

# Ornamental Plant Germplasm Center

## Progress Report

### Presented to the HOCGC



<http://opgc.osu.edu>

Report prepared by  
Pablo Jourdan, Director  
Susan Stieve, Curator

Meeting: 31 July 2012  
Subtropical Horticulture Research Station  
Miami, Florida

#### Our Mission

“The OPGC will acquire, document, maintain, characterize, and distribute herbaceous ornamental genetic resources and associated information for conservation, enhancing scientific research and floriculture.”

#### Our Vision

The industry values our materials and information  
NPGS values our science  
There is high level of requests for germplasm  
We solve problems for industry  
We generate new materials of domestic species for crop development

This report covers accomplishments and activities undertaken by the OPGC since the last meeting of the HOCGC on 9 July 2010 although the emphasis is on activities for 2011 and the first half of 2012. In July, 2011, the OPGC-subcommittee of the HOCGC met to review the previous year's activities. A report prepared for that subcommittee is being shared separately with the HOCGC, so there may be some overlap between what presented in both reports.

#### Outline:

##### Significant accomplishments

##### Germplasm Activities

- Acquisitions
- Maintenance
- Distributions
- Characterization & Evaluations

##### Work priority genera

- Coreopsis* & *Rudbeckia*
- Phlox*
- Begonia*
- Viola*
- Lilium*

##### Other research and collaborative projects

- Facilities Maintenance and Improvements
- Personnel changes
- Outreach Activities

## Significant Accomplishments

- Large acquisition of 104 new *Phlox* accessions through the collection efforts of Peter Zale, Graduate Research Assistant, The Ohio State University. The collection stands at 207 accessions.
- Development of crop descriptors for *Coreopsis*, *Rudbeckia* and *Phlox*.
- Continuing second year characterization of *Rudbeckia* and *Coreopsis* field-grown plants.
- Development of OPGC outdoor nursery area as a place to grow and display accessions; this was accomplished through construction of raised beds and an unheated polyhouse while also maintaining nursery irrigation lines for container-grown plants.
- Extraction of DNA from *Coreopsis*, *Phlox*, *Rudbeckia* and *Begonia* successfully accomplished for the first time in the OPGC laboratory. Preliminary amplification of *Phlox* using microsatellite markers.
- Received USDA ARS grant for “A flow-cytometric evaluation of the *Rudbeckia* and *Coreopsis* collection in the National Plant Germplasm System” (\$12,657). This work will be completed in 2012.
- Awarded 2 Exploration Grants for collection of *Phlox* in the Southeastern USA (2011) and collection of *Phlox subulata*, *P. ovata*, *P. buckleyi* and *Coreopsis rosea* in the Mid-Atlantic states serpentine, shale and sand barrens.
- Peter Zale received an OARDC graduate student support grant “Interspecific hybridization in *Phlox*: Analysis of genetic diversity, relatedness, and crossing barriers” (\$5,000)
- Approximately 730 samples of *Phlox* have been analyzed by flow cytometry
- Susan Stieve received 2011 OSU Staff Career Development Grant for flow cytometry book and training.
- Steven Haba received a 2012 OSU Staff Career Development Grant to attend the American Begonia Society meeting in San Diego
- Established an in vitro backup system for 50% of the *Begonia* clonal collection
- Continuing focus on workplace safety, completion of SOPs for flammable and corrosive chemicals, colchicine; development of Continuity Management Plan to follow in the event of an incident that threatens to disrupt critical operations.
- Developed and maintained an upgraded website (<http://opgc.osu.edu>)

## 2011-2012 Germplasm Activities

168 accessions were acquired in 2011:

<i>Phlox</i>	104
<i>Begonia</i>	21
<i>Coreopsis</i>	3
<i>Rudbeckia</i>	3
<i>Lilium</i>	2
<i>Viola</i>	1
Other genera	34

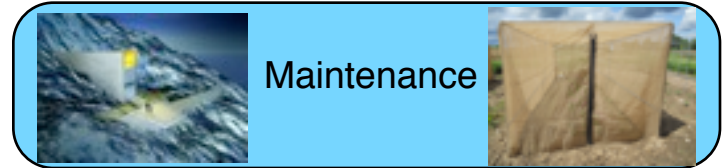
*Phlox* accessions were collected by Peter Zale, Graduate Research Assistant, through NPGS-PEO-funded collection trips to numerous regions of the Eastern United States: a trip beginning in the Florida panhandle and ranging to the Edwards Plateau of Texas and into Oklahoma yielded 43 new accessions of 8 species of *Phlox*; additional trips to Georgia, Illinois, Kentucky, North Carolina, Ohio, Tennessee, Virginia, and West Virginia resulted in the acquisition of additional species of *Phlox*. Additionally, 14 commercial cultivars were acquired for comparative and research purposes.

