



Hardy Fern Foundation
Quarterly



Fall 2018

THE HARDY FERN FOUNDATION

P.O. Box 3797
Federal Way, WA 98063-3797
Web site: www.hardyferns.org

The Hardy Fern Foundation was founded in 1989 to establish a comprehensive collection of the world's hardy ferns for display, testing, evaluation, public education and introduction to the gardening and horticultural community. Many rare and unusual species, hybrids and varieties are being propagated from spores and tested in selected environments for their different degrees of hardiness and ornamental garden value.

The primary fern display and test garden is located at, and in conjunction with, The Rhododendron Species Botanical Garden at the Weyerhaeuser Corporate Headquarters, in Federal Way, Washington.

Affiliate fern gardens are at the Bainbridge Island Library, Bainbridge Island, Washington; Bellevue Botanical Garden, Bellevue, Washington; Birmingham Botanical Gardens, Birmingham, Alabama; Coastal Maine Botanical Garden, Boothbay, Maine; Dallas Arboretum, Dallas, Texas; Denver Botanic Gardens, Denver, Colorado; Georgia Perimeter College Garden, Decatur, Georgia; Inniswood Metro Gardens, Columbus, Ohio; Lakewold, Tacoma, Washington; Lotusland, Santa Barbara, California; Rotary Gardens, Janesville, Wisconsin; Strybing Arboretum, San Francisco, California; University of California Berkeley Botanical Garden, Berkeley, California; and Whitehall Historic Home and Garden, Louisville, Kentucky.

Hardy Fern Foundation members participate in a spore exchange, receive a quarterly newsletter and have first access to ferns as they are ready for distribution.

Cover design by Willanna Bradner

HARDY FERN FOUNDATION QUARTERLY

**THE HARDY FERN FOUNDATION
QUARTERLY**

Volume 28 No. 4 Editor- Sue Olsen
ISSN 1542-5517



President's Message.....70
Richie Steffen

**George Sanko~
Teacher, Mentor, Friend, Fern Gardener.....71-72**
Rick Barnes

Alternate President's Message.....73
Sue Olsen

Thank you to our 2018 Donors.....73

HFF New Website.....74
Dave Gibson

**A comparison of the genus Dryopteris of northern
India and the Himalaya with native and cultivated
species in North America.....75-79**
James R. Horrocks

Dimorphism in Ferns: A Tale of Two Forms.....79-82
Joan Eiger Gottlieb

The Cuban Fern Tour, March 8-15, 2018.....83-92
Introduction by Daniel Yansura

Visit our new website! hardyferns.org

President's Message

The garden is littered with fallen leaves and my clean-up schedule is seriously in need of help, but truthfully, I am enjoying ignoring it all for a few more weeks. After a hot and dry summer in the Northwest I'm relishing the beginnings of the steady autumn and winter rains. It was great to turn my attention to our annual meeting and Fall Fern Social where I help display and label a fantastic collection of fern fronds contributed by our members. The social was a fun event (as usual!) and it was great to see so many friends there. Thanks to board member Linda Pyles for her work in organizing this event, also thanks you to board member Susie Egan for giving such a great lecture at the social! It was a great way to finish the day!

I hope that some of our members were able to attend the Fall Foliage Festival in late October at the Rhododendron Species Botanical Garden. The Garden holds our main collection of ferns as well as our beautiful Victorian stumpery garden. Our HFF Curator, Jo Laskowski, gave an informative (if not risqué) presentation on the sex life of ferns. I hope those in attendance did not blush too much!

Also, a huge thanks goes out to Lori and Dave Gibson, chairs of our website renovation committee. Dave serves as a board member and recently proposed renovating our website. Working with Spiderlily Web Design our committee completely revamped the website and it is greatly improved in functionality along with the amount of information available plus it is really beautiful! Be sure to take a look at it and enjoy the new fern information that is now at your fingertips!

On a final note, a reminder to think about making an end of the year contribution to help support the HFF. Our organization counts on the generous contributions of our members. Projects like our website will require regular maintenance and upkeep to remain viable and useful. Your contributions greatly help in accomplishing tasks such as this. I will be writing to you soon with more information about how we use your donations and our goals for the future of the HFF.

I hope you enjoy the rest of the autumn and have a mild and quiet winter. I will be thinking about how I will try to catch up on my garden maintenance!

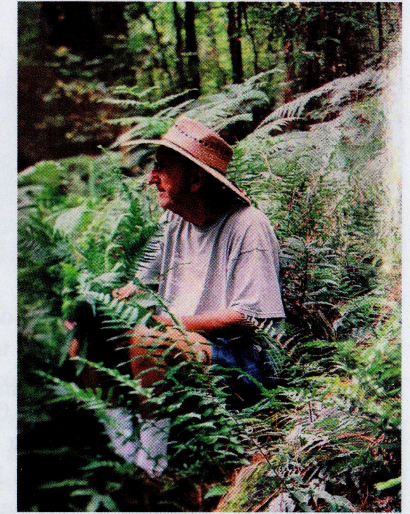
All the best,

Richie Steffen
HFF President

George Sanko~ Teacher, Mentor, Friend, Fern Gardener

Rick Barnes

It is with a deep sense of loss that I write today to the Hardy Fern Foundation to inform its membership that George Sanko passed away on May 23, 2018 at the age of 86. George was all of the things that the title suggests, and was all of those things to me. He touched thousands of lives during a two-phase career that spanned half a century. During his teaching career at Georgia Perimeter College (previously DeKalb Community College and now a campus of Georgia State University), George taught the complexities of basic college-level Biology and Botany to an estimated 20,000 students (some of whom he would "recycle" through his classes during times when student enrollments were low!). In order for those students to have an adequate opportunity to assemble plant collections, George led over 150 field trips throughout the Southeast and beyond. To the best of my knowledge, there was never a serious mishap on any of those trips, though many re-countable misadventures!



In 1990, he started the Georgia Perimeter College Native Plant Botanical Garden as a teaching garden for students that morphed into a platform of outreach to the surrounding community and an island of conservation of the native plants of Georgia and North America. The Garden celebrated its 25th Anniversary in 2015, one year after HFF's Silver Anniversary. Many of the plants in the Garden were rescued from development sites in concert with the Georgia Native Plant Society.

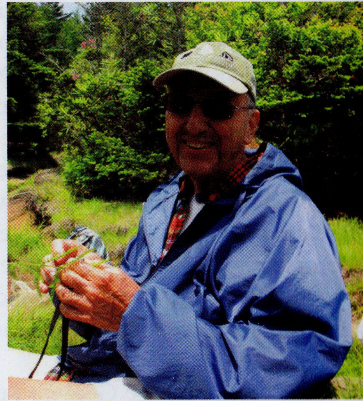


George's love of ferns and native plants was kindled relatively early in his career. Long-time friend and colleague, David Funderburk, who also sits on the Advisory Council for the Garden, shares this memory: "Fall quarter of 1964 we both enrolled on Botany 720- Field and Lab Botany. Among the requirements for the course was to make a herbarium collection of at least 25 ferns and fern allies and a separate herbarium collection of at least 50 trees... Fortunately I was included in the study group in which George was a member." Both men continued their careers in DeKalb County, Georgia, and remained friends until George's passing.



George received many awards for his work during both phases of his career. As Chairman of the Georgia Green Industry Association, I had the honor of presenting him with the "Educator of the Year" award in 1998. That moment rekindled a kinship between mentor and student that would last the next 20 years. But George was not about receiving awards – he was far more excited about the

planned visit of the Hardy Fern Foundation and the British Pteridological Society to the Native Plant Garden in 2011. Even more exciting to him was having the Garden become an Affiliate Garden after that visit. George was all about the plants! In the HFF Quarterly, Summer, 2012, Jo Laskowski wrote of Sanko's invasion of the Great Northwest. George always claimed to be a teacher, not a gardener. I would like to dispel that myth once and for all: George Sanko may have been a teacher first, but as a supplement to that desire, was one of the most innovative gardeners I have ever known. Godspeed, George Sanko.



