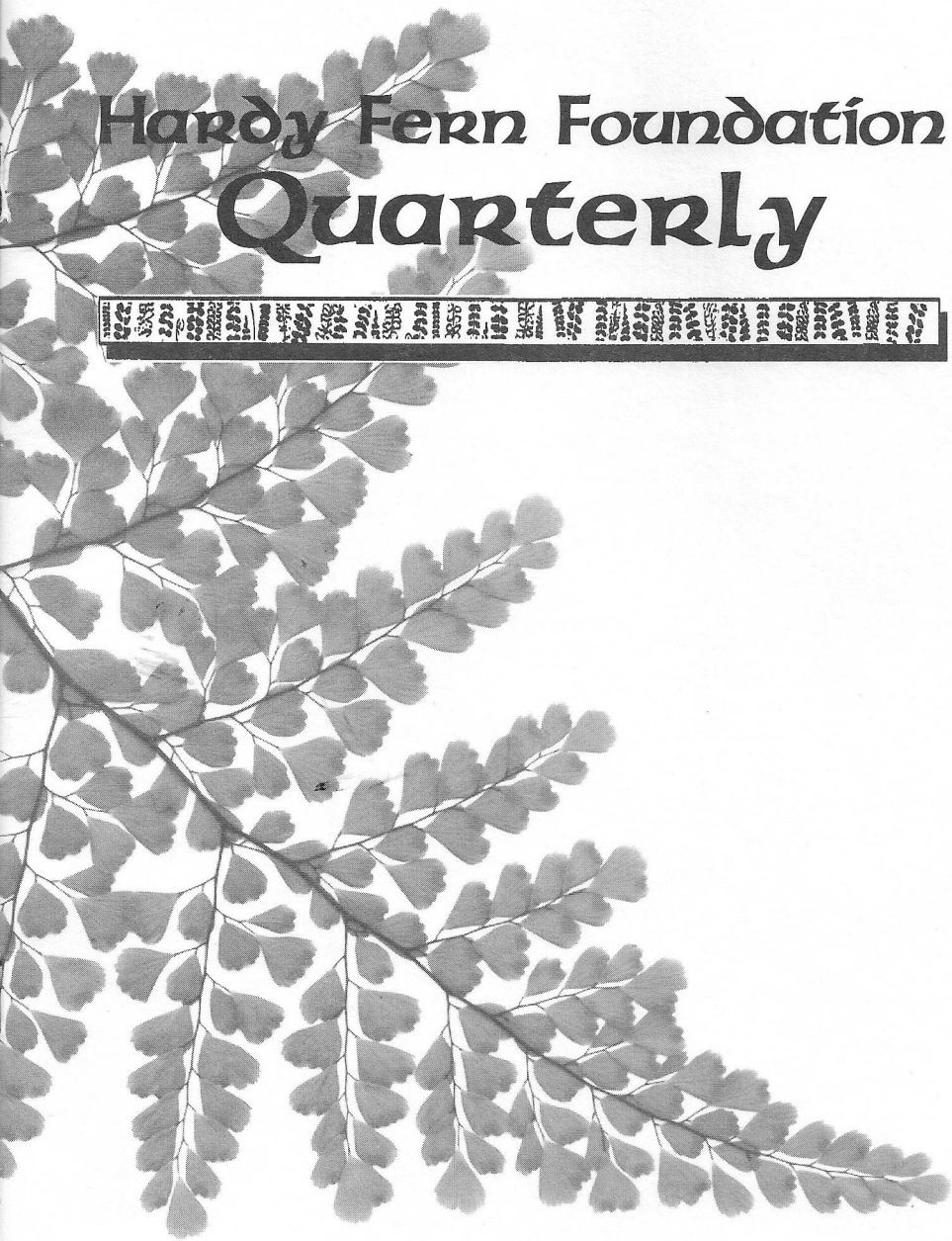
Hardy Fern Foundation Quarterly



THE HARDY FERN FOUNDATION

P.O. Box 166

Medina, WA 98039-0166

(206) 870-5363

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.

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

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

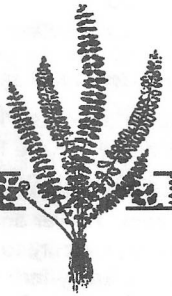
Hardy Fern Foundation members participate in a spore exchange, receive a quarterly newsletter and have first access to ferns as they are ready for distribution.

Cover Design by Willanna Bradner

THE HARDY FERN FOUNDATION

QUARTERLY

Volume 11 • No. 1 • Editor Sue Olsen



The Spore Exchange Needs You

Please continue to send spores to:

Shannon Toal
4717 SW Graham Street
Seattle, WA 98136

Winter 2001

Pat Kennar, President Elect

Happy New Year to all and welcome to the New Millennium, this time for real!

While John Putnam, our Hardy Fern Foundation President is continuing his recovery at home, I have been pressed into early service. I find the task to be enjoyable as well as challenging.

The Northwest Flower and Garden Show, February 7 – 11, 2001, presents the customary opportunity to express our interest in the uncommon but rewarding occupation of hardy fern cultivation. Also as is customary, we need volunteers to help staff the booth. Volunteers receive free admission to the show and your help would be most welcome. Please contact Michelle Bundy at (206) 870-5363 or e-mail at sabina98@earthlink.net to select your time(s).

Our display area will stress the use of ferns in landscape situations as well as promoting the Annual Fern Festival meeting, lecture, sale and clinic on propagation. An attractive brochure will be available listing the location and directions for those interested in attending this function. The dates will be Friday June 1, 2001 with the plant sale from 1:00 – 4:30, and a brief meeting at 6:30 followed by a lecture "A Garden Stroll Through China" by John van den Meerendonk. The sale will continue on Sat. June 2 from 10:00 – 2:00 with a propagation clinic at 11:00. This will be one of the best opportunities for "Fern Mavens" to acquire some of the more rare and unusual species and varieties of ferns as well as companion plants normally unavailable in local nurseries.