*Begonia* accessions were donated to the OPGC from the Fort Worth Botanic Garden, Baker's Acres Greenhouse, and Dr. Cecil Pounders, USDA/ARS.

Acquisition work will be facilitated by the development of a new HOCGC crop vulnerability report, the first draft of which will be completed in 2012.



**Accessions available for distribution: 945/3,557 (26.6%)**



The ten largest collections of genera and *Lilium*, a priority genus for conservation, being maintained at the OPGC are listed in the table below. The six current OPGC priority genera for conservation are indicated in bold type:

Genus	Number of Accessions	No. Accessions Available for Distribution
<i>Oenothera</i>	646	120
<b>Phlox<sup>1</sup></b>	<b>207</b>	<b>0</b>
<b>Rudbeckia</b>	<b>199</b>	<b>89</b>
<i>Pelargonium</i>	191	191
<b>Viola</b>	<b>166</b>	<b>32</b>
<i>Penstemon</i>	151	18
<i>Tagetes</i>	140	45
<b>Coreopsis</b>	<b>119</b>	<b>30</b>
<b>Begonia</b>	<b>116</b>	<b>99</b>
<i>Dianthus</i>	140	78
<b>Lilium</b>	<b>61</b>	<b>2</b>



<sup>1</sup>Bold type indicates an OPGC priority genus.

Improvements in plant culture included development of an automated drip irrigation system for the clonal *Begonia* and *Pelargonium* plant collections.

<b>Long-term Storage Backup</b>	1,602 of 3,557 accessions backed up at NCGRP (45%) 20 additional accessions (primarily clonal, e.g. <i>Leucanthemum</i> ) are backed up at another NPGS site  57 seed-maintained accessions were sent to the National Center for Genetic Resources Preservation (NCGRP) for long-term storage backup. Accessions included 15 <i>Rudbeckia</i> , 10 <i>Dianthus</i> , 8 <i>Coreopsis</i> , 7 <i>Tagetes</i> , and others.  No accessions were sent to the Svalbard Global Seed Vault in 2011.
<b>Regeneration</b>	151 accessions were grown for seed replenishment in 2011; this included 66 accessions sown in 2011 as well as <i>Begonias</i> and perennial accessions carried over from previous years. Seed production on 67 accessions was successfully completed (44%).
<b>Viability Testing</b>	78 seed viability tests were conducted to monitor seeds in storage, and an additional 173 tests were conducted to determine viability of seeds post-production.
<b>Inactivation</b>	No accessions were inactivated in 2011.



## Distribution

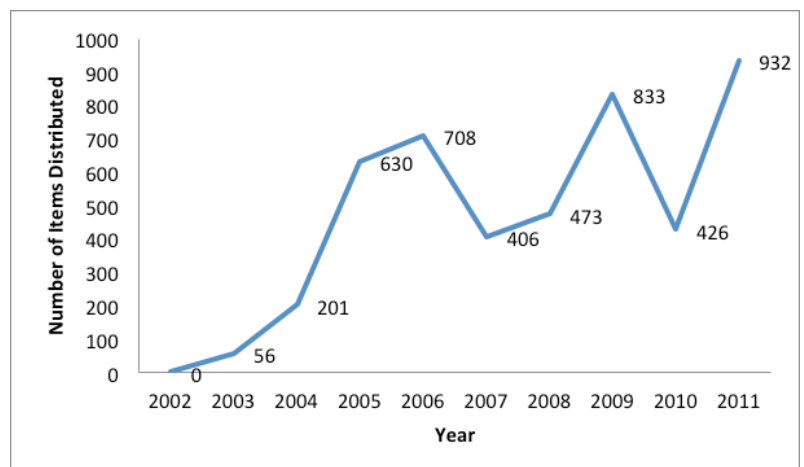
In 2011 the OPGC distributed 104 germplasm orders containing a total of 932 items. The most order items were requested by U.S. commercial companies (344 items), followed by foreign non-commercial organizations (273 items). The most orders received were from U.S. individuals with no affiliation (37 orders), followed by U.S. state agencies/universities (28 orders).