All photos courtesy of Rick Barnes

We had a great Fall Fern Sale at the BBG, September 8, 2018

Beautiful ferns and fern fans!

We had a fun and successful day at the Bellevue Botanical Garden last Saturday. Thanks to all those who came and shared, learned, and purchased ferns! It was a beautiful selection of ferns.

And thanks to all the volunteers who helped make the sale such a success! See you next year!



Tear down crew, left to right - Chuck Ogburn, Dave Gibson, Lori Gibson, Neve Norton, Pat Riehl, Nancy Strahle, Mark Leichty and Michelle Bundy

Alternate President's Message.....

Fictional ~ Just for fun*

(Sue Olsen pretending to write as Richie)

I was delighted that so many of you were able to join us for the Fall Social. And yes it was very unfortunate that someone spilled a hot cup of coffee in our speaker's lap but you were very understanding when she had to go home without giving her talk. And many thanks to those of you who complimented me on my impromptu substitute talk using the fronds from the fern display. It also gave me an opportunity to again explain that yes I had noticed that all the fronds in the display are yellow but weather permitting we plan to go back to green in the future.

I'd especially like to compliment the faithful members who attended the fall foliage festival at the Rhododendron Species Garden. I was pleased that Jo did a great talk in spite of the wind storm that blew all of the examples away from the display table. Hopefully next year we won't have the wind and driving rain that made it impossible to tour the stumpery.

Meanwhile very best holiday wishes to you all. We had an unusual early snow storm last week and while it was deep it melted off in just two days. So while flattening many evergreens it only damaged the deciduous material which was half dead from the summer anyway.

Thank you for your donations!

Bryan, Joe & Linda	Ougland, Myrna
Campbell, Forrest & Rene	Read, Rosemary J.
Campbell, Pat	Rice, Daniel R.
Daar, Nancy	Rodgers, Elizabeth
Descloux, Nancy	Sanko, George
Eggers, Susan	Scroggins, Tom
Eichhorn, Susan E.	Sears, Ally
Gibson, Dave & Lori	Spearman, Marie A.
Hiatt, Julie	Steffen, Richie & Rick Peterson
Lamade, Charles D.	Strahle, Nancy
McCune, Amy	Stuhmeier, Jorn
McDonald, Susan	Taylor, Carl
Michimoto, Lindsay	Tonsing, Mary Ellen
Mount, Daniel	Tyszowska, Anna
O'Connor, Sean	van den Meerendonk, John
Ogburn, Chuck	Yansura, Daniel & Pat Tanttila
Olsen, Sue	

NEW HFF Website

Dave Gibson

Bainbridge Island, WA

For the last year a team of seven people including myself from the HFF board have been working on building the new hardyferns.org website. We applied for and received a grant from the Pendleton and Elisabeth Carey Miller Charitable Foundation. This grant covered the costs for SpiderLily Web Design to design the new site.

Our goal was to upgrade the software to WordPress and to make improvements for easier navigation and maintenance.

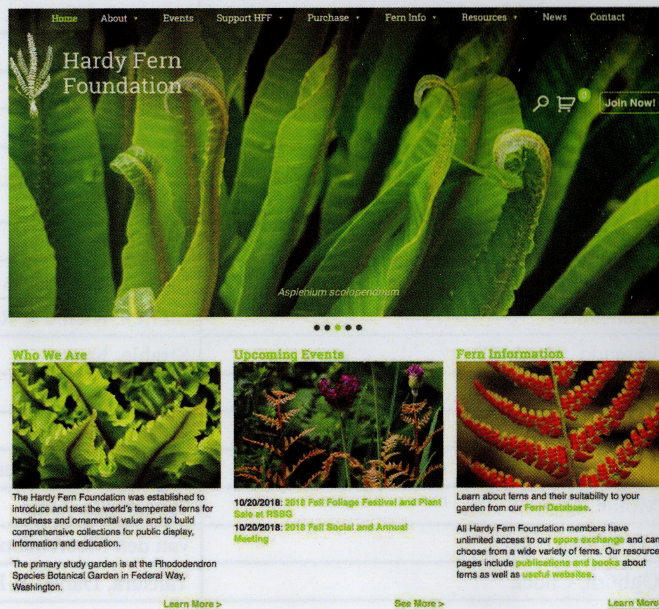
The new powerful store functionality has streamlined the payments of merchandise, events, memberships, the spore exchange, the fall distribution and charitable donations.

Much work went into and continues on the new fern database. This database includes approximately 70 ferns with multiple ways to search for them. Amazing photos taken by HFF board members have been uploaded to help identify and determine the cultural needs and uses of each fern. More ferns are planned to be uploaded in the coming year.

The fern resources and info sections include updated information from growing ferns from spores to where to buy them. There are current links to other educational and fern organizations and a list of the Hardy Fern Foundation's affiliated test gardens.

We also added pages for events and news. This is where you can find information on all of our upcoming events and what's going on.

So please take a look at our exciting new hardyferns.org website and let us know what you think.



Home About Events Support HFF Purchase Fern Info Resources News Contact

Hardy Fern Foundation

Join Now!

Asplenium scolopendrium

Who We Are

Upcoming Events

Fern Information

The Hardy Fern Foundation was established to introduce and test the world's temperate ferns for hardiness and ornamental value and to build comprehensive collections for public display, information and education.

The primary study garden is at the Rhododendron Species Botanical Garden in Federal Way, Washington.

10/20/2018: 2018 Fall Foliage Festival and Plant Sale at RRSG

10/20/2018: 2018 Fall Social and Annual Meeting

Learn about ferns and their suitability to your garden from our Fern Database.

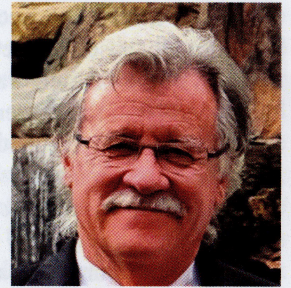
All Hardy Fern Foundation members have unlimited access to our spore exchange and can choose from a wide variety of ferns. Our resource pages include publications and books about ferns as well as useful websites.

Learn More >

See More >

Learn More >

A comparison of the genus *Dryopteris* of northern India and the Himalaya with native and cultivated species in North America



James R. Horrocks ~ Salt Lake City, UT

ABSTRACT

The genus Dryopteris is considered a cosmopolitan group of over 200 species and scores of hybrids. The distribution of this genus worldwide, especially in temperate climates, has been a fascinating subject and a challenging one. Comparisons between species widely separated geographically have raised some interesting questions. This article compares species from the Himalaya and northern India as they relate to North American and some European species that are cultivated in North America. Obvious relationships are apparent in some species but in others questions still remain. Distribution of species, especially in recent times, aided by man himself, is considered.

A fascinating topic among botanists and anyone interested in ferns is the, at times, puzzling distribution of fern species throughout the world. For example, a very striking disjunction is found between the ferns of eastern North America and north-eastern Asia. Hokkaido, the northernmost island of Japan, has about the same number of species as does the north-eastern part of North America. In fact, some of the same species occur in both regions. Pairs of closely related sister species are known, occurring in eastern Asia and in eastern North America (Moran 2004). The magnificent *Dryopteris goldiana* in eastern North America is paralleled by *D. monticola* in East Asia.

In recent years, ferns have been collected from many parts of the world and man is no doubt aiding in their distribution in gardens worldwide. This may ultimately prove to be a step toward distribution into the wild. Indeed, in the United States we have reports of introduced species escaping and establishing themselves in a disjunct assortment of habitats. The Asian fern *Arachniodes simplicior* has escaped in South Carolina as has *Cyrtomium fortunei*. The latter has also escaped in Oregon (Olsen 2007)

When we consider the distribution of ferns in a particular area of the world, it is the ferns of northern India and the Himalaya that give us pause. *Dryopteris* is certainly one of the largest genera found in this region and the complexity and close relationships between them has presented an on-going and monumental task to properly classify.

