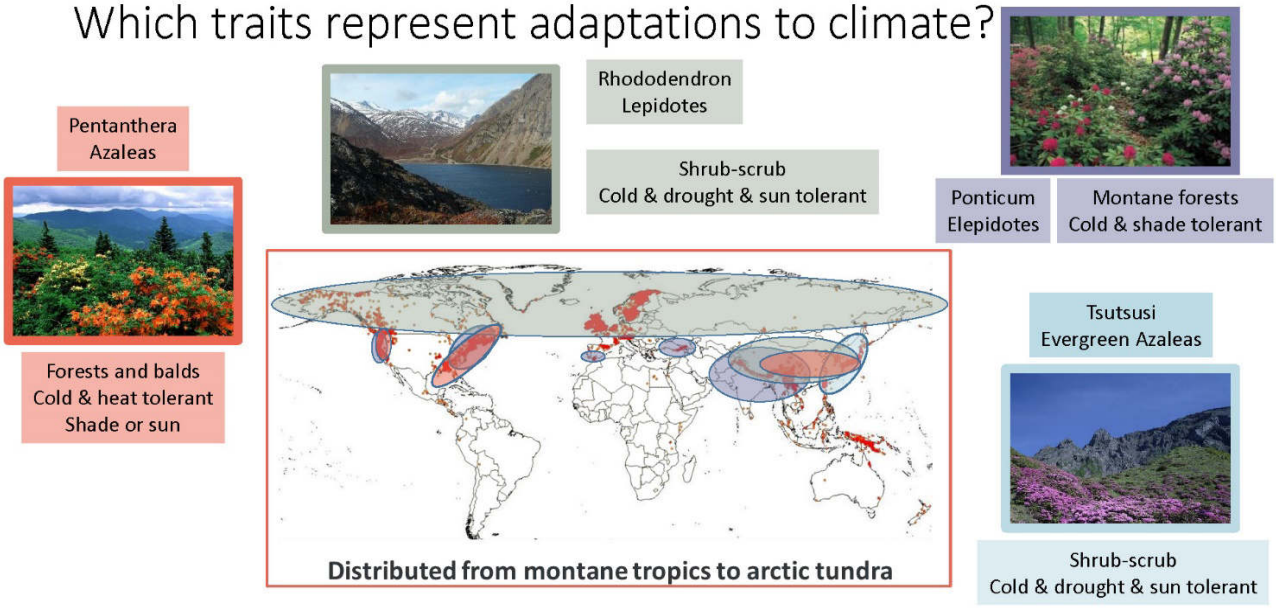
This fascinating talk, full of eye-catching, colourful diagrams and graphs was well received by a large Niagara Chapter audience at the November 2018 meeting. Juliana Medeiros presented her latest research findings on the dramatic diversity of roots within genus *Rhododendron* from montane tropical forests to arctic tundra. Initially she discussed the ecological and evolutionary implications, followed by the complex interaction or mutualism between rhododendron roots and specialist ericoid mycorrhiza, and other good and bad soil microbes.

Juliana is the principal investigator at the Holden Arboretum's Medeiros laboratory in Holden Forests and Gardens, Kirtland, Ohio, and lead for the 'ARS Network', designed to build liaisons between ARS members, international research scientists, and Rhododendron hybridizers. Her lab is now focused on *Rhododendron* as a model system to understand how plant traits evolve in response to the environment. She is a Professor at two American Universities, in demand as a dynamic, popular speaker, and also actively involved in Youth and Adult Outreach science education programs.

Introduction:
The presentation addresses eight main themes: climatic diversity, root diversity (yes?), investment strategies, roots and climate (yes?), working with microbes, good guys and bad guys, roots and microbes (yes?), and why do we care? Highlights are summarized by the following major questions:

- Are Rhododendron roots diverse?
- Do Rhody root investment strategies differ across climates?
- Do different Rhody roots host different microbes?
- What are the implications for disease resistance, propagation and breeding, and conservation or restoration?