Requester Affiliation	Number of Items Requested	% of Total Items Ordered	Number of Orders
U.S. commercial company	344	36.9	11
Foreign non-commercial organization	273	29.3	13
U.S. state agency/university	154	16.5	28
U.S. individual no affiliation	121	13	37
Agricultural Research Service	16	1.7	5
Foreign individual no affiliation	12	1.3	2
U.S. non-profit organization	10	1.1	6
Foreign commercial company	2	0.2	2
Total	932	100	104

The top ten genera most requested in 2011, followed by the number of items requested, were:

1. *Pelargonium* 228
2. *Oenothera* 142
3. *Zinnia* 98
4. *Begonia* 89
5. *Tagetes* 79
6. *Rudbeckia* 48
7. *Petunia* 32
8. *Iris* 28
9. *Stokesia* 26
10. *Coreopsis* 16

Since the OPGC began distributing germplasm in 2002, 4,665 germplasm items have been distributed. There is a general trend of annual increases, as indicated in the graph below; as OPGC germplasm collections continue to grow and are publicized and experienced staff are present to oversee distributions this trend is expected to continue.





## Characterization & Evaluation



Herbarium voucher specimens were taken for 120 accessions. Once mounted and labeled these will be deposited at the U.S. National Arboretum Herbarium and The Ohio State University Herbarium.

In 2011 crop descriptors were developed for *Coreopsis*, *Phlox*, and *Rudbeckia*. These descriptors will be presented to the HOCGC for approval at the annual meeting in 2012. Characterization of *Rudbeckia* and *Coreopsis* field-grown plants using these descriptors continued for a second growing season in 2011 and is expected to conclude in 2012.

### Work on priority genera: *Coreopsis* and *Rudbeckia*

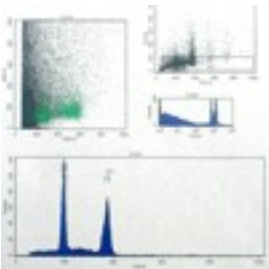


#### Characterization of U.S. Native *Coreopsis* and *Rudbeckia* Germplasm Conserved at the Ornamental Plant Germplasm Center

Susan Stieve



Susan is pursuing a PhD program in addition to her duties as OPGC Curator



*Coreopsis* and *Rudbeckia* are two genera of herbaceous ornamentals which have many species native to the United States. Since 2006 both genera have been priorities for conservation at the Ornamental Plant Germplasm Center (OPGC), a genebank that is part of the USDA's National Plant Germplasm System. About 28 species of *Coreopsis* are native to the U.S.A. including annual, perennial, and shrub-like forms; the OPGC currently conserves over 100 accessions representing 19 species. *Rudbeckia* is a genus of 23 species of annual, biennial, and perennial forms; currently over 200 accessions representing 18 species from all sections of the genus are being conserved at the OPGC. To fill gaps in our knowledge about these genera we have initiated a multi-year characterization of wild-collected accessions and have been comparing them to representative cultivars using a set of 53 descriptors selected to identify differences in characteristics such as growth habit, leaf and flower morphology, phenology, hardiness, quality, fecundity, disease susceptibility, and stress tolerance. Differences among accessions within species or sections have been identified for characteristics such as flower size, flower color, plant height, flowering time, hardiness, and disease resistance. For example, *Rudbeckia* floral color and pattern variation is most prevalent in species of the sections *Rudbeckia* and *Dracopis* (*R. hirta*, *R. triloba*, *R. amplexicaulis* and others) while little variation has been observed in species of the *Macrocline* section (including *R. laciniata*, *R. maxima*, *R. mohrii* and others). Variation for disease resistance is primarily determined at the species level with some species susceptible and others not, although some accessions within a species have been identified which exhibit variable susceptibility to a disease, for example to powdery mildews on *R. hirta*. Characterization of these accessions may also help identify new commercial possibilities for the floriculture and nursery industry. One example is *R. auriculata*, a native to the southeastern U.S. (Georgia, Alabama, and Florida) but that has overwintered in Columbus, Ohio (USDA Plant Hardiness Zone 6a); it shows some potential as a late-blooming architectural plant. Our goal is to make more information about accessions conserved at the OPGC available to public and private researchers, thereby making this germplasm more valuable and increasing its utilization in plant breeding and other programs. Conserved plant material is made freely available in small quantities to researchers and educators worldwide through the Germplasm Resources Information Network (GRIN) database, [www.ars-grin.gov](http://www.ars-grin.gov).