With a new year and the hopes for an early spring, thoughts turn to visions of unfurling *Matteuccias*, lovely pink *Woodwardias* and dancing Maidenhairs all in a row! In addition a list of resolutions includes the comprehensive assessment of projected goals with appropriate time priorities and budgeting to achieve them, additional means to expand our sales base involving other venues and an emphasis on the expansion of membership with more complete participation. As a start, please note the research being initiated and co-ordinated by HFF member Ralph Archer on the timing of spring new frond growth (see info). There are many variables and we look forward to his compilation of information and insights on the performance and vagaries of new growth on our native and exotic ferns. Please support this research by sending him your observations on our fern "centerfold".

I would like to express appreciation to the board for their generous gifts of time and effort – John van den Meerendonk for his latest projects involving the installation of a fern grotto at the Park at University Place in Tacoma and a fern garden at the Poulsbo Library; - Sylvia Duryee for providing the unselfish gift of time and plants; - Willanna Bradner for creating beautiful graphics; - Michelle Bundy for all the help and expertise in plant care and last but not least, Sue Olsen for her tireless devotion to content and detail in providing us with a first class Quarterly. Sometimes people do their jobs so well that we forget and take them for granted.

To all please accept my sincerest gratitude for a mission well done and may everyone have a wonderful New Year with "frond memories".

Dryopteris juxtaposita

James R. Horrocks

The species name refers to the opposing pinnae being placed side by side on the rachis. Considered a Sino-Himalayan species of the widespread sort, *Dryopteris juxtaposita* occurs mainly in the outer reaches of the Himalaya, being uncommon in the central area. It also ranges into southern India and is found in parts of China and southeast Asia. This species grows in mid to upper-level forests, mostly on the ground, but often on banks and between rocks. It even occasionally grows in walls.

Originally included as a subspecies of *D. odontoloma*, it is now recognized as quite distinct. *D. juxtaposita* is frequently found in the wild as a somewhat stunted plant, but this is largely due to the fact that it often prefers growing on steep, rocky banks.

Dryopteris juxtaposita. Photo by Richard Young - Salt Lake City, Utah.

Dryopteris juxtaposita may be confused in the wild with *D. nigropaleacea* but there are subtle differences, including scales at the base which are lighter brown, fronds that are less blue-green and slightly glossy, and pinnules that are wider and more truncated. The spores of *D. juxtaposita* are much larger and this is easily confirmed under the microscope. *D. juxtaposita* is a triploid and apogamous while *D. nigropaleacea* is a sexual diploid. Some of the more foliose specimens of *D. juxtaposita* can be close to *D. stewartii*, but the stipe scales are darker and more glossy, and the upper pinnules are less dissected and more truncated. Mature fronds of *D. juxtaposita* can be two to three feet in length, triangular and bipinnate. There is considerable variation, causing confusion among other Himalayan species.

Description: The rhizome is for the most part semi-erect and ascending, producing medium-sized to rather large fronds, two to three feet long, that are bipinnate and elongated triangular-lanceolate. They are also somewhat evergreen and will last through the winter if covered with snow. The stipe is from two-thirds to the same length as the lamina, the base being clothed with pale brown scales which are ovate-lanceolate, thick, and glossy at the widest part. The scales can be medium brown to black-brown and become scattered, narrower, and somewhat lighter further up the stipe. The rachis is nearly devoid of scales, but for a few narrow small ones. The pinnae, which are beautifully ta-

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The Role of the Alpine House in the Hardy Fern Garden

Catharine W. Guiles

New Gloucester, Maine

The inspiration for this topic goes back several years to the Holttum Memorial Pteridophyte Symposium, "Pteridology in Perspective," held at Kew Gardens in 1995. Hardy Fern Foundation members who attended will perhaps recall that the building in which the meetings were held was adjacent to the garden's alpine house and its surrounding rock garden. Between sessions, or when amateurs like me decided to skip a specialized presentation, one could take a few steps and explore this charming structure and its display, which included quite a few ferns among the delicate alpine and rock-garden flowering plants. This glass house was not like Kew's vast conservatories of tropical plants; rather, it offered plants that grew on mountaintops, in rocky locations, and even on permafrost and in zones at which temperatures would routinely fall below 0°C. To accomplish this latter feat, the curators had built a plant bench atop a refrigeration unit!

In addition to the alpine house at Kew, I have also on several occasions visited the similar structure at Wave Hill, a beautiful park in Riverdale, New York City, a neighborhood in the Bronx. This park, which fronts directly on the Hudson River, was formerly a private estate—Theodore Roosevelt's parents, Mark Twain, and Arturo Toscanini all rented one or another of its houses at various times. Coming down to our era, Woody Allen used it for a scene in *Hannah and Her Sisters*. It is one of the treasures of New York City. As at Kew, its alpine house has ferns among its many flowering plants, and it also stands in the middle of a rock garden.

An Internet search turned up yet another alpine house, this one at the botanical garden of the Memorial University of Newfoundland, in St. John's. It too houses a few ferns.

Alpine Houses

First, a few details about alpine houses that point up the differences between them and the usual greenhouse. Ventilation is of primary importance. This is accomplished with many vents supplemented by fans. Ideally, air enters the house through openings below and above the benches in which the plants are placed and exits through additional openings in the roof. These vents are closed only during extended periods below freezing, or when winter weather is especially humid. According to H. Lincoln Foster, author of *Rock Gardening*, the alpine house needs no heat until temperatures go below 20 degrees F, and then a source of heat should be provided only during prolonged cold periods. In summer, to reduce temperatures, the floor is dampened, shade cloth can be used, and a ventilating system operated as necessary. The purpose, of course, is to reproduce the natural growing conditions so that plants follow their yearly cycle of growth and dormancy.

