

Ornamental Plant Germplasm Center

2005 *Annual Report*

The goal of the OPGC is to conserve, assess and distribute herbaceous ornamental plant germplasm and to develop new techniques for conserving seed and clonally propagated germplasm.




**Ornamental Plant
Germplasm Center**
670 Vernon Tharp Street

**T · H · E
OHIO
STATE
UNIVERSITY**
OARDC

USDA

Ornamental Plant Germplasm Center

Permanent Staff

Steve Slack, Ph.D., Principal Investigator
David Tay, Ph.D., Co-Principal Investigator
Jennifer Ehrenberger, M.S., Clonal Crop Curator
Susan Stieve, M.S., Seed Crop Curator
Eric Renze, B.S., Seed Crop Research Assistant
Art Wells, B.S., Clonal Crop Research Assistant
Russell Eckley, Research Aide

USDA-National Plant Germplasm System (NPGS) Contact Person

Mark Widrechner, Ph.D., Authorized Departmental Officer's Designated Representative

Graduate Students

Samuel Contreras, Department of Horticulture and Crop Science, The Ohio State University
Ling Guo, Shandong Agricultural University, Shandong, China
Xiaolei Hu, Department of Horticulture and Crop Science, The Ohio State University
Ka Yeon Jeong, Department of Horticulture and Crop Science, The Ohio State University
Jing Luo, Department of Horticulture and Crop Science, The Ohio State University
Alice Mweetwa, Department of Horticulture, Virginia Polytechnic Institute and State University
Rose Palumbo, Department of Plant Pathology, The Ohio State University
Roel Rabara, Department of Horticulture and Crop Science, The Ohio State University
Susan Stieve, Department of Horticulture and Crop Science, The Ohio State University

Undergraduate Students

Nicolas Bellizzi, Department of Evolution, Ecology, and Organismal Biology, The Ohio State University
Pedro Henrique Santin Brancalion, Escola Superior de Agricultura 'Luiz de Queiroz,' University of São Paulo, Piracicaba, Brazil
Lizzy Chirlin, Honors Student, Department of Horticulture and Crop Science, The Ohio State University
Rafael R. Otoni, Department of Agriculture, University Federal of Lavras, Lavras, MG, Brazil

Student Workers

Danny Beane	Christine Leyland
Brad Carr	Michael Sartor
Timothy Copeland III	Sidney Seavers
Jillian Ervin	Paul Schnapp
Tim Fleischer	Brian Shininger
Jacob Fugate	Amanda Stricker
Liberty Gibson	Brian Thomason
Nick Graves	Angela Thompson
Fred Higginbotham III	Joseph Tychonievich
Teresa Jaskowiak	

High School Student Interns

Nathan Addis, The Graham School, Columbus, Ohio
Mohamed Ahmed, Columbus Alternative High School, Columbus, Ohio
Jamie Brew, Columbus Alternative High School, Columbus, Ohio
Justin Curtis, The Graham School, Columbus, Ohio
Bill Fankhauser, The Graham School, Columbus, Ohio
Andika Gunadi, Columbus Alternative High School, Columbus, Ohio
Kunjai Patel, Columbus Alternative High School, Columbus, Ohio

Volunteers

Jackie DeVine
Nancy Gosztyla
Rick Kisker
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A Message from the Director

Preparing for the Next Phase

The Ornamental Plant Germplasm Center (OPGC) has made significant progress in its first four years of operation. In 2005, we had the opportunity to get into some of the routine germplasm acquisition, conservation, and distribution activities.

The collection of Ohio native herbaceous ornamental germplasm with Ohio Department of Natural Resources Botanist Rick Gardner has provided us with experience in germplasm collection in the wild during the past two years. We have developed a protocol and a set of related documentation and forms; this effort is described later in this report.

Seed regeneration and seed cleaning continue to consume most of our resources. We have learned how to handle many species, but new species continue to present us with new challenges.

The concept of using outside volunteer expertise in the form of the Crop Specific Technical Working Groups, launched at the 2003 American Society for Horticultural Science (ASHS) National Floriculture Forum, has proved to be very useful. We continue to create new groups to cover all the priority genera. I would like to invite people with technical knowledge of our priority genera to volunteer.

Germplasm documentation in the USDA Germplasm Resource Information Network (GRIN) databases continues to make progress, especially for germplasm distribution use. As a result, our distribution increased significantly this year, from 189 samples in 2004 to 891 samples.

We have developed a monitoring and maintenance program for all of our facilities and equipment. This overall progress has allowed us to begin writing an operations manual for the Center. We hope to be able to complete the first draft in 2006.

In addition to our USDA service-orientated mandate, we made remarkable progress in public awareness about the Center and the importance of germplasm conservation. More than 12 stories about the Center appeared in newspapers and popular magazines. Our research network continues to grow, and in this report, some 12 research projects are described.

With this development, it is important to continue looking forward and planning ahead so that we will not fall into a state of complacency. It is time for review and strategic planning, and we



are working with USDA, the floriculture industry, and botanical gardens to examine and plan for the future. I will keep you informed about this.

Finally, I would like to thank all our donors, cooperators, students, and volunteers for their continuing support.

David Tay, Ph.D.
Director
February 6, 2006

Major Accomplishments

The Ornamental Plant Germplasm Center (OPGC) is the first specialized flower genebank in the world, working to conserve and nurture the world's wealth of herbaceous ornamental plant diversity. The Center's major accomplishments during 2005 are listed here.