Comparisons between these species and those found in North America are fascinating and also perplexing. Commenting on the perplexity of the genus *Dryopteris*, a quote from Hoshizaki and Wilson (1999) sums it up:

“The large number of species and the few definitive characters, often a matter of degree and normally based on the dissection of mature fronds, are problems enough without the addition of the inherent variability of the plants. The fronds tend to vary greatly on the same plant, and the presence of hybrids makes identification particularly troublesome. Cultivated plants compound the problem by the absence of data on their place of origin and their tendency to appear different or underdeveloped under various cultural conditions.” (Hoshizaki & Wilson 1999)

In beginning our comparison, an interesting observation immediately draws our attention to the fact that the large once-pinnate complex comprising *Dryopteris scottii*, *D. stenolepis*, *D. gamblei*, and *D. dickinsii* of the Himalaya has no North American counterparts. There is not a single species of North American *Dryopteris* that is truly once-pinnate. Some are pinnate-pinnatifid but they are more deeply cut than the merely toothed to lobed pinnae of the once-pinnate India - Himalaya group. Most North American species are either bipinnate or bipinnate-pinnatifid with a few approaching tri-pinnate.

Himalayan species that include *Dryopteris ramosa*, *D. pulvinulifera*, *D. caroli-hopei*, and *D. marginata*, with their elongated basal pinnules, do have counterparts in North America. They are comparable to *D. carthusiana*, *D. dilatata*, *D. expansa*, and the hybrid *D. campyloptera*. *D. carthusiana* may also be compared with *D. juxtaposita*, in that, both species have a foliose form, but other than that, they are quite dissimilar, although the foliose forms of both species are often incorrectly identified as *D. stewartii*.

The bipinnate *Dryopteris sublacera* is somewhat comparable to the North American *D. marginalis* but the sori in the former are closer to the midvein of the pinnules than to the margins, whereas in *D. marginalis* they are right at the margins, hence the species name.

The widespread species *Dryopteris filix-mas*, a fertile tetraploid sexual, or more properly, a segmental allopolyploid hybrid between *D. caucasica* and *D. oreades*, and found in the north-western Himalaya, matches plants found in Europe and west Asia. Fraser-Jenkins (1989) considers it “a European element reaching the westernmost part of the Himalaya” In fact, it is the only European *Dryopteris* to be present in the Himalaya and “the only polyploid *Dryopteris* species present in the Indian subcontinent whose origin has been resolved” (Fraser-Jenkins 1989)

What is of interest, too, concerns the two distinct types of this species found in North America. The relatively rare eastern plants, with an affinity for limestone, are different from the western form found from California to the Colorado Rockies. The western form is the only species of *Dryopteris* found in the author’s State of Utah. Strangely, the western form is a closer match to those found in Europe, the Himalaya, and western Asia. This is yet another example of a disjunct distribution of a species. Himalayan species which are more or less comparable to *D. filix-mas* make up quite a list and include *D. barbigerana*, *D. blanfordii*, *D. chrysocoma*, *D. juxtaposita*, *D. khullarii*, *D. komarovii*, *D. nigropaleacea*, and perhaps a few others.

Another Himalayan fern with wide distribution is *Dryopteris wallichiana*, a complex species with several variations and close relationships to *D. lepidopoda*, *D. yigongensis*, *D. redactopinnata* and *D. xanthomelas*. *D. neorosthonii* is thought to be a subspecies of *D. wallichiana* (*nepalensis*) (Fraser-Jenkins 2008) although the former is a triploid apomict while *D. wallichiana* is considered diploid apomict, even though triploid apomict forms are known. (In Western literature, the term apogamous is used in place of apomictic. Both terms denote reproduction by asexual means rather than by fertilization.) All of the species in this complex exhibit the quaint rectangular truncated pinnules that give them such a unique and charming aspect in the garden. According to Fraser-Jenkins (1989) “it seems highly likely that *Dryopteris wallichiana* contains the same genome as that which must have given rise by hybridization to the European *D. affinis* complex.” This is interesting since, like *D. wallichiana*, *D. affinis* is apomictic. Of even more interest, the robust *D.x complexa*, a cross between *D. affinis* and *D. filix-mas* and also apomictic, has in some forms, the more or less truncated pinnules, especially near the basal portion of the frond. Finally, the North American *D. marginalis* has a recorded variety “Davenportii” which also has truncated pinnules, although the fronds are somewhat variable. (Rush 1984)

Cytological studies (Hoshizaki & Wilson 1999) (Gibby 1985) of closely related *Dryopteris* species occurring naturally in the same locality have proven fascinating. In the Himalaya and northern India there are slightly more diploid sexual species than triploid apomicts but these two groups represent the larger portion of native species. A much lesser number of diploid apomicts are known and slightly fewer that are tetraploid sexual (Fraser-Jenkins 1989) (Khullar 2000) In the United States and Canada only diploid sexual and tetraploid sexual species are known with one rare hexaploid, *D. clintoniana*, a cross between the diploid *D. goldiana* and the tetraploid *D. cristata*. Lellinger (1985) tells us that “Most of the North American species of *Dryopteris* fall into one large biosystematic complex. Several species from Eurasia are part of the complex.” Triploids are unknown except for a hybrid cross reported between *D. filix-mas* and *D. marginalis*. All of the tetraploids in North America are known to be hybrids between diploids with a doubling of chromosomes. In Mexico there is one triploid apomict, *D. pseudo-filix-mas*, which is included in the *D. wallichiana* complex, but sports more pointed pinnules rather than truncated. It, in fact, resembles *D. affinis*. The appearance of new species from hybridization is an interesting topic in and of itself. Knobloch (1976) tells us that “about 27% of hybrids are fertile or partly so.”

Of interest, and mentioned earlier, the diploid sexual *D. goldiana* has a sister species in Asia, *D. monticola*, that is also a diploid sexual. (Hirabayashi 1969)

An intriguing parallel is found in the hybrid *Dryopteris x flemingii* of the Himalaya and the hybrid *D. x complexa* from Europe. *D. x flemingii* is a rare tetraploid apomict (Khullar 2000) and the offspring of either *D. chrysocoma x D. juxtaposita* or of *D. nigropaleacea x D. sublacera*. Either way the parent plants are diploid sexual and triploid apomict. The European *D.x complexa* is the hybrid of *D. filix-mas*, a tetraploid sexual and *D. affinis*, a triploid apomict, and is also a rare tetraploid apomict. (Hoshizaki & Wilson 1999) The appearance of these two species is somewhat similar although *D. x complexa* has pinnae that are closer together, sometimes overlapping. The pinnules, however, are often

truncated in both, particularly near the base.

Species from North India and the Himalaya which have been in cultivation in North America for a number of years include the triploid apomicts, *Dryopteris stewartii*, *D. blanfordii*, *D. juxtaposita*, *D. sublacera*, *D. gamblei*, *D. neorosthornii*, and *D. yigongensis*. Cultivated diploid apomicts include *D. wallichiana*, *D. stenolepis*, *D. lepidopoda*, *D. conjugata*, *D. pulcherrima*, and *D. dickinsii*. The tetraploid sexual *D. scottii* has been grown with success. Of the diploid sexual species, many have strangely been available only recently. They include *D. pulvinulifera*, *D. marginata*, *D. nigropaleacea*, *D. panda*, and *D. chrysocoma*.

In the author's garden in northern Utah which has a semi-arid climate, only certain Himalayan species have done well. They include *Dryopteris stewartii*, *D. sublacera*, *D. juxtaposita*, and *D. blanfordii*. *D. filix-mas* is native to Utah and is cultivated although the material has originated either in North America or in Great Britain or Europe but not likely from the Himalaya. Other Himalayan species failed, due, no doubt, to low humidity during the summer months. Certain species that are strong possibilities for gardening success in North America but have not been mentioned as having been attempted include *D. barbigerata*, *D. ramosa*, and *D. splendens*, to name just a few.