In his book *The Alpine House: Its Plants and Purposes*, British alpine-gardening expert Robert Rolfe discusses several refinements to this basic plan: dehumidifiers, air conditioning, the mentioned refrigerated benches, supplementary lighting, seasonally installed insulation, soil-warming cables, and heaters controlled by a minimum-maximum thermostat. Clearly, alpine-house gardening can be a high-maintenance business! Foster mentions that a pit house is a possible alternative to a free-standing alpine house. Such a structure is "dug into the ground with only the glass or plastic roof above ground" (p. 80). In this type of shelter, the temperature of the soil itself provides a moderating influence, and in winter, the northern side of the roof can be covered with insulating material against extreme cold and winds.

Figure 1 shows the interior of the Alpine House at Wave Hill; apparent are the bank of windows which open and the translucent glass roof. The north side of this particular house abuts a stone wall, and the interior masonry absorbs heat, reradiating it at night (which may actually be a disadvantage).

Figure 1.

Interior of the alpine house at Wave Hill, Riverdale, New York, NY. Interpretive gardener Laurel Rimmer assisted me in my visit there in April 1997.

According to Rolfe, plants in alpine houses are ideally grown in clay pots filled with a mixture of a potting soil and stone grit in proportions simulating the plant's natural conditions. As excessive moisture is the main enemy of these plants, the potting medium usually slopes away from the plant and the top is covered with additional grit. (Those attending the Holttum Symposium will certainly remember the beautiful, diverse collection of ferns planted in this manner which were displayed near the entrance to the meeting hall.) The pots are then placed in deep benches filled with damp river sand (this is very important), which can supply moisture and wick it away, if necessary, and which also serves to moderate temperatures.

The pairing of alpine houses with rock gardens is essential because, in many cases, plants which spend the winter in the house are best kept outside during the summer. Rolfe suggests building cold frames along the edge of the alpine house and filling them with a bed of sand for the pots. Figure 2. shows a group of plants summering in pots or troughs outside Wave Hill's alpine house.

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The Role of the Alpine House *Continued from pg. 5*

Ferns for the Alpine House

In reviewing this subject, the reader must always keep in mind that flowering plants, not ferns, are the focus of these houses. See the web site entitled The Alpine Garden or Rolfe's book for photos of such exquisite plants as the Lewisias,

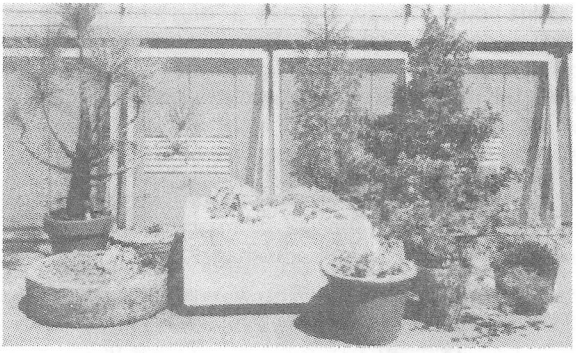

Figure 2.

Display of plants in pots and tubs outside Wave Hill's alpine house.

a blue, blue gentian, and, a pink form of *Ranunculus parnassifolius*. Indeed, Rolfe does not even mention ferns! Nevertheless, there is a place for them.

At Wave Hill, the fern species growing in the alpine house when I visited there in 1997 were: *Polypodium scouleri* (z. 8-9), *Cheilanthes lanosa* (z. 5-8), *Cheilanthes intertexta* (an epipetric species found in California); *Blechnum penna-marina* (z. 5-8), *Athyrium filix-feminina* 'Minutissimum' (z. 4-8), and *Polypodium hesperium* (z. 5-8). The species found in the Memorial University's alpine house are *Asplenium viride* (z. 2-5) and *Athyrium niponicum* (z. 4-9). At Kew, as I was informed by Tony Hall, the curator of the alpine house (pers. comm.), the ferns which are grown permanently in the alpine house are: *Adiantum jordanii* (California maidenhair, z. 8-10), *Pellaea atropurpurea* (Purple cliff brake, z. 4-9), *Selaginella sanguinolenta, Cheilanthes lindheimeri* (Fairy swords, z. 8-9), and *Ophioglossum gramineum*. However, at Kew, many plants spend part of their time indoors and part outside, and Mr. Hall kindly sent me a long list of ferns which fall into this category (Appendix A). Figure 3 shows a corner of the Kew alpine house.

Let us examine the different types of ferns grown in and in conjunction with these houses. First, are species found at high altitudes or northern latitudes. I was delighted to learn that the Memorial University of Newfoundland has *Asplenium viride* (also denominated *Asplenium trichomanes-ramosum*), the Green spleenwort, a North American species which grows in limestone crevices and on talus. I wish that one of the three locations had listed *Dryopteris fragrans*, the Fragrant wood fern, also an epipetric species found in northern North America. Kew's long list certainly offers many ferns found in mountainous or rocky, but not necessarily high-altitude, habitats. These include: *Adiantum aleuticum, Adiantum jordanii, Asplenium fontanum, Athyrium flexile, Blechnum penna-marina, Cystopteris fragilis, Polystichum tripteron, Woodsia polystichoides,* and *Pellaea atropurpurea*. Another group at Kew includes temperate or subtropical

species such as *Arachniodes simplicior, Phegopteris connectilis, Bommeria hispida, Davallia mariesii, and Asplenium flaccidum.*

The Wave Hill offerings, listed above, included two Cheilanthes species, all requiring a dry habitat, and *Blechnum penna-marina*,. which prefers wet alpine grasslands and is found in Australia, New Zealand, Chile, and South Africa.