- The Center continued to provide training and work opportunities for nine graduate students (six Ph.D. and three M.S.); four undergraduate students; 19 OSU undergraduate student helpers, which included 18 Federal Work-Study students; seven high school student interns; and seven volunteers.
- OPGC staff began writing and distributing the *OPGC Newsletter* to inform others about OPGC current events. Issues were distributed by e-mail in January, July, October, and December to interested people, and a newsletter sign-up page was added to the OPGC web site to encourage others to sign up to receive the newsletter.
- The Center developed an off-site computer backup system for files stored on the OPGC shared server. Brian Mowery (Horticulture and Crop Science Computer Specialist) alternately takes one of three LaCie portable backup hard drives off-campus for storage each evening. Additionally, files commonly accessed and modified by many staff members will be re-named with the day's date after any changes are made; this will ensure that both old and new computer files will be backed up as needed.
- OPGC staff members Russell Eckley, Jennifer Ehrenberger, Susan Stieve, and Art Wells attended the first-ever National Plant Germplasm System (NPGS) Curator Workshop December 5-6 in Chicago, Ill. Susan Stieve was on the workshop organizing committee, chaired the regeneration session, and gave a presentation titled *Cross-Pollination of Herbaceous Ornamentals*. Upon returning to the OPGC, staff members wrote a summary of what they learned at the workshop, including how to apply knowledge gained at the workshop to their work at the OPGC.
- OPGC personnel continued collecting germplasm of Ohio native species from Ohio nature preserves and The Nature Conservancy property with Rick Gardner, Botanist, Division of Natural Areas and Preserves, Ohio Department of Natural Resources. Some 185 accessions of Ohio native species from 20 sites in Ohio were collected.
- OPGC staff worked with Gary Sherwin, President of the American Violet Society, to collect 52 *Viola* accessions from the Dunbar Hills region of Pennsylvania on May 19.
- The Center germinated more-than-40-year-old *Petunia* seeds and regenerated new seed lots for long-term storage.
- OPGC obtained the donation of capillary matting from Justin Marotta, Possum Run Greenhouse, and tested the automated irrigation system on the *Pelargonium* greenhouse collection. We will continue to experiment with automated irrigation techniques in coming years to reduce labor.
- Staff developed a *Collecting Frequently Asked Questions* (FAQs) handout for distribution to germplasm collectors and updated the *OPGC Germplasm Collection* form. Samples of a completed collection form, a blank collection form, and the FAQs handout were posted on the OPGC web site for easy access by collectors.
- Permission to Collect and Germplasm Donation forms were developed for use at the OPGC and approved by National Plant Germplasm System (NPGS) Representatives Karen Williams and Mark Widrlechner.
- Center personnel developed OPGC accession inactivation guidelines and forms; these will be used to inactivate accessions when we will no longer maintain them at the OPGC. Inactivation may be the result of duplicate accessions, Technical Working Group decisions, inviability, etc.
- Staff members began work on an OPGC Operations Manual, which will be completed in 2006.
- Three OPGC staff members — Eric Renze, Susan Stieve, and Art Wells — maintained their Ohio Pesticide Applicator Licenses and received OSU pesticide physical examinations (April 2005).
- The Center passed the Facility Safety Inspection by Tim Butcher, OSHA Program Coordinator for Ohio State University's College of Food, Agricultural, and Environmental Sciences (CFAES), on January 13.
- The Center passed OSU's inspection of the Faxitron X-Ray System on March 7 and September 1.
- The OPGC Seed and Tissue Culture Laboratories passed the OSU Research Laboratory Inspection, August 22.
- Scales in the OPGC Seed and Tissue Culture Laboratories were calibrated and certified by Mettler-Toledo, November 11.
- An air filtration unit with a HEPA filter was purchased and installed in the OPGC Tissue Culture Laboratory, July 27.
- OPGC personnel established a recycling program for office paper, aluminum cans, and plastics, April 19.
- The Center completed the OSU Ergonomic Assessment to comply with the university's standards, August 18.

Germplasm Collections

Acquisition

During 2005, 431 new accessions of herbaceous ornamentals were received. OPGC staff collected 185 accessions of Ohio native species from 20 sites in Ohio in cooperation with Rick Gardner, Botanist, Ohio Division of Natural Areas and Preserves. Susan Stieve and Eric Renze traveled to the Dunbar Hills region of southwestern Pennsylvania to collect 52 accessions of *Viola* with Gary Sherwin, President of the American Violet Society. Twenty-six accessions were collected from the Marion County Historical Society's Greencamp Railroad Prairie in cooperation with Kensel Clutter, Sandusky Plains prairie expert and Ohio Prairie Association member.

The OPGC is also serving as the point of entry for herbaceous ornamental plant releases from the USDA's Natural Resources Conservation Service (NRCS) into the National Plant Germplasm System (NPGS) for conservation (18 accessions). OPGC curators continued to work with National Center for Genetic Resources Preservation (NCGRP) staff to transfer appropriate genera and expired Plant Variety Protection (PVP) accessions to the OPGC; 570 accessions of *Oenothera* in a safety backup collection (NSSB) were identified and will be transferred from NCGRP to the OPGC in 2006. The Palmer, Alaska, genebank transferred three accessions to the OPGC.

Bill Claybaugh, member of the American Begonia Society, continued to identify and send *Begonia* species to the OPGC for long-term conservation; 10 species were received in 2005. Jennifer Ehrenberger visited the Lyon Arboretum and the University of Hawaii at Manoa in June 2005 to collect a total of 53 priority genera accessions. Mount Cuba Center donated 42 accessions.

Additional germplasm was donated by Bartram's Garden, Nancy Wygant (1), Don Beam (2), the Chicago Botanic Garden (1), Ken Brunswick, Friends of Limberlost (1), Columbus Area MetroParks, Gordon Mitchell (2), Paul Cover (2), Russell Eckley (1), Rick Gardner (2), J F New Native Plant Nursery (8), Dr. Robert Klips (2), Debra Knapke (1), Select Seeds (14), Jim Stieve (2), and Mike and Nancy Valentine (1)

Susan Stieve developed a *Collecting Frequently Asked Questions* (FAQs) handout for distribution to germplasm collectors and updated the *OPGC Germplasm Collection* form. Samples of a completed collection form, a blank collection form, and the FAQs handout were posted on the OPGC web site for easy access by collectors. *Permission to Collect* and *Germplasm Donation* forms were also developed for use at the OPGC and approved by NPGS Representatives Karen Williams and Mark Widrechner.



The germplasm collection maintained at the OPGC is as follows:

Priority Genus	2003	2004	2005	Total
Alstroemeria	1	1	-	2
Anthurium	-	-	13	13
Aquilegia	8	25	7	40
Aster	8	54	5	67
Baptisia	3	10	8	21
Begonia	136	29	15	178*
Campanula	35	24	3	62
Chrysanthemum	12	3	1	13*
Dianthus	110	19	-	129
Dieffenbachia	-	-	1	1
Euphorbia	2	2	3	7
Geranium	9	5	3	17
Hemerocallis	20	1	-	21
Impatiens	50	4	4	58
Iris	44	22	5	71
Lilium	54	6	2	62
Narcissus	12	1	-	13
Pelargonium	372	513	-	770*
Petunia	4	4	5	13
Philodendron	-	-	25	25
Phlox	2	1	1	4
Rudbeckia	13	60	11	84
Spathiphyllum	-	-	5	5
Tagetes	123	1	-	124
Verbena	19	10	1	30
Veronica	4	-	-	4
Viola	18	13	111	142
Priority Genera	1,059	808	229	1976
Other Genera	797	121	202	1120
Total	1,856	929	431	3,096*

* 2 accessions of *Begonia*, 3 accessions of *Chrysanthemum* and 115 accessions of *Pelargonium* were inactivated (see section on Inactivation below for details).

Maintenance

Accessions available for distribution: 1,168/3,442 (34%).

Work on the first OPGC Operations Manual began in 2005 and will continue during 2006. Our goal is to document all major activities at the OPGC, including seed and vegetative regeneration activities.

In conjunction with the manual, OPGC accession inactivation guidelines and forms were developed and will be used to inactivate accessions when we will no longer maintain them at the OPGC. Inactivation could result from finding duplicate accessions, be a Technical Working Group decision, be due to accession inviability, or be prompted by other reasons. Additionally, curators worked to verify that proper collection or donation permits were on file for germplasm in the collection.

The Center also worked on adding genus experts to the priority genera Technical Working Groups. A listing of current members can be found on the OPGC website at: <http://www.opgc.osu.edu/section.php?id=2#list>.

Susan Stieve submitted a report on the status of *Asclepias*, *Oenothera*, and *Stokesia* collections to the New Crops Crop Germplasm Committee in October.