Rhododendron has a global distribution of about 800 to 1,100 species ranging from montane tropical forests to arctic tundra. This includes four major clades or evolutionary groups with unique climate and environmental associations:
Ponticum elepidotes, montane forests, cold and shade tolerant;
Tsutsusi semi- evergreen to evergreen azaleas, shrub and scrub, cold, drought and sun tolerant;
Rhododendron lepidotes, shrub and scrub, cold, drought and sun tolerant;
Pentanthera deciduous azaleas, forests and mountain meadows, shade or sun.



Are Rhody roots diverse? Yes!

As soil specialists which thrive in low pH and low nutrient environments, 27 species of rhododendron were studied in 2017 to determine why Rhody roots are so diverse (Medeiros, et al. American Journal of Botany, May, 2017). In general, roots are dependant on a complex soil ecosystem that includes nutrients, water, good and bad microbes, but climate seasonality and temperature are also major factors to take into consideration.

Investment strategies

Root structure can be characterized as an investment strategy, where roots represent the infrastructure for soil resource acquisition, and investment in roots determine uptake rates for nutrients and water. When nutrient or water supplies are high or rapid, carbon priority is for leaves, wood, flowers or seeds, but when supplies are low or slow, carbon allocation shifts back to roots, and more wisely to particular kinds of roots.

Absorption which happens at the root surface is facilitated by root diameter primarily. Thinner roots, for example, have a higher surface area to volume ratio. Root length, however, in the form of long thin roots can explore and absorb from larger areas, whereas root tip abundance is an adaption for exploring smaller soil volumes more efficiently. Roots also store and distribute photosynthesis-derived carbohydrates from which carbon, the ultimate building block for all plant proteins and cell walls is derived. During adverse climate or changing environmental conditions, root survival depends on extra carbon allocation and thicker roots.

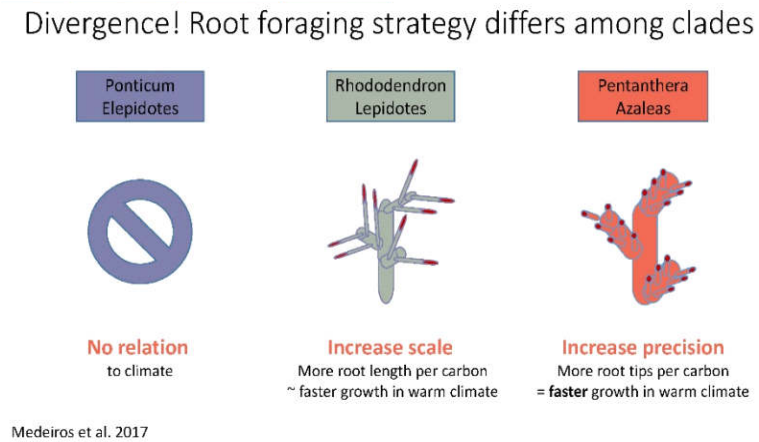
Juliana suggests, for example, that with a mild, warm climate and a good supply of water and nutrients, faster growth results in longer, thinner roots or root tips, but under stressful colder conditions, different roots including the right kind of roots are needed for survival. Survival of the fittest may actually mean short, fat roots with thick cell walls where growth is slow but more resistant to stress, and therefore longer lived.

Comparisons of two wild *Rhododendron* species growing in warm and cold climates appeared to confirm these expectations. For example, studies of *Rhododendron brookeanum*, found in the warm, damp climate of Mt. Kinabalu, Borneo, faster growth combined with rapid decomposition and nutrient recycling rates was suggestive of less carbon investment in roots and short root life. In contrast, *R. groenlandicum*, found in the cold, damp climate of Wedgemount Lake in B.C, Canada, slower growth combined with slow decomposition and nutrient recycling rates was suggestive of the greater survival potential of more carbon investment in roots and longer root life (Medeiros et al, 2017).

