

Gifford Arboretum Newsletter

Spring 2005

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Photo by Derek Artz

The beautiful, butterfly yellow flowers of Bulnesia arborea (Zygophyllaceae)

Workshop series

Fascinating Tropical Trees



Dr. Guillermo Goldstein, Smathers Professor at the University of Miami at the Annual Picnic

Dr. Guillermo Goldstein, Professor of Tropical Ecophysiology at the University of Miami, gave a wonderful mini-tour and lecture in December about fascinating tropical trees. Dr. Goldstein told stories about the hardships that some tropical trees must endure in order to survive including extreme temperatures such as the plant's foliage freezing daily! More lectures and workshops are being planned for the future.

Pruning techniques workshop by Dr. George Fitzpatrick

Some of the highlights of Dr. George Fitzpatrick's pruning workshop are given here. First the definition: pruning is the selective removal of plant parts for a defined purpose. Landscape tree pruning has different goals than orchard pruning. Orchard pruning is primarily motivated by economic issues to maximize yield and simplify harvest, while landscape tree pruning emphasizes crown maintenance including cleaning, thinning, raising and reduction of crowns. Its objectives are to maintain and improve the safety of the landscaped environment, the health of the tree and the appearance of the tree. Selective removal of dead, diseased, broken or weakly attached branches is the most common goal. Removal of the less desirable of two branches that cross or rub is also important as is removal of branches that block street signs or are too close to utility wires. Finally training of young trees another reason to prune.



Dr. Fitzpatrick teaching pruning techniques on a Ligustrum tree during the workshop

There are two sets of safety rules: a set for professionals and for laypersons. Dr. Fitzpatrick covered both, but in this article we focus on the latter.

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Carlos Garcia-Robledo

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Pruning techniques (Cont.)

Speaking of "ladders," that is the first rule. If you have to get on a ladder a tree is too large for you to prune on your own; call a professional! When else is a professional necessary? If the branch is over 2 cm in diameter, if it is near a power line or if it was injured in a storm, do not attempt to prune it yourself. Some tips for those jobs you CAN do on your own:

- (a) use protective hats, gloves, glasses and wear a long-sleeved shirt,
- (b) use sharp tools that are in proper working condition.
- (c) never use a chain saw
- (d) know where the cord is on electric shears
- (e) concentrate on your job
- (f) do not work alone
- (g) know your limits and don't hesitate to call a professional.



Workshop participants were trained in the use of tools and different pruning techniques.

Three main types of cuts were demonstrated at the workshop, reduction, heading and removal cuts. A reduction cut, a.k.a. a thinning lateral cut or a drop crotch cut, reduces the length of branch back to a living lateral branch that can become the new dominant stem. A heading cut reduces the length of a branch back to a predetermined height regardless of the position of lateral branches and does leave a stub. Appropriate use of a heading cut includes tip pruning of young trees and shearing of shrubbery, while an example of an inappropriate use of a heading cut is ha-tracking. A removal cut, a.k.a. a thinning cut or a collar cut, removes a branch from the trunk or parent branch. Reduction cuts and heading cuts often preclude the formation of a branch protection zone are thus potentially more damaging than removal cuts.

The workshop ended with everyone participating in the pruning of a small *Ligustrum* tree. The group, guided by Dr. Fitzpatrick, selected the branches to trim and carried out the trimming. All agreed that the tree was much better off in appearance and health after its pruning was completed.

Flowering Trees Celebrated at Gifford Annual Picnic

A "celebration of tropical flowering trees" was the focus this past December at the Gifford Annual Picnic. The picnic focused on trees that have remarkably showy flowers that have evolved to attract a variety of animal pollinators. The forms and fragrances are not only beautiful, but they tell the story of evolution in the tropics which is driven by intense biotic interactions. Joining in the celebration was the Tropical Flowering Tree Society, a cosponsor with the Gifford Arboretum. The picnic included a variety of sandwiches, homemade salads, cookies, and other delicious foods.



Graduate students don some of the beautiful tropical flowers at the Arboretum Annual Picnic in December collected from members of the Tropical Flowering Tree Society.