Jennifer Ehrenberger contacted Metter Toledo to calibrate and certify the scales for the OPGC Seed and Tissue Culture Laboratories.

An air filtration unit with a HEPA filter was installed to reduce air contaminants in the OPGC Tissue Culture Laboratory.

The Clonal Crop Curatorial Team and volunteers continue to establish clonal materials in the OPGC's *in vitro* collection. In 2005, 379 *Pelargonium* accessions were attempted in tissue culture; 236 are successfully growing *in vitro* (62%). There are 770 *Pelargonium* accessions total in our collection. Also in 2005, four *Chrysanthemum* and five *Anthurium* accessions (acquired from University of Hawaii) were added to the *in vitro* collection.

Distribution

In 2005, the OPGC shipped 71 orders containing germplasm from 40 genera; a total of 891 accessions were distributed as shown in the following table.

Genus	No. of Accessions Shipped
<i>Antirrhinum</i>	54
<i>Aquilegia</i>	2
<i>Asclepias</i>	3
<i>Aster</i>	2
<i>Begonia</i>	71
<i>Campanula</i>	3
<i>Chrysanthemum</i>	2
<i>Clematis</i>	1
<i>Cleome</i>	24
<i>Consolida</i>	1
<i>Coreopsis</i>	26
<i>Cosmos</i>	1
<i>Delphinium</i>	2
<i>Dianthus</i>	60
<i>Gypsophila</i>	14
<i>Iris</i>	18
<i>Leonotis</i>	1
<i>Leucanthemum</i>	27
<i>Liatris</i>	3
<i>Lilium</i>	3
<i>Myosotis</i>	1
<i>Oenothera</i>	32

Distribution Table (continued)

Genus	No. of Accessions Shipped
<i>Osteospermum</i>	10
<i>Passiflora</i>	26
<i>Pavonia</i>	1
<i>Pelargonium</i>	362
<i>Penstemon</i>	8
<i>Petrorhagia</i>	1
<i>Petunia</i>	9
<i>Portulaca</i>	12
<i>Rudbeckia</i>	29
<i>Silene</i>	2
<i>Stokesia</i>	3
<i>Tagetes</i>	26
<i>Talinum</i>	1
<i>Turnera</i>	2
<i>Verbena</i>	8
<i>Veronica</i>	2
<i>Viola</i>	4
<i>Zinnia</i>	34
Total	891

Distributions continued to increase from previous years; in 2004, 18 orders containing accessions from 18 genera were shipped. This increased distribution is most likely due to both the increased awareness of the germplasm conservation work being done at the OPGC and OPGC staff having a better understanding of GRIN (Germplasm Resource Information Network) so as to process requests in a timely manner.

In future years it is anticipated that distributions will continue to increase as the OPGC becomes more widely known in the germplasm user community.

Long-term Storage Backup

Backed up at NCGRP: 717/3,431 (21%).

Additionally, 108 accessions that have been successfully regenerated (see the section on *Regeneration*) will be sent to the National Center for Genetic Resources Preservation (NCGRP) once inventory lots have been entered into GRIN. This will raise backup to 24%.

Regeneration

To date a total of 108 accessions have been successfully regenerated as follows:

- 2002 — 4 accessions
- 2003 — 18 accessions
- 2004 — 25 accessions
- 2005 — 41 accessions

The 2005 regeneration numbers are based on seed harvested through December 2004, which were cleaned and germination tested through spring 2005. Seed was harvested from 87 accessions in field cages and 63 accessions in the greenhouse. OPGC staff successfully used the NCGRP screening program on GRIN for the first time to determine NCGRP inventory backup needs.

Viability Testing

Germination tests performed: 150/2,639 accessions held as seed (6%).

Tests included germination for seed production as well as initial germination tests performed post-harvest, before storage.

Inactivation

Accessions inactivated: 158/3,442 (4%)

In 2005, a germplasm inactivation procedure with accompanying forms was established. Jennifer Ehrenberger and Richard Craig (Chair of the Pelargonium Technical Working Group) evaluated the *Pelargonium* collection and inactivated 115 accessions that had genetic duplicates and plant patents.

The *Salvia* collection of 38 accessions was transferred to Barbara Hellier at the Western Regional Plant Introduction Station, Pullman, Washington. The Chrysanthemum Technical Working Group agreed to eliminate three accessions that did not appear to have any unique merits that would warrant keeping them. Jennifer went through the *Begonia* collection and eliminated two accessions that had plant patents.

Research and Teaching Activities

Projects

- *Development of an Efficient Molecular Marker System for Germplasm Classification and Evaluation of Herbaceous Ornamental Plant Species Focusing on Pelargonium Species* — USDA-Agricultural Research Service (ARS) Wooster in collaboration with Guo-liang Wang, Ohio State University Department of Plant Pathology, and Charles Krause, USDA-ARS Wooster (David Tay).
- *Plant Exploration in Upper Mesopotamia, Turkey, to Collect Campanula, Dianthus, Euphorbia, Geranium, Iris, Narcissus, Salvia, Verbena, Veronica, and Viola* — USDA-ARS Plant Exploration Program funded in 2005 and to be extended to 2006 in collaboration with Harran University, Sanluifa, Turkey (David Tay).
- *Characterization of Pelargonium Using DNA Markers* — NPGS funded in 2005 in collaboration with Guo-liang Wang, Ohio State University Department of Plant Pathology (David Tay).
- *Long-Term Storage of Orchid Seed for Germplasm Conservation* — Mid-America Orchid Congress and Virginia Polytechnic and State University, funded for a Ph.D. student in collaboration with Gregory Welbaum (David Tay).
- *Novel Pharmaceutical and Crop Protection Chemicals from Plants* — Consortium for Plant Biotechnology Research

(CPBR), Ohio Plant Biotechnology Consortium (OPBC), and Dow AgroSciences in collaboration with Terrence Graham, Ohio State University Department of Plant Pathology; Robert Brueggemeier and Douglas Kinghorn, OSU College of Pharmacy; and Linda Watson, Miami University, Oxford, Ohio (David Tay).

- *Community-Based Floriculture Industry Development Project (CFIDP)* — Food for Progress Act of 1985 Agreement (No. 52b5/MINPLAPDAT/SG/DCET/AA/AA2 of February 18, 2005) in Cameroon under implementation by Limbe Botanical Garden and back-stopped by the OPGC (David Tay).
- *Conservation and Use of Germplasm of Kyrgyzstan's Wild Flora* — International Science and Technology Center, Russia, under implementation by the Institute of Biotechnology of the Kyrgyz Republic National Academy of Science and back-stopped by the OPGC (David Tay).
- Active partner in Miller McDonald's Cooperative State Research, Education, and Extension Service (CSREES) Higher Education Challenge Grant on distance education in seed science and technology teaching and learning (David Tay).
- Active partner in Miller McDonald's International Science and Education Competitive Grants Program on distance education in seed science and technology teaching and learning (David Tay).
- Active partner in Miller McDonald's American Distance Education Consortium Grant on distance education in seed science and technology teaching and learning (David Tay).
- Active partner in Miller McDonald's USDA Foreign Agricultural Service grant on distance education in seed science and technology teaching and learning (David Tay).