## Work on priority genera: *Phlox*



Peter is pursuing a PhD degree with a focus on plant conservation and breeding

Interspecific hybridization in *Phlox*: Analysis of genetic diversity, relatedness, and crossing barriers  
Peter Zale

ASHS abstract:

Interspecific hybridization among the Eastern USA native species of *Phlox*.

Of the nearly 60 *Phlox* species native to North America, only a handful are economically significant, yet the potential for novel forms with enhanced attributes is immense. Interspecific hybridization has played a role in the improvement of some phlox cultivars, but a more thorough delineation of sexual compatibility among the species is lacking. To test such relationships, we have been making crosses between numerous genotypes of 25 phlox species native to eastern U.S.A. utilizing germplasm that includes wild collected and cultivated material. Thus far, we have completed over 10,000 pollinations comprising over 500 unique cross combinations performed in a partial diallel. A minimum of 50 pollinations per reciprocal cross have been performed. Success of a given cross is heavily influenced by phylogenetic relationships. Crosses between species within section *Divaricatae* have a high rate of success when made in both directions. Crosses involving some genotypes of *P. amoena* and *P. floridana* are only successful when these species are used as female parents perhaps due to cytoplasmic effects or differences in ploidy. Hybridization between species in different sections have a low rate of success. Crosses between *P. paniculata* (section *Paniculatae*) and *P. carolina* (section *Ovatae*) are only successful using the former as the female parent and only using selected genotypes. Hybrids are being identified by microsatellite (SSR) and morphological markers; assessment of hybrid fertility to produce advanced generations is ongoing.



Peter Zale in action



Locations within the Eastern USA where collections of phlox were made in 2011

The phlox collection currently consists of over 200 accessions, representing over 50 taxa (ca. 30 species); approximately half of the collection is of wild origin and the other half is from cultivated materials. Some cultivated forms are essentially wild-collected material that have been propagated while others are highly bred cultivars. The number of accessions in the collection will continue to increase as new material is acquired.

## Interspecific hybridization studies with *Phlox*

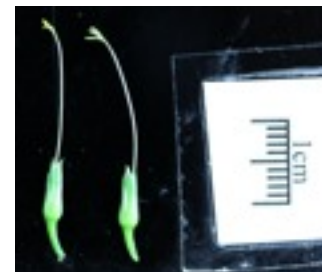
One of the major goals of our phlox germplasm work is to assess the potential for genetic exchange among different species. Between 2011 and 2012, nearly 5,000 pollinations have been performed in multiple combinations of species. We've had variable success in seed production among the crosses. We have confirmed new hybrid combinations and are thoroughly documenting the outcome of each combination.



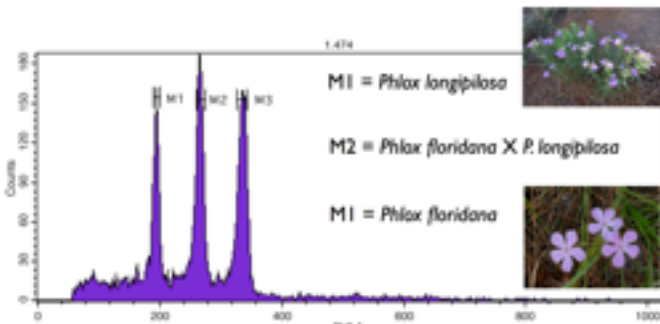
Student Marcus Nichols assisting in the painstaking process of controlled pollination.

Summary of some of the interspecific crosses.