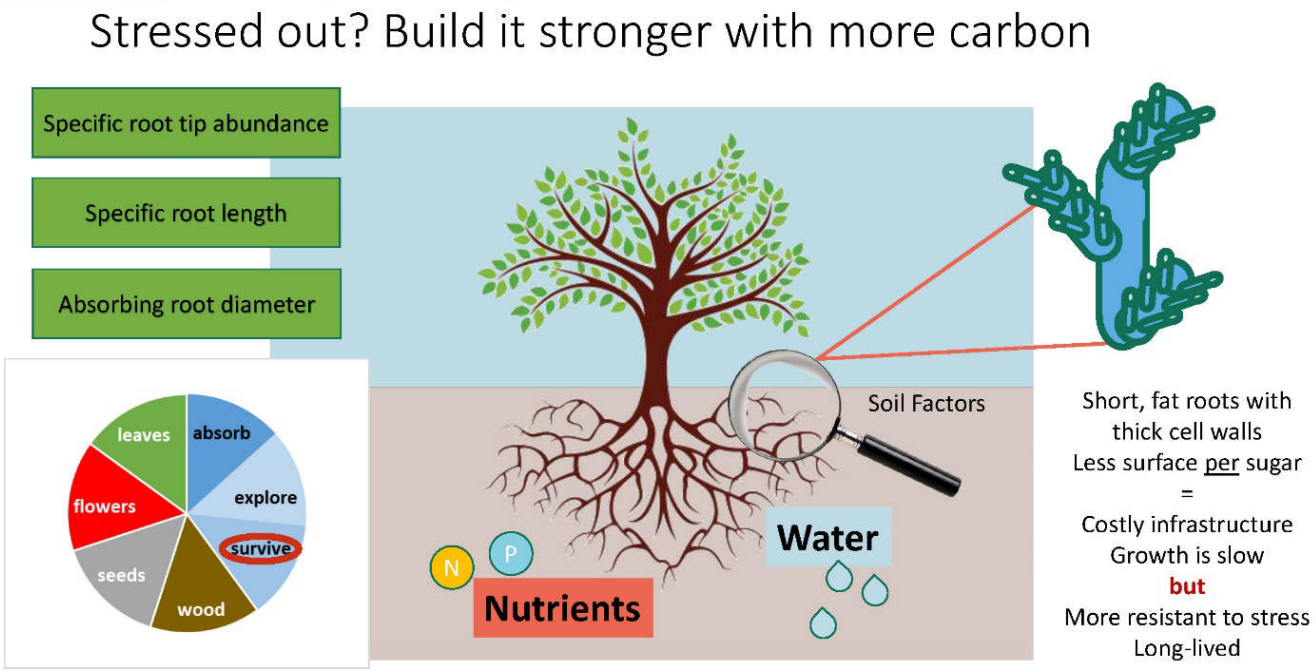
So, do Rhody root investment strategies differ across climates? Yes!

Further studies compared 25 species of *Rhododendron* at two widely separate locations in the U.S. - the mild oceanic, west coast at the *Rhododendron Species Foundation* in Seattle, Washington, and the cold continental climate of *Holden Arboretum* in Ohio. Observations of faster growth on the west coast and slower growth at *Holden Arboretum* confirmed that under good growth conditions where resource acquisition is fast, rhody roots adapt with increased, thinner root length or root tips per unit of carbon, but have shorter root life, in contrast to thicker roots and longer life at *Holden Aboretum.*

Interestingly, studies also showed different leaf-root relationships or divergence patterns between species in the rhody clades in response to climate. For example, in the evergreen *Ponticum* elepidotes, observations suggested an evolutionary divergence or decoupling between root and leaf traits, and only a weak link to climate effects. But in the evergreen to semi-evergreen *Rhododendron* lepidotes, faster growth resulted in increased **specific root length,** and that *Rhododendron* root traits are related to climate, not leaf growth. In contrast, deciduous *Pantanthera* azaleas show increased **specific root tip abundance** with faster growth, also suggesting a strong link to climate, not leaf traits.



But as Juliana mentioned, observations don't always fit expectations when trying to compare various rhody species' root adaptions to cold and warm environments. It's also useful to recognize that there will be many more questions…and that there are distinctly different driving factors and foraging strategies between the various clades (Medeiros et al, 2017).