Research

- Brancalion, Pedro Henrique Santin. Undergraduate student, Escola Superior de Agricultura 'Luiz de Queiroz,' University of São Paulo, Piracicaba, Brazil. Studied seed priming and drying regimes of four native Brazilian species. (Advisor — David Tay).
- Bellizzi, Nicolas. Undergraduate student, Department of Ecology, Evolution, and Organismal Biology (EEOB), The Ohio State University. Optimizing DNA extraction technique for *Begonia* species. (EEOB 693, Advisor — David Tay).
- Chirlin, Lizzy. Undergraduate Honors student, Department of Horticulture and Crop Science, The Ohio State University. Conducting a two-year student research project to determine if there is a species of *Dianthus* that is suitable for use as an ornamental substitute for grasses that grow between pavers. (HCS 593, Advisor — David Tay).
- Contreras, Samuel. Fulbright Scholar from Chile and Ph.D. student in the Department of Horticulture and Crop Science,

The Ohio State University. Researching how environmental factors during seed development affect seed germination in species from the Asteraceae family. (Advisors — Mark Bennett, David Tay).

- Guo, Ling. Ph.D. student, Shandong Agricultural University, Shandong, China. Utilizing Target Region Amplified Polymorphism (TRAP) reactions to develop a phylogeny of *Malus* species. (Advisors — Guo-Liang Wang, David Tay).
- Hu, Xiaolei. M.S. student, Department of Horticulture and Crop Science, The Ohio State University. Researching computerized seed vigor testing methodology on ornamental species. (Advisors — Miller McDonald, David Tay).
- Jeong, Ka Yeon. M.S. student, Department of Horticulture and Crop Science, The Ohio State University. Evaluating the effects of pH, EC, and shading levels on growth of several OPGC Begonia accessions. (Advisors — Claudio Pasian, David Tay).
- Luo, Jing. Ph.D. student, Department of Horticulture and Crop Science, The Ohio State University. Researching the biological traits that make a plant species become weedy utilizing *Taraxacum* and other species. (Advisors — John Cardina, David Tay).
- Mweetwa, Alice. Ph.D. student, Department of Horticultural Sciences, Virginia Polytechnic and State University, Blacksburg, Va. Creating a protocol for the long-term storage of *Phalaenopsis* orchid seeds. (Advisors — Gregory Welbaum, David Tay).
- Otani, Rafael Ribas. Undergraduate student, Department of Agriculture, University Federal of Lavras, Lavras, MG, Brazil. Using X-ray technology to study seed quality and vigor. (Advisors — David Tay, Miller McDonald).
- Palumbo, Rose. Ph.D. student, Department of Plant Pathology, The Ohio State University. Utilizing Target Region Amplified Polymorphism (TRAP) reactions to develop a phylogeny of *Pelargonium* accessions maintained at the OPGC. (Advisors — Guo-Liang Wang, David Tay).
- Rabara, Roel. Fulbright Scholar from the Philippines and M.S. Student, Department of Horticulture and Crop Science, The Ohio State University. Determining moisture isotherms, desiccation tolerance in seeds, and storability of ultra-dried seeds utilizing *Aster*, *Tagetes*, *Lupinus*, and other species. (Advisors — Miller McDonald, David Tay).
- Stieve, Susan. Ph.D. Student, Department of Horticulture and Crop Science, The Ohio State University. Developing descriptors for evaluation of *Viola* accessions and researching seed production and dormancy of native and commercial species of *Viola*. (Advisors — Miller McDonald, David Tay).
- Stieve, Susan and Tay, David. Researching *Asarum* germination to assist Chuck Powell and Gilson Gardens, an Ohio commercial greenhouse.
- Stieve, Susan and Tay, David. Using X-ray technology to further clean and improve seed production lots.

Proposals Submitted in 2002-2005

- Plant Exploration in Costa Rica for Indigenous Germplasm of Begonia Species and Genera of the Verbenaceae Family — submitted to the USDA-ARS Plant Exploration Program in collaboration with Centro Agronómica Tropical de Investigación y Enseñanza (CATIE) (David Tay).
- Plant Exploration in the Southwest and South Provinces of Cameroon to Collect *Impatiens* and *Begonia* Species — submitted to the USDA-ARS Plant Exploration Program in collaboration with Limbe Botanical Garden, Limbe, Cameroon (David Tay).
- Investigation of Noni (*Morinda citrifolia*) on Liver Function — submitted to the National Institutes of Health (NIH) in collaboration with the Ohio State University College of Pharmacy (David Tay).
- An Automated System for Seed Germination, X-Ray, and Purity Analysis — submitted for the Ohio Agricultural Research and Development Center (OARDC) Interdisciplinary Team Research Competition in collaboration with Miller McDonald, Department of Horticulture and Crop Science, The Ohio State University, and Kikuo Fujimura, Department of Computer Science and Engineering, The Ohio State University (David Tay).
- The D. C. Kiplinger Chair in Floriculture — Gregory Welbaum — submitted to the Ohio State University College of Food, Agricultural, and Environmental Sciences (CFAES) Kiplinger Chair Committee in collaboration with Jim Chatfield, Michelle Jones, and Miller McDonald, Department of Horticulture and Crop Science, The Ohio State University (David Tay).
- Detection of Genetic Variation in the Genus *Pelargonium* by Target Region Amplification Polymorphism (TRAP) Marker — submitted for an OARDC Seed Grant in collaboration with Guo-liang Wang, Department of Plant Pathology, The Ohio State University; Charles Krause, USDA-ARS Wooster, Ohio; and Jinguo Hu, USDA-ARS North Dakota (David Tay) — Not awarded.
- Chicago Botanic Garden Plant Collection Expedition to the Changhai Mountains in the Jilin and Liaoning Provinces, People's Republic of China — submitted to the USDA-ARS Plant Exploration Program in collaboration with the Chicago Botanic Garden (David Tay) — Not awarded.
- Management of Cancer with Botanical Dietary Supplements — submitted to the National Institutes of Health (NIH) in collaboration with the Ohio State University College of Pharmacy, OSU School of Public Health, OSU College of Medicine, OSU College of Veterinary Medicine, and OSU Department of Plant Pathology (David Tay) — Not awarded.