The question of how these species would fare in different climates presents itself. From descriptions, they seem robust enough. Through experimentation, collectors have made some interesting and even surprising discoveries about the adaptability of a fairly large number of ferns. As research and experimentation continue, one can only wonder at the possibilities for future gardens. Here in northern Utah, with its afore-mentioned semi-arid climate, low humidity is not the only factor. Semi-arid climates usually mean alkaline soils which can be a problem. Supplementing the soils with organic acidifiers and maintaining a micro-climate are beneficial. It has been sometimes quite surprising to discover what will actually thrive here from far off places. Areas where the summers are hot and humid also pose some difficulties for certain species which prefer cooler conditions. It is always exciting to try something new, to be a test station of sorts. And who knows? Given time, potentially one of us may have inadvertently introduced a new species to a new habitat.

References:

1. *The Cultivated Species of the Fern Genus Dryopteris in the United States*, 1999, Vol. 89 No. 1, pp. 1-2, 12, 17, 20-71, Barbara Joe Hoshizaki and Kenneth A. Wilson, American Fern Journal, Vienna, VA.
2. *A Monograph of Dryopteris In The Indian Subcontinent*, 1989, Christopher Fraser-Jenkins, Botany Series, Vol 18 No. 5, pp. 330-443, British Museum of Natural History, London
3. *A Guide To Hardy Ferns*, 1984, p. 40, Richard Rush, British Pteridological Society, London
4. *Cytological Observations on Indian Subcontinent and Chinese Dryopteris and Polystichum*, 1985, Mary Gibby, Vol. 14 No. 1, pp. 2-8, Bulletin of The British Museum

of Natural History, London

5. *Chromosome Numbers In Japanese Species Of Dryopteris*, 1969, Haruki Hirabayashi, Vol. 44 No.3, pp. 25-26, Journal of Japanese Botany, Tokyo
6. *An Illustrated Fern Flora Of The West Himalaya Vol II*, 2000, p 298, S.P. Khullar, International Book Distributors, Dehra Dun, India
7. *Pteridophyte Hybrids*, 1976, p. 1 Irving W. Knobloch, Michigan State University, East Lansing
8. *Encyclopedia Of Garden Ferns*, 2007, pp. 101, 190, Sue Olsen, Timber Press, Inc., Portland
9. *A Field Manual of the Ferns and Fern Allies of the United States and Canada*, 1985, p. 319, David B. Lellinger, Smithsonian Institution Press, Washington D. C.
10. *A Natural History of Ferns*, 2004, pp. 187-189, Robbin C. Moran, Timber Press, Inc., Portland
11. Taxonomic Revision of Three Hundred Subcontinental Pteridophytes With a Revised Census List, 2008, pp. 318-319, Christopher Fraser-Jenkins)

Dimorphism in Ferns: A Tale of Two Forms

Joan Eiger Gottlieb

Pittsburgh, PA

The textbook fern frond is segmented (pinnate), even lacy-looking, green, and dotted or lined with sporangia in groups (sori) on the under (abaxial) side. Fern watchers could rightly challenge nearly every word of that description, especially while watching a cinnamon fern (*Osmundastrum cinnamomeum*) emerge in early spring. First up are the **fertile** fronds, completely festooned with sporangial "beads" resembling Lilliputian grape clusters. Blade tissue is gone, the whole leaf having been transformed into masses of sporangia and supporting veins. In *O. cinnamomeum* ripe, green spores are shed quickly and the empty-nested, now cinnamon-brown stalks shrivel and collapse. (see photo right) Around this time a second crop of crosiers unfurls, this time **sterile**, classically fern-like, and green - well prepared for a long





season of photosynthesis and food storage. This is classic leaf **dimorphism** (from Greek, “two forms”).

There is an embarrassment of ferny riches on the dimorphic theme. Think of ostrich (*Matteuccia struthiopteris*) and sensitive (*Onoclea sensibilis*) ferns. These garden stalwarts also have completely different looking spore-bearing and photosynthetic fronds, but the green ones emerge first (in the spring), and tough, beady, fertile ones follow in late summer,

producing and protecting the spores as they ripen over winter for spring dispersal. Incidentally, they make great conversation pieces in dried plant arrangements. (“What are those bubbly-looking brown things?”)

Other ferns produce fronds with **dimorphic segments**. As they mature it becomes clear that the segments at the tip of some leaves have morphed into sporangial zones with sharply contracted fertile pinnae. Think climbing fern (*Lygodium palmatum*), (see photo above) Christmas fern (*Polystichum acrostichoides*), and royal fern (*Osmunda regalis*). The well-named interrupted fern (*Osmunda claytoniana*) has an eye-catching fertile zone of several pinna-pairs in the middle of its otherwise typical leaves. And let’s not forget the familiar dimorphic species with late season leaves that are visibly narrowed, retaining slim strips of green tissue alongside the sporangia, e.g. netted chain fern (*Woodwardia areolata*) and marsh fern (*Thelypteris palustris*).

Not all foliar dimorphism centers around the dual needs of photosynthesis and reproduction. A perfect example is the epiphytic staghorn fern (*Platycerium*) (see photo right). All species are dimorphic, but not related to spore production. Staghorns produce green, pendulous, lobed fronds that are fertile on their undersides in familiar fern fashion, but they also make flat, roundish, papery leaves



that spread and cling to the fern’s support structure (typically the notch of a tree branch). These “ballast” fronds quickly fade to tan and assume their mature “prop-up” function. There is no pattern to their production. It’s not two green to one brown or any other repeated sequence. Rather, the development of these attachment leaves appears to be triggered by the changing balance requirements of a large, heavy plant on a precarious perch.

Another example of foliar dimorphism in a non-traditional environment (for ferns) is water spangles (*Salvinia*). This open water, free-floating genus often forms solid mats on the surface of tropical lakes and slow-moving streams. Branching, fragmenting rhizomes bear small, round, hairy leaves (that trap air and resist immersion) in whorls of three. There are no roots, but one leaf of each whorl unfurls as a feathery, underwater structure that also helps to trap air and keep the plant afloat. In good conditions berry-like trusses of sporocarps (reinforced sporangial capsules containing micro- or mega-sporangia) develop on these submerged fronds.

The frond is usually the largest and most familiar part of the sporophyte fern. Primitive ferns (eusporangiates) like whisk fern (*Psilotum*), adder’s tongue (*Ophioglossum*), grape fern (*Botrychium*), and the osmundas produce each of their rather large sporangia (easily visible to the naked eye) from several epidermal cells of the leaf. Each sporangium can contain thousands of spores. These super-sized spore sacs often replace part or all of the blade completely and may resemble bunches of tiny “berries” on otherwise naked stalks (as described earlier). The more advanced and much more numerous ferns (leptosporangiates) generally have miniscule sporangia (you will need a good hand lens), each formed from a single epidermal cell and containing up to 64 spores. These tiny spore sacs typically cluster in groups called sori on the underside of a green fern frond. Dimorphism is common and not limited to leaves or fertility. Bracken (*Pteridium*) has **dimorphic stems** in the form of distinct long- and short-shoots. If the long-shoot tip is damaged or removed, a short-shoot behind it will become long. This reversible dimorphism results from the well understood interaction between growth hormones responsible for cell elongation (auxins) and those that promote cell division (kinins) in plants, resulting in dominance by the main shoot.