To spare the reader, I will touch only lightly on the topic of plant pests and diseases which attack plants in the alpine house. Aphids, spider mites, earwigs, botrytis, mildew, fusarium wilt, rusts, mosses and liverworts—the alpine house guardian must be vigilant to ensure that the often tiny plants in his or her care are not overcome by these enemies.

Conclusion

The comments on these pages lead back to the main question: What is the role of the alpine house for the hardy fern enthusiast? It is evident that alpine-house gardening can be very demanding. From a reading of Rolfe's book, one infers

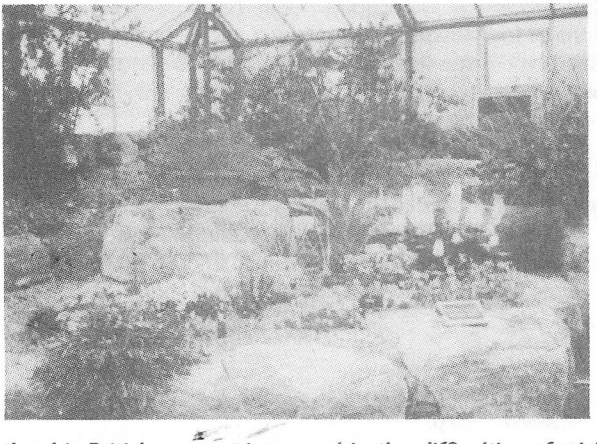

Figure 3.

Interior of the alpine house, Kew Gardens. Note that this section has been landscaped as an interior rock garden, 1995.

that his British compatriots revel in the difficulties of raising these fussy plants. On The Alpine Garden's web site, Geoff Rollinson, described as "the undisputed No. 1 alpine exhibitor of all time," discusses at some length his three alpine houses and routines for caring for his plants.

For growers in North America, I first suggest that only public institutions, such as Wave Hill and Memorial University, or individuals with infinite patience and leisure (extra funds would help, too) are best suited to maintaining such establishments and their accompanying cold frames and/or rock gardens. Second, the three alpine houses discussed are well into northern latitudes. Unless it were situated at a very high altitude, an alpine house in the southern part of the United States would not be possible.

I found David Lellinger's discussion of two North American floristic provinces, the Tundra Province and the Northern Coniferous Province, useful in compiling a list of ferns and fern-allies which would make an interesting alpine house collec-

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The Role of the Alpine House *Continued from pg. 7*

tion, if they could be kept cool enough in summer. From the tundra area, these are: *Dryopteris fragrans* (Fragrant wood fern), *Equisetum scirpoides* (Dwarf scouring-rush), *E. variegatum* (Variegated Scouring-rush), *Selaginella sibirica* (Siberian spike-moss), *Woodsia alpina* (Alpine cliff fern), *W. glabella* (Smooth cliff fern) and *W. ilvensis* (Rusty cliff fern). He also mentions the true alpines *Cystopteris montana* (Mountain bladder fern), *Lycopodium complanatum* (Northern running-pine), and *Huperzia selago* (Fir club moss).

The long list of ferns grown at Kew shows us that an alpine house can greatly enhance a northern public or private garden's offerings of hardy ferns which either have special requirements or which would not be appropriate for the grower's climate zone. An alpine house does not have to be large and it does not have to have a refrigerated bench and all the elaborations referred to by Rolfe. A simple one can certainly house those species—ferns and otherwise—which have already proven easy and successful when raised in such conditions. I would like to think that this article will inspire Hardy Fern Foundation members—whether institutions or individuals—to consider if such a house would be appropriate for their location. I see it as offering a new challenge; as the beginning of a dialogue. Is there someone out there game for a try?

Acknowledgments: I would like to thank the following for their assistance, either personally, through correspondence, or through the Internet: Tony Hall, Curator of the Alpine House at Kew; Laurel Rimmer, Interpretive Gardener, Wave Hill; Carl White, Head Gardener, Memorial University of Newfoundland Botanical Garden; and Louis Chinnery, University of the West Indies, Barbados, for help with terminology.

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Foster, H. Lincoln. 1968. *Rock gardening. A guide to growing alpines and other wildflowers in the American garden.* Boston: Houghton Mifflin. 466 p. Reprinted 1982 by Timber Press, Portland, OR.

Jones, David. 1987. *Encyclopedia of ferns.* Port Melbourne, Victoria (Australia): Thomas C. Lothian Pty. Ltd. 433 p. Reprinted 1987 by Timber Press, Inc., Portland, OR.

Lellinger, David B. 1985. *A field manual of the ferns and fern-allies of the United States and Canada.* Washington, D.C.: Smithsonian Institution Press. 389 p.

Mickel, John. 1994. *Ferns for American gardens.* New York: Macmillan Publishing Company. 370 p.

Rolfe, Robert. *The alpine house: Its plants and purposes.* 1990. Bromley (Kent): Christopher Helm (Publishers) Ltd. 131 p. Reprinted 1990 by Timber Press, Portland, OR.

World Wide Web pages

The Alpine Garden (http://web.ukonline.co.uk/alpines).

Memorial University of Newfoundland (http://www.mun.ca/botgarden/tour/alpine.htm)

The Missouri Botanical Garden's W³Tropicos database (http://mobot.org/Pick/Search/pick/html).

Wave Hill (http://www.wavehill.org).

Appendix A. Ferns grown in and around the Kew Alpine House

List supplied by Tony Hall, Curator. Additional material added by the author using the listed reference books and the W³ Tropicos database of the Missouri Botanical Garden.

The following species are grown in pots for regular display in the alpine house.