- *Antikinetoplastid Compounds from Plants* — submitted to the National Institutes of Health (NIH) in collaboration with the Ohio State University College of Pharmacy (David Tay) — Not awarded.
- Long-term Storage of Orchid Seed for Germplasm Conservation — submitted to the American Orchid Society in collaboration with Gregory Welbaum, Department of Horticulture, Virginia Polytechnic Institute and State University, Blacksburg, Va. (David Tay) — Not awarded.
- Evaluation of Response of Begonia Species to Substrate Properties and Light Levels — submitted to NPGS in collaboration with Claudio Pasian, Department of Horticulture and Crop Science, The Ohio State University (David Tay) — Not awarded.
- The Response of Begonia Species to Light Levels and Substrate Properties — submitted to Gloeckner Foundation in collaboration with Claudio Pasian, Department of Horticulture and Crop Science, The Ohio State University (David Tay) — Not awarded.
- An Automated System for Seed Measurement and Purity Analysis — submitted for the OARDC Interdisciplinary Team Research Competition in collaboration with Miller McDonald and Mark Bennett, Department of Horticulture and Crop Science, The Ohio State University, and Kikuo Fujimura, Department of Computer Science and Engineering, The Ohio State University (David Tay) — Not Awarded.
- Assessment of Trait Diversity in Impatiens for Horticultural, Ecological, and Evolutionary Investigations — submitted to the Ohio Plant Biotechnology Consortium (OPBC) in collaboration with the University of Dayton and the University of Cincinnati (David Tay) — Not awarded.
- Computer Imaging to Improve Flower Seed Quality and Performance Properties — submitted to Gloeckner Foundation in collaboration with Miller McDonald, Department of Horticulture and Crop Science, The Ohio State University, and Kikuo Fujimura, Department of Computer Science and Engineering, The Ohio State University (David Tay) — Not awarded.
- Computer Imaging to Improve Flower Seed Quality and Performance Properties — submitted to the American Floral Endowment in collaboration with Miller McDonald, Department of Horticulture and Crop Science, The Ohio State University, and Kikuo Fujimura, Department of Computer Science and Engineering, The Ohio State University (David Tay) — Not awarded.
- Taught HCS 693 — Jennifer Ehrenberger, OPGC staff, Winter Quarter (Advisor — David Tay).
- Lectured to Seed Production Course (HCS 630), Wildflower Seed Production, March 2 (Susan Stieve).
- Lectured to Ron Hammond's Entomology 664 class, May 17 (Susan Stieve).
- Lectured to Local Flora Course — Evolution, Ecology, and Organismal Biology (EEOB 210), NPGS and OPGC, August 22 (David Tay).
- Organized and taught the International Seed Production Course (HCS 830 — 10 weeks), first internet-based course using the Polycom system in cooperation with Escola Superior de Agricultura 'Luiz de Queiroz,' University of São Paulo, Brazil, and Pontifical Catholic University of Chile, Santiago, Chile, September 30 – December 2 (David Tay).
- Taught HCS 593 — Russell Eckley, Senior, School of Environment and Natural Resources, The Ohio State University, Summer Quarter (David Tay).
- Taught EEOB 693 — Nicolas Bellizzi, Junior, Department of Evolution, Ecology, and Organismal Biology, The Ohio State University, Autumn Quarter (David Tay).
- Lectured to Seed Science Course (HCS 420), Importance of Native Plants, October 7 (Susan Stieve).
- Lectured to Seed Science Course (HCS 420), NPGS, OPGC, Seed production and cleaning, October 24 (David Tay).
- Samuel Contreras, Ph.D. candidacy examination, December 2 (David Tay).

Teaching

- Taught Horticulture and Crop Science (HCS) 593 and HCS 683 — Lizzy Chirlin, Horticulture and Crop Science Undergraduate Honors student, Winter Quarter, Spring Quarter, and Autumn Quarter (Advisor — David Tay).

Communication Activities

Presentations and Abstracts

- Tay, D. NPGS and OPGC. Wilderness Center Botanizers talk series, March 6.
- Tay, D. 2005. Seed Threshing and Cleaning in Flowers. *HortScience* 40:1023.
- Tay, D., and X. L. Hu. 2005. Effect of Seed Radiography on Seed Quality. *HortScience* 40:1022.
- Tay, D., J. Tychonievich, and S. Burns. 2005. Application of X-Ray in Flower Seed Technology. *HortScience* 40:1022.
- Contreras, S., D. Tay, and M. Bennett 2005. Light and Temperature Interactions in Promoting Lettuce Seed Germination. *HortScience* 40:1021.
- Jeong, K. Y., C. Pasian, and D. Tay. 2005. Response of Six Begonia Species to Different Substrate pH. *HortScience* 40:1085.

- Jeong, K. Y., C. Pasian, and D. Tay. 2005. Response of Six Begonia Species to Different Substrate EC. *HortScience* 40:1085.
- Palumbo, R., W. F. Hong, J. G. Hu, C. Krause, D. Tay, G. L. Wang. 2005. TRAP Markers Help Categorize a *Pelargonium* Collection. *HortScience* 40:1067.
- Tay, D. 2005. Seed Science and Technology in Plant Germplasm Conservation. Workshop Abstracts, 8th International Workshop on Seeds — Germinating New Ideas. May 8-13, 2005, Queensland, Australia.
- Tay, D. and X. L. Hu. 2005. Effect of X-Ray on Seed Germination. Workshop Abstracts, 8th International Workshop on Seeds — Germinating New Ideas. May 8-13, 2005, Queensland, Australia.
- Contreras, S., M. Bennett, and D. Tay. 2005. Effects of water availability during seed development in lettuce. Workshop Abstracts, 8th International Workshop on Seeds — Germinating New Ideas. May 8-13, 2005, Queensland, Australia.
- Tay, D. 2005. Ornamental plant collections in the U.S. National Plant Germplasm System. 2005 American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America (ASA-CSSA-SSSA) International Annual Meetings, November 5-11, Salt Lake City, Utah.

Publications

- Tay, D. 2005. Ornamental plant genetic resources conservation and utilization in CBD era. *Acta Hort.* (ISHS) 683:233-242.
- Park, Y. G., G. S. Kwon, and D. Tay. 2005. Cryopreservation for gene conservation of *Acer mono Max*. *Propagation of Ornamental Plants* 5:78-83.

Book Chapters

- Tay, D. (In publication). New Crop Development: Collection, Germplasm Preservation, and Utilization. In: *Flower Breeding and Genetics: Issues, Challenges, and Opportunities for the 21st Century*. Kluwer Academic Publishers.
- Tay, D. (In printing). *Hartmann's Plant Science*. (Revision of Chapter 3 and 4 into 8.) Prentice Hall, New Jersey.
- Tay, D. (In publication). Seed Technology in Plant Germplasm Conservation. In: *Seed Science and Technology: Trends and Advances*. Haworth Press.
- Tay, D. (In publication). Vegetable Hybrid Seed Production in the World. In: *Seed Science and Technology: Trends and Advances*. Haworth Press.

Manuscript and Proposal Review

- Journal of Food, Agriculture, and Environment (JFAE), WFL Publisher (David Tay — Editorial Board).
- Journal of New Seeds, Food Products Press (David Tay — Editorial Board).
- HortScience — Reviewed two papers (David Tay).
- Native Plants Journal — Reviewed one paper (David Tay).
- U.S. Civilian Research and Development Foundation — Reviewed one proposal (David Tay).
- Minnesota Agricultural Experiment Station — Reviewed one proposal (David Tay).
- Gene Bank Establishment of the Genetic Resources of Azerbaijan — reviewed for the U.S. Civilian Research and Development Foundation (David Tay).