Working with soil microbes and ericoid mycorrhiza to leverage investments

According to microbial geneticists, a teaspoon of good loamy soil can contain at least a billion invisible bacteria, several yards of invisible fungal hyphae, several thousand protozoa, and a few dozen nematodes, and they all need carbon to survive (Lowenfels & Lewis, 2010). Opportunistic bacteria and specialist ericoid mycorrhiza can certainly affect Rhody root function as well.

With so many unknowns in a time of climate change, no surprise that mycology today is one of the fastest growing scientific fields. Mutualist mycorrhiza fungi which exchange soil- derived nutrients and water for plant-derived sugars or carbon, can grow on or inside roots - in the process root surface area can be increased by 100X to 1000X.

There are three main types of mycorrhiza: **Arbuscular** mycorrhiza, common throughout the plant world in trees and shrubs, that grow into outer root cells or hairs; **Ectomycorrhiza** which commonly grow on the surface of roots, and specialist **Ericoid** mycorrhiza in the Rhody microbiome, of which there are many. Some may even have evolved as opportunistic saprophytes with the ability to switch over to mutualistic roles with living plants under the right conditions (Vohnik et al, 2012).

Good guys and bad guys

Clades are known to be associated with many different specialized mycorrhiza and other soil microbes. For example, the ericoid mycorrhiza, *Oidiodendron* is commonly found associated with all four clades, whereas other ericoid mycorrhiza may be associated with only one other clade. Elepidotes also form mutualistic relationships with **Ectomycorrhiza**, whereas species of **Arbuscular** mycorrhiza are commonly found with many lepidote species.

In addition, there are many anti-microbes in the soil known to affect roots of certain *Rhododendron* lepidotes and evergreen *Tsutsusi* azaleas, including *Penicillium*, *Pseudomonas*, *Streptomyces*, and *Trichoderma*. Clades also have many soil enemies or pathogens such as *Armillaria, Rhizoctonia, Cylindrocladium*, *Pythium* and notably *Phytophthora*, a plant killer associated with many species of elepidotes, lepidotes, and evergreen azaleas.

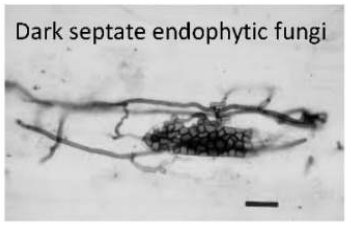
The good, the bad and the unknown

Intriguingly mysterious **dark septate endophytic fungi (DSEF**) with unknown functions have also been identified inside rhody roots, but many other potential associations from mutualistic mycorrhiza to anti-microbes or pathogens among the clades have not been investigated apparently (Medeiros et al, in Prep.).