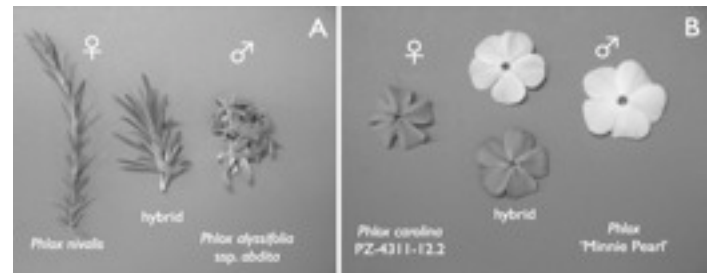
Species combinations that have resulted in viable seed	Species combinations that have <b>not</b> produced seed
<i>Phlox paniculata</i> x <i>P. carolina</i>	<i>Phlox pilosa</i> x <i>Phlox bifida</i>
<i>Phlox paniculata</i> x <i>Phlox</i> 'Minnie Pearl'	<i>Phlox pilosa</i> x <i>Phlox paniculata</i>
<i>Phlox maculata</i> x <i>Phlox carolina</i>	<i>Phlox pilosa</i> x <i>Phlox glaberrima</i>
<i>Phlox drummondii</i> x <i>Phlox pilosa</i>	<i>Phlox carolina</i> x <i>Phlox pilosa</i>
<i>Phlox carolina</i> x <i>Phlox</i> 'Minnie Pearl'	<i>Phlox nivalis</i> x <i>Phlox carolina</i>
<i>Phlox amoena</i> x <i>Phlox divaricata</i>	
<i>Phlox divaricata</i> x <i>Phlox pilosa</i>	
<i>Phlox nivalis</i> x <i>Phlox alyssifolia</i> ssp. <i>abdit</i> a	



Long styles of some phlox



Confirmation of hybrid by flow cytometry. The hybrid had DNA content intermediate to that of the parents.



Examples of putative interspecific hybrids in *Phlox* indicating the direction of the cross. A. Cross between *Phlox nivalis* and *Phlox alyssifolia* ssp. *abdit*a. B. Cross between *Phlox carolina* and *Phlox* sp. 'Minnie Pearl'



Examples of some of the *Phlox* interspecific hybrids under evaluation

DNA quantification in *Phlox* using flow cytometry.

Nearly 750 samples of phlox, representing wild species, cultivars, and interspecific hybrids have been examined for DNA content using flow cytometry. This information will be incorporated into GRIN and used for broad characterization studies.

## Seed increase of wild-collected accessions



First attempts at seed increases of some of the wild collected *Phlox paniculata*, *P. pilosa*, and *P. divaricata*.



Collected material from the Southeastern USA overwintered in a polytunnel and used for hybridization, flow cytometry and DNA isolation. Individual plants are propagated for seed increase.

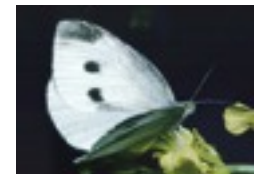


Characterization plots for *Phlox*. A multi-year field study to generate baseline information for the crop descriptors. Individual accessions have been planted at Waterman Farm in blocks of 12-24 samples each. The plants will be examined at multiple times during the season to develop phenological, morphological, and adaptive characteristics.

## Controlled pollination for seed increases



*Phlox* flowers are not typically pollinated by bees. We've initiated a program to assess the use of butterflies for pollination. Thus far we've been successful in using cabbage whites, but their efficiency in seed production is still being determined.



Cabbage White Butterfly - *Pieris brassicae*



American Painted Lady - *Vanessa virginiensis*





**Work on priority genera: *Begonia***



Steven Haba

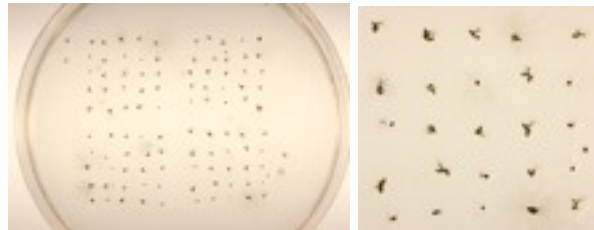
Steven is the greenhouse coordinator for the OPGC. In addition to his regular duties, he's pursuing seed research interests with *Begonia*.



The *Begonia* collection of the OPGC represents one of our more visually stunning materials and also a very challenging one for curation because of the large number of species and the plethora of hybrids that exist in the trade. Our general focus is to secure the collection we already have, but to seek to maximize the genetic resources of the species that have contributed to the major groups of begonia, especially the *Semperflorens* group. We are seeking representation of the major species involved in the development of these complex hybrids.



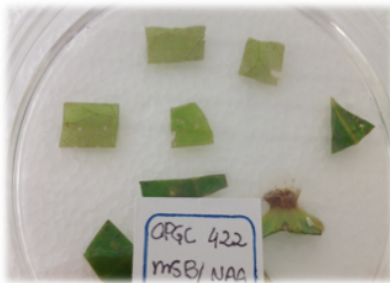
**Seed production** in selected accessions of *Begonia* is providing material for important seed biology studies.