Although we seldom think of it this way, the angiosperm flower is a spectacular example of **polymorphism**. A flower “bud” is actually a short-shoot with very young leaf primordia that are transformed in quick succession into at least four types of floral parts. A complete, perfect flower will have a bottom set of sepals (tough, scaly leaves for protection of the bud), a higher set of petals (colorful and/or aromatic to attract pollinators), a group of stamens (leaves reduced to a midrib and a few sporangia [anthers] where microspores [pollen] develop), and a crowning group of pistils (folded leaves that produce one or more megasporangia containing megaspores [future seeds]). After pollination and fertilization the entire pistil ripens into a fruit (think avocado).

All this di- and poly-morphism comes courtesy of malleable meristems located in strategic places on the plant body. A meristem is a cell or group of cells set aside from the embryo to remain permanently totipotent (able as an embryo would be to divide,

making new daughter cells and body parts as long as the plant is alive). Meristems can also remain dormant to be activated later; or they can be “used up” (determined) as in the frenzied growth that produces a flower. Tip (apical) meristems are responsible for growth in length of the stem(s). Lateral meristems (like the cambium under the bark of trees and shrubs) increase girth, and axillary meristems in the angles between leaves and stems create side branches resulting in “bushiness.” Regulatory genes respond to reproductive or growth hormones and to environmental factors (e.g. injury, rainfall, photoperiod, temperature) to stir these meristems into specific action(s) and keep them on task until their work is completed. There are parallels with tumor cells in animal bodies but when those divide and grow in uncontrolled ways we call them cancer. Life is always a delicate balance within the genome (complete set of genes), with not all genes active at the same time, the whole system dependent on efficient, complex regulation and timing.

To this writer the examples of dimorphism cited so far pale by comparison with the dual, independent body forms (gametophyte and sporophyte) that alternate during the life cycle of ferns. The genome of a typical fern can express itself either as a tiny, ephemeral, sexual (with eggs and sperms) gametophyte thallus OR as a perennial, 3-D, non-sexual, sporophyte plant (with roots, stems, leaves, sporangia, and vascular tissues). Furthermore, each of these body forms can generate the other directly through apogamy and apospory - the disparate forms are fully interchangeable! The science behind this incredible, dimorphic lifestyle has fascinated botanists for many decades, and has given us an ever-expanding respect for life in all its forms and ferns.

Additional Reading:

Farias, R. de Parva et al. 2018. Leaf phenology of *Danaea*.... *Amer. Fern Jour.* 108(2): 35-46.

Gottlieb, J. and T.A. Steeves. 1965. Experimental control of the shoot system in sporelings of *Pteridium aquilinum*. *Amer. Jour. Bot.* 52(4):359-368.

Gottlieb, Joan Eiger. 2005. Further reflections on apogamy and alternation of generations - Part II. *HHF Quarterly* 15(4):44-47 Fall.

Kenrick, Paul. 2017. How land plant life cycles first evolved. *Science* 358(6370):1538-1539.

Powledge, Tabatha M. 2009. Epigenetics and development. *Bioscience* 59(9):736-741.

The Cuban Fern Tour, March 8-15, 2018

Introduction

Daniel Yansura ~ Pacifica, CA

Although none of us had ever imagined going to Cuba to see ferns, much less going with the foremost expert on those ferns, we were, indeed, lucky enough to be able to do just that. A few fortuitous encounters with Carlos Sanchez the year before planted the idea in a number of people's minds, and I was particularly intrigued by the thought.

Dr. Sanchez is the Professor of Botany at the University of Havana, and he specializes in ferns. I learned about him first through his book, *Los Helechos Y Likofitos De Cuba*, which is a good resource for anyone interested in Cuban ferns. (Although it is written in Spanish, it has the Latin fern names with colored photographs.) Then, in 2017, he came to the US to work for a few months at the Jepson Herbarium in Berkeley, during which time he gave three lectures. He spoke at both the Hardy Fern Foundation in the Seattle area and at the UC Botanical Garden in Berkeley. The lectures, of course, planted the idea of a fern trip in our minds, but we could only imagine one if Carlos led it. A few months later, when he came to the SF Fern Society to speak, he had obviously been thinking the same thing, as when he arrived he handed out fliers for a Cuban Fern Tour!

Only four of us were able to go on this first Cuban Fern Tour, but our glowing reports will, no doubt, spark interest in future trips. It was sponsored by Betchart Expeditions and was designed to cover hiking in the Sierra del Rosario, a western mountain range, and in Parque de Codina and Topes de Collantes National Park, both of which are in the Sierra del Escambray, a south-central mountain range. These areas of higher elevation have more rainfall, and are the most likely places to find ferns. Carlos knows the ferns and the areas exceptionally well, and he was the key to this successful new venture for Betchart Expeditions and the country's tourism industry: a Cuban Fern Tour.

Thursday 8th of March – We arrive in Havana

Daniel Yansura

Our flight to Cuba departed very early in the morning, so we spent the night before in Miami. Once at the airport, getting our boarding passes and checking our luggage was nothing unusual, but getting a stamp on our boarding passes at the Cuba Ready Station was new to all of us. This insured we all had passports, a visa, and an affidavit before boarding the plane.

Our first morning started the tour off well. The flight to Havana was pleasant and took less than an hour. We could see the Florida Keys on the way out, and seeing the island of Cuba was really exciting. On landing we departed the plane by stairs, and once in the small airport we passed rather easily through customs. Dr. Carlos Sanchez and Gretel Sintez Gomez, who managed the logistics of the tour, were both waiting for us; their friendly, competent manner put us all at ease. We boarded a small van and, on our way to lunch, stopped for a short time at the Revolutionary Square in Havana, where there is a

large monument to José Martí, a hero in Cuba's independence from Spain in the late 19th century. Many government buildings surround the plaza, and two of them have facades that are large steel memorials, one to Che Guevara and the other to Camilo Cienfuegos. Fidel Castro addressed more than a million Cubans in this square on many important occasions. We all took some pictures of the square and of some of the old cars from the 1950's parked along the street.

We had lunch in the Hotel Nacional de Cuba, known for all the famous people who have stayed there. It is a grand building, and the walls in the lounge are covered with pictures of many of those famous people. Near the entrance to the building we saw our first fern in Cuba, *Nephrolepis falcata* 'Furcans', the fishtail fern. Although this is a commonly cultivated fern in the tropics, we were nonetheless delighted to see it. After lunch, our walk back through the building led us by a large potted plant of *Microsorium grossum*, another non-native cultivated fern.



After checking into our hotel, Habana Paseo, we converted our American dollars to Cuban Convertible Pesos. Our afternoon was free, and we all decided to walk around the lovely neighborhood near our hotel. In many of the small residential courtyards we could see the

residents' potted plants; these included *Platycerium bifurcatum*, *Nephrolepis falcata*, *Microsorium grossum*, and *Microsorium punctatum* 'Grandiceps'. The only native fern we saw was *Pteris vittata*, (see photo above) often growing in the mortar cracks of walls.

Friday 9th of March – The National Botanical Garden and Historic Havana Pat Riehl

With Dr. Carlos Sanchez as our guide, the first stop of the day was the 1,500 acre National Botanic Garden, opened to the public in 1984. The garden is divided into tropical geographical zones: Cuba, America, Africa, Asia, and Australia. It also has areas of mixed forest and serpentine forest, plus over 200 palms from all over the world. There are two display gardens, one featuring cactus and the other, ferns. Both are housed in a very interesting architectural building shaped like a pyramid but open to allow breezes at either end. While our goal was the fern house, we lingered in the cactus area because it was so well designed and full of cactus and succulents from all over the world.