Conferences/Meetings

- Ohio State University Nursery Seminar and Central Environment Nursery Trade Show, January 24-26 (Jennifer Ehrenberger, Russell Eckley, Eric Renze, Susan Stieve (moderator), David Tay).
- 5th Annual Ohio Botanical Symposium, April 1 (Russell Eckley, Jennifer Ehrenberger, Eric Renze, Susan Stieve, Art Wells).
- Cincinnati Flower Show, April 20 (Susan Stieve and Jennifer Ehrenberger).
- 8th International Workshop on Seeds, International Society of Seed Science, Brisbane, Australia, May 8-13 (David Tay).
- National Plant Germplasm System (NPGS) In Situ Subcommittee meeting and field trip, Washington, June 7 (David Tay).
- National Plant Germplasm System (NPGS), Plant Germplasm Operations Committee (PGOC) meeting, Western Regional Plant Introduction Station, Pullman, Washington, June 8-9 (Jennifer Ehrenberger, Susan Stieve, David Tay).
- American Association of Botanical Gardens and Arboreta Annual Conference, Chicago, June 27-30 (David Tay).
- Ohio Florists Association (OFA) Short Course and Trade Show, July 9-12 (Jennifer Ehrenberger, Eric Renze, Susan Stieve, David Tay, Art Wells).
- Herbaceous Ornamental Crop Germplasm Committee (HOCCG) meeting at the OFA Short Course, July 11 (Jennifer Ehrenberger, Susan Stieve, David Tay).
- American Society for Horticultural Science (ASHS) Annual Conference, Las Vegas, July 17-20 (David Tay).
- Cooperative State Research, Education, and Extension Service (CSREES) Competitive Program Workshop and American

- Society for Horticultural Science (ASHS) Research Working Group meeting, July 17 (David Tay).
- American Society for Horticultural Science (ASHS), Seed and Seedling Stand Establishment Working Group business meeting — July 19 (David Tay, Chair).
 - 24th Ohio Prairie Association Conference, Prairie Nature Center, The Ohio State University at Marion, Marion, Ohio, August 5-7 (Susan Stieve).
 - The Ohio State University, College of Food, Agricultural, and Environmental Sciences (CFAES) Faculty Meeting, September 9 (David Tay).
 - The Ohio State University, College of Food, Agricultural, and Environmental Sciences (CFAES) Safety Meeting, October 18 (Jennifer Ehrenberger and Susan Stieve).
 - The Ohio State University, Kiplinger Chair Committee meeting, October 26 (David Tay).
 - 2005 American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America (ASA-CSSA-SSSA) International Annual Meetings, Salt Lake City, Utah, November 5-11 (David Tay).
 - Advising and Mentoring Graduate Students: A Candid Roundtable Discussion for Graduate Faculty meeting, November 16 (David Tay).
 - National Plant Germplasm System (NPGS) Curator Workshop, December 5-6, Chicago, Ill. (Russell Eckley, Jennifer Ehrenberger, Susan Stieve, and Art Wells).
 - Virginia Nursery and Landscape Association (VNLA) Virginia Plant Introduction Program strategic planning meeting — Charlottesville, Va., December 5-8 (David Tay).

Training Received

- Robert Webster, USDA-ARS-NPGS, Beltsville, installed GIS software and trained OPGC staff, January 14.
- Horticulture and Crop Science, HCS 631 Seed Physiology, HCS 693 Independent Study — Tissue Culture — taken by Jennifer Ehrenberger for credit.
- The Ohio State University Research Foundation (OSURF) Principal Investigator Portal training, March 9 (David Tay).
- Ohio Foundation Seed field trip with seed biology group, April 19 (Susan Stieve).
- Leadership Conference for Women, Association of Faculty and Professional Women, April 22 (Jennifer Ehrenberger).
- The Ohio State University, College of Food, Agriculture, and Environmental Science (CFAES) Fire Safety Training, May 26 (Jennifer Ehrenberger, Russell Eckley, Eric Renze, Susan Stieve, David Tay, Art Wells).

- The Ohio State University, Minority Mentoring Program Workshop — training to be a mentor. May 31 (David Tay).
- National Clonal Germplasm Repository, Corvallis, Oregon. Met with tissue culture and greenhouse staff to learn about germplasm conservation techniques, June 5-6 (Jennifer Ehrenberger and Susan Stieve).
- North American Plant Collections Consortium (NAPCC) Reviewer Training Workshop, Morton Arboretum, Chicago, Ill., June 28 (David Tay).
- The Ohio State University, Roles and Responsibilities of Graduate Faculty Workshop, September 16 (David Tay).
- Ecology of Seed Dormancy Workshop presented by Jeff Walck, October 14 (Jennifer Ehrenberger, Susan Stieve, David Tay).
- Cincinnati Zoo and Botanical Garden, October 7. Viewed tissue culture lab techniques and cryopreservation research (Jennifer Ehrenberger and Art Wells).
- Dick Craig, OPGC *Pelargonium* Technical Working Group member, visited the OPGC to discuss the *Pelargonium* collection, November 2-3 (Jennifer Ehrenberger and other OPGC staff).
- The Ohio State University, Ohio Agricultural Research and Development Center (OARDC) SAS statistical software, 12-week course (Susan Stieve).
- International Seed Production (HCS 830) taken for credit (Susan Stieve).

Publicity

- Germplasm Center reviving 'Old-Style' petunias, OSU-CFAES, Communication and Technology News Release and OSUToday e-mail news. April.
- Regerminating the Past, Palladium-Item News, Richmond, Indiana, April 22.
- Heirloom petunias not all cut and dried, The Columbus Dispatch, May 16.
- Old plants kept alive thanks to work of Ohio State researchers, article in The Lantern, Ohio State University student newspaper, May 27.
- Research could revive old-style petunias, Greenhouse Management and Production (GMPro) Magazine, July issue.
- Preserving beauty: OPGC preserves genomes of herbaceous plants, onCAMPUS, Volume 35, No. 1, July 21.
- Reviving Heirloom Petunias, The American Gardener, July/August Issue.
- Preserving genomes of herbaceous plants, article in The Lantern, Ohio State University student newspaper, August 18.
- Saving the World's Flowers, Northern Plains Area 2004 Research Highlights, USDA-ARS publication, September 2005.