Donated tropical trees were auctioned off at the picnic. Donors included Valerie Klevan, Peter Ostrowski, Strelkow Associates, Rob Bobson and Larry Schokman. Books on tropical botany and ecology were also donated for a silent auction.

Larry Schokman and other members of the Tropical Flowering Tree Society assembled a magnificent display of tropical flowers, some collected from the Kampong. John Cozza, Graduate Student at the University of Miami and member of the Gifford Arboretum, took guests on a tour of the botanical collections on campus, focusing on the tropical flowering trees in the Arboretum collection. A great time was had by all!



Jon Bennett and Douglas Parks exchange pruning stories at the Arboretum Picnic

Director's Notes

by Carol C. Horvitz, Ph.D.

Director's Notes

This is a dynamic time for the Gifford Committee and a promising time for the future of Tropical Plant Science at UM (see special page on the Momentum in the Arboretum Committee)!

George Fitzpatrick (Professor of Environmental Horticulture at University of Florida, with offices at both TREC and FLREC) joined the Arboretum Committee. He has long been interested in the writings and philosophy of John Gifford. Already we have benefited enormously by his expertise. Dr. Fitzpatrick gave a great workshop on pruning (see article). We look forward to his advice on more programs and projects. **Richard John** (Professor in the School of Architecture, UM) had been away in Italy, but recently rejoined the committee, bringing fresh perspectives about understanding gardens in relation to architecture. A visiting scholar Fulbright fellow from the National Autonomous University of Mexico (UNAM), **Eduardo Mendoza**, whose specialty is interactions of mammals with plants in tropical forests, has joined us for a year. **Brendan Turley** joined the Arboretum as undergraduate assistant. *Brendan is currently in charge of the shadehouse facilities. Other new members of the committee are Susanne Kayyali, Kirsten Llamas, and Carole Hanna Miller, each with a very unique contribution to our merry band.*



Undergraduate student Brendan Turley, the new Arboretum Assistant taking care of the plants in the shadehouse

Derek Artz, who served with distinction for 3 years as the Belton G. and Margaret T. Aldridge Horticultural Assistant and Curator of the Arboretum will be defending his Ph.D. dissertation this spring on pollinator communities in a restored area of Everglades National Park. He will then embark upon a fascinating new post-doctoral project studying the evolution of floral fragrances in South Carolina. Derek will be missed. Students graduate and go on to pursue their professional lives (as they should) and they do not replace one another, but each new one

brings her/his own special talents and interests to the position. We are very pleased to announce that the new Aldridge curator is **Carlos Garcia-Robledo** (see article) who is fascinated by tropical plant reproductive biology and by the evolutionary interactions of beetles with tropical plants. He

started our graduate program with an unusually strong research background, including many publications on field work carried out in his native Colombia, Peru and Costa Rica. He has already redesigned the Arboretum website (see below) and has energetically engaged in a myriad of activities, like the Annual Picnic and the recent Native Plant Day. The new website features a re-organized home page and more accessible links to the programs of the Arboretum and a virtual tour. It is being added to almost every day! Please check it out to find out what's going on (<http://www.bio.miami.edu/arboretum>).

The **New Checklist of Plants (2004)** by **Derek Artz** and **Kirsten Llamas** has been published as has the long awaited **Guide to the Plants of the Gifford Arboretum**, originally penned by **Sue Scully** before she moved west to Sarasota, but recently edited, updated and illustrated with photos by **Derek Artz**. Both are available for sale (only \$8). Thanks to Kirsten, all the nomenclature has been updated and a new section has been added to the checklist that includes all the plants in the Gifford Arboretum, the Taylor Alexander Microbiome, the Palmetum, the Flowering Trees Collection and the Florida Keys Arboretum by genus and gives a reference to where they are located on campus. The Checklist (2004) can now also be found on our newly updated website.

If you would like to share in our trials, tribulations, joys and dreams, please contact me.