We didn't spend much time in the fern display house because the real treasures were in the "behind the scenes" greenhouse, which is off limits to the public. We slowly -- very slowly -- fondled and photographed our way through this space. Being from the Northwest, I wasn't familiar with any of the 90 species. *Thelypteris scolopendrioides* looks like our *Blechnum spicant*. *Anemia adiantifolia* has fertile fronds, which rise

above the sterile ones, emerging from the lowermost pinnae, which are modified to produce a stalk carrying the sporangia. *Bolbitis portoricensis*, with the fertile frond underside covered with black spore, is just beautiful. An interesting note, I searched for information on this fern but mostly found information on two species, *B. heteroclita* and *B. heudelotii*, both from Africa, and common to the aquarium business since both survive under water. *B. portoricensis* is from the Neotropics. We also saw *Maxonia apiifolia*, which was thought to be extinct in Cuba but was rediscovered in the central part of the country; the garden is trying to propagate it to reintroduce it back into the wild. Carlos also showed us *Cyclospeltis semicordata*, *Olfersia cervina*, *Psilotum nudum*... the list seems endless. The hardest job was getting us out of the greenhouse, but lunch was waiting in another area of the garden. We ate while a nearby band played Cuban music.

Our afternoon was spent in Old Havana, the historical center of the city, which was declared a world heritage site by UNSECO in 1982. After being neglected for many decades, Cuba is restoring Old Havana to its glory days -- not just government buildings, but also shops and homes. We wandered through several plazas: Plaza of the Cathedral, with the Cathedral of Cristobal begun in 1748; Plaza of Arms, dating from the 1600's, which, over several centuries, was transformed from military use to a place for the wealthier citizens to see and be seen; and finally Plaza of San Francisco, where the most important building is the Basilica of San Francisco, started in the late 16th century. All of the restoration in Old Havana is an attempt to increase tourism and bring in more foreign revenue. Every week, three cruise ships dock near this area, so the plazas are always crowded with tourists.

It turned out to be a good day of ferning at the botanical garden, and we enjoyed sightseeing in Old Havana.

Saturday 10th of March – Vinales Valley Corina Rieder

Our third day in Cuba did not start out very 'ferny.' After visiting Carlos' beautiful greenhouse the previous day, the four of us were ready to see some wild ferns. Instead, our itinerary listed a number of cultural and scenic stops once we arrived in Pinar del Rio, but no mention of hikes or botanizing. We were a sad bunch of fern-crazed people. The drive from Havana took us past grand colonial estates (including the Castro compound) and out through the lowland tropical scrub/savannah where most Cuban agriculture can be found. The Viñales area is mostly known for three things: mogotes, tobacco, and its status as a UNESCO World Heritage site. A mogote is basically a jungle-covered limestone butte sprouting from the valley floor. The forest on the mogotes is a curious mix of pine, oak, tree hibiscus, and scrub, with *Roystonea* palms mixed in. We really wanted to explore a mogote, but sadly they are off limits. Instead, we were treated to a lesson in cigar rolling at one of Cuba's famous tobacco plantations. Imagine Pat R. and Wendy B. posing for photos with a Cubano cigar!

A lovely group lunch at the Finca Agroecologica El Paraiso opened the way for a fern-filled afternoon. After eating, we finally spied our first new ferns of the day near the restaurants entryway: *Cyathea myosuroides* and *Thelypteris kunthii*. Somehow, we

ooled and ahhed our way into a special treat. Carlos and Gretel got permission for us to hike along the farm's perimeter in search of ferns. So, along with farmhand Rafael and his cute dog Kira, we trekked through the farm down to the creek. Our first ferns weren't far away. Growing among the pineapple and corn -- in full sun -- we found a strange combination of *Odontosoria wrightiana* and a *Pityrogramma* species. If you're not familiar with *Odontosoria*, the fronds are quite lacy in appearance yet durable, and this species in particular has small thorns along the stipe for protection and to help it scramble up other plants. We encountered this one several more times during the week, always along exposed roadcuts and other open areas, where it makes a delicate-looking, yet formidable, barrier. Eventually, we made it down to the creek out of the tropical sun and into a humid, riparian understory. On this short hike, we found at least ten additional fern species and two lycophytes. We tromped as delicately as possible through the dense undergrowth of small pines and oaks covered in epiphytes -- mostly *Tillandsia*, but also aroids and often *Campyloneurum phyllitidis*. Here, dotting the creek bank, grew *Blechnum occidentale* and several *Adiantum* (*petiolatum*, *latifolium*, *pulverulentum*, *cristatum*), with many individuals of *Cyathea myosuroides* in between. Carlos was delighted to name and discuss our finds, while Kira trotted happily alongside. I was quite excited to find *Lygodium cubense* climbing up a heartleaf philodendron, which in turn was growing up a tree and into one of the aerial termite nests that encircle tree trunks here. Growing out of the termite nest was yet another *Campyloneurum*. I'm particularly fond of *Lygodiums*, and *L. cubense* has lovely, frilly fertile fronds without the encroaching habit of other *Lygodiums* (eg, *L. microphyllum*). In a few days, we would find more colonies in Topes de Collantes growing at 2000 ft elevation. Our fern-tastic day ended at the Hotel Ermita, with sweeping views of the Viñales Valley, its mogotes lit up by a fantastic tropical lightning storm.

Sunday 11th of March – Sierra del Rosario Mountains Wendy Born

Our morning outing was originally scheduled to be a hike in the Sierra del Rosario Biosphere Reserve to look for ferns, but due to some technical problem we were denied access. As an alternative, Carlos took us up some remote dirt road in the mountains nearby, and we easily began finding ferns to identify in the wet forest. *Anemia adiantifolia* was very common near the side of the road, as was *Blechnum appendiculatum*. *Lygodium cubense*, a vine fern with simple, sparse leaves, was also often found climbing up shrubs and trees nearby. A small grove of *Cyathea myosuroides* tree ferns was spotted just off the road in the forest, but their height precluded any detailed look, so we just took some pictures. *Christella schizotis*, a rather large wood fern with fertile fronds, was located near a small stream. We observed it in detail and compared it with *Christella hispidula*, which was nearby. We left the road and followed the stream, hoping for a chance to find some different ferns, and we were delighted to find the delicate and dainty *Anemia cuneata* close to the water and *Tectaria minima* growing on a bank on the opposite side. With the vegetation near the stream becoming very dense and with no trail to follow, we decided to return to the road, where we located *Goniopteris obliterated*, *Adiantum tenerum*, and a *Selaginella* species.

For lunch we drove to one of Cuba's lesser-known destinations, Las Terrazas. It is a community of about 1,200 people located in the Sierra del Rosario Mountains, less than an hour's drive from Havana, and it is in the center of a large reforestation program. The early settlers had cut down most of the trees to farm, but ended up in extreme poverty. The federal government started the reforestation program about 50 years ago to help the community, and most of the people were moved into the town of Las Terrazas. Much of the community now works in the eco-tourism industry, and their standard of living has greatly improved with electricity, running water, and medical care.

In the afternoon, we took another hike in the Sierra del Rosario Mountains on a different dirt road, one that was badly rutted and impassible for most vehicles. We immediately noticed a fertile leaf of *Lygodium cubense*, whereas in our previous sightings of this fern I had seen only sterile ones. The protruding sori on the leaf edges made it more interesting, and of course also offered a chance to look at some spores for the first time. We then spotted *Adiantum tenerum* and the spectacular *Adiantum trapeziforme*. The latter maidenhair fern formed a colony just off of the road in a shaded location. After taking many pictures of this photogenic fern with 2-3 ft fronds, we moved on, sighting *Campyloneurum phyllitidis* growing on a tree and then *Adiantum pulverulentum*, a much smaller but attractive maidenhair fern. Farther along we spotted *Anemia adiantifolia* near the side of the road, *Phlebodium aureum* growing on a tree branch, and the two *Christellas* seen on the morning hike, *C. schizotis* and *C. hispidula*. Just as we decided to return for the night, we found *Pleopeltis polypodioides* and *P. marginata* attached to different trees. *Pleopeltis polypodioides* has pinnatifid leaves, and is native in the Southeastern U.S., while *P. marginata* has simple fronds about 6 inches long.

For the night we stayed at the Hotel Moka, beautifully built around a number of large trees, and one of the first eco-tourism complexes in Cuba.