- OSU Germplasm Center Reviving Old-Style Petunias, Greenhouse Canada, November issue.
- *X-Ray Technology Improves Seed Assessment*, OSU-CFAES Communication and Technology News Release, December.
- *X-Ray Technology Improves Seed Assessment, News at Ohio State Horticulture and Crop Science*, Issue 24, December.
- *Heirloom Petunias Bloom Again*, OSU Alumni Magazine, May/June issue.
- The OPGC web site was updated with photos and articles written by staff.
- OPGC poster display, 5th Annual Ohio Botanical Symposium, April 1.
- OPGC poster display, Ohio State University - Wooster, OARDC Plant Discovery Day, May 7.
- Participated in OSU Scarlet and Gray Day, May 20.
- Chris Cumo, Our Ohio of Ohio Farm Bureau, interviewed David Tay, May 24.
- OPGC poster display, OFA Short Course and Nursery Show, July 9-12.
- Sensaphone, Dan Brennan, interviewed David Tay for their newsletter. August 19.
- Nursing Students, The Ohio State University, April 28 (Susan Stieve).
- Chinese visitors, May 9 (Susan Stieve).
- Carla Garzon, Department of Plant Pathology, The Pennsylvania State University, May 16 (David Tay).
- Karl Werbovertz, College of Pharmacy, The Ohio State University, May 18 (David Tay).
- The Ohio State University, OSU Scarlet and Gray Day, high school student tours, May 20 (Art Wells).
- Chuck Powell, May 23 (Jennifer Ehrenberger and Susan Stieve).
- Glen Aukerman group (four people), Center for Integrative Medicine (CIM), The Ohio State University, May 25 (David Tay).
- Ministry of Agriculture and China Academy of Agricultural Sciences delegation (six people), June 2 (David Tay).
- Dan Zerke and Cincinnati Master Gardeners (16 people), Cincinnati, Ohio, June 9 (Art Wells).
- Karen Goodell, Department of Evolution, Ecology, and Organismal Biology, The Ohio State University, Newark, Ohio, June 24 (David Tay).
- Fairfield County Master Gardeners (Ohio), July 6 (Art Wells).
- Janet Oberleissen and Susan Applegate-Hurst, Meredith Corporation, July 7 (Susan Stieve).
- Herbaceous Ornamental Crop Germplasm Committee (HOCGC) members (Brian Corr and Scott Trees), July 11 (David Tay and Art Wells).
- Ohio Association of Garden Clubs tour (109 people), July 11 (David Tay).
- Olaf Bosman group from Novartis, July 12 (Susan Stieve).
- Greene County Master Gardeners (Ohio) tour (nine people), July 13 (David Tay).
- The Ohio State University, Chadwick Arboretum Open House tour, July 24 (Jennifer Ehrenberger).
- Czech Republic agriculture delegation (six people), July 27 (David Tay).
- Ellen Purpus, Marengo, Ohio, July 28 (David Tay).
- Barber Roselea Senior Citizens Center tour, Columbus, Ohio (12 people), July 29 (David Tay).
- The Ohio State University, OSU Floriculture Trial tour (six people), August 2 (David Tay).
- Sharon Heights Club tour, Columbus (five people), August 10 (David Tay).
- Mike Valentine, Columbus (donated *Petunia* germplasm), August 12 (Susan Stieve).
- Ohio Seed Improvement Association tour (four people), August 17 (David Tay).

OPGC Visitors

- Angela Crump, J F New, Jan. 6 (Jennifer Ehrenberger and Susan Stieve).
- Richard Mack, Washington State University, Pullman, Wash., February 4 (David Tay).
- Circleville and Teays Valley, Ohio, gifted student field trip — 22 students, February 9 (David Tay).
- Cuyahoga County 4-H group, Ohio — two students, February 10 (David Tay).
- Jianqiang Li, Associate Dean, College of Agriculture and Biotechnology, China Agricultural University, February 14 (David Tay).
- Robert Webster, USDA-ARS-NPGS, January 14 (David Tay).
- Jonathan Frantz, USDA-ARS Toledo, and Scott Liesner, University of Toledo, February 17 (David Tay).
- David Hansen, Associate Dean, CFAES, The Ohio State University, February 25 (David Tay).
- Kris Gremillion, Department of Anthropology, The Ohio State University, February 25 (David Tay).
- Peggy Deleber, Franklin Park Conservatory, Columbus, Ohio, March 3 (David Tay).
- Alice Mweetwa, Virginia Polytechnic Institute and State University, Blacksburg, Va., March 10 (David Tay).
- Ivana Draganic, April 13 (Susan Stieve).

- Zhenyang Ge, Kunming University of Science and Technology, September 6 (David Tay).
- Song Cheng, September 14 (David Tay).
- Doug Trueman, Toledo Botanic Garden, Ohio, September 16 (David Tay).
- Ohio Agricultural Research and Development Center (OARDC), The Ohio State University, Wooster (three people), September 16 (David Tay).
- Grazyna Grauer and Toby Musgrove, North American Rock Garden Association, and Debra Knapke, Columbus State Community College, Columbus, Ohio, September 21 (David Tay).
- OARDC, ATECH (Food and Agricultural Technology Commercialization and Economic Development Program) tour (Steve Slack and five others), October 11 (David Tay).
- Richard and Sue Abbott, Lions Club, Cuyahoga County, Ohio, and Carlos de la Cuadra, Universidad Catolica de Valparaiso, Chile, October 13 (David Tay).
- Jeff Walck, Middle Tennessee State University, Murfreesboro, Tenn., October 14 (David Tay).
- Department of Physics tour, The Ohio State University (three people), October 17 (David Tay).
- Bob Harter group tour (three people), October 19 (Susan Stieve).
- USDA Minor Crop Pest Management (IR 4) delegation tour (six people), October 19 (David Tay).
- Mike Swintosky, Ohio Prairie Association, October 28 (David Tay).
- Annie Carlson, The Graham School, Columbus, November 1 (David Tay).
- Muhabbat Turdieva, International Plant Genetic Resources Institute (IPGRI-CWANA), Uzbekistan, November 1 (David Tay).
- Chris Gecik, Department of Food, Agricultural, and Biological Engineering, The Ohio State University, November 4 (Susan Stieve).
- OSU-HCS Beat Michigan Tailgate tour (30 people), The Ohio State University, Department of Horticulture and Crop Science, November 19 (David Tay).
- Udai Bishnoi, Alabama A&M University, Normal, Ala., and Julio Marcos Filho, Escola Superior de Agricultura 'Luiz de Queiroz,' University of São Paulo, Piracicaba, Brazil, November 23 (David Tay).
- Dennis Raath, National Greenhouse Manufacturers Association, November 28 (David Tay).

Ohio State University Activities

- OSU, Minority Affairs Mentoring Program participation (David Tay).
- OSU, College of Food, Agricultural, and Environmental Sciences Library Committee (David Tay).
- Core partner of the OSU International Seed Consortium and its Distance Education project (David Tay).
- OSU, Kiplinger Chair Committee member (David Tay).
- OSU Floriculture group member (David Tay).
- Hosted Robert Webster, USDA-ARS-NPGS to present a seminar entitled GIS Protocols for NPGS Applications in collaboration with the OSU Department of Horticulture and Crop Science, January 14 (David Tay).
- Participated in OSU Honors and Scholars Day, January 21 (David Tay).
- Participated in the interviewing of a tenure-track position for the OSU College of Pharmacy — Esperanza J. Carcache de Blanco, February 15 (David Tay).
- Participated in the OSU Horticulture and Crop Science Departmental CSREES Review, April 11-15 (Susan Stieve).
- Denman Undergraduate Research Forum judge, May 18 (David Tay).
- Participated and organized Chinese graduate students meeting with the Ministry of Agriculture and China Academy of Agricultural Sciences delegation (six people), June 2 (David Tay).
- Participated in the OSU Seed Consortium's Strategic Planning, June 3 (David Tay).
- Discussed and planned cooperation with Kikuo Fujimura on student projects in computerized imaging, June 23 (David Tay).
- Participated in Claudio Pasion's summer trial open house, August 2 (Susan Stieve).
- Discussed cooperation with Interim Chair and Associate Chairs, OSU Department of Horticulture and Crop Science, August 12 (David Tay).
- Participated in the OSU Department of Plant Pathology graduate student orientation, September 16 (David Tay).
- Participated in the OSU Department of Horticulture and Crop Science graduate student orientation, September 19 (David Tay).
- Participated in the OSU Department of Evolution, Ecology, and Organismal Biology graduate student orientation, September 21 (David Tay).

