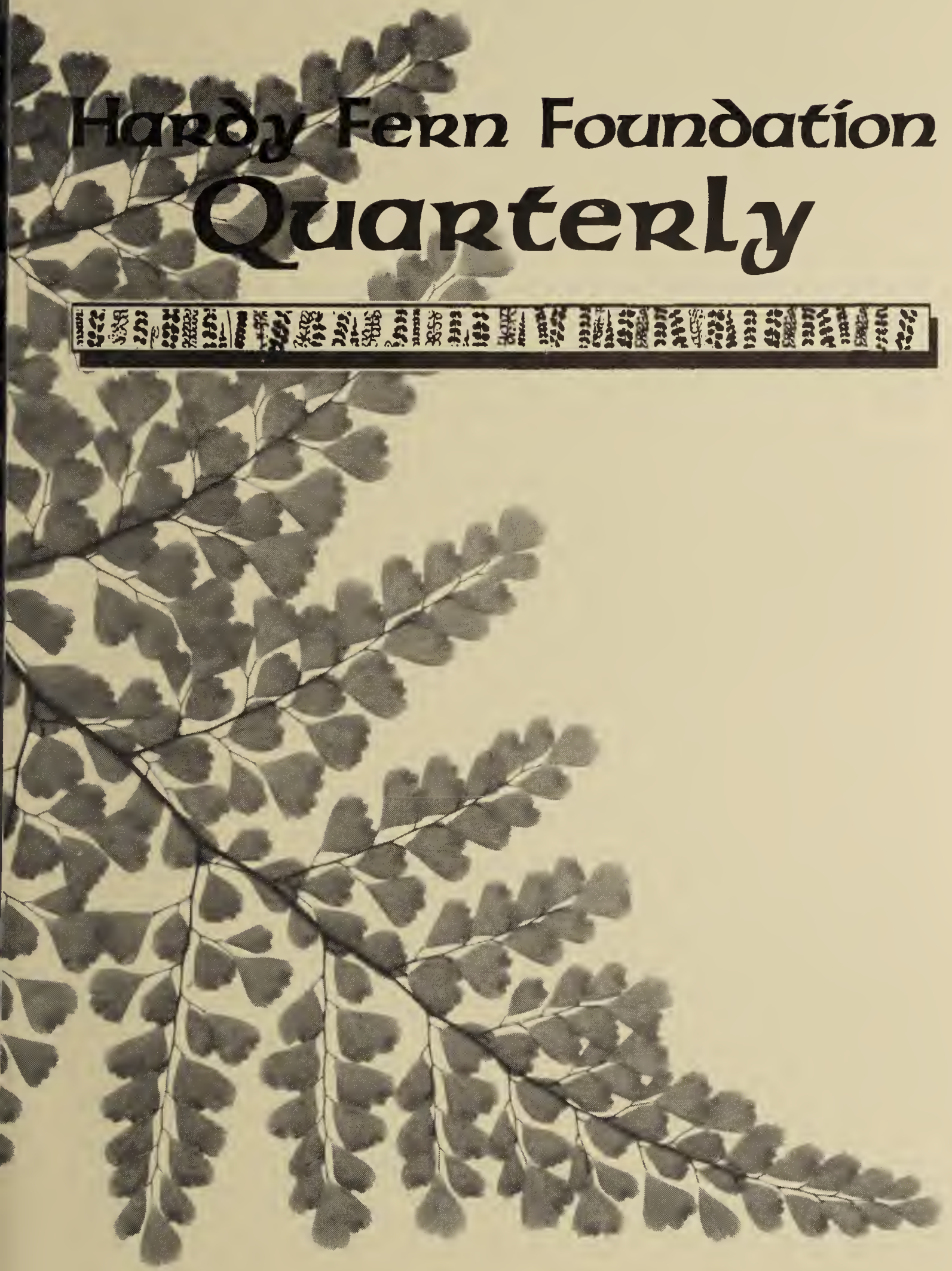
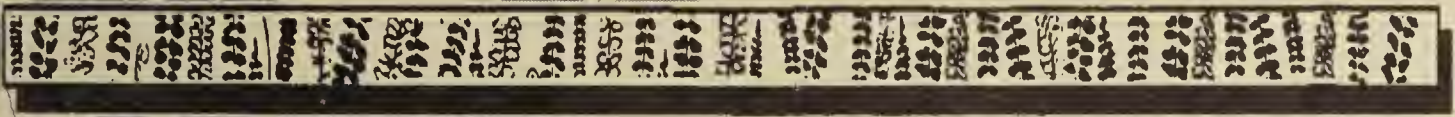


Hardy Fern Foundation Quarterly



THE HARDY FERN FOUNDATION

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darkwing.uoregon.edu/~sueman/

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.

Satellite fern gardens are at the Stephen Austin Arboretum, Nacogdoches, Texas, Birmingham Botanical Gardens, Birmingham, Alabama, California State University at Sacramento, Sacramento, California, Dallas Arboretum, Dallas, Texas, Denver Botanic Gardens, Denver, Colorado, Georgeson Botanical Garden, University of Alaska, Fairbanks, Alaska, Harry P. Leu Garden, Orlando, Florida, Coastal Maine Botanical Garden, Wiscasset, Maine, Inniswood Metro Gardens, Columbus, Ohio, New York Botanical Garden, Bronx, New York, and Strybing Arboretum, San Francisco, California.

The fern display gardens are at Lakewold, Tacoma, Washington, Les Jardins de Metis, Quebec, Canada, University of Northern Colorado, Greeley, Colorado, and Whitehall Historic Home and Garden, Louisville, KY.

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.

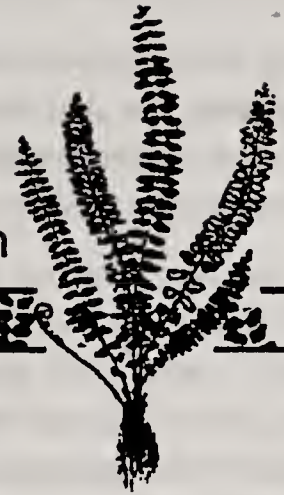
Cover Design by Willanna Bradner.

HARDY FERN FOUNDATION QUARTERLY

THE HARDY FERN FOUNDATION

QUARTERLY

Volume 9 • No. 3 • Editor Sue Olsen



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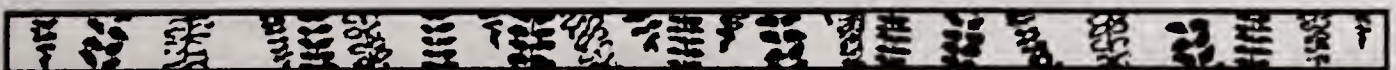
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President's Message

The Hardy Fern Foundation's 1999 Fern Festival was held on June 4-5 and was a great success. As you know, It consists of three Important activities: the Annual Meeting of the membership, a public lecture and a fern sale. As one result of the annual meeting, I will be serving the Foundation as its President. I am honored.

The lecture was present by Dr. Herb Wagner, Professor Emeritus from the University of Michigan, Ann Arbor. Dr. Wagner was introduced by Dr. Art Kruckeberg. They both spent their graduate student years together at Berkeley and have been long time friends. Dr. Kruckeberg recalled that when introducing his biology class to his students, Dr. Wagner would define biology as, "the study of Plants and their Parasites".

The title of Dr. Wagner's slide-lecture was "Unusual Ferns", with, he said, "due attention to the smallest, the rarest, and the ugliest". During his lecture he suggested greater use of Club Mosses and Horsetails in the garden, although he warned that the latter might be invasive. (*Ed. note, yes they are*). His own area of special Interest is the *Botrychiums* or "Grape-ferns" but these were considered more for their interesting evolution than for the garden. His closing statement stressed the importance of seeing beauty in all the natural world.


Dr. Wagner is a man of many Interests from ferns to butterflies to geology and he seldom travels anywhere without his butterfly net in hopes to add to his collection. It was a pleasure to have him with us.

The fern sale was also a huge success. It was sort of a good news bad news situation. The good news was that we had a big crowd of buyers on Friday, but the bad news was that we had a smaller inventory due to the cold and wet spring. We were completely sold out of ferns about noon on Saturday and were sold down on companion plants as well. The sale grossed well over eight thousand dollars! (The bills have yet to be paid.)

The Fern Festival is the major fund raiser for the Foundation and we couldn't have done it without the hard work of all of you who took part. But I wish to thank particularly Sylvia Duryee and Sue Olsen whose expertise, detailed planning and hard physical work set the framework for success.

Most sincerely,

John Putnam



THE HARDY FERN FOUNDATION
QUARTERLY

The Hardy Fern Foundation Quarterly is published quarterly by the Hardy Fern Foundation,
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A Gardener's Lexicon

Don't Treat Your Soil like Dirt

Arthur R. Kruckeberg

Professor Emeritus, University of Washington

Mary Robson

WSU extension agent for King and Pierce Counties WA

Free Dirt. Signs proclaim availability, but have you ever seen a sign offering "Free Soil"? *Of course* dirt is free. Anyone who's ever cleaned a house or tidied an old garage knows that dirt costs nothing and arrives unbidden. Dirt: It is the blackish scum that appears outdoors on a freshly painted white windowsill, or the film clouding a seldom-used casserole dish from the top shelf. Dirt is random, unwelcome, and requires handling with rubber gloves. Dirt is not generally considered a living substance, or rather, most of us do not want to think of what might be living in it. Dirt may be composed of intriguing components such as old spider webs, insect detritus, dog hair, and sweater lint, but it is never desired.

Gardeners crave and covet *soil*. The fragrance of a turned-over shovelful of soil in early spring thrills the winter-bound soul. Soil-complex, appealing to all five senses-has mineral, organic, and living elements combined. The gradual reduction of rock to grit, the stems and fallen leaves of autumn, the microorganisms of decay and growth: These are some components of soil in the temperate zone. Soil can be studied scientifically or appreciated as the poetry of earth.

Soil lives and changes. Some soil changes occur in geologic time, volcanically or catastrophically. The weathering of minerals, as lichens and moss gradually reduce rock to fragments, occurs more slowly than gardeners can see. But the quick decay of compost dug into the spring garden and the mulch of leaves disappearing into the upper soil surface are visible changes. Gardeners proudly say they "build soil," but the infinitely small contribution of the individual to the earth's soil should help us with perspective. The natural processes of the earth build soil.

The micro fauna of the soil coionize plant roots and assist in making nutrients available to plants. A native plant in its own ecosystem participates in the life of the soil. Cleaning up dirt is only necessity; working with soil is a privilege.

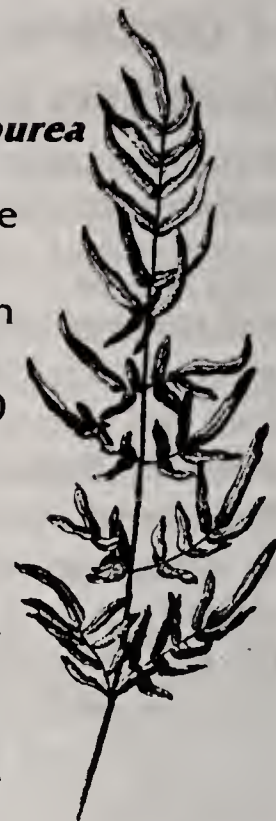
Is there a bottom line to our distinguishing dirt from soil? Try this: For gardeners and lovers of tame and wild nature, it is soil-not dirt-in which all terrestrial life is ultimately rooted. That thin skin of living substance, the soil, mantle of the earth, like sun and water, is the driver of nature. So in gardens, in vacant lots, in old-growth forests, and in Serengeti grasslands, it is soil-not dirt-that nourishes our green world.

Reprinted from the *Washington Park Arboretum Bulletin*,
Winter 1999, Vol. 60:4 with permission.

SWFS ARKANSAS FIELD TRIP

Ann Herrington
Garland, TX

*Pellaea
atropurpurea*



The weather report didn't look promising. Torrential rains were already in central and south Texas, and rain was forecast for northern Texas and on into Arkansas. But did that stop a bunch of crazed fern fanatics from taking a field trip to Arkansas? Absolutely not. Eighteen of us gathered in Hot Springs at 8:00 on Saturday morning, October 17, and piled into a car and a 15-passenger van to begin our day's foray.

We were most ably led by Don Crank, who had journeyed to Dallas to speak to us about Arkansas ferns during the summer. He had asked Dr. Jim Peck, biology professor at the University of Arkansas at Little Rock, and Dr. Wayne Owen, botanist for the Ouachita National Forest, to accompany us, so we were in very knowledgeable company.

Our first stop was at a cedar glade where we found tiny, exquisite plants of *Ophloglossum engelmannii*. The 2" entire-leaved plants had been covered by cut cedar branches, but Don knew where to look for them. Small-growing plants of *Cheilanthes lanosa* were fairly abundant, and we also saw *Pleopeltis* (formerly *Polypodium*) *polypodioides* (sometimes called the resurrection fern because it curls up in dry weather, then springs to life with the rains), *Asplenium platyneuron* (the ebony spleenwort), *Woodsia obtusa*, and *Pellaea atropurpurea*, in addition to lots of mosses and fungi. This site is also the habitat of *Isoetes butleri*, but none were up.

Driving along the road to our next stop, we saw *Equisetum hyemale* and *Pteridium aquilinum* (bracken) from the van windows. Bracken, of course, is common everywhere, but still qualifies as a "fern sighting." We parked near a volunteer fire department location and trekked behind it to find a large colony of *Lycopodiella adpressa*, growing in really wet, gravelly areas.

Our next stop showed us *Onoclea sensibilis*, the sensitive fern, growing with *Woodwardia areolata*, which made comparison of the two easier. Their sterile fronds are look-alikes, but the fertile fronds quickly show the difference. The *Onoclea* has a fertile frond that looks like a collection of little beads on a stick, while the *Woodwardia* has a more normal-looking, although contracted, fertile frond. On really close examination, one sees that the sensitive fern has a smooth frond margin, and the *Woodwardia* has a serrate margin. Other ferns in this area included *Asplenium platyneuron*, *Polystichum acrostichoides* (the Christmas fern), *Athyrium asplenioides* (lady fern), *Thelypteris palustris*, *Pleopeltis polypodioides* (growing lithophytically as well as epiphytically), more and bigger *Cheilanthes lanosa*, and *Selaginella eclipes*.

Lunch was a picnic at a rustic shelter beside a small waterfall above a little rocky-bottomed creek with ferns growing everywhere.

The Meyers Creek area that was the next stop was practically uncharted territory. There were no well-marked smooth trails here. We felt like explorers as we pushed our way through the undergrowth and crossed streams (those of us with knee-high boots suddenly became very popular—yes, we shared footwear!) to get to the ferns. And we found lots of them: *Thelypteris hexagonopteris* (broad-beech fern), *Osmunda regalis* (royal fern) and *Osmunda cinnamomea* (cinnamon fern), *Woodwardia areolata* and *Onoclea sensibilis*, *Botrychium virginianum* and *Botrychium biternatum* (easy to spot because of their beautiful erect golden fertile fronds), *Thelypteris noveboracensis* (the New York fern—easy to recognize because the pinnae taper at both ends of the blade), *Dryopteris australis* and *Dryopteris celsa*, and a few remains of fronds of *Adiantum pedatum* (northern maidenhair), nearly done in by the hot dry summer. We also were excited to see (non-fern) *Monotropis uniflora*, Indian pipe, a parasitic plant that lives underground on rotting wood, with only the flowering portion venturing above ground.

Paradise must come in several forms, and this trip surely showed us some of them.

Chellanthes lanosa



1999 Plant Distribution

The following ferns are available for fall shipment. Orders should be sent to Michelle Bundy, 1716 S. 223rd St., Des Moines, WA 98198. Orders must reach her no later than Friday Sept. 3. *Dryopteris corleyi* and *D. kashmeriana* are new to cultivation in the U.S. All ferns are \$5.00 with the exception of *Athyrium filix-femina* 'Frizelliae' and *Dryopteris kashmeriana* which are \$6.00. You will be billed at the time of shipping.

Adiantum aleuticum - Zone 4 - 8, deciduous 2'

Athyrium filix-femina 'Frizelliae' - Zone 3 - 8, deciduous 1'

Blechnum spicant - Zone 7 - 9, evergreen 2'

Dryopteris blssetiana - Zone 5 - 9, evergreen 2'

Dryopteris corleyi - Zone 6 - 9?, evergreen? 2'

Dryopteris cristata - Zone 3 - 8, evergreen 2'

Dryopteris kashmeriana - Zone 6 - 9?, evergreen 2'

Dryopteris sieboldii - Zone 7 - 9, evergreen 2'

Polypodium interjectum - Zone 6 - 8, deciduous 1'

Polystichum munitum - Zone 6 - 9, evergreen 2 - 3'

Polystichum setiferum - Zone 6 - 9, evergreen 2'

Asplenium platyneuron

Brown-stem Spleenwort

James Horrocks Salt Lake City

In the past, this fern was referred to as the Ebony Spleenwort but "Ebony" is a misnomer because it denotes "black" and there is nothing about this fern that is.

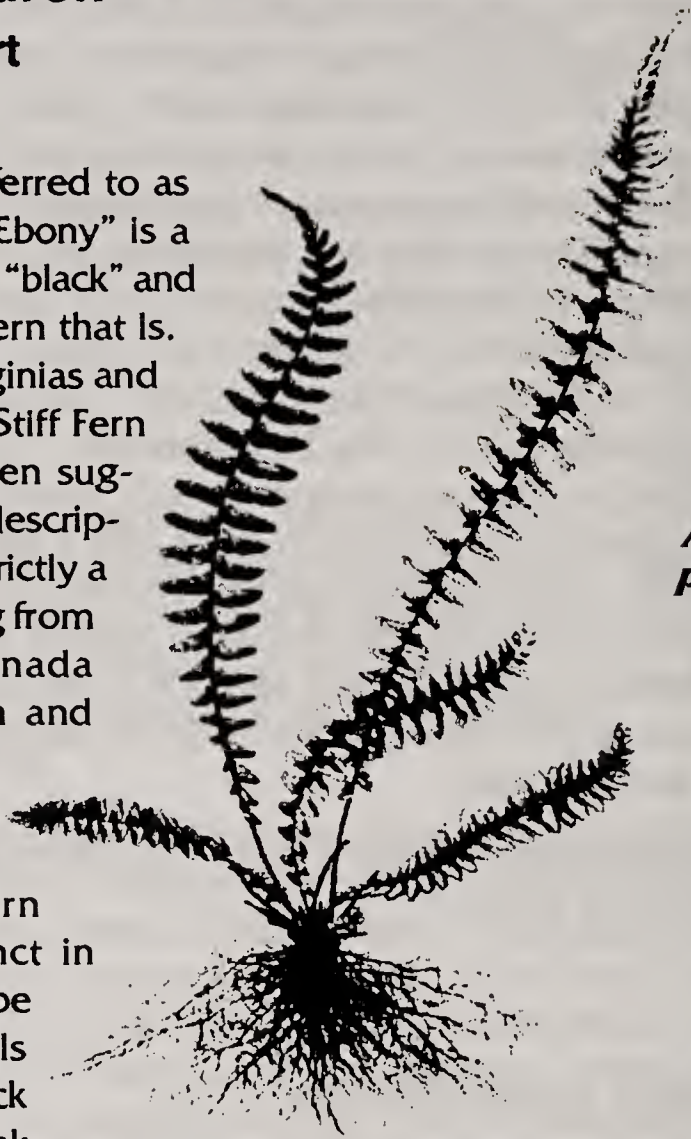
The mountaineers of the Virginias and Carolinas have called it the Stiff Fern and Stiff Spleenwort has been suggested by Durand as a good descriptive name. This species is strictly a North American fern, ranging from Quebec and Ontario, Canada down through the eastern and mid-western United States to the Gulf states. It is also known from southeastern Colorado and northwestern New Mexico and is disjunct in northeastern Arizona. It can be quite abundant in subacid soils and is often epipetric on rock ledges, masonry and rock

walls. It is also found growing in the open ground on wooded slopes in stony or sandy leaf mold and occasionally on calcareous rocks.

There are several varieties including an imbricated form with crowded overlapping pinnae occurring in the Northeast. Form *bacculum-rubrum*, with elongated pinnae and coarse, irregularly toothed margins is native mostly to the southern states. Form *hortonae* is very rare with pinnae deeply cut into lobes, having been found in the Northeast. Form *incisum* is delicate in appearance and native to the southern states. Rush mentions 'Proliferum', which is proliferous on the stipes or lower part of the rachis, but otherwise unremarkable.

Asplenium platyneuron has hybridized with *A. trichomanes* to form *A. x virginicum*, a very rare plant. It has also hybridized with *A. pinatifidum* to form *A. x kentuckiense*, with *A. montanum* to form *A. bradleyi* and with *Camptosorus rhizophyllus* to form the curious *A. ebenoides*.

Description: The creeping rootstock is thick and erect, possessing many wiry black rootlets and forming a spreading mat. The stipes are very short and a lustrous brown. The fronds are narrowly linear-rhombic and slightly dimorphic in that the fertile fronds are much taller than the sterile and stand stiffly erect. They can be from eight to twenty inches in length. The sterile fronds are rarely more than six inches long and lay close to the ground, curling over and about each other. Both the fertile and sterile fronds are once pinnate, the pinnae being longer and narrower than those of *A. trichomanes*. The pinnae also exhibit an



*Asplenium
platyneuron*

acroscopic basal auricle and the pinnae are reduced to mere wings at the base. Wherry calls this fern "tardily deciduous". The sori are numerous and nearer the midveins than the margins. The indusium is translucent to whitish and slightly erose-toothed.

Culture: This species can be grown in a well-drained gritty humus. Care must be taken not to over water as it is quite sensitive to this. The soil should be slightly acid to encourage its best growth. It is short-lived if the soil is limed or fertilized. It is also said to do better in partial sun rather than total shade, but this would depend on the amount of humidity. The Brown-stem Spleenwort is an interesting and rather attractive plant if you can meet its growing requirements.

References:

A Field Manual of the Ferns and Fern Allies of the United States and Canada (1985) David B. Lellinger, Smithsonian Institute Press, Washington, D.C.
A Guide to Hardy Ferns (1984) Richard Rush, British Pteridological Society, London
The Fern Guide (1961) Edgar T. Wherry, Doubleday, New York
Field Book of Common Ferns (1949) Herbert Durand, G. P. Putnam's Sons
Ferns for American Gardens (1994) Dr. John T. Mickel, Macmillan Publishing Co., New York

Spore Exchange

We are sorry to report that Roger Boyles who has been in charge of the Spore Exchange for both the Hardy Fern Foundation and the American Fern Society had to resign because of health problems. Consequently there have been a number of problems with spore distribution for the 1998/99 season. We apologize for delays and disappointments.

We are very happy to report that Jeff Cross has volunteered to take over the exchange. He comes with enthusiasm and computer expertise and looks forward to managing the exchange. At this point he will be doing this exclusively for the Hardy Fern Foundation as the American Fern Society also has a new curator. That is to say we will be starting from scratch as it is uncertain whether any of the spores from past contributions will be available. **IT IS THEREFORE OF PARAMOUNT IMPORTANCE THAT WE ALL CONTRIBUTE SPORES.** In the past just a few members have carried the exchange for all of us. We hope to change this and get a good selection of spores ready to share. Please collect and send your contributions (preferably cleaned) to Jeff at:

121 Esplanade Ave.
L305
Kenner, LA 70065

Contributions are welcome throughout the year and we hope to have an initial list of available ferns ready for the fall 1999 Quarterly. Thank you for working to make this a success and a special thanks to Roger Boyles for all of his efforts.

An Independent Hardiness Report

Sue Olsen
Bellevue, WA

One of the goals of the Hardy Fern Foundation is to test ferns for cold hardiness. Quite independently Mother Nature imposed a test on the ferns in our garden and our Foliage Gardens nursery in Bellevue, WA with an unexpected arctic whammy in December 1998. For four nights our temperatures dropped to 14°F with daytime temperatures not exceeding 25°. We realize that in some parts of the country this is just a typical winter experience, however, we like to think that in USDA Zone 8 that this is exceptional. Our nursery stock which we grow in 4", 6", gallon and larger pots certainly wasn't prepared. All were on the ground without the benefit of poly or better yet snow cover so were totally exposed (vulnerable). There were a number of surprises (some of them even pleasant such as the survival of *Lemmaphyllum microphyllum* growing in a somewhat protected whiskey barrel planting.) We were pleased to have *Polystichum acutidens*, untested and new to us, survive along with *Polystichum tripterum* which we've had in a pot and the ground for a long time, but never in extreme cold.

The stress was compounded by a record setting cold and wet spring. Some of our *Dryopteris*, for example, waited until mid-May to even think about unfurling and as I write this on June 12, our *Lygodium japonicum* which I had considered long gone is "trying" with 1/4 inch nubs.

The real winner was the compost heap. It was not a happy occasion to bid adios to flats of *Athyrium otophorum*, *Polystichum setiferum* cv's and quantities of assorted *Dryopteris*. Some of these plants have been with us for over 20 years.

A summary of the good news and bad news follows:

FERNS GROWING IN THE GROUND AND IN POTS THAT SURVIVED (some barely)

<i>Adiantum venustum</i>	<i>Dryopteris bianfordii</i>
<i>Arachniodes standishii</i>	<i>Dryopteris championii</i>
<i>Asplenium adulterinum</i>	<i>Dryopteris crispifolia</i>
<i>Asplenium trichomanes</i>	<i>Dryopteris cristata</i>
<i>Asplenium trichomanes</i> ssp & cv's	<i>Dryopteris cystolepidota</i>
<i>Athyrium filix-femina</i> 'Frizelliae'	<i>Dryopteris dickinsii</i>
<i>Athyrium niponicum</i>	<i>Dryopteris dilatata</i>
<i>Athyrium niponicum</i> 'Pictum'	<i>Dryopteris dilatata</i> many cv's
<i>Athyrium vidalii</i>	<i>Dryopteris erythrosora</i>
<i>Athyrium yokoscense</i>	<i>Dryopteris erythrosora</i> 'Prolifica'
<i>Cyrtomium falcatum</i> x <i>caryotideum</i>	<i>Dryopteris filix-mas</i>
<i>Cyrtomium fortunei</i> 'Intermedia'	<i>Dryopteris filix-mas</i> many cv's
<i>Cyrtomium ionchitoides</i>	<i>Dryopteris fuscipes</i>
<i>Dryopteris affinis</i>	<i>Dryopteris goldiana</i>
<i>Dryopteris affinis</i> many cv's	<i>Dryopteris lacera</i> 'Type'
<i>Dryopteris bissetiana</i>	<i>Dryopteris lepidopoda</i>

<i>Dryopteris marginalis</i>	<i>Polystichum acrostichoides</i>
<i>Dryopteris munchii</i>	<i>Polystichum acutidens</i>
<i>Dryopteris namegatae</i>	<i>Polystichum andersonii</i>
<i>Dryopteris nipponensis</i>	<i>Polystichum braunii</i>
<i>Dryopteris polylepis</i>	<i>Polystichum braunii x andersonii</i>
<i>Dryopteris pseudo filix-mas</i>	<i>Polystichum lemmonii</i>
<i>Dryopteris pycnopteroides</i>	<i>Polystichum mayebarae</i>
<i>Dryopteris sacrosancta</i>	<i>Polystichum mohrioides</i> 'Cristata'
<i>Dryopteris yigongensis</i>	<i>Polystichum munitum</i>
<i>Dryopteris varia</i>	<i>Polystichum neolobatum</i>
<i>Dryopteris x complexa</i>	<i>Polystichum polyblepharum</i>
<i>Equisetum scirpoides</i>	<i>Polystichum proliferum x braunii</i>
<i>Gymnocarpium dryopteris</i>	<i>Polystichum setiferum x andersonii</i>
<i>Gymnocarpium dryopteris</i> 'Plumosum'	<i>Polystichum setigerum</i>
<i>Gymnocarpium oyamense</i>	<i>Polystichum squarrosum</i> aff.
<i>Lemmaphyllum microphyllum</i>	<i>Polystichum tagawanum</i>
<i>Matteuccia struthiopteris</i>	<i>Polystichum tripterum</i>
<i>Onoclea sensibilis</i>	<i>Polystichum tsus-simense</i>
<i>Osmunda japonica</i>	<i>Polystichum xiphophyllum</i>
<i>Osmunda regalis</i>	<i>Pyrrosia lingua</i>
<i>Osmunda regalis</i> cv's	<i>Selaginella mutica</i>
<i>Phyllitis scolopendrium</i>	<i>Selaginella tamarascina</i>
<i>Phyllitis scolopendrium</i> cv's	<i>Woodsia polystichoides</i>
<i>Polypodium scolopendrium</i>	<i>Woodwardia areolata</i>
<i>Polypodium vulgare</i> cv's	

FERNS THAT SURVIVED GROWING IN THE GROUND BUT KILLED IN POTS

<i>Adiantum aleuticum</i> 'Subpumilum'	<i>Dryopteris walllichiana</i>
<i>Athyrium otophorum</i>	<i>Phegopteris decursive-pinnata</i>
<i>Blechnum penna-marina</i>	<i>Polystichum piceopaleaceum</i>
<i>Blechnum spicant</i> cv's	<i>Polystichum rigens</i>
<i>Cyrtomium falcatum</i> 'Eco-Korean Jade'	<i>Polystichum setiferum</i> and all <i>P. s.</i> cv's
<i>Cyrtomium falcatum</i> 'Rochfordianum'	<i>Selaginella kraussiana</i>
<i>Dryopteris sublacera</i>	<i>Woodwardia fimbriata</i>

FERNS THAT SURVIVED IN THE GROUND (BUT WHICH WE DID NOT HAVE GROWING IN POTS)

<i>Adiantum aleuticum</i>	<i>Blechnum spicant</i>
<i>Adiantum japonicum</i>	<i>Chellanthes intertexta</i>
<i>Arachniodes simplicior</i> 'Major'	<i>Chellanthes jamaicensis</i>
<i>Blechnum cordatum</i>	<i>Chellanthes lanosa</i>
<i>Blechnum nipponicum</i>	

continued on page 48

FERNS THAT SURVIVED IN THE GROUND

(BUT WHICH WE DID NOT HAVE GROWING IN POTS) cont. from page 47

<i>Cheilanthes lindheimeri</i>	<i>Dryopteris koldzumiana</i>
<i>Cheilanthes pruinata</i>	<i>Dryopteris lacera</i>
<i>Cheilanthes tomentosa</i>	<i>Dryopteris oreades</i> 'Crispa'
<i>Cheilanthes wootonii</i>	<i>Dryopteris sabae</i>
<i>Cheilanthes yavapensis</i>	<i>Dryopteris tokyoensis</i>
<i>Cyrtomium caryotideum</i>	<i>Dryopteris uniformis</i>
<i>Cyrtomium fortunei</i>	<i>Lygodium japonicum</i>
<i>Cyrtomium macrophyllum</i>	<i>Polypodium glycyrrhiza</i>
<i>Deparia japonica</i>	<i>Polystichum imbricans</i>
<i>Dryopteris arguta</i>	<i>Polystichum x lonchitiforme</i>
<i>Dryopteris carthusiana</i>	<i>Polystichum retroso-paleaceum</i>
<i>Dryopteris crassirhizoma</i>	<i>Polystichum woronowii</i>
<i>Dryopteris cycadina</i>	<i>Polystichum x illyricum</i>
<i>Dryopteris darjeelingensis</i>	<i>Pteris cretica</i>
<i>Dryopteris decipiens</i>	<i>Pyrrosia shearerii</i>
<i>Dryopteris expansa</i>	<i>Selagineilla densa</i>
<i>Dryopteris formosanum</i>	<i>Woodwardia unigemmata</i>
<i>Dryopteris justapospita</i>	

FERNS KILLED GROWING IN POTS

(WHICH WE DID NOT HAVE GROWING IN THE GROUND)

<i>Asplenium fontanum</i>	<i>Cheilanthes iendigera</i>
<i>Blechnum wattsii</i>	<i>Doodia aspera</i>
<i>Ceterach officinarum</i> 'Crenatum'	<i>Dryopteris ceisa</i>
<i>Cheilanthes coriacea</i>	<i>Dryopteris iudoviciana</i>

FERNS KILLED GROWING IN POTS AND IN THE GROUND

<i>Acystopteris japonica</i>	<i>Asplenium obtusatum</i>
<i>Arachniodes aristata</i>	<i>Dryopteris hondoensis</i>
<i>Arachniodes cavalerii</i>	<i>Dryopteris scottii</i>
<i>Asplenium adiantum-nigrum</i>	<i>Dryopteris erythrosora</i> 'Whirleytops'
<i>Asplenium billotii</i>	<i>Polystichum richardii</i>
<i>Asplenium marinum</i>	<i>Quercifilix zeylanica</i>

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Fern Riches in Costa Rica

Joan Eiger Gottlieb

The announcement brochure was titled "Montane Pteridophytes of Costa Rica," January 8-18, 1999. There was an itinerary starting in centrally located San José and fanning out to Poás, Barva, and Arenal Volcanos, Braulio Carillo National Park, the Monteverde Cloud Forest, Tapantí and Cuericí Reserves, and the Wilson Botanical Garden. Trip leaders were listed as Alan R. Smith, research botanist and curator of ferns at the UC Berkeley Herbarium and Mateo C. Rutherford, a graduate student at UC Berkeley.

But none of this information prepared us for the great adventure in which we would find 410+ pteridophytes in 87 genera and 24 families in a country the size of West Virginia!

Biodiversity in tropical areas is widely acclaimed (and its decimation just as widely deplored), but it is especially impressive in Costa Rica where 10% of the world's pteridophyte and butterfly species can be found. In addition to roughly 1,000 species of ferns and 700 species of butterflies, Costa Rica is home to 205 mammalian, 150 amphibian (including poison-dart frogs), and 850 avian species. These numbers are even more impressive when you realize that in all of North America there are about 400 species of pteridophytes and 700 kinds of birds. There are several reasons for the species richness in Costa Rica. First is the gentle climate and the many habitats created by coastal to mountain ecosystems, the latter running north/south, forming a continental divide between Pacific and Atlantic coast watersheds. Frost sometimes occurs at the highest elevations (3,900m), but it does not snow. Along the Pacific and Atlantic coasts, and at moderate elevations, the days and nights are mild to warm and dry to very wet, depending on the prevailing trade winds.

Second, Costa Rica is a young country. It was created only 4-5 million years ago when the Central American isthmus closed here, creating a new land mass at the meeting point of three continental plates. Volcanic activity and tectonic uplift shaped mountain chains, valleys, and coastlines. The resultant isolating elevations led to rapid speciation and a 10-15% endemism as plants and animals from both North and South America migrated into the area and thrived. It was during this great migration that South American marsupials were extirpated, primarily by placental mammals moving down the isthmus.

Finally, Costa Rica is a progressive country which has had the wisdom to set aside about 27% of its land mass as national parks (11%) and reserves (16%), although many of the reserves are privately (and therefore, precariously) held.

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Funds are desperately needed for the acquisition of additional tracts of forest and shoreline before they are cleared or altered for development and agriculture (coffee, banana, pineapple), so as to minimize the fragmentation and isolation of the preserves. It is especially critical for Costa Rica to create corridors of continuity among its natural ecosystems - a real philanthropic opportunity at bargain prices for Bill Gates!

While tropical ferns may be of limited interest to Hardy Fern Foundation members, some of the higher elevation montane species we saw should thrive in Zones 7 and up, with Zone 6 a possibility, given some protection. I will point out some of these as I take you along on a recap of this remarkable trip.

January 9 – From the capital city of San José, which lies in a volcanic bowl at 1,190m, our group of 15 headed north into the Central Valley Mountain Range

and up the saddle between **Poás** (2,704m) and **Barva** (2,906m) volcanoes. All of Costa Rica's 15 volcanic peaks (5 of them still active) are protected in National Parks. A roadside stop at 1,270m on **Poás** revealed a vast expanse of coffee plantation, the reddening beans ripe for handpicking from November through March. Rich volcanic soil, cooperative, local ownership, and quality varieties such as "arabica" make Costa Rica a premier coffee producer. But the ecological price has been large-scale clearing of the rain forest in the growing zone between 260-1,500m elevations. Recent appreciation of the traditional methods of shade cultivation for coffee has come too late for large portions of Costa Rica's denuded countryside.

Ferns (*heiechos* in Spanish) along the roadcut included robust specimens of *Thelypteris resinifera*, *T. rudis*, *T. dentata*, and *T. patens*, all sharing the two vascular bundles per petiole that distinguish this large genus. It seemed remarkable to find four different *Thelypteris* species and 14 other pteridophytes at this one, small, casually selected, disturbed spot – a harbinger of what was yet to come! The terrestrial Spanish flag orchid (*Epidendrum radicans*), flashing orange-red blooms here, is found only near 1,000m. Near the park visitor center on Poás the regal fronds of *Lophosoria quadripinata* (monotypic genus in its own family) decorated the hills with their striking gray undersides. This handsome species lacks a true trunk, so it is not technically a tree fern.

A well-developed walking path to the crater lip passed through an elfin forest with huge, flowering specimens of *Gunnera* (Poor Man's Umbrella), its peltate leaves notable as the largest simple (undivided) leaves in the world. Some were nearly a meter wide. In places *Lycopodiella pendulina* clung to the volcanic slopes. Impressive specimens of *Histiopteris incisa* (a member of the Dennstaedtiaceae with stipule-like basal pinnules clasping the rachis), the spiny-stiped tree fern *Cyathea fuiva*, and the dimorphic (distinctively different sterile and fertile fronds) *Plagiogyria pectinata* completed the ooh! and ahh! aspect of the trail. Close to 50 newly seen species were logged for the morning, 12 of which were not seen again on the tour, e.g., *Eriosorus congestus* which might be hardy in well-drained sites in frost-free areas of the U.S. Other ferns found only on Poás included *Blechnum christii*, *Nephrolepis cordifolia*, *Polyypodium macrolepis*, *Sticherus revolutus*, the diminutive grammitids *Melpomene xiphopteroides* and *Grammitis marginella* (with entire leaf margins),



Elaphoglossum piloselloides

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and the filmy *Hymenophyllum fragile*. A sulfurous odor reached us before the crater came into view. Its gaping maw was filled with a deep lake that had a surreal copper sulfate blue color. Another volcanic lake nearby – Laguna Botos – was much larger and shallower. Its acidic shores are home to large colonies of *Isoetes storkii*.

An afternoon hike up a flank of **Barva** yielded the familiar North American species *Botrychium virginianum* and *Cystopteris fragilis*. *Cheilanthes marginata*, also seen here, might be a candidate for cultivation in warmer parts of the U.S. In keeping with our biodiversity theme, it is worth noting that six different species of *Asplenium* were found in close proximity on Barva – *A. flabellulatum* being especially exquisite with its attenuated, bud-bearing frond tip and lacy pinnae. This morphology is a com-



Joan & Milton Gottlieb at Braulio Carillo National Park. Photo by Frank Damgaard.

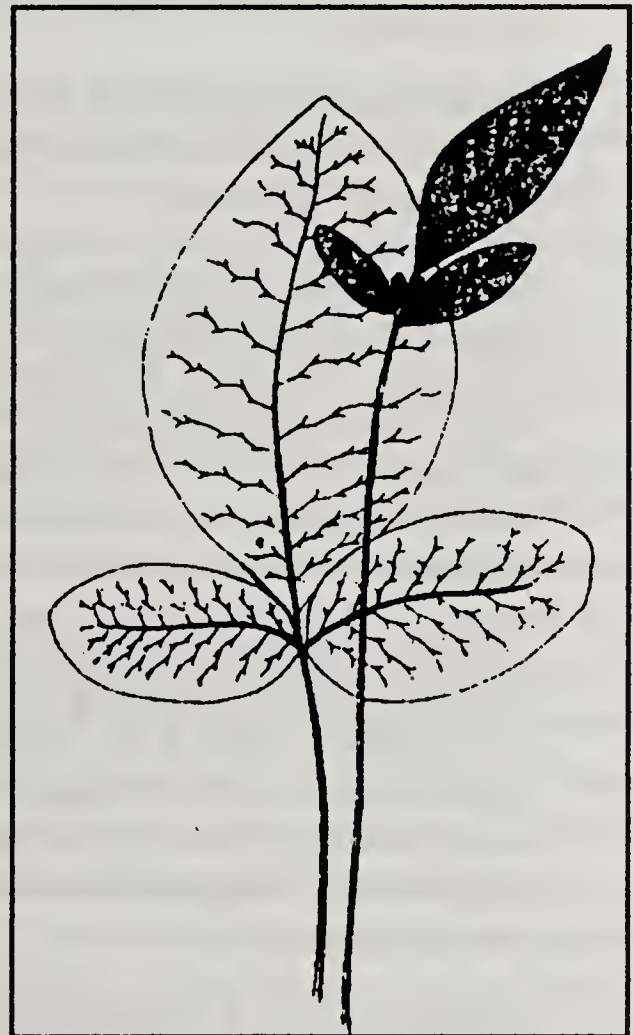
mon one in the genus. I recall similar species from Trinidad and New Zealand. There were three delicate *adiantums* here as well – *A. poiretii*, *A. andicola*, and the ubiquitous *A. concinnum*. And, dare I mention all the species of *Elaphoglossum* (5 on Poás and 3 more on Barva) that confounded most of us, but not Alan Smith or Alexander Rojas, the young Costa Rican expert on this genus who accompanied us on several trails. 14 of the 38 fern species found on Barva were not encountered again during our trip. Particularly notable among these rarities were *Blechnum stoloniferum*, *Selaginella porphyrospora* (graceful, flagelliform branch tips), and the polypodiaceous species *Loxogramme mexicana* (elongated, sunken sori) and *Pleopeltis macrocarpa*.

January 10 – Another foray from San José this time northeast to **Braulio Carillo National Park**, an impressive 44,000 hectares (109,000 acres) of primary forest named for Costa Rica's third head of state. Here ferns were surveyed at 4 stops,

representing an elevation gradient of 650-1,380m. An amazing 137 species were seen, 49 of which were not found any place else on our itinerary. 17 species of *Elaphoglossum* were here. The intrepid Alexander Rojas plunged into the forest, disregarding all danger and discomfort, to retrieve specimens of this taxonomically difficult genus for us to compare. All elaphs have dimorphic fronds, as do other genera we saw during the trip (e.g., *Polybotrya*, *Lomariopsis*, *Acrostichum*, *Danaea*, *Plagiogyria*, *Olfersia*, *Bolbitis*). Also found in Braulio Carillo were the grammitid genera *Lellingeria*, *Cochlidium*, *Micropolypodium*, and *Terpsichore* (as in the Greek muse of song and dance), all epiphytic on the broadleaf evergreen trees. The epiphytic life style accommodates more than a third of Costa Rica's pteridophytes. These "perchers" usually have simple or lobed fronds (no true pinnae), while terrestrial species tend to be more finely dissected.

At our first stop, just before the Zurqui Tunnel, *Lycopodium clavatum* (an eastern North American staple) was spreading on scree along with *Huperzia reflexa* and *Selaginella stellata*. In an especially exciting moment at our highest elevation stop our leaders found a new species of *Thelypteris*. The specimens here were amply endowed with leafy plantlets along their rachises. Dr. Smith will name it *T. rojasii* for Alexander Rojas who had collected this species previously. Other highlights of the fern flora in Braulio Carillo included:

- lush stands of dimorphic *Bolbitis nicotianifolia* and *B. oligarchica*, the latter with bulblets at the pinna bases of its fertile fronds.
- three species of *Danaea* (Marattiaceae), a genus of handsome, terrestrial ferns with sturdy, dimorphic, once-pinnate leaves; the fertile fronds narrow and nearly covered with fused sporangia that extend from pinna midveins to margins. *D. cuspidata*, *D. nodosa*, and *D. wendandii* were seen.
- exquisite colonies of tiny *Elaphoglossum peltatum*, its 3-5cm high, flabellately-divided fronds cloaking tree limbs and mimicking dwarf running "pine" (a common North American *Lycopodium*). In sharp contrast *E. crinitum*, with huge, simple fronds 50+cm long, was also found here.



Bolbitis oligarchica

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***Fern Riches In Costa Rica* continued from page 53**

- *Asplenium holophlebium*, a delicate, miniature, fully fertile species, forming extensive mats on dead stumps, casually mistaken for a “leafy” moss.
- two species of *Diplazium* (Athylraceae), superficially resembling the unrelated *Asplenium*, but having back-to-back linear sori along the veins. *D. macrophyllum* and *D. striatastrum* were not found at other sites.
- five different species of *Cyathea* distinguished by stipe scales and other technical characters. Also here was their smaller, but no less spectacular relative, *Cnemidaria mutica* (called “stitchery” fern from the precision alignment of its submarginal sori). At higher elevations another tree fern, *Alsophila polystichoides*, was recognized by its thrice-pinnate fronds.
- six species of filmies, including the luminescent blue-green “plastic” fern, *Trichomanes elegans*. Filmies have translucent blades that are usually one cell layer thick (thicker along the veins), and lack stomates. They have short-lived, green spores. *T. elegans* has relatively “thick” (3-cell layer) fronds.
- heroic-sized specimens of *Dennstaedtia dissecta* (grooved rachis) and its cousins, the leathery-leaved *Saccioioma inaequale* and the spiny-stiped *Hypolepis nigrescens*.
- abundant, scrambling ferns like *Odontosoria gymnogrammoides* (2-4m long, skeletonized fronds) and several species of forking ferns, e.g., *Sticherus paliescens*, *S. intermedius*, and *Gleicheneila pectinata*. These successional species form extensive, probably clonal colonies, blanketing exposed hillsides and steep banks. It was humbling to hear Dr. Smith identifying them as our mini-bus sped along. He explained the distinctive leaf architecture that enabled him to tell them apart.
- climbing ferns that begin life on the ground, but soon produce long-creeping rhizomes bearing leaves that twine and hook their pinnae on nearby tree trunks. Thus they grow 20+m into the forest canopy where higher light intensities trigger fertility. We saw 2 species of *Lomariopsis* (winged rachis) plus *Polybotrya alfredii* (both dimorphic dryopterids) and *Salpichlaena volubilis* (bronze-red young leaves revealing its close relation with *Blechnum*).
- *Marattia laevis* – a beautiful species of higher elevation forests in a genus known for compound sporangia (synangia) and complex vascular structure.
- clumps of *Equisetum bogotense* along open ditches – the only member of its genus encountered on the trip.

The lush montane forest of Braulio Carrillo hid many other treasures of note, including a blooming *Miltonia* orchid, leaf-cutter ants, giant millipedes and well-

camouflaged mantids and katydids. The younger members of our troop could not resist a swim in a woodland pool complete with a beautiful waterfall.

January 11 – It was time for the long trip to the **Monteverde Cloud Forest Reserve** with a mid-day stop at the **San Luis Ecolodge**. Heading west out of San José, we were soon in Atenas, reputed to have the best climate in the world, but visibly having the most altered ecology. The original forest has been completely replaced with citrus, almond, mango and sugar cane plantations. Once near the Pacific coast in Costa Rica's largest province of Puntarenas, we headed north at the town of Orotina on the Pan American Highway (one of only a few good roads in the country). A spectacular vista soon opened onto Caldera Port, visited by cruise ships today. A roadside stop, prompted by our first sights and sounds of howler monkeys, produced our only site for the climbing fern *Lygodium venustum* and the dramatic *Adiantum trapeziforme*. All too soon we left the paved highway at the Monteverde turnoff into the Tilarán Mountains on a punishing, gravel, switch-backed road. Dramamine anyone?

A detour through the San Luis Valley into the privately owned Ecolodge and Reserve took us to our afternoon stop and a welcome farm-style lunch of fresh salad, rice, and beans (with some chicken for the non-vegetarians). At a moderate 1,200m elevation the Ecolodge grows coffee (much enjoyed at lunch) and produces milk and cheese while providing modest accommodations for naturalists, researchers, students, and other guests. Sustainable, tropical ecotourism is the mission here; guests can participate in experimental reforestation and organic agriculture. The site has potential, but it will take money and years of effort to improve the deep, muddy tracks and other scars of past land abuse. A nice assortment of native orchids was planted on trees around the property. Their small size belied their exquisitely ornate, colorful blooms. We spent the afternoon surveying the ferns along nearby trails and preparing specimens for an embryonic lodge herbarium. Fronds and plants collected during the trip were used for evening group review sessions and then pressed for the INB (Institute for National Biodiversity) program. 17 out of the 41 pteridophytes collected here were not seen at any other site on our trip. These included four *Aspleniums*, *Lastreopsis effusa*, *Polystichum platyphyllum*, *Tectaria mexicana*, *Campyloneurum xalapense* (two rows of sori between parallel, lateral veins), *Polypodium fuscopetiolatum*, *P. rhodopleuron*, *Pecluma consimilis*, *Adiantum radiannum*, and *Polytaenium feei* (Vittariaceae).

Near dusk, on the way out of the Ecolodge, a handsomely colored, but venomous coral snake was immobilized by our fearless guide Uvi (with the hook of her umbrella handle) so we could get a good look. From a high point on the "road"

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to Monteverde we feasted on the changing beauty of sunset over Costa Rica's Pacific coast. Speaking of feasts, near our destination we passed a dairy-farming Quaker community founded in 1951. At its Cheese Factory we watched *los quesos* being made and bought samples of several types – each fresh and luscious – never mind the calories and cholesterol. It was well past dark when we arrived, hungry and weary, at La Casona – a dormitory-style, bunk-bedded hostel at the western edge of “El Triángulo” (The Triangle), the central part of the private **Monteverde Cloud Forest Reserve**. Its excellent trails and strict regulations attempt to minimize the impact of human visitors to this popular place. A pair of quetzals (spectacular members of the trogon family) had been spotted in an avocado (*Persea*) tree at La Casona, but, alas, they did not reappear during our stay.

January 12 – When hiking in a “cloud forest” prepare to get wet! It wasn't exactly raining, but we all got soaked and chilled by the ambient, saturated air and occasional, showery mists. The coati-mundi (a raccoon relative) that greeted us on the trail did not seem to mind, nor did it deter the iridescent hummingbirds and blue-crowned motmots that relished the feeder fare at La Casona. A 7 km (4.2 mile) hike around the circumference of The Triangle (at around 1,500m) produced 101 pteridophyte species, over 30 of which were uniquely seen here. This biologically rich area is home to 2,500 plant species (including over 400 kinds of orchids), 100 kinds of mammals (e.g., jaguar, ocelot and tapir), and about 400 species of birds. Elevations in Monteverde rise from 600m in the riparian lowlands of the Río Peñas Blancas to 1,840m at the top of Cerro Tres Amigos. A lovely spot on our trail was La Cascada, an impressive series of waterfalls surrounded by towering trees dripping with epiphytes of all taxonomic persuasions. The monotypic, dimorphic genus *Olfersia* (*O. cervina*) was first seen in Monteverde; and it was our only location for stately *Dennstaedtia arborescens*, aptly named *Lonchitis hirsuta*, several new *Elaphoglossum* and *Thelypteris* species, the filmies *Hymenophyllum asplenioides* and *H. hirsutum*, the grammitid *Lellingeria subsessilis*, *Selaginella oaxacana*, *Stigmatopteris contracta*, *Polybotrya osmundacea*, *Oleandra articulata* (scattered sori), *Ctenitis hemsleyana* and *Sticherus pteridellus*.

The **Monteverde Reserve** (only 2,500 hectares, 6,178 acres) is one of the most luxuriant of the Central American cloud forests and is owned by the Tropical Science Center (TSC) based in San José and dedicated to science and conservation. It occupies an exposed position atop the Tilarán Mountain Range, thus straddling the low continental divide. Moisture-laden trade winds, a long rainy season (April through November), and steeply sloped peaks and valleys have

created an exceptional array of life zones and an amazing biodiversity here. Something grows on virtually every surface. Long-lived fern fronds eventually get covered with algae, lichens, and mosses. Huge strangler figs (*Ficus*) mingle with *Meliosma*, *Sapium*, *Quararibea*, *Guarea*, and trees and shrubs in the Lauraceae and Myrtaceae (among other largely tropical genera and families) to make a dense, multi-layered, fern-"infested" montane rain forest. Magnificent!

If time and weather had permitted, we would have hiked out to El Valle, a field station in Monteverde where Mateo Rutherford, our very knowledgeable, bilingual co-leader is doing his PhD thesis on the ecology and evolution of pteridophytes, with emphasis on the Cyatheaceae. He has been transplanting large specimens of these tree ferns to study their ability to adapt to various habitats. The genus *Cyathea*, with about 10 species in Monteverde, contains the tallest tree ferns in Costa Rica. Specimens reach heights of 10m or more. Another tree fern family is represented here by *Dicksonia sellowiana*. Its stocky, dark trunks are easily distinguished from the slender cyatheas. These elegant tree ferns occupy the same niche in the tropical forest understory as does the similar-sized flowering dogwood (*Cornus florida*) in temperate North America.

January 13 – It was time to get our heads out of the clouds, rejoin the Pan American Highway, and head north through Tilarán in the fire-prone, dry forest of Guanacaste Province (on the Pacific side of the divide). The region is named for the guanacaste tree, *Enterolobium cyclocarpum*, a tall, dome-crowned legume. Soon we were at Lake Arenal (Costa Rica's largest at 87 km²) and the base of conical-shaped **Arenal Volcano** (1,633m high and the country's most active). In 1968 a major, Mt. St. Helens-type eruption killed 75 people here. There is a hydroelectric plant and an array of windmills nearby, reminding us that renewable sources like these supply over 90% of Costa Rica's energy (no consolation in San José and other cities where vehicles operate without emission controls and the air is chokingly polluted). At roadside stops along this part of the trip we found *Cyclopeltis semicordata*, a monotypic, *Polystichum*-related lowland fern. It has clumps of large, once-pinnate fronds with sori in 1-3 rows on each side of the costa and round, peltate indusia. The base of each pinna forms a distinctive auricle that overlaps the rachis – a handsome fern, perhaps for Florida gardens. Other "new" fern finds were *Stigmatopteris sordida*, *Alsophila firma*, *Adiantum lunulatum*, *A. villosum*, and a large shoestring fern – *Ananthacorus angustifolius*. At drier locations on this side of Costa Rica many ferns (e.g., *Pleopeltis astrolepis*) and fern allies (some *Selaginella* species) live as resurrection plants.

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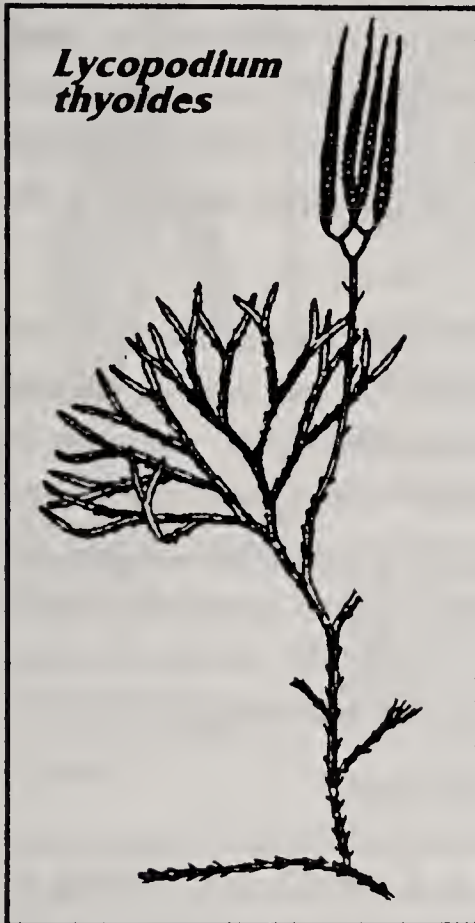
The afternoon was spent basking in sunshine and bathing in thermal springs at the elegant **Tabacón Resort**, just north of Arenal Lake. The water is naturally heated as it flows down volcanic flanks into the valley. Impressive stands of dimorphic leather fern (*Acrostichum aureum*) thrive along the stream edges; and *Polypodium pseudoaureum* clammers around tree trunks with fat, orange-scaled rhizomes and grey-blue, deeply lobed fronds. A long bus trip returned us to San José, where our cozy hotel rooms were most welcome after two damp nights at Monteverde in rooms crowded with bunk beds.

January 14 – Southeast of San José lies **Tapantí Wildlife Refuge**, at the end of the Río Macho river (where there is another hydroelectric plant and lake) in the Orosi Valley. The oldest church in Costa Rica (from the 1600's) is here in the town of Orosi (does the name break down to "Gold-yes?" we pondered), and both sun and shade coffee are grown on the flanks of the valley. Tapantí is not a typical tourist stop and is pristinely wild. A forest trail yielded 93 ferns in an easy morning tramp, 34 of them found at none of our other sites. Here we saw *Blotiella lindeniana*, a distinctive dennstaedtioid fern, *Macrothelypteris torresiana*, and *Blechnum polypodioides*, with fronds narrowly tapered at both ends to a pinnatifid apex and nubbins-only base. *Huperzia dichaeoides* and *H. tenuis?* (the latter perched too high above our heads to be sure) formed long, pendulous tassels of stringy stems on steep slopes near the parking lot. Other originals for this site included our own, northern *Osmunda regalis*, *Polybotrya gomezii*, *Pteris podophylla*, the grammitids *Ceradenia kalbreyeri*, *Enterosora percrassa*, and *E. trifurcata.*, several new filmies, elaphs, and many more.

A refreshing box lunch at a picnic spot in this enchanting forest and we were off again, back to the Pan American Highway. At a roadside stop near a plantation our leaders found specimens of two Pteridaceae – *Doryopteris pedata* var. *palmata* and *Hemionitis palmata* (strawberry fern). Both are small, terrestrial ferns with palmately-lobed fronds, but *Doryopteris* has marginal sori while *Hemionitis* sports sori along the veins of its sporophylls.

Our next, and most ecologically different stops were at high elevations on **Cerro de la Muerte** –literally Mountain of Death. This area lies south of Tapantí as the Pan American Highway winds over the western (Pacific) edge of the Talamanca Mountain Range. It used to be an old ox-cart route through the continental divide, and has some of the severest, most changeable weather in the country – thus, a high death rate for travelers in past centuries. Today there is a decent road through the pass, though the trip is full of roller coaster thrills, sharp curves, heroic potholes and "pavement out" zones. Recent heavy rain, courtesy of

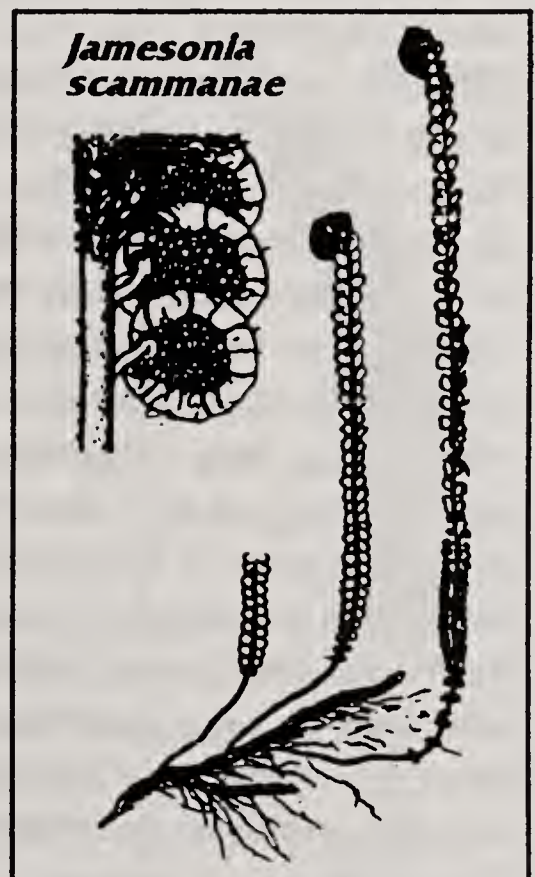
Hurricane Mitch, was responsible for a lot of the road damage we encountered. Near the crest, at the 67 km marker, we were in an elfin forest where members of our group plunged into a *Sphagnum* bog formed from glacial melt about 10,000 years ago. Some spectacular, eco-adapted ferns make their home here, especially the massive-trunked *Blechnum buchtienii*. It looked like a large cycad sending up leathery, once-pinnate fronds to make a vase-shaped crown. Also



notable here was dimorphic *B. loxense*, leathery-leaved and possibly hardy farther north, and monotypic *Culcita conifolia* (Dicksoniaceae), the latter with a stout rhizome but no trunk (like the *Lophosoria* on Poás Volcano). Fertile colonies of *Lycopodium contiguum* (a *L. clavatum* look-alike) and *L. thyoides* (resembling North America's *L. digitatum*) sprawled across the moist ground here.

Pushing ever higher to 3,490m our second stop was above tree line in Costa Rica's cold, damp, harsh páramo ecosystem (at or near the northernmost limit of this unusual life zone). Here, woody "tree asters" (1-2m) are among the tallest plants, and the dominant grass is the bamboo *Swallenochloa*. The famed fern genus *Jamesonia* is fairly common on exposed banks. Two of the three species known from the area were found quickly –

the hairy, skinny-leaved *J. scammanae* and the somewhat broader, hairier *J. alstonii*. Their linear, stiffly-erect fronds, looking like fuzzy wires, are once-pinnate, the pinnae reduced to tiny orbs, only 2-3mm in diameter. The fronds can grow to 30+ cm and have permanently coiled (circinate) tips – truly eye-popping, weird ferns. Dr. Smith told us that *Jamesonia* is a relatively new pteridoid genus (its neotropical páramo habitat being only a few million years old), and may be derived from *Eriosorus* (seen earlier on Poás) to which it does have physical and genetic affinity. As evidence of their recent divergence, the *Jamesonia* species hybridize frequently with each other and also with *Eriosorus*. It would be an interesting challenge to grow *Jamesonia* in North American gardens. Two species of *Polystichum* found here (*P. concinnum*



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and *P. talamancanum*) have very coriaceous, congested foliage, xerically adapted to severe conditions. Could they be grown up north? *Dryopteris wallichiana*, also at this site, grows quite vigorously in my Pittsburgh garden, a possible promise of success for more páramo ferns. Other pteridophytes of this strange, high elevation place included *Asplenium polyphyllum* (simple veins and prominent epidermal pores called hydathodes), *Melpomene moniliformis* (a small grammitid), and *Huperzia crassa* (a robust, terrestrial lycopod producing stout aerial stems and tightly appressed, shiny "leaves" with conspicuous fertile zones). This spectacular fern ally was a great finale to our all-too-brief search for the pteridophyte treasures of the páramo.

Mt. Chirripó (at 3,819m it is Costa Rica's highest) played peek-a-boo with the clouds to the east as we crested the Mountain of Death on our way to **Cuericí Biological Reserve and Field Station** at nearby Montañadentro. Despite its bunk bed accommodations in an uninsulated, unheated cabin (with night temperatures near freezing), we voted Cuericí one of the trip highlights. It had the best food, lovingly prepared by native cooks. Some birders greeted us with news of a pair of nesting quetzals. Together with our near miss at Monteverde, it seemed we were always a day late in our quest for the elusive quetzals.

January 15 - A loop trail starting in the rain forest at **Cuericí** and climbing up through drier oak forest (dominated by *Quercus costaricensis*) produced 9 different *Aspleniums*, including *A. squamosum* and *A. blepharophorum*. The diminutive, but fully fertile *Elaphoglossum squamipes*, *Tectaria incisa*, *Terpsichore senillis* (a large grammitid), *Hymenophyllum tegularis*, *Hypolepis bogotensis*, *Huperzia hippuridea*, and two new shoestring ferns, *Polytaenium lineatum* and *Scoliosorus ensiforme* were among the 18 pteridophytes seen only here (out of the 67 species total for the Cuericí area). There were great views toward Mt. Chirripó from the seriously rutted field station driveway, as well as handsome stands of bracken, *Pteridium arachnoideum*. Colorful flowers included a wild, white dahlia, deep magenta salvias, and several gesneriads. We were treated to an evening talk by Carlos, our host and one of the original farmers who combined resources to establish Cuericí. He described how indiscriminant forest destruction was stopped by the conservation buffer here at Cuericí between the Río Macho and Chirripó reserves. The people practice low-impact farming and raise trout in large ponds below the residences. Our pre-departure lunch of freshly harvested trout was scrumptious. The rest of the day was consumed by the I-o-n-g drive south to **San Vito** and two nights at **Las Cruces Field Station/Wilson Botanical Garden**.



Ophioglossum palmatum

Ed. note - This just looks upside down. Pendulous orientation is correct!

January 16 – The Wilson Garden, named for founders Kathryn and Robert Willson, was purchased in 1973 by the OTS (Organization for Tropical Studies – a consortium of North American and Costa Rican Universities centered at Duke University). Today its former coffee fields and pasture lands are returning to forest, and contiguous land is being acquired to expand the holdings. The aim is to create a biological corridor for large animals like the mountain lion. There is riparian habitat along a stream, extensive secondary forest, and terraced garden acreage with impressive collections of palms (700 spp.), bromeliads (85 spp.), heliconias (40 spp.), tree ferns (12 spp.), and many orchids. Costa Rica’s native, endangered cycad, *Zamia fairchildiana*, with mature seed cones, was seen here. 80% of the country’s mammalian species can be found on the reserve and nearby conservation area, including a tropical, prehensile-tailed porcupine.

We were cautioned to be watchful on the trails since “jumping” and “eyelash” vipers occur in the area – great names for deadly snakes! You can, however, get up close and personal with exquisite birds at Willson. Fiery-billed and chestnut-mandibled toucans, brown robins (the state bird of Costa Rica), red-rumped, silver-throated, yellow-hooded, blue-gray, and speckled tanagers, green honeycreepers, violaceous euphonias, and many more beauties were eager diners at strategically suspended banana feeders.

The most exciting fern find at Wilson was the epiphytic *Ophioglossum palmatum* – its sizable, pendant, lobed fronds bearing upright, fertile spikes at the base – a rare and much admired sight. It grows in shaded cavities of tree trunks or stumps. Other ferns seen for the only time on the trip were *Angiopteris evecta*, *Dryopteris patula*, *Ctenitis nigrovenia*, *Lastreopsis exculpta*, *Campyloneurum repens*, *Thelypteris linkiana*, *T. urbanii*, *Cyathea multiflora* and spiny-budded *Alsophila imrayana*. Clumps of hairy *Trichomanes crispum* growing on exposed rocks seemed promising for cultivation in zone 7 or higher. There were 19 ferns added to our “first seen” list out of a total of 60 species found here – a lucrative end to an incredibly productive foray in a country rich in history, culture, and biodiversity. Thank you seems in-

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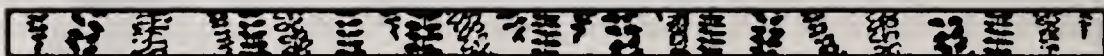


adequate for all the expertise, hard work, patience, and friendship extended to us by Alan Smith*, Mateo Rutherford* and our local guides. We learned enough to reach satiety, but still wanted more! That is, indeed, the sign of a "pterific" trip. *Adiós, a los buenos amigos y los helechos hermosos de Costa Rica!*

* *Gracias* of a very special kind are owed to **Dr. Alan R. Smith** for his careful review and correction of this report. It was a rare and cherished privilege to see the ferns of Costa Rica in his competent hands. *Muchas gracias* goes to **Mateo C. Rutherford** for the firsthand knowledge of Costa Rica that was invaluable in so many ways.

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