The good, the bad and *the unknown*

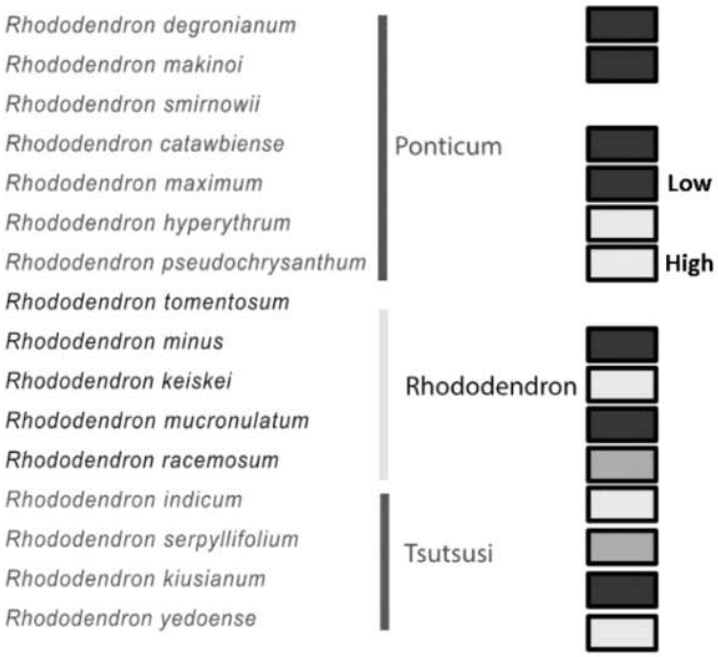
Microbial genera	Putative function	Azalea	Elepidote	Lepidote	Ev. Azalea
Oidiodendron	Ericoid mycorrhizae				
Leotiomycete	Ericoid mycorrhizae	?	?		?
Meliniomyces, Rhizocyphus, Sebacinales	Ericoid mycorrhizae	?		?	?
Cenoccocum, Russula, Thelephoraceae, Tricholoma, Helotiales	Ectomycorrhizae	?		?	?
Various sp.	AM mycorrhizae	?	?		?
Penicillium, Pseudomonas, Streptomyces, Trichoderma	Anti-microbial	?	?		
Armillaria, Rhizoctonia, Cylindrocladium	Pathogen	?		?	
Pythium	Pathogen		?	?	
Phytophthora	Pathogen	?			
Phialocephala, Cryptosporiopsis, Leohumicola, Neonectria, etc.	Unknown	?			?

Soil decomposer?
Inhibit disease microbes?
Assist stress response?



Truth is, most possibilities have not been investigated!

Disease resistance also varies within clades



Phytophthora

Resistance

Disease resistance to *Phytophthora* spp. also varies tremendously within the clades. For example, Ponticum elepidotes, *R. hyperythrum* and *R. pseudochrysanthum* are known to have high disease resistance and subsequently make good candidates for breeding cold, heat tolerant and disease resistant hybrids. Cultivars of *Rhododendron* lepidote, *R. keiskei* also have high resistance, as do cultivars of Tsutsusi evergreen azaleas, *R. indicum* and *R. yedoense*.

So, do different Rhody roots host different microbes ? Yes !

At *Holden Arboretum* 12 species from the four clades were studied for taxonomic and climate diversity and *Phytophthora* resistance at the Seattle, oceanic west coast location, and the cold, continental *Holden Arboretum* site. State-of-the-art DNA sequence scores plotted against specific root length identified different ericoid mycorrhiza among the clades, as well as

different good and bad soil microbes. Although not yet confirmed by further studies, one of the main early conclusions is that not only root investment strategies, but also disease resistance relates to root and soil microbiomes (Medeiros et al, in Prep.).

What are the implications of diverse ericoid root mycorrhiza and soil microbes ?

1. Propagation – factors affecting plants such as climate and soil conditions also affect microbes. Combined with poor planting or horticultural techniques, many soil amendments such as excessive organic or inorganic fertilizers and pesticides can kill or discourage good microbes.

2. Disease resistance – encouraging good microbes like **Ericoid** mycorrhizae *Oidiodendron, or* anti-microbe *Penicillium* can make it harder for bad guys like *Phytophthora* and *Armellaria* to get a foot-hold.

3. Breeding – capitalize on variation within clades and selection of ornamental qualities combined with disease resistance in species like *R. hyperythrum* to create disease resistant hybrids. But to ensure long term resilience and survival, it's extremely important to also capitalize on nature's readily available resources like soil microbes, roots and specialized mycorrhizae.

4. Conservation and restoration – in a time of climate change, with the four Rhododendron clades widely distributed around the world, it's important to understand their unique requirements and importance - preserving the viability and biodiversity of entire ecosystems. ¤

Touring the Gardens of Varengeville sur Mer, Normandy, France

(See the full article on page 17.)

Cyclamen naturalised on forest floor, probably *Cyclamen hederifolium* . [Photo John Brett]

Positions of Responsibility

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Director , Social & Volunteer Coordinator:	Lynn Rotin	902-346-2018
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Photo Album - October Hydrangeas in the French National Collection, Shamrock Garden, Haute-Normandie. Photos by John Brett