- Hosted Ling Guo, Beijing Botanical Garden, to present a seminar entitled *Beijing Botanical Garden* in collaboration with the OSU Department of Horticulture and Crop Science, September 23 (David Tay).
- Pat Sweeney/Allison Snow of the Department of Evolution, Ecology, and Organismal Biology, using OPGC seed cleaning equipment, October 7 (David Tay).
- Discussion with Chris Hammel, OSU Department of Physics, on seed research, October 10 (David Tay).
- Hosted Pedro Henrique Santin Brancalion, Escola Superior de Agricultura 'Luiz de Queiroz,' University of São Paulo, Piracicaba, Brazil, to present a seminar entitled *Seed Production and Ecology of Native Tree Species in Brazil* in collaboration with the OSU Department of Horticulture and Crop Science, October 12 (David Tay).
- Hosted Jeff Walck, Middle Tennessee State University, Murfreesboro, Tenn., to present a seminar entitled *Seed Germination — Ecological Considerations and Applications to Conservation Biology* in collaboration with the OSU Department of Horticulture and Crop Science, October 14 (David Tay).
- International graduate degree in seed science and technology — curriculum development, November 21-23 (David Tay).
- Recruiting meeting with Michael Broe for the Department of Evolution, Ecology, and Organismal Biology, Ph.D. program, November 30 (David Tay).
- Discussion with Dennis Lewandowski, new OSU ornamental plant pathologist, December 1 (David Tay).
- Bob Klips of the Department of Evolution, Ecology, and Organismal Biology, Marion Campus, using OPGC seed cleaning equipment, December 14-30 (David Tay).
- Recruiting meeting with Joseph Tychonievich for the OSU Distinguished Fellowship in Horticulture and Crop Science, December 22 (David Tay).
- NPGS Operations Manual Revision Subcommittee (David Tay).
- SL-USDA Germplasm Development Programme Mid Term Progress Review in Sri Lanka — Member of Review Team, May 1-7 (David Tay).
- USDA-ARS Toledo — discussed cooperation with the floricultural project, June 17 (David Tay).
- USDA Minor Crop Pest Management (IR 4) meeting with Jack Norton and delegates at OSU, July 5 and October 19 (David Tay).

Association and Society Memberships

- American Association of Botanic Gardens and Arboreta (David Tay).
- American Horticultural Society (Jennifer Ehrenberger, David Tay).
- American Penstemon Society (Susan Stieve).
- American Society for Horticultural Science (Jennifer Ehrenberger, Susan Stieve, David Tay — Chair-elect Seed and Stand Establishment Working Group (WG), Member of Floriculture WG, Ornamental Plant Breeding WG, Genetic and Germplasm WG, Nursery Crop WG, and International Horticultural Consultants WG).
- International Seed Testing Association (ISTA) (David Tay — Member of Flower Seed Committee).
- International Society for Horticultural Science (David Tay — Co-organizing the International Horticultural Congress 2006 Symposium 1, Day 2, on the safe movement of plant materials and ornamental plant germplasm conservation).
- Mohican Native Plant Society (Susan Stieve).
- Ohio Florists' Association (David Tay)
- Ohio Prairie Association (Susan Stieve).
- Society of American Florists (David Tay).

USDA and National Plant Germplasm System (NPGS)

- Herbaceous Ornamental Crop Germplasm Committee. (Jennifer Ehrenberger, Susan Stieve, David Tay — Ex-officio).
- NPGS Curator Workshop Organization Committee and Regeneration Session Chair (Susan Stieve).
- NCGRP Storage Policies teleconference, March 2 (Jennifer Ehrenberger, Susan Stieve, David Tay)
- Associate Germplasm Collections Subcommittee (David Tay).
- Barcode of Economic Plants Initiative (David Tay).
- In situ Collections Subcommittee (David Tay).
- Medicinal Plants Subcommittee (Susan Stieve, David Tay).

Professorship and Accreditation (David Tay)

- Visiting Professor in Agronomy and Biotechnology, China Agricultural University, Beijing, China.
- Adjunct Professor, Department of Horticulture, Virginia Polytechnic Institute and State University, Blacksburg, Va.
- Adjunct Associate Professor, Department of Evolution, Ecology, and Organismal Biology, The Ohio State University, Columbus, Ohio.
- Certified evaluator for the accreditation of the North American Plant Collections Consortium (NAPCC) collections.

Conclusions and Plans for 2006

- Continue seed collection trips with Rick Gardner, Botanist, Division of Natural Areas and Preserves, Ohio Department of Natural Resources; five collection trips are currently scheduled for five different nature preserves in Ohio.
- Collect prairie species in Killdeer Plains Wildlife Area; permit already obtained.
- Continue progressing with the Germplasm Resources Information Database (GRIN) in areas including upload of OPGC accessions, adding inventory lots, data checking of accessions transferred from other sites, and backup of regenerated accessions with NCGRP.
- Continue to determine the quality of regenerated seed lots through germination and X-ray tests prior to storage at the OPGC and NCGRP.
- Continue addition and improvement of greenhouse automated irrigation using both capillary mat and drip-tube systems.
- Continue to emphasize seed production through use of greenhouse compartments and field cages at Waterman Farm. The seed curatorial team goal for 2006 is 65 successful regenerations, an increase of 24 from 2005. This should be possible with the same staffing level as many of the herbaceous perennial plant accessions that have been in field cages and greenhouses for several years begin to flower and produce seeds, and plant culture and pollination techniques learned in past years make strategies and staff more effective and efficient.
- Continue promotion and publicity of OPGC through display at OFA, Ohio Prairie Association Conference, 6th Annual Ohio Botanical Symposium, news stories, tours, and other opportunities as they arise.
- Utilize priority genera Technical Working Groups for specific genera recommendations; each genus will be reviewed as a whole to identify gaps in the collection, and the TWGs will be asked where to find germplasm to fill them.
- Continue to put more clonal materials into in vitro collections and research how to minimize culture contamination and callusing.
- Continue to experiment on protocol to maximize time between subcultures for plants in vitro.
- Send established *Pelargonium* plants in vitro to NCGRP for cryogenic storage experimentation and OPGC germplasm backup.
- Continue seed production of species of clonal crops, e.g., *Begonia* and *Pelargonium*, through use of bee and hand pollination in greenhouse compartments and field cages at Waterman Farm.
- Post digital photos and scanned images of accessions on GRIN for viewing by germplasm users.
- Establish long-term labeling method for clonal plants in the greenhouse.
- Consider beginning characterization and evaluation of accessions. This will necessitate drafting descriptor lists for all of the many genera in collaboration with the priority genera Technical Working Groups and submitting proposals for additional funding to support this activity.
- OPGC staff will continue to participate in pertinent Ohio State University classes and seminars.
- OPGC staff will continue to participate in USDA-NPGS activities and professional society activities.
- The first OPGC operations manual, based on information and experience accumulated to date, will be completed in 2006.



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