Actiniopteris semiflabellata, Ethiopia
Adiantum jordanii (California maidenhair), Oregon, California, epipetric, z. 8-10
Adiantum venustum (Himalayan maidenhair), Himalayas, China z. 8-10
Arachniodes simplicior (Simpler East Indian holly fern), Japan,China, z. 6-9
Asplenium flabellifolium (Necklace fern), Aust., N.Z., epipetric (not listed in W³Tropicos database)
Asplenium flaccidum (Weeping spleenwort), epipetric
Asplenium fontanum, alpine, calciphile
Asplenium incisum, China, Japan, Korea, epipetric
Asplenium richardii, (not listed in W³Tropicos database)
Athyrium flexile , Europe, epipetric (not listed in W³ Tropicos database)
Athyrium spp. ("Japanese collections impossible to identify at species level"-T. Hall)
Blechnum penna-marina (Alpine water fern), Aust., N.Z. Chile, S. Africa, wet alpine grasslands
Bommeria hispida (Copper fern), SW U. S., Mexico, epipetric; arid
Cheilanthes lindheimeri (Fairy swords), SW U. S., N. Mexico, epipetric, arid
Cheilanthes pteridioides
Cystopteris dickieana
Cystopteris fragilis (may be same species as *C. dickieana*) (Fragile fern), circumboreal, epipetric
Davallia mariesii, China, epipetric
Dryopteris dracomontana, South Africa
Gymnocarpium dryopteris (Oak fern), circumboreal, epipetric
Gymnopteris vestita, Himalayas, China
Lepisorus amaurolepidus (*Pleopeltis amaurolepida*)
Lepisorus annuifrons , China
Lepisorus nudus , China
Microlepia wilfordii, China
Onychium contiguum, China
Ophioglossum gramineum, China
Pellaea atropurpurea (Purple cliff brake), N.A. and Mexico, epipetric, z. 4-9
Phegopteris connectilis (Long beech fern), circumboreal
Pleopeltis erythrolepis , Mexico
Polystichum tripteron, Asia, alpine, z. 5-8
Pseudophegopteris levingei, China
Selaginella sanguinolenta, Mexico
Woodsia polystichoides (Holly-fern woodsia), China, Japan, Korea, epipetric

The following species are grown on peat or rock slopes around the alpine house. There is some overlap with the above list.

Adiantum aleuticum (Serpentine form), circumboreal, epipetric
Asplenium ruta-muraria (Wall rue), Eastern N. A., epipetric, calciphile
Blechnum penna-marina (Alpine water fern), Australia, N.Z. , Chile, wet alpine grasslands
Cheilanthes marantae , China
Leptorumohra miqueliana, Japan
Osmunda japonica, S. and E. Asia, z. 6-9
Plagiogyria matsumureana, Japan
Selaginella sp. (U.S.)
Woodsia polystichoides (Holly-fern woodsia), China, Japan, Korea, epipetric

Fern Emergence Time Study

Ralph C. Archer

While finalizing content of a previous article, the subject of time of emergence of ferns became the subject of discussion. As a result of early warm spring weather in the central United States, a significant number of the author's ferns started early growth, particularly a number of Asian species. A hard freeze occurred during the third week of April which killed growth on most ferns. Those that had significantly broken dormancy were killed back to the ground and took several weeks to months, in a few cases, to resume growth. These specific ferns did not have the vigor nor the frond length during this year's growing season compared to others that had not emerged to any extent. Several people suggested that a study of the time and order of emergence would be valuable information for gardeners both from the viewpoint of garden layout as well as knowing which ferns might be vulnerable in areas where late freezes regularly occur.

All HFF members are invited to join the study, We hope to receive information on both native as well as exotic ferns. Follow-up information on plants damaged by spring freezes would be particularly appreciated and members are requested to provide information regarding their long term performance and hardiness.

The following guidelines are provided for participants information and to provide uniformity of reporting. Suggestions for improvement and discussion of any factors believed by participants to be relevant are encouraged and will be gratefully received and reviewed. A decision as to any follow-up study will be made after conclusion of this first effort.

Send completed data sheets to Ralph Archer at P.O. Box 43035 Louisville, KY 40253-0036.

The special factors report section is for a listing of general garden conditions that affect air temperature, available light and soil warmth. They include items such as garden location (in a city, out in the country, beds under trees, relationship to buildings, fences, and other plants), the amount that ground slopes and it's direction (level, gentle slope, or hillside, east facing, etc.), near ponds or streams and surface mulch, if any, and it's type.

If a killing frost occurs after growth has started, it would be appreciated if a second data sheet is also sent noting under special conditions that a frost occurred, the frost date as well as the dates for re-emergence or a note that the fern was killed by the freeze.

Date of Emergence means full emergence from ground or full separation from crown of the first fiddlehead.

Date of Full Extension is when the first frond is no longer curled at the tip.

HFF

Data Sheet

Fern Frond Initial Growth

Observer's name ____________________ **Town and State** ____________________

Hardiness Zone ____________________ **Date of normal last frost Agr.. Extension Service** ____________________

Special factors:

____

____

____

Plant name Genus Species Cultivar	Age	Date of Emergence	Date of Full Extension

Salmon la Sac Field Trip, July 15, 2000

Sylvia Duryee and Dr. Arthur Kruckeberg, Seattle, WA

Eight members of the Hardy Fern Foundation enjoyed a field trip to Cle Elum basalt and serpentine sites east of the Cascade Mountains on the east side of Lake Cle Elum. The area was formerly a coal mining center with headquarters in the town of Roslyn. (now better know as the site of TV's Northern Exposure). The original dam for Lake Cle Elum (an Indian term for swift waters) was built of wood and was two feet high and 223 long. When completed in 1905, a rival irrigation company immediately dynamited it. The Bureau of Reclamation built the present earthfill dam between 1931 and 1933. A much more imposing structure it is 160 feet high and 1801 feet long with the lake over 140 feet deep. Recreation has replaced mining as the local "industry".