Monday 12th of March - Las Terrazas to Topes de Collantes National Park Daniel Yansura

When we left the Hotel Moka in Las Terrazas early in the morning we knew that the day included the long 5-hour drive to Topes de Collantes National Park in the Sierra del Escambray Mountains. This mountain range in south-central Cuba is relatively high in elevation (just over 3,000 ft.), and its significant rainfall gives rise to tropical rainforest vegetation.

Our drive was through a relatively flat landscape with sugar cane farms and small farming towns where horses were still used for transportation. Carlos had given each of us one of his books, *Sistematica de plantas 1 Briofitos, licofitos y helechos*, and although it was written in Spanish, the figures and pictures were self-explanatory. It provided some interesting browsing when the landscape proved otherwise.

We stopped for lunch in the southern port city of Cienfuegos, an old colonial city with many beautiful buildings, which is now a UNESCO site. On entering the restaurant, Villa Lagarto, we noticed many plants, including ferns, decorating the trendy room. This

included *Adiantum trapeziforme* and *Campyloneurum phyllitidis*, both impressive native Cuban ferns.

We continued on our journey after lunch, stopping briefly at a visitor center where we noticed *Macrothelypteris torresiana*, a relatively large terrestrial fern, near the entrance. As we drove on, we started climbing, and all eyes were on the vegetation by the side of the road. The ground became wetter, and soon ferns were very common. It was tempting to stop, but we all wanted to reach our final destination, Hotel Los Helechos, at 2,200 ft elevation. On arrival, we were immediately delighted to see several *Cyathea arborea* tree ferns, most at least 8 ft. tall, planted in the front garden; they were interspersed with *Cycas circinalis* and Roystonea palms.

While the main entrance and lobby were part of a modern building, the hotel rooms were in separate, linear, concrete buildings out back, suggestive of the Soviet era, but fortunately the grounds were not so stark. After checking in, we searched the hotel grounds and discovered several wild ferns that had become established in favorable sites. On one of the *Cycas circinalis* plants near the entrance, we discovered a large colony of *Microgramma lycopodioides* with its small simple leaves, and protruding through this matted fern were the large fronds of *Serpocaulon triseriale*. Nearby we noticed a tree fern stump supporting both a colony of *Pleopeltis polypodioides* and a *Campyloneurum angustifolium* plant. Our search was interrupted by dinner, but afterwards we uncovered *Pteris vittata* protruding from cracks in the concrete walls, and, growing in the ground near the foundation, a colony of *Goniopteris reptans*. Landscape ferns in the entrance garden included the usual *Nephrolepis cordifolia* and *Microsorium grossum*. Finally, on an evening excursion just before dark, I noticed a different type of tree fern growing in a wild wooded area across the street from the hotel's main entrance. This tree fern differed from the landscaped *Cyathea arborea* in front of the hotel in that the trunk, stipe and rachis were all dark brown in color. Additionally, the stipe had spines, and this made trying to extract a few stipe scales for identification difficult. Fortunately, Carlos easily identified it as *Alsophila cubensis*, and although it lacked any fertile fronds, we would later see many other plants with spore producing sori.

In the evening, we all gathered in the room Carlos and I shared, and watched the first of three slide shows that he had prepared, this one on the geography and flora of Cuba. Our screen was a bed sheet that Carlos generously provided off of his bed, hung on the curtain rod.

Tuesday, 13th of March - Parque de Codina

Pat Riehl

Today we hiked in Parque de Codina, just 3 miles from Topes de Collantes National Park. Before the revolution this whole area was covered with coffee plantations, but afterwards they were abandoned. Codina was then turned into a recreational area with lots of hiking trails and a restaurant. The plan for the day was to explore one trail in the morning, have lunch, and then hike another trail in the afternoon.

While we waited for our transportation, there was time to explore the area near the hotel. It was easy to spot the tree ferns, *Alsophila cubensis* and *Cyathea arborea*, but not so easy to identify *Serpocaulon triseriale* hanging from a palm tree. There was also *Pleopeltis astrolepis* everywhere.

Yesterday we heard we would be getting a "Russian massage" this morning. The "massage" was a ride to our drop off point in an old, Russian troop transport with metal seats -- seats meant for young bottoms, but not this old one! No car or bus could manage the deep mud and rutted road. The vista was beautiful with mountains in the distance and lush green vegetation by the side of the road. We passed lots of *Sticherus bifidus* and tree ferns on our drive up.

At our drop point, there was an alley of *Cyathea arborea* over the road which we enjoyed exploring. In the trees was the sound of a tiny bird, a Cuban Toby with a white chest and vivid pink throat.

We soon left the road and walked on a well maintained path, resuming our routine of spotting a fern, taking its picture, Carlos telling us the name and its characteristics, and then moving on to the next one. This happened all day. Carlos was doing what he loves: ferns and teaching! It was slow going. Ferns were everywhere, from epiphytic *Microgramma lycopodioides* to large knife-blade-shaped *Campyloneurum phyllitidis* and medium-sized *Amauropelta scalpturoides*. *Christella dentata* showed off when the sun hit its limey frond set against the dark green of surrounding forest. Farther on were *Diplazium striatum*, *Diplazium arboreum*, and *Amauropelta scalpturoides* close to a *Tectaria heracleifolia*. *Tectaria* is one pinnate with heart-shaped first pinnae, while the lateral pinnae seem to have wings. I like this fern because it is easy to recognize. On a huge boulder in deep shade was *Asplenium erosum*.



I did have favorites amongst the many ferns we saw. One of the easiest tree ferns to identify was *Cyathea horrida* (*Cnemidaria horrida*). (see photo above) It has brown

stipes covered in spines, and the sori along the pinnule margin form a zigzag pattern. Very nice. Plus how can one not love a fern with a name like horrida! Another favorite was *Hemionitis palmata*, growing flat to the ground in an open grassy area. (see photo left) It looked like tiny velvety maple leaves. Tucked into a recess of a huge limestone rock formation was a small *Goniopteris reptans* that looked like *Asplenium trichomanes*. Next to it was *Goniopteris sclerophylla*, another small fern with



simple serrated blades. The last ferns seen for the day were two tree ferns, *Alsophila balanocarpa* (see photo right) and *Sphaeropteris insignis*.

We missed our lunch and combined two hikes into one long one. Finally, at about 3pm, we sat down for lunch, and then waited for our afternoon massage.

Later that evening, Carlos gave us a talk and slide show about the conservation of ferns in Cuba. It was a very good day, with thirty new ferns and great company.



Wednesday, 14th of March, Vegas Grande Trail, Topes de Collantes National Park

Corina Rieder

Would it be possible to see more ferns than we did on our fantastic fern walk of the previous day? Perhaps Elaphoglossums or filmy ferns would do...but at 2,200 ft, our elevation wasn't quite high enough. In any case, surprises were still possible.

Our trek started just a short drive from Los Helechos Hotel at Don Pancho Coffee Farm, one of the few privately owned coffee estates on the island. Because of its convenient location next to park trails, Don Pancho does a brisk trade in 'Campesino' coffee for hikers and locals alike. It wasn't surprising to find our usual fern friends here: *Microsorium*, *Platyserium*, and even a pot made from a tree fern trunk (*Cyathea* sp.), planted with *Nephrolepis* and *Sticherus*. The pot and planting imitated the traditional coffee bean dehusker made out of palm trunks -- imagine a tree fern mortar and pestle.