University of Miami graduate students Erin Kuprewicz and Summer Scobell representing the Gifford Arboretum during the celebration of the Native Plant Day at Crandon Park and Nature Center

New Aldridge Curator at the Gifford Arboretum

Carlos Garcia-Robledo has been selected as the new Aldridge Curator of the Arboretum starting spring 2005. He replaces Derek Artz, curator for the past two and a half years, who will be graduating this spring and working as a postdoctoral fellow in South Carolina.

Carlos is interested in the ecology and taxonomy of the plant families Araceae, and Rubiaceae and the order Zingiberales and author of papers and books on butterflies, pollination, herbivory, and the processes affecting the invasion of native plant communities by exotic plants. He has done research on plant ecology and flora diversity in endangered tropical ecosystems including tropical montane and rain forests, and the paramos in Colombia, Peru, and Costa Rica.



Carlos Garcia-Robledo, graduate student in Biology Department, is the new Aldridge Curator of the Gifford Arboretum.

Georgia Tasker 2005 Arboretum Lecture

The arboretum lecture is honored by the visit of Georgia Tasker, world renowned garden writer, who will lecture on "The People, Pleasures and Politics of Orchids." Georgia has been a journalist for The Miami Herald since 1979.

World renowned garden writer Georgia Tasker. 2005 Gifford arboretum lecturer



Among her awards are the Barbour Medal from Fairchild Tropical Garden, the botanical garden's highest environmental award, and the first lifetime achievement award from Tropical Audubon Society. Some of her works include such books as "Enchanted ground, gardening with nature in the subtropics", "Wild Things, The Return of Native Plants" and "Florida Gardeners Guide" and innumerable papers written on her research in tropical countries as Bolivia, Brazil, Colombia, Costa Rica, and Mexico.

David Fairchild Medal for Exploration 2005

In a ceremony conducted by Dr. P. B. Tomlinson, at the Kampong, the National Tropical Botanic Garden and the Gifford Arboretum honored Dr. Thomas Croat, researcher at the Missouri Botanical Garden in St. Louis with the David Fairchild medal for plant exploration.



At the Kampong ceremony. Left to right: Carlos Garcia-Robledo, Erin Kuprewicz, Dr. Carol Horvitz, Dr. Thomas Croat, Ana Salazar, Lucero Sevillano and Eduardo Mendoza.

Dr. Croat is one of the most legendary botanists and explorers of the tropics, and the world's foremost expert in the family Araceae. He described more than 550 species new to science. During decades he collected countless dry and living specimens all over south, central America and Mexico.

Dade County Teachers, Introductory Biology and Environmental Science Study the Living Plants and Ants on Campus

By Blase R. Maffia, Ph.D.

Over the last few years, I have had the opportunity to 'extend my classroom' from the confines of the Cox Science building to the arboretum. In this way, city-bound students in my large lecture classes (Introductory Biology, Bill101), can visit 'nature' if only for an hour. Overwhelmingly, the response is positive. Students are exposed to a range of botanical and natural history topics during the arboretum tours.



*Dr. Maffia and his students observing a cannonball tree (*Couroupita guianensis*) in bloom*

Dade County Teachers (Cont.)

In my 'smaller classes' (Environmental Science, ESC101), I can lead the students around campus, highlighting the plants in flower at the time. I can also discuss pollination, epiphytes and of course fungi and mycorrhizas! As Co-director of the Integrated Summer Science Institute, Summer-time sees me leading Dade County teachers through the Arboretum.

There, we can talk about physical or abiotic factors involved in maintaining a plant community. Teachers collect data on the ant communities found in the Arboretum and parking areas. We have also gathered aquatic plants and snails from the microbiome area for photosynthesis and respiration labs.

Research by Undergraduates at the Arboretum: Seed Storage Proteins in the Mallow Family

The evolution of a gene family that codes for seed storage proteins which function to provide amino acids to developing embryos was investigated by Stephanie Berg as an independent senior research project, supervised by Barbara Whitlock, Assistant Professor of Biology, our expert in tropical plant systematics. Stephanie searched the arboretum for leaves from the Mallow Family (Malvaceae, which now also includes the families which were formerly known as Bombacaceae, Sterculiaceae, and the Tiliaceae) to sequence this gene from as many different species as she could find.