A glorious day greeted us and soon warmed us. We only made three stops but were fully satisfied The first stop was by a massive rock outcrop (probably Teanaway basalt) rising abruptly on the east about two thirds of the way up the Lake Cle Elum – Salmon la Sac Highway. Access to the outcrop from the paved highway is via a short dead-end side road at the south end of the outcrop. A steep rocky trail climbs from the end of the spur up the mostly treeless terrain. Scattered yellow pine and Douglas fir are the only conifers, but the area is covered with many low evergreen shrubs – *Pachystima myrsinites* (Oregon box), *Arctostaphylos nevadensis* (pinemat manzanita), *Berberis aquifolium* (low form of Oregon grape), and *Penstemon fruticosus* (shrubby penstemon). Dominant herbs included *Zygadenus paniculatus* (death camas), *Allium acuminatum* (wild onion), *Fritillaria lanceolata* (checker lily), *Eriophyllum lanatum* (Oregon sunshine) and as we scrambled up the hillside the Pteridophytes! *Aspidotis densa* (rock brake or Indian's Dream) is abundant and *Cheilanthes gracillima* (lip fern) is frequent tucked into crevices in the sunnier exposures and ranging from young single plants to large clumps. In the more sheltered spots we found *Cryptogramma acrostichoides*, *Woodsia scopulina* and *a Polypodium (P. amorphum?).* This rich site certainly deserves to be protected.

L-R: Pat Kennar, Sue Olsen, Art Kruckeberg, Enid Kruckeberg, Thor, Sylvia Duryee, Marilyn Adams. Photo by Harry Olsen.

After a picnic lunch at the Salmon la Sac campground we drove up the Tukwala (Fish) Lake Rd. stopping about midway between Paris Creek and Little Boulder Creek. Here the site is an open Douglas fir/Lodgepole pine forest with a bank of mixed alluvium (Hawkins greenstone and serpentinized peridotite) above the road. We found our first serpentine ferns, *Adiantum aleuticum* (serpentine form) and *Polystichum lemmonii* (Mt. Shasta holly fern). In a nearby shaded draw, we found *P. munitum* (sword fern) and what appeared to be the hybrid, *P. munitum* X *P. lemmonii*. Below the road on a steep bank the *Adiantum* was abundant, as was *P. lemmonii* and a large clump of the possible hybrid *P. munitum* X *P. lemmonii*, or even *P. scopulinum* itself again. According to Dr. Warren H. Wagner, *P. scopulinum* is a polyploid species derived by chromosome doubling of the sterile cross, *P. munitum* X *P. lemmonii*. Thus we could have been witnessing the first step in yet another population of *P. scopulinum*.

Stop number 3 took us further up the Cle Elum River Rd. to Little Indian Spring, just below Big Boulder Creek an area of mostly alluvium of serpentinized peridotite yielding a serpentine soil. Surrounding the spring is a dense thicket of slide alder (*Alnus incana*) and the shrub phase of western yew (*Taxus brevifolia*). Lush stands of *Adiantum aleuticum* (serpentine form) border the runoff of the spring. On the steep slopes above the spring, we saw clumps of *Polystichum lemmonii* and *Aspidotis densa*. Again the possible hybrid *P. lemmonii* X *P. munitum* was here in a summer-dry rocky ravine. Common juniper (*Juniperus communis*) makes a low elevation occurrence on serpentine here.

Some of the party continued up past Scatter Creek and Tukwala (Fish) Lake to view the lush meadows with their rich display of low to tall herbaceous perennials including elephant's trunk (*Pedicularis goenlandica*), monkshood (*Aconitum columbianum*), tiger lily (*Lilium columbianum*), bead lily (*Clintonia uniflora*) and many other tall forbs and grasses.

This was an excellent trip and we recommend that the HFF take one regularly for all to enjoy.

Welcome New Members

Larry Booth
Kevin Briegel
Marilynn Cartwright
Shelley Dillard
Debby Hanmer
Sharon Pedersen
Greg and Eileen Pforr
Elizabeth Reichow
Alma Reynosa

THE HARDY FERN FOUNDATION QUARTERLY

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2003 128th Ave SE,
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Newsletter:

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Karie Hess (inside design)

The Susquehanna Fern in Shenandoah

Joan Eiger Gottlieb

Previous issues of the *H.F.F. Newsletter* have carried my articles "**Shenandoah Ferns**" (Fall, 1993) and "**Hybrid Hi-Jinks**" (Winter, 1995). In this update an exciting new hybrid fern is added to the plant list for Shenandoah National Park – the Susquehanna wood fern, ***Dryopteris*** X ***neo-wherryi*** W.H. Wagner. This rare and beautiful hybrid was named for the renowned botanist Edgar T. Wherry.*

I was first introduced to the Susquehanna wood fern in 1987 by its discoverer, the late Dr. Warren H. (Herb) Wagner, Jr. It was on a field trip southeast of Columbus, Ohio in the Hocking Hills.** On a privately owned, wooded hillside off Route 374 near Horseman's Camp we were given strips of bright orange plastic ribbon for marking any hybrids we might find. There, among populations of ***Dryopteris goldiana*** (Goldie's wood fern) and ***Dryopteris marginalis*** (marginal wood fern) were a few plants of their sterile hybrid – classically intermediate between the two parents. Dr. Wagner pointed out their diagnostic features, and I have used pressed pinnae from them in teaching about hybrids ever since. I tied the orange ribbon onto my camera bag as a keepsake of this memorable experience and of the inimitable Dr. Wagner.

Although I have been to Shenandoah National Park nearly three dozen times in as many years, I did not find ***Dryopteris*** X ***neo-wherryi*** there until fall, 2000. I went to check on a colony of Goldie's wood fern that had been pointed out to me a few years earlier by a local plant enthusiast. The ***D. goldiana*** grows near a spring off the Appalachian Trail at Hawksbill Gap, Milepost 45.6 on the Skyline Drive. There are many fine specimens of ***D. marginalis*** there as well, all intermixed on a slope with a seep that feeds the spring. Lingering in the area to enjoy the balmy, mid-September day, I noticed a fern that looked "odd." It was my second lifetime sighting of the Susquehanna fern, the hybrid I associate with fond and grateful memories of the fern expert who named it and first showed it to me. I will return to the park next spring to see if ***D.*** X ***neo-wherryi*** is deciduous (like Goldie's wood fern) or evergreen (like marginal wood fern). Because of its sturdy leaf texture, I expect it to be somewhat winter lasting, but stay tuned.

A mature specimen of ***D. neo-wherryi*** has the vigor of many hybrids, with some frond lengths exceeding those of either parent. Frond widths are generally intermediate between the parents, giving the hybrids a regally slender appearance. The fronds taper abruptly to a sharp tip, the pinnules are long-pointed, and the stipe scales are dark – all resembling the ***D. goldiana*** parent. On the other hand, the fronds are leathery and are bipinnate near the rachis; the pinnae taper gradually to points and the pinnules are shallowly scalloped (crenate,) as in the ***D. marginalis*** parent. The defining (and easiest to compare) character is the distribution of sori. On ***D. marginalis***, as the name implies, they are discreet "dots" along the upper and lower pinnule edges. On ***D. goldiana*** the "dots" are arranged linearly on both sides of the mid-veins. On the hybrid the two rows of sori are almost exactly half way between the edge and the mid-vein of each pinnule, an excellent example of intermediate (non-dominant) inheritance. Check it out for yourself in the accompanying illustration.

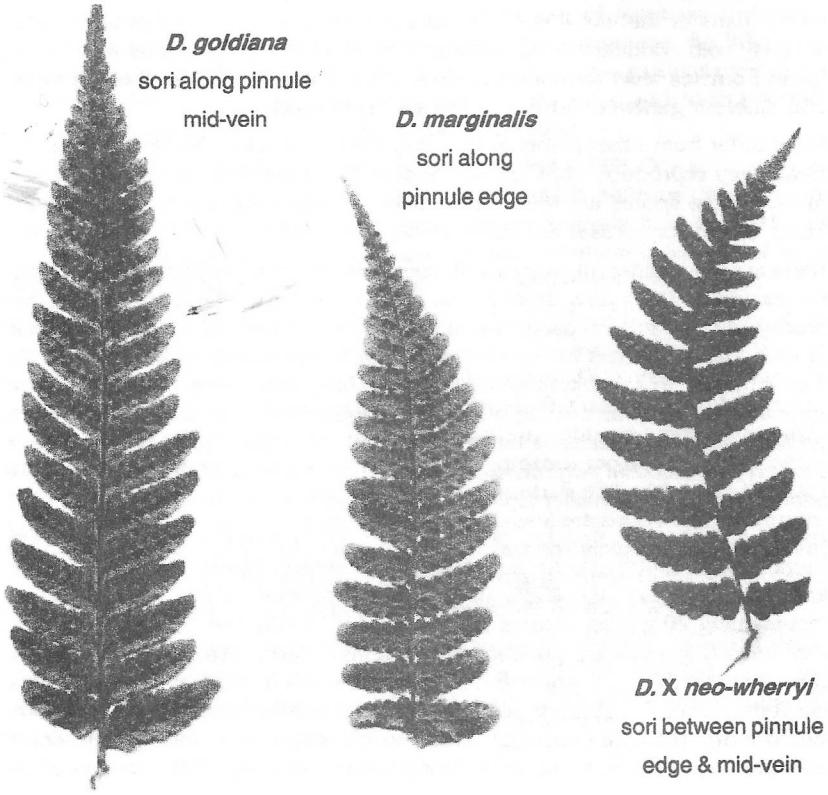
D. goldiana is one of the parents of the fertile hybrids ***D. celsa*** and ***D. clintoniana***. It also backcrosses (incestuously) with these ferns to make sterile, secondary hybrids. Additional crosses are known with ***D. intermedia***, ***D. carthusiana***, and, of course, ***D. marginalis*** as featured in this report. In addition, there is an eye-popping, inter-generic hybrid between ***D. goldiana*** and ***Polystichum lonchitis*** known from Ontario. This sterile hybrid is intermediate looking between its promiscuous parents.

Likewise, ***D. marginalis*** forms hybrids through crosses with ten other *Dryopteris* species, including Goldie's wood fern. *** All, however, are sterile. Fern species (and occasionally genera) that are closely related and relatively recently divergent from common ancestors may remain reproductively compatible under favorable conditions. The resulting hybrids are fascinating visual clues to these relationships. Searching for them wherever the putative parents grow in the same area is challenging, and occasionally rewarding.

* Edgar T. Wherry is the author of "*The Fern Guide: Northeastern U.S. and Adjacent Canada*," 1961 and "*The Southern Fern Guide*," 1964, both from Doubleday.

** Fern Finding in the Hocking Hills" by Joan Eiger Gottlieb and Warren H. Wagner, Jr., *H.F.F. Newsletter*, Winter, 1998.

*** "*Flora of North America*," Vol. 2, 1993, Oxford University Press, pp.280-285



The Hardy Fern Foundation

Michelle Bundy

Published with permission from ***The Rhododendron Species Foundation Newsletter*** *Vol. 25, No2, April 2000.*

The Hardy Fern Foundation is a non-profit organization founded in 1989. The Foundation's mission is to establish a comprehensive collection of temperate ferns and fern allies of the world for display, evaluation, public education and introduction. Founding members include Sue Olsen, Sylvia Duryee, Marge Baird, Jocelyn Horder, Mareen Kruckeberg, Jeanette Kunnen, Barbara Carman, Jan Dalby, John Mickel, Martha Robbins and the late Joe Beitel. Current membership totals 265 individuals whose homes range from Washington State to Australia.

The founding member's passion for ferns moved them to create this organization to make a greater variety of ferns available. Information on ferns and their culture was difficult to come by and few people were growing them. These "fern lovers" wanted to change this by educating the public on the beauty, ease, and diversity of these wonderful plants.

Ferns and their allies are in a major division of the Plant Kingdom called Pteridophyta, and they have been around for millions of years. At one time they were a dominant part of the earth's vegetation. Ferns tend to be distributed in wetter parts of the world but it is not uncommon to find ferns in very dry or severely cold conditions. The majority inhabit wet, tropical forests and can be found from sea level to mountains over 15,000 feet in altitude. There are over 250 different genera of ferns and about 12,000 species.

Ferns differ from other plants in that they do not produce flowers or seed, instead they reproduce from spores. Spores are one-celled microscopic structures. These spores are found most often on the underside or edges of the frond, and in some cases are borne on separate stalks.

There are many different shapes and sizes of ferns as well as textures and colors. For example, *Dryopteris erythrosora*, commonly called the autumn fern, has bronzy-red new growth darkening to a lush glossy green. *Athyrium otophorum*, or eared lady fern, has triangular light green fronds with burgundy stems, the leaves mature to a soft gray-green while the burgundy stems remain. They are stunning! Some ferns are large and very tropical looking such as *Dryopteris wallichiana*, which reaches a height of six feet tall! Others such as *Polypodium scouleri* and *Woodsia polystichoides* grow to be less than 12 inches tall and are perfect additions to smaller alpine or rock gardens.

The Rhododendron Species Botanical Garden is home to the Hardy Fern Foundation's main fern collection. The complimentary nature of rhododendrons and ferns has made the RSBG an ideal site. Currently, a total of 74 species representing 20 genera of ferns can be found in the Garden. Some of the more well-known genera are *Adiantum* (maidenhair fern), *Athyrium* (lady fern), *Blechnum* (hard fern), *Dryopteris* (wood fern, shield fern, buckler fern), *Osmunda* (flowering fern), *Polypodium* (polypody fern), *Polystichum* (holly fern, shield fern, sword fern), *Woodsia* (woodsia), *Woodwardia* (chain fern). Initially, the entire collection was planted in the lower Study Garden. In 1998, all the species of the

fern genus *Dryopteris* were transplanted to the upper Woodland Garden to accommodate the expanding collection.

At this time the HFF has 12 satellite gardens throughout the United States. These are in essence test gardens, where a variety of ferns are evaluated yearly to obtain accurate hardiness information and garden worthiness under varying climatic conditions. The HFF supplies ferns to these gardens free of charge in exchange for these yearly evaluations. Last year almost 500 ferns comprised of 21 different species were sent to members, satellite and display gardens. The locations of the satellite gardens are as follows: **Birmingham Botanical Gardens**, Pelham, Alabama; **California State University**, Sacramento, California; **Coastal Maine Botanical Garden,** Boothbay, Maine; **Dallas Arboretum and Botanical Society**, Dallas, Texas; **Denver Botanic Gardens**, Denver, Colorado; **Georgeson Botanical Garden / University of Alaska**, Fairbanks, Alaska; **Harry P. Leu Garden**, Orlando, Florida; **Inniswood Metro Gardens**, Wexterville, Ohio; **Lewis Ginter Gardens,** Richmond, Virginia; **New York Botanical Garden**, Bronx, New York; **Strybing Arboretum Society / Golden Gate Park**, San Francisco, California; and the **Stephen F. Austin Arboretum**, Nacogdoches, Texas.

In addition to these satellite gardens, the HFF has developed six distinct display gardens. These include: **Bainbridge Island Kitsap County Library,** Bainbridge Island, Washington; **Bellevue Botanical Garden**, Bellevue, Washington; **Lakewold Gardens**, Tacoma, Washington; **University of Northern Colorado**, Greeley, Colorado; **Les Jardins de Metis**, Quebec, Canada; and the **Whitehall Historic Home and Garden**, Louisville, Kentucky. All of the gardens mentioned are open to the public. If you plan on visiting one and need additional information, please contact Michelle Bundy at 206-870-5363.

Many members contribute time, energy and ferns to the HFF. One such member is Sue Olsen, owner and founder of Foliage Gardens in Bellevue, Washington. Sue's nursery is the oldest mail order nursery for spore grown ferns in the United States. She has traveled to many places across the globe in search of ferns including a trip to New Zealand, a place which she termed "fern heaven."

The HFF supports the RSF in a variety of ways. Ferns grown in the nursery of the RSF are sold at plant sales and through the plant sales pavilion near the entry to the Garden with half of the proceeds benefiting the RSF. A donation was also made to Curator Steve Hootman's 1997 to China. The organization is very excited with the spore-grown ferns brought back from this trip. Steve has tentatively identified them as *Dryopteris wallichiana* and they are planted in the newly renovated upper Woodland Garden. The HFF contributed $5,000 toward the RSF endowment challenge two years ago and this year pledged $9,000 toward the renovation of the lower study garden. The HFF values the support it has received over the years from the RSF and these gifts provide a way to show our appreciation. We look forward to a continued successful alliance in the future.

If you like ferns or are interested in learning more about them, we are currently requesting volunteer help with fern propagