



"Niagara Rhodo" Newsletter of the The Niagara Chapter, Rhododendron Society of Canada March 2011

Our Purpose: We are a non-profit organization whose aim is to promote, encourage and support interest in the genus *rhododendron*. Our goal is to encourage gardeners to grow and appreciate these plants, by providing educational meetings with knowledgeable speakers, access to topical publications and hosting joint meetings with other chapters.

Inside This Issue:

1. Speaker, April 10, 2011: What's in the Annual Plant Sale? & New Material on Growing Rhodos
2. Program Reminder & Spring Program review.
3. Pre-orders & 4 Brueckner Hybrids Introduced
4. Summary of March 10 meeting & Plant lists.

Word of Caution

By becoming a successful grower, the reader will be exposed to a contagion for which there is no cure. Once infected with an appreciation of rhododendrons and azaleas most gardeners spend a lifetime collecting these most beautiful of all plants.

H. Edward Reiley

Program Reminder

Sunday, April 10, 2011, 2 P.M. Slide Show, Description, Coffee, Sweets & Discussion. Location: Vineland Research & Innovation Centre, Victoria Avenue. Vineland
What's in the Annual Plant Sale? Plus Thinking about Where Rhododendrons Come From & Why They are Fussy about How We Plant Them.

Nick Yarmoshuk will describe and present a slide show of all the cultivars that will be available at the upcoming Annual Rhododendron Sale, April 30.

Also, in a newly developed presentation he will describe the growing conditions of rhododendrons in their natural habitat and compare these conditions to growing environments to be found in most areas of southern Ontario.

This will form the background for discussion of different techniques appropriate for growing rhododendrons in clay soils or sandy loam soils in our gardens.

He will also show two videos which describe, in considerable detail, simple techniques for dealing with container grown rhododendrons and azaleas.



Garden in St. Catharines

The Spring Program

Saturday, April 30, 2011, 9:00 A.M. to Noon Annual Plant Sale. Location: Vineland Innovation & Research Centre, Garage & Implement area, at the former (HRIO), Victoria Avenue, Vineland Station.

Note: Plant Sale closes before Noon when all plants are sold out.

Garden Tours in Mississauga Open to Niagara & ARS Members Only

Saturday, May 14, 2011. 10 A.M. to Noon.

Tour 1: Brueckner Garden in Mississauga. A 2 acre garden containing mature samples of Dr. Brueckner's hybrids which will be subjects of the Brueckner Project in which all members are invited to participate. (Program and Project details to follow in April, 2011)

Sunday, May 22, 2011. 11 A.M. to 4 P.M. Rain or Shine.

Tour 2: Bob Ramik invites members of the Niagara and Toronto Chapters to visit his Mississauga garden. This is a very large ravine garden. A Picnic with wine is planned. (Program and Directions to follow in April 2011)

Photos of the garden may be viewed at these two web sites.



<http://www.facebook.com/album.php?aid=164181&id=726778214&l=53c39412fe>

<http://www.facebook.com/album.php?aid=68442&id=726778214&l=73e5851d8d>

(Program details to follow in April 2011)

Saturday, May 28, 2011. 10 A.M. to 2 P.M.

P4Ms Plant Sale. Members only. Venue TBA

Thinking About Pre-orders & Planting

The 2011 Pre-order form is on Page 3. Photographs of most of the plants to be available at the Annual Sale are shown on Page 4. detailed descriptions with larger and additional photos are available on the Chapter's web site at

<http://www.rhodoniagara.org/2011plantsale.pdf>

Prices shown on the Pre-order form include members' 10% discount and all sales taxes.

Members are invited to send early orders to Lillie Haworth at the indicated address so that orders will be received before April 18, 2011.

Please make cheques payable to "ARS - Niagara"

Pre-orders will be available for pick-up on the day of the sale between 9 A.M. and 11 A.M. The plant sale will close at the time that the last plant is sold or at 12 Noon . . . whichever comes first.

Deadline Extended: The Annual Plant Sale is scheduled for Saturday, April 30, 2011. In view of the inclement weather of the past few weeks and some members' desire to escape the slings and arrows of outrageous winter, we have extended the period for membership renewal to April 1, 2011. If you believe your membership has lapsed or wish to introduce new members please send your membership fee to Lillie Haworth, 4 Deer Park Court, Grimsby, ON., L3M 2R2

Unique Cultivars: Additional information describing two unusual offerings, Magnolia Grandiflora "Bracken's Brown Beauty & Franklinia", is provided on the website. The former is suitable for adventurous gardeners who wish to "push the limits". The latter is rarely available, because of difficulty to propagate and sources of supply. Both are prized for their form and interest. Also, this year, 3 species are offered. They are *R. quiquefolium*, *R. hodgsonii* & *R. cinnabarinum* (red form)

Planting Instructions: Two videos describing, in detail, how pot grown plants should be prepared for planting will be shown at discussed the meeting on April 10. Also, written instruction of planting techniques for clay and sandy soil will be distributed at the meeting and at the Plant Sale.

Please Note: In view of the price of each cultivar offered in this sale, and, because of the extensive planting advice provided, we cannot provide replacements for plants that do not succeed in your garden.

4 Brueckner Hybrids Registered

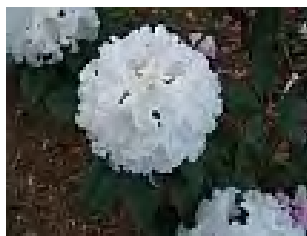
By Christina Woodward

The Summer Supplement of the JARS will announce 4 Brueckner hybrids have been added to the International Rhododendron Register. This may be of particular interest to Niagara's membership in anticipation of the soon to be launched Brueckner Test Project. These four hybrids have been on the family property for over 30 years. Joe Brueckner

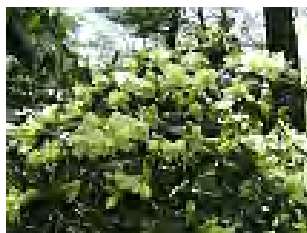
recorded his detailed observations on these plants, and the process was revisited 5 years ago by Marta Brueckner and Christina Woodward. Each plant was considered to have features unique enough to warrant applying for registration. The data recorded in the application were derived from records of both time periods.

Naming plants affords us an opportunity to honour an individual, as is the case with the newly named Brueckner hybrid, *Joseph Brueckner*, that pays tribute to the work of its creator. Choosing the name can draw attention to characteristics of a plant; *Limoncello*, for instance, points to the colour of the flower (lemon yellow) and in this case also reflects Joe Brueckner's affection for the Italian culture (*Limoncello* is the Italian lemon-flavoured liqueur).

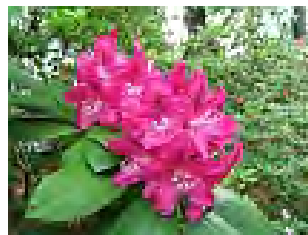
Registering plants provides a mechanism to add to the pool of plant features that may be of interest to other hybridizers. For instance *Limoncello*'s parentage has been replicated in other, registered hybrids. However, the offspring of these crosses have been low growing. *Limoncello* is a taller form, 3-4ft in height and, if successfully commercialized, could provide important genetic material for further hybridizing endeavours. The 4 newly registered cultivars are show below with their registered names and parentage.



Ayomi
(*Janet Blair x Yakushimanum*)



Limoncello
(*keiskei x fletcherianum*)



Impromptu
(*Pinnacle x open pollinated*)



Joseph Brueckner
[*Brachycarpum Tigerstedtii x Arboreum (Edinburgh)*]



2011 Annual Plant Sale Members' Pre-Order form

Name:

Address:

.....Postal Code

Telephone: Email:

* These prices per plant apply to Memberships paid prior to April 1, 2011

* Prices include members' 10% discount and all applicable taxes.

Photographs & Descriptions are available at <http://www.rhodoniagara.org/2011PlantSale.pdf>

Plant	Members' Price	Qty.	Plant	Members' Price	Qty.
DECIDUOUS AZALEAS			LARGE LEAF RHODODENDRONS		
Candy Lights	\$21.60		Eruption	\$21.60	
Mandarin Lights	\$21.60		English Roseum	\$21.60	
Northern Hi-Lights	\$21.60		Fantastica	\$21.60	
Tri-Lights	\$21.60		Ingrid Melquist	\$21.60	
White Lights	\$21.60		Ken Janek	\$21.60	
Arneson Gem	\$21.60		Landmark	\$21.60	
Millenium	\$13.50		Lemon Dream	\$21.60	
Pink & Sweet	\$21.60		Melrose Flash	\$21.60	
Rh. quinquefolium	\$10.80		Mist Maiden	\$21.60	
Weston's Sparkler	\$10.80		Polarnacht	\$21.60	
Weston's Popsicle	\$21.60		Sapporo	\$21.60	
EVERGREEN AZALEAS			Teddy Bear	\$13.50	
Girard's Pleasant White	\$21.60		Species RHODOs Pre-Order only		
Stewartsonian	\$21.60		hodgsoni	\$18.00	
SMALL LEAF RHODODENDRONS			cinnabarinum red	\$1800	
April Mist	\$21.60		HELLEBORUS		
Blue Baron	\$21.60		Ivory Prince	\$18.00	
Bubblegum	\$21.60		Pink Frost	\$13.50	
Checkmate	\$21.60		COMPAN'N SHRUBS		
Karin Seleger	\$21.60		Magnolia Grandiflora "Bracken's Brown Beauty"	\$21.60	
mucronulatum	\$27.00		pieris "Shojo"	\$21.60	
mucronulatum (Pink)	\$10.80		kalmia "Sarah"	\$21.60	
Molly Fordham	\$13.50		franklinia	\$27.00	
Purple Gem	\$21.60		corylopsis spicata	\$10.80	
HOSTAS			disanthus	\$10.80	
Niagara Falls	\$10.80				
Ice Cream	\$9.90				

Total number of plants ordered # Please make Cheque (payable to **ARS - Niagara**) \$

* **Pre - Orders close April 18, 2010**

* **Pickup** between 9am and 11 am at the Plant Sale, April 30th,
at Vineland Research & Innovation Centre, Victoria Avenue, Vineland Station

Mail this form and Cheque to: Lillie Haworth 4 Deer Park Court, Grimsby, ON L3M 2R2	For Information concerning orders write to: ljhaworth@sympatico.ca or Call: 905-945-2433
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For Larger Images and Descriptions Visit
<http://www.rhodoniagara.org/2011PlantSale.pdf>

Deciduous Azaleas

---→ (11)



Candy Lights



Mandarin Lights



Northern Hi-lights



Tri-Lights (1)
Tri-Lights (2)



White Lights



Arneson's Gen



Millenium



Pink & Sweet



Rh quinquifolium
Rh quinquifolium leaves



Weston's Sparkler



Weston's Popsicle

Evergreen Azaleas

---→ (2)



Pleasant White



Stewartsonian

Species Rhododendron

(Pre-order only)

---→ (2)



Rh hodgsonii



Rh Cinnabarium red

Elepidotes

---→ (11)



Eruption



English Roseum



Fantastica



Ingrid Melquist



Ken Janeck



Lemon Dream



Melrose Flash



Mist Maiden



Polarnacht



Sapporo



Teddy Bear

Lepidotes

----→ (10)



April Mist



Blue Baron



Bubblegum



Checkmate



Karin Seleger



Landmark



White mucronulatum



Mucronulatum (pink)



Molly Fordham



Purple Gem

Hosta

---→ (2)



Hosta Niagara Falls



Hosta Ice Cream

Helleborus

----→ (2)



Ivory Prince



Pink Frost

Companion Shrubs

----→ (6)



Magnolia Grandiflora
Bracken's Brown Beauty"



Pieris japonica Shoyo



kalmia "Sarah"



franklinia



corylopsis spicata



disanthus

Improving Rhododendrons and Azaleas

A Summary of Stephen Krebs's talk with additional data

Forty-three rhododendron lovers braved an overnight snowfall and treacherous driving conditions on Sunday, February 6, to hear Steve Krebs, Director of the Leach Research Station of the Holden Arboretum, discuss his quest to develop new hybrids of deciduous azaleas (that would be less susceptible to Powdery mildew) and broadleaf rhododendrons (that would be resistant to phytophthora root rot).

This talk summarized the process and results of two studies. The Powdery Mildew (PM) study was initially reported in HortScience Vol. 45(5), May 2010, pp. 784 - 789. The Phytophthora root rot (RR) study was reported in HortScience Vol. 37(5), August 2002, pp. 790 – 792. This account of the talk abstracts materials from Steve's slideshow, ideas from his talk and direct quotes from his two articles.

Steve's audience was well rewarded with an carefully structured talk that traced the various stages of a research based breeding program: Explanation of why the projects are important; Description of conditions under which PM & RR develop; Identification of species and cultivars most susceptible to PM & RR; Deciding on which species and cultivars to employ for a systematic breeding program; Means to produce adequate numbers of samples of new cultivars to employ in field testing; Explaining the need for and process of field testing.

Powdery Mildew: Prevalence, Source and Control. Various systematic studies suggest that incidence of PM is increasing, perhaps as a result of expansion of areas where appropriate conditions for mildew development can exist. PM is favoured by overcast or shady conditions, high humidity and low rainfall. Growing plants in exposed locations and using overhead rather than drip irrigation provide appropriate control conditions. In the United States the high costs of fungicides and associated concern for health risks has made chemical control of PM an unattractive option. Elsewhere in the world growers apply fungicides up to 8 months per year to control the disease. This is an inadequate long term response because fungicide resistant PM has been reported.

Cultivars resistant to PM. Although PM resistant cultivars of Deciduous Azaleas exist most of the cultivars named in the last 100 years are closely related and are susceptible to PM, especially the Exbury hybrids. The obvious solution is to grow cultivars that are resistant to PM. The challenge is to clearly identify PM resistant species and cultivars and to use them in breeding programs. Following carefully controlled laboratory and field techniques, 41 Deciduous Azalea cultivars were tested for the susceptibility to PM. The results of these tests were compared with controlled test for a significant number of the same cultivars in *Growth Chambers*. Although the cultivars' susceptibility to PM in the Growth Chamber trials appeared to be more severe, there was a strong correlation between the two sets of results.

Table 1 lists the results of the field trials indicating the susceptibility of various Deciduous Azaleas to PM. In the table, **N** refers to the number of each cultivar in the trial.

The SCORE, in a range from 1 to 5, is the disease rating based on visual assessment of % of top of leaf area covered by PM.

- 1 = 0% covered
- 2 = 1% to 25% covered
- 3 = 26% to 50% covered
- 4 = 51% to 75% covered
- 5 = 76% to 100% covered

Table 1
Average Powdery Mildew Disease ratings on 41 Deciduous Azalea cultivars grown in field trials at two locations (Ohio & Minnesota) and evaluated for 2 to 3 years.

CULTIVAR	Mean Disease Rating	
	N	Score
Fragrant Star	19	1.00
Garden Party	19	1.00
Millennium	16	1.00
Parade	17	1.00
Popsicle	20	1.00
June Flame	20	1.00
Snowbird	20	1.05
Magic	17	1.05
Late Lady	18	1.10
Pink and Sweet	19	1.10
Lollipop	13	1.13
Jane Abbott	20	1.55
Northern Hi-Lights	20	1.75
Homebush	20	2.25
Golden Lights	15	2.30
Apricot Surprise	15	2.38
Jolie Madame	20	2.50
Tri-Lights	19	2.65
Crimson Tide	19	2.73
Mandarin Lights	20	2.80
Molalla Red	17	2.98
White Lights	18	3.30
Yellow Pom Pom	17	3.38
Fireflash	19	3.40
Fireball	13	3.40
George Reynolds	12	3.43
Klondyke	19	3.45
Gibraltar	20	3.50
Rosy Lights	19	3.57
Orchid Lights	20	3.60
Cannon's Double	15	3.63
Western Lights	19	3.63
Lemon Lights	17	3.67
Cheerful Giant	14	3.69
Mount Saint Helen	20	3.80
Arneson Gem	19	3.87
Strawberry Ice	15	4.10
Arneson Ruby	19	4.35
Orange Jolly	18	4.40
Yellow Cloud	17	4.62
Irene Koster	16	4.85
MEAN RATING		2.71

Source: Long, M.C., Krebs, S/L., & Hokanson, S.C. *Field and Growth Chamber Evaluation of Powdery Mildew Disease on Deciduous Azaleas.* Hort Science. Vol.45(5), May, 2010.

Other PM Findings: Many of the very popular and showy azalea cultivars are susceptible to PM. Table 2 shows the intensity of this susceptibility by Hybrid Group. The table indicates the hybrid group in the first column. The second column shows the number of cultivars evaluated. The third column lists the names of the resistant cultivars in each group.

Table 2

<u>Hybrid Group</u>	<u># Cultivars Evaluated</u>	<u># and Resistant Cultivars</u>
Knap Hill	9	2 Whitethroat Homebush
Exbury	28	1 Annabella
Knap Hill / Exbury Derived	13	1 Goldflakes
Ilam	6	1 Melford Lemon
Girard	11	2 Arista Red Pom Pom
Northern Lights	15	3 Candy Lights Northern Hi-Lites Northern Lights

Note: See Tables 4 & 5 for additional resistant hybrid groups and resistant Ghent cultivars.

Table 3 lists the susceptibility to PM of various Deciduous Azalea species. Notably most of the resistant species are those found in North America.

Table 3

<u>Azalea Species</u>	<u>Disease Score</u>	<u>Disease Rating</u>
R. arborescens	1.00	R
R. canadense	1.00	R
R. canescens	1.00	R
R. schlippenbachii	1.00	R
R. vaseyi	1.00	R
R. atlanticum	1.08	R
R. cumberlandense	1.14	R
R. viscosum	1.18	R
R. calendulaceum	1.29	R
R. prunifolium	1.38	R
R. prinophyllum	1.62	MR
R. periclymenoides	1.95	MR
R. luteum	2.73	S
R. molle subs. japonicum	4.06	S

R = Resistant MR = Marginally Resistant
S = Susceptible

What to do? Live with PM, grow Deciduous Azaleas in open spaces, provide lots of sun, spray the plants frequently, hope for low humidity. . . **OR** . . .grow highly resistant cultivars.

Table 4

Other Hybrid Groups Susceptibility to PM

<u>Hybrid group</u>	<u>E Cultivars Evaluated</u>	<u># and Resistant Cultivars</u>
Leach	8	8 Pink Puff June Bride July Joy
Weston	9	9 Lollipop Millenium Parade

Table 5

Variable Ghent Hybrids

<u>Cultivar</u>	<u>Rating</u>
Fanny	R
Josephine Klinger	R
Quentin Metsys	R
Narcissoflora	R
Daviesii	S
Irene Foster	S

Phytophthora Root Rot: Description, Prevalence, Source and Control. Figure 1 below is a photo of a plant that has been infected with phytophthora. In its early stages leaves will curl down as though the plant is suffering from lack of water. A plant infected with phytophthora will not respond to watering. The plant will continue to decline until the final stage is reached as shown in Figure 2, Page 4.

Figure 1



Chlorosis & Wilting . . . death – Figure 2 Page7

Figure 2

Root rot is likely to occur when drainage around the root ball is poor, when a plant may be over-fertilized and/or when the night soil temperature is too warm. Commercial growers are not immune from the scourge of phytophthora root rot. They are able to suppress disease development in container production by using composted hardwood and pine bark in potting mixes. The home gardener has only two routes to minimize phytophthora problems, follow excellent cultural practices or grow resistant cultivars.

The array of resistant cultivars currently available to the industry and to home gardeners is small. Studies over the past 25 years have shown that fewer than 20 out of 336 rhododendron cultivars have moderate to high resistance to root rot. There appears to be no evidence of immunity to the disease and those plants identified as “resistors” were those in which root rot damage was confined to younger roots.

Despite their resistant attribute, these previously tested rhododendron cultivars are not widely distributed in the nursery trade nor, it appears, have they been widely used in breeding programs.

The task then is to identify resistant cultivars and to use them in a breeding program. Following a systematic process, as in the previous Deciduous Azalea research, Krebs and his collaborators rated 57 rhododendron cultivars for their susceptibility to *Phytophthora cinnamoni*.

Table 6 Shows the mean root rot ratings for 57 rhododendron cultivars treated with one or more amounts of *P. cinnamoni*. The two columns headed by 10 CFU and 30 CFU are results for two concentrations of “colony forming units” of inoculant of *P. cinnamoni* employed in the study.

Scores are: 1 = healthy roots; 2 = necrosis of young fine roots; 3 = necrosis of older, coarse roots; 4 = crown rot; 5 = dead plant.

See **Figure 3, Page 8** for photos of Score = 1 and Score = 3.

Table 6

Cultivars	10 CFU	30 CFU	
Susceptible			
PJM Elite	5.0	--	S
Blutopia	5.0	5.0	S
Edith Bosely	5.0	5.0	S
Goldbukett	5.0	5.0	S
Lavendula	5.0	5.0	S
Mikkeli	5.0	5.0	S
Northern Starburst	5.0	5.0	S
Roseum Elegans ^w	5.0	5.0	S
White Peter	5.0	5.0	S
Haaga	5.0	4.8	S
Rangoon	5.0	4.0	S
Hachmann's Charmant	5.0	3.5	S
Firestorm	4.5	5.0	S
Nicoletta	4.5	5.0	S
Percy Wiseman	4.5	5.0	S
Chionoides ^w	4.5	4.0	S
Hudson Bay	4.3	--	S
Party Pink	4.3	5.0	S
Azurro	4.3	4.3	S
Fantastica	4.3	4.0	S
Besse Howells	4.0	5.0	S
Kalinka	4.0	5.0	S
Manitou	4.0	5.0	S
PJM Compact form	4.0	5.0	S
Wojnar's Purple	4.0	5.0	S
Arctic Pearl	3.8	4.5	S
Elviira	3.8	4.5	S
Bikini Island	3.5	5.0	S
Capistrano	3.3	5.0	S
Rio	3.3	4.0	S
Scarlet Romance	3.0	5.0	S
Sumatra	3.0	5.0	S
Tennessee	3.0	5.0	S
Trinidad	3.0	5.0	S
Oudijk's Sensation ^w	3.0	4.3	S
Summer Glow	3.0	4.0	S
Janet Blair ^w	3.0	3.5	S
Weston's Pink Diamond	3.0	3.0	S
Lavender Princess	3.0	2.8	S
Nova Zembla ^w	2.8	4.3	S
Queen Alice	2.8	3.5	S
Hachmann's Polaris	2.5	4.0	S
Lee's Dark Purple ^w (rooted)	2.0	5.0	S
Golden Gala	2.0	5.0	S
Group mean	3.9	4.6	S
Moderately Resistant			
Samoa	2.8	2.0	MR
Anna H. Hall	2.5	2.8	MR
Hawaii	2.5	2.3	MR
Peter Tigerstedt	2.5	2.3	MR
Crete	2.3	3.0	MR
Bali	2.0	3.0	MR
Group Mean	2.4	2.6	MR
Highly Resistant			
Caroline – rooted	2.0	1.5	HR
Brittany	1.8	2.5	HR
Vernus	1.8	2.5	HR
Rocket	1.8	1.8	HR
Ginny Gee	1.8	1.5	HR
Normandy	1.5	2.3	HR
Ingrid Melquist	1.3	2.5	HR
Group mean	1.7	2.1	HR

Source: Krebs, S.L. & Wilson, M.D. HortScience, Resistance to Phytophthora Root Rot in Contemporary Rhododendron Cultivars. Vol.37(5), August 2002

Figure 3



Thoughts about Rhododendrons & Phytophthora:

1. In this study, no cultivar exhibited immunity to phytophthora.
2. The data suggest that some cultivars such as 'Golden Gala', 'Lee's Dark Purple' and 'Hachmann's Polaris' may be resistant to light inoculations of phytophthora but will succumb to higher level of the disease.
3. Rhododendrons as a group are highly susceptible to Phytophthora root rot. Estimates are that some 77% to 94% of rhododendron cultivars are susceptible; while only 38% of azaleas tested show severe root rot.
4. Collectively the 13 resistant cultivars in Krebs's current work include at least 14 different species from North America and Asia in their pedigrees. But most of these species also appear in the parentage of susceptible cultivars. So there is no obvious connection to root rot.
5. *R. kieskei* shows little root damage in Krebs's work and they make up about half the genetic contribution to resistant cultivars 'Ginny Gee' and 'Brittany'.
6. *R. minus* and *R. racemosum* contributing to 'Ginny Gee' and 'Brittany', respectively, are believed to be uniformly susceptible or variable in resistance to *P. cinnamomi*.
7. Resistance to *P. cinnamomi* at the species level appears to be fairly uncommon. Any species identified as resistant would be especially valuable for breeding purposes.
8. The 13 cultivars identified as resistant are genetically diverse, includes white, pink and red flowers, but no yellows, are all cold hardy to USDA zones 5 & 6 and they embody current tastes and trends in ornamental value.
9. Other research suggests that resistance to *P. cinnamomi* may be an inheritable trait.
10. Gains in root rot resistance from conventional breeding may be substantial.

Editor's Note: The editor thanks Stephen Krebs for providing slides and permission to use material from his talk and published material in preparing this summary. Any errors of interpretation to be found in this account of Dr. Krebs's work are to be attributed to the editor alone.

At the Meeting – March 6, 2011



Brian Schram & Stephen Krebs



Membership Matters



Reminder

Rhododendrons as a group are highly susceptible to Phytophthora root rot. Nevertheless, they are easy to grow provided two fundamental rules are followed.

Success with rhododendrons depends on providing (1) appropriate drainage, and (2) highly organic loose soil while minimizing the amount of fertilizer applied.