In the lab, she extracted DNA in a multi-step process, grinding the leaves, extracting fractions and then spinning down multiple times until only DNA remained. Then she amplified this particular gene using PCR. The next step would have been sequencing the genes which she did not quite get to during the one-semester project.



Research at the Arboretum. Stephanie Berg. Undergraduate student researching with Dr. Barbara Whitlock genes involved in seed protein storage

However, she was exposed to questions and methods in this area of tropical plant science. Stephanie had never really focused on plants before; she was stimulated aesthetically and intellectually

By the diverse trunks, spines and flowers found in this plant family. In doing the research, she began to ponder such issues as: Can you use this gene family as a phylogenetic marker? Does this gene family give results concordant with other phylogenetic treatments of the group? Among these species: do differences in seed size, dormancy, longevity, germination requirements, and location of seed storage reserves covary with the different forms of the gene? These questions remain for future young scientists to pick up where Stephanie left off.

Howard Hughes Medical Institute Funds Research Experience for First Year Students

The Howard Hughes Medical Institute funded a special section of the introductory biology lab to give first year students a taste of independent research. The students were selected by the Undergraduate Research Office. The goal of the program is to introduce first semester students into a research lab environment for the first time. In total 48 first year biology students had special research experiences in the Arboretum. These were the students in two of the sections of this special course, the one taught by Dr. David Janos and the one taught by Dr. Zhiyong Han. Students spent about 3 hours a week for a total of five weeks on their projects.

Anti-cancer properties in the Spurge, Rue, Soapberry, Wood-Sorrel and Theophrast Families

Students who worked with Dr. Zhiyong Han, Research Assistant Professor in the lab of Dr. James Wyche, were introduced to the idea of natural products as anticancer drugs. Natural products are organic compounds produced by living organisms. Students went out on their own to choose the plants to screen at random.

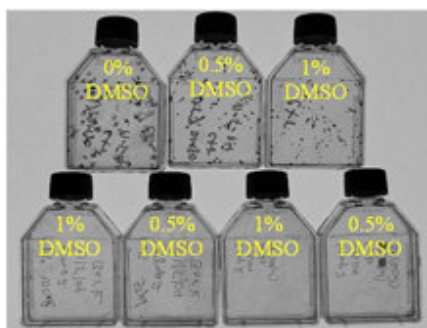


Garcia nutans (Euphorbiaceae). One of the plants tested during the anti-cancer properties survey at the Gifford Arboretum

They collected plant samples, branches, fruits, and flowers. Plants that were assayed included *Garcia nutans* ("Garcia"), *Euphorbia tirucalli* ("Pencil tree"), *Harpullia arborea* ("Tulipwood"), *Averrhoa bilimbi* ("Bilimbi"), *Zanthoxylum fagara* ("Wild Lime") and *Jacquinia armillaris* ("Joewood"). They extracted organic compounds with methanol.

Anti-cancer properties in plants (cont.)

Then they filtered and dried the extracts and solubilized the material with an organic solvent DMSO (dimethyl sulfoxide). Finally, the sample was used to treat cultured human colon cancer cells (one of many cell lines used in the Wyche lab), in culture dishes raised in an incubator for a week. They then observed whether or not there are any live cells in the dish after a week. About 16 different plant extracts were assayed. It turned out that 10 out of 16 contained bioactive compounds that killed cancer cells. Students presented the results at a poster session. Going from such preliminary results to a full scale scientific study of the potential value of a given plant to medical science requires many steps, but at least students got a taste of the first step of discovery and an introduction to the idea that plants contain bioactive compounds of as yet undiscovered pharmaceutical value.

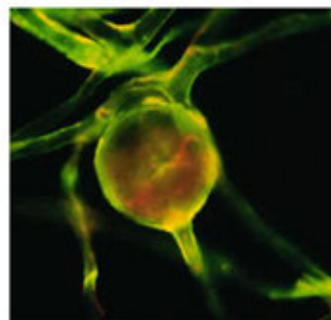


Plant extracts from trees at the Gifford Arboretum were surveyed for anti-cancer properties (Illustrations of this article from poster by Michelina de la Maza, Preston Spitz, Aron Nusbaum, and Niki Ramos.)