Once fully caffeinated, off through the farm we went into the mixed understory. There we soon found a number of shade-loving plants, including *Blechnum appendiculatum* and tree ferns. Farther along the trail, we came across young plants of *Cyathea horrida*; in spite of being more of a shade-grower, it was growing in full sun amongst large colonies of *Lycopodiella cernua*, *Sticherus bifidus*, and *Lygodium cubense*. In Botanical Latin, 'horrida' means rough or prickly (referring to the scales or spines), and a stand of *Cyathea horrida* has a very Jurassic feel. Its fronds are singly pinnate, thick and fleshy, vegetal green, and they appear edible, like lettuce on legs--truly my favorite tree fern. Later, we walked through another steep grove--this one in deep shade--of *C. horrida*, with *C. aspera* and *Alsophila cubense* nearby. The latter two looked outwardly alike but Dr. Sanchez explained that the difference is in the distinct scales and growth habits. Upon closer examination we could see that *Cyathea aspera* grows as a clumper, expanding itself rhizomally.

Farther along the trail the dominating ferns became epiphytes and lithophytes, both growing on mossy hardwoods or rock outcroppings: here, a nice contrast of *Serpocaulon triseriale* with *Microgramma lycopodioides*; there, *Pleopeltis polypodioides* with

Campyloneurum angustifolium and *C. phyllitidis* juveniles; and, over there, pockets of *Pleopeltis astrolepis*, with *Lepanthes* orchids and many unknown vines in tree crotches.

Our hike brought us to a fork in the trail. One branch led to Vegas Grande waterfall, where in a normal year we might have found mist-loving ferns. Unfortunately, in the autumn of 2017 the extreme precipitation of Hurricane Irma scoured the ferns from the waterfall area, so we opted for the other trail across the valley instead. This path took us to the brisk stream that we had crossed earlier on a handcrafted bridge. Here, the area was obviously ravaged by Hurricane Irma's force and no bridge remained, forcing us to take our shoes off and wade. Once on the other side, the steep, sunny slope didn't look promising for ferns, but in the rainy tropics plant life re-grows at an astounding pace. Amid the muddy jumble from the flood were clumps of *Piper auritum*, melastomes, grasses, legumes, *Roystonea* seedlings, and also many sun-tolerant juvenile ferns; more *Sticherus* and *Lygodium*, of course, and also *Amauropelta* (*Thelypteris*) and *Anemia*. The trail eventually wound between houses up towards the road; pockets of mixed *Adiantum* and *Anemia* grew below fruit trees, and chickens and mongrels greeted us.

Back on the road we left our wonderful guide, Neysi, at her home and walked the short way back to the hotel for our farewell-to-Cuba dinner. Funnily enough, the last ferns to greet us that day were painted on the dining room wall.

Thursday, 15th of March – Leaving Los Helechos Hotel

Wendy Born

Unfortunately this was the end of our trip, and we knew we had to spend endless hours driving across Cuba and flying to the United States. We were promised a short hike in the morning though: one hour out on the trail, and then one hour to return.

After checking out of our hotel, we loaded our luggage into the van and then drove about 5 minutes down the road to a place where we could start our hike. The trail led down into a gully, and as we descended, we admired one of our now favorite tree ferns, *Cyathea horrida*. The trunks of this species are not very tall, about 2-3 ft, but the beautiful crown of fronds, seen from above, caught the attention of all of us. We stopped to take some pictures of the unusual sori pattern and the unfolding crosiers.

Farther down the trail we saw many of the ferns that we had observed the previous day. Off of the trail we noticed a different group of tall tree ferns (~15 ft.) with clean trunks that were probably *Sphaeropteris insignis*. Because of our limited time, we took a few pictures and moved on. As we approached a stream crossing, we noticed a man leading a mule that was carrying bags of coffee beans across the shallow water, and this reminded us of the wonderful fresh brew we had had the day before. After watching the man and mule disappear into the forest, we hiked farther and came across *Cyathea aspera*, with its thin trunk (6-8 ft.). The old stipe bases were appressed to the trunk, and they all appeared to be twisted, making it a very distinguished-looking tree fern. There were many of these ferns on both sides of the trail, forming a large colony. On our return hike to the van we came across *Odontosoria wrightiana* again, with its tiny wedge-like segments. This is a

dainty and very attractive fern, and it would be interesting to see it in cultivation.

As we made the final stream crossing on a small bridge, we saw a trogon or tocororo, Cuba's national bird, sitting above us on a branch. With blue, white, and red patches of feathers, it is an exceptionally colorful and beautiful bird, and seeing it was a spectacular ending to our trip.

On our drive to the airport, we stopped for lunch at a resort that largely catered to foreign visitors. It was a very nice meal, and our last one in Cuba. At the airport, we said goodbye to Carlos, Gretel, and our driver. The airport was small and easy to navigate; after a long wait we passed through Cuban customs and boarded our plane. On arriving in Miami, the throngs of people seemed a bit overwhelming, and we moved quickly to some long rows of self-service kiosks in the customs area. Rather than filling out those small and almost unreadable customs forms on return flights, these electronic machines supposedly make the process quicker and more efficient. Pat and I, however, made the mistake of checking "no" on every question without reading each one carefully. This meant we spent over an hour in another customs line for further questioning, while Dan and Corina patiently waited on the other side with our luggage.

Conclusion ~ Daniel Yansura

At dinner that night in Miami we all agreed that it had been a wonderful tour. It had met our highest expectations. In the months and weeks before the tour started, we all had had our reservations. Would the trip really be primarily focused on ferns? Would our movements in the field be so restricted that we wouldn't be able to pluck a pinnule for closer examination with a hand lens, or collect a few spores? In the end, however, we needn't have worried. This trip was very much like other international fern trips, with the additional benefit that, because there were so few of us, we had easy access to Carlos, the fern expert. We also enjoyed many non-fern cultural experiences such as seeing Revolution Square, Old Havana, a cigar tobacco plantation, and, of course, eating the wonderful Cuban cuisine.

We saw approximately 75 species of ferns and lycophytes out of a total of 600 species in Cuba. It seemed like each area we hiked had a different set of ferns, with some overlapping species. The most diverse area for ferns was the wetter Sierra del Escambray Mountains (Topes de Collantes National Park and Parque de Codina), particularly for tree ferns, Diplazium species, and epiphytes. In the drier but still moist and shaded gully in the Viñales Valley, where we found a number of ferns, the Adiantum species were especially diverse. The Sierra del Rosario Mountains offered a different set of ferns, particularly Anemia and Christella species.

We were all pleased with the professional organization of the trip by Betchart Expeditions in Cupertino California, which included obtaining our Cuban visa for us. Once in Cuba, Carlos Sanchez and Gretel Sintes Gomez greatly enhanced our daily travels with their knowledge of the areas we visited and their warm companionship. Dr. Sanchez's encyclopedic knowledge of Cuban ferns was a real highlight. We give our sincerest thanks to both him and Gretel.

THE HARDY FERN FOUNDATION QUARTERLY



*The Hardy Fern
Foundation Quarterly*
is published quarterly
by the

Hardy Fern Foundation
P.O. Box 3797
Federal Way, WA
98063-3797
253-838-4646 ext. 111

Articles, photos, fern and
gardening questions,
letters to the editor, and
other contributions are
welcomed!

*Please send your
submissions to:*

Sue Olsen
2003 128th Ave SE
Bellevue, WA 98005
foliageg@gmail.com

Editor:
Sue Olsen

Graphics:
Willanna Bradner
(cover design)
Michelle Bundy
(inside design)

Webmistress:
Michelle Bundy

THE HARDY FERN FOUNDATION

Curator: Jo Laskowski

BOARD OF DIRECTORS

President: Richie Steffen

Vice President: Michelle Bundy

Immediate Past President: John van den Meerendonk

Recording Secretary: Kathryn Crosly

Corresponding Secretary: Pat Riehl

Treasurer: Nancy Strahle

Board Members:

Forrest Campbell	Rick Peterson
Susie Egan	Linda Pyles
David Gibson	Diane Thompson
Daniel Mount	Meredith Smith
Charles Ogburn	Jane Whiteley

Honorary/Advisory Members:

Naud Burnett	Carolyn Doherty
Jerry Doherty	Joan Gottlieb
James Horrocks	Nils Sundquist

Members at Large:

Sue Olsen