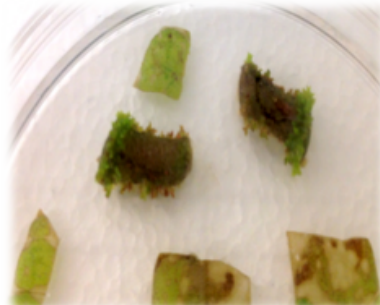
Seeds plated on 1% agar

We have adopted protocols used with *Arabidopsis* seed for a more efficient germination test of *Begonia*. Seeds are suspended in a viscous 0.1% solution of Agarose and then pipeted onto 1% agar plates. Although still relatively slow, this method is vastly improved over the traditional blotter paper system

**Establishment of in vitro protocols for virus elimination and maintenance of a clonal collection in *Begonia***



Leaf explants initiated in culture



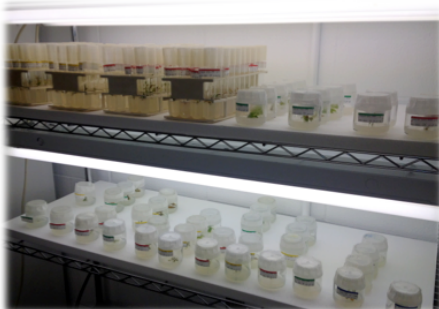
Regeneration within 1-2 months



Prolific shoot formation



Established shoot in culture



Each accession consists of 6 baby food jars with 3-4 explants per jar

*Begonia* accessions have been introduced into tissue culture as a backup to the clonal collection, and also as a means of reducing exposure of the plants to viruses. Although contamination can still be a challenge for initial explant establishment, we have been able to introduce 63 of 123 accessions (50%) in culture. Once the collections are routinely maintained, experiments will be initiated to reduce the growth rate of the plants to a minimum. The experience gained in working with *Begonia* should permit us to develop a similar in vitro backup for the *Pelargonium* collection.

**Work on priority genera: *Viola***



One of our major goals is to develop a better understanding of the pollination biology of *Viola* as a prelude to further studies of interspecific hybridization between the pansy/viola group and Asian/Australasian species with interesting foliage and prostrate growth habit. The ultimate goal is to develop germplasm that will permit breeders to manipulate foliage attributes and growth habit to develop new pansies.

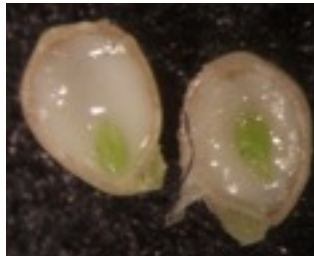


Explored hybridization between pansy/viola and other species, *V. altaica*, *V. tricolor* and *V. grypoceras*. As expected hybrids are easily obtained with other violas in the section *Melanium*, but there are positive indications of hybrids with more distant species. Work is in progress to control the production of open flowers in species that produce both open and closed flowers.

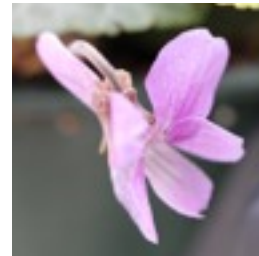
Altering foliage and growth habit of the pansy - interspecific hybridization: *Viola altaica*, *V. tricolor*, *V. hederacea*, *V. grypoceras*, *V. 'Heartthrob'*



Somatic embryogenesis in *Viola pedata*



Pansy embryos prior to culture



Control of chasmogamous flower production in *Viola grypoceras*.



Claudio Pasian

We have also collaborated with Prof. Claudio Pasian in the evaluation of environmental tolerance (mainly heat) of pansies, violas, and species within the OPGC collection.



Plants for the environmental tolerance study ready for transplant (above) and in late June, 2012 (below)

Evaluated field performance of 68 cultivars and OPGC accessions over the spring/summer to identify lines with good heat tolerance. Plants were evaluated for flower effect, flower quality, vegetative effect, and uniformity. The 4 overall best performers were

- *Viola Velocity Lavender with Yellow Eye* (Paul Ecke Ranch)
- *Pansy Plentifall Lavender Blue* (Ball Horticulture - PanAm Seed)
- *Pansy Rain Purple* (Ball Horticulture - PanAm Seed)
- *Viola Sorbet XP -Violet Beacon* (Ball Horticulture -PanAm Seed).

The experiment is being repeated in 2012 using a subset of the accessions and the top performers. Preliminary results suggests the top performers in 2011 are also the same ones in 2012.

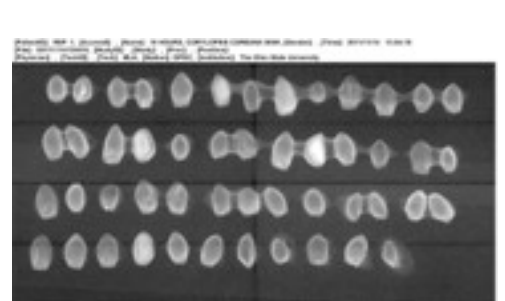


## Other Projects & Collaborators

Project	Collaborator
<p>Evaluation of <i>Pelargonium</i> collection for Quisqualic acid, a paralyzing agent for Japanese beetles. A collaborative assessment of the biological function of quisqualic acid in seeds and plants; provided plant material and evaluated seed response to q.a.</p>	Drs. Chris Ranger and Jonathan Frantz, USDA-ARS, Wooster & Toledo
<p>Ethylene sensitivity of <i>Phlox drummondii</i> seeds Provided seeds and advise on germination for characterization of OPGC priority genera response to ethylene</p>	Dr.. Michelle Jones, OARDC - OSU
<p>Development of molecular markers for <i>Phlox</i> (work is part of Peter Zale's thesis) Dr. Freudenstein's lab has provided guidance and facilities for assessment of microsatellite diversity in phlox.</p>	Dr. John Freudenstein, EEOB Museum of Biological Diversity
<p>Progenitors of the common Pansy: floral morphometric studies and molecular markers Use of Tomato Analyzer software to assess flower morphology and color in characterizing germplasm.</p>	Dan Robarts, PhD candidate, and Dr. Andy Wolfe, EEOB
<p>Seed X-ray studies with <i>Acer</i>, <i>Cornus</i>, <i>Tsuga</i> and other woody taxa OPGC has generated all the X-ray images in numerous batches of seeds generated by Dr. Roh.</p>	Dr. Mark S. Roh USDA, ARS, US National Arboretum Beltsville, MD 20705
<p>Taxonomic studies of <i>Rudbeckia fulgida</i> Dr. Campbell has donated plants and assisted in collections of Rudbeckia and Phlox; we have examined DNA content and chromosome numbers of selected Rudbeckia for a possible taxonomic revision of the group.</p>	Dr. Julian Campbell Bluegrass Woodland Restoration Center Lexington, KY
<p>Seed production for <i>Arabis patens</i>, one of the rarest plants in Ohio. Curator Susan Stieve collected the rare plant in its only habitat in Ohio and we have produced over 2000 seeds for growing plants that will be reintroduced into the habitat.</p>	Rhonda White City of Dublin, OH
<p>Seed processing, viability assessment and quality studies in <i>Taraxacum kok-tsayhyz</i>, a source of natural rubber</p>	Drs. Mark Bennett (Seed Biology Program) Katrina Cornish, Matt Kleinhenz, John Cardina (OARDC)



Dr. Julian Campbell in the lab

*Arabis patens* seed increaseX-rays of *Cornus* seeds

## Facilities Maintenance and Improvements

The outdoor fenced-in nursery area to the north of the OPGC greenhouses was renovated to facilitate its use. A polyhouse (50' x 20') was constructed with two large raised beds for culture of plants which may not be winter-hardy if left unprotected and/or require dry growing conditions and protection from rainfall. Twenty-nine raised beds (approximately 12' x 4') were built and filled with varying soil and media types for cultivation of plants with different moisture requirements; these beds will be used for seed production of plants which can't successfully produce seeds in greenhouse or field conditions, as well as other purposes. Additionally, two large raised beds (approximately 100' x 4') were built to display herbaceous ornamental plants, and seven 50' long irrigation lines were maintained for container culture.



Wet Lab



Culture Room



Trials Beds



OPGC Nursery & Exterior Growing Area  
The "Backyard"



Automated irrigation system for *Pelargonium*  
and *Begonia* clonal collections

## Personnel Changes (since July 2010 HOCGC meeting)



**Steven Haba** joined the OPGC as greenhouse manager in October, 2010

Steven earned a B.Sc. degree in Crop Science from The Ohio State University. He worked as a grower for Green Circle Growers, Oberlin OH for 2 years. He is responsible for all greenhouse operations, the nursery production systems, and distributions.

He has initiated a graduate program towards the M.Sc. degree focusing on *Begonia*

## Visiting Scholars

We've had a steady stream of short-term visiting scholars who contributed to various projects and to general operations of the OPGC



### **Flavio Oliveira**

Undergraduate scholar, Universidade Federal de Lavras, Brazil

January-June 2011

Examined seed dormancy in *Rudbeckia* and accelerated aging in *Phlox*.



### **Nancy Huarachi**

M.Sc. scholar, Earth University, Costa Rica

February-September 2011

Examined flower development and interspecific hybridization in *Viola*; evaluated heat tolerance among *Viola* accessions and cultivars.



### **Vanessa Neumann-Silva**

PhD scholar, ESALQ, Universidade de Sao Paulo, Brazil

March-August 2011

Collaboration with Prof. Mark Bennett of the Seed Biology Program at OSU; examined relationship between seed free space and germination/vigor in *Portulaca*



### **Guilherme Texeira**

Undergraduate scholar, Universidade Federal de Lavras, Brazil

August 2011- January 2012

Provided support for field operations and developed protocols for seed production, germination, and flower induction in *Viola grypoceras*



### **Joana Fernandes**

Undergraduate scholar, Universidade Federal de Lavras, Brazil

January- June 2012

Developed protocols for in vitro backup of the *Begonia* collection



### **Raquel Pires**

M.Sc. scholar, Universidade Federal de Visçosa, Brazil

February 2012

Examined germination protocols for *Osteospermum*

## Ohio State University Interns

In 2011 we had 3 OSU students pursue their required internships at the OPGC.

## Outreach Activities: Seminars, Workshops, Classes, Tours



Seminars and Mini-Symposium on Seeds  
3,4 March 2011

Drs. Carol & Jerry Baskin from the University of Kentucky led a series of lectures on seed dormancy and participated in the first Mini-Symposium about seed research at The Ohio State University



Seed Science of Ornamental Plants  
16,17 February 2012

Dr. Francis Kwong from Pan American Seed participated in a graduate Seed Biology Journal Club, presented a lecture in the Seed Science class and held a discussion with graduate students about seed work in the industry.



### OPGC Tours:

20 tours were conducted in 2011 to groups ranging from the general public, Master Gardeners, industry professionals, and various students taking courses on The Science of Growing Plants; Seed Science; Entomology; Agricultural Engineering; Natural Resources; Landscape Horticulture; Floriculture Production.

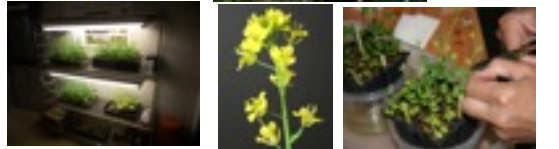


### Participation in the OFA Trade Show and Short Course

The OPGC staffs a booth at the annual OFA Trade Show; P. Jourdan gave a presentation about current activities at the OPGC during the 2011 Short Course. The OPGC was included in the Annuals Trials Open House held during the OFA



The OPGC provided propagation materials and advise to a new student club, H&CS Student Growers, who focused on learning how to grow begonias (from seeds and cuttings). The plants were grown in the Horticulture greenhouses and sold during the Chadwick Arboretum Plant Sale and Garden Fair. The organization raised \$3000 from the sale of plants.



The OPGC provided growing facilities and support for a workshop for teachers on using Fast Plants® for science education in Agricultural Schools. June 2011 and 2012.

## Outreach Activities: Trade Publications



Phlox 101: Perspectives on an underutilized genus of native plants  
Peter Zale & Pablo Jourdan  
The Buckeye - October 2011



Begonias at the Ornamental Plant Germplasm Center  
Steven Haba & Pablo Jourdan  
The Begonian - March/April 2012



Beautiful, Beguiling, Bodacious Begonias  
Pablo Jourdan  
OFA Bulletin Nr. 933 - May/June 2012



Work on the potentially threatened species *Lilium iridollae* at the Ornamental Plant Germplasm Center  
Peter Zale & Pablo Jourdan  
QB- Quarterly Bulletin of the North American Lily Society - Vol 66 (2) June, 2012