Compounds that are under formal scientific investigation in the Wyche lab now come from a tree that is native to SW China, *Camptotheca acuminata* (Cornaceae, same family as dogwood tree) ("the Happy Tree"), a tree used in traditional Chinese medicine, which produces a well-known anti-cancer compound, camptothecin, that is being studied in many labs. It is too costly to synthesize in large quantities, so it is extracted from the bark, seeds and leaves of the trees. Reasons to study it include: the compound has been purified, is commercially available for research labs, the structure is known, and the target in the cells has been identified for many years. The compound kills cancer cells. Drs. Han and Wyche are trying to find out how this compound kills cells at the molecular level, focusing on the molecular biology. Two derivatives have been approved by FDA for treating cancer patients.

Symbiotic Fungi on Tree Roots Produce Glomalin: a Newly Discovered Ubiquitous Component of the Soil Matrix

Students who worked with Dr. Dave Janos were introduced to mycorrhizae and glomalin. Glomalin is a glycoprotein produced ubiquitously by arbuscular mycorrhizal fungi with which most trees in the Arboretum are associated. Mycorrhizae are fungi that live in the roots of trees that are believed to have a mutualistic relationship, that is one that benefits both partners. Glomalin was just discovered in 1996 and information on its occurrence is lacking, but it is already known to play an important role in soil aggregate ability. It is "sticky" and thus helps glue small particles together to make big ones, improving aeration and water relations in the soil. Glomalin stores carbon in protein and carbohydrate sugar subunits. Students investigated the effects of different species of plants on the amount of glomalin in the soil in their vicinity.



Undergraduate students and Dr. Dave Janos study glomalin at the Gifford Arboretum (Illustrations and information on sample preparation from a poster by Ilene Magrogon, Meghan Tucker, Marlana Fernandez, Kerri-Ann Lewis, and Leslie Afable).

The main results were that everybody found glomalin and that it was rather variable in its abundance. All the students got experience thinking about and testing questions. They also learned to extract and quantify glomalin from soil samples, using a centrifuge with various extraction techniques, then microplating the samples and finally examining the prepared samples in a spectrophotometer. Among the questions posed by students was whether the amount differed among 3 species of trees in the Sapindaceae, by distance from tree, or by location across the campus.

The Momentum in the Arboretum Committee

Mary Catherine Chesser
Lundy Clarke
Roberta Foote
Kathy Gaubatz
Lauren R. Gould
De Armand Hull
Carol Horvitz
Susanne Kayyali
Robert L. Kelley
Valerie J. Klevan
Martha Gifford Parker Melahn
Carole Hanna Miller
Stephen Pearson, Esq.
Paula Swetland
Christiane Tyson

invite you to visit the diverse array of Living Botanical Collections on the UM campus



Map representing the location of the Botanical collections at the University of Miami

Our dream is for a Director of the Living Botanical Collections of UM who will be an endowed chair in the Biology Department. This distinguished scientist will make UM the premiere tropical plant science program in a degree-granting institution, optimize the use of our living collections in research and education and most importantly strengthen our academic ties with FTBG, NTB (the Kampong), MBC and Chapman Field.

Share in our vision for the future of Tropical Plant Science at the University of Miami.
Call Professor Carol Horvitz (305 284 5364) for a presentation
or a private tour of the Collections!

Here are just a few of the wonderful sites you can see on our campus, a unique resource on a college campus.



Projects of UM Architecture Students at the Arboretum



Architecture student Maria Casucelli's depiction of a Royal Poinciana (Delonix regia) in the Arboretum. This is one of the beautiful drawings performed during Professor Rocco Ceo's freehand drawing class visit to the arboretum.

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The Gifford Arboretum of the University of Miami is a collection of living tropical and subtropical trees. Our goal is to promote knowledge about tropical trees, both native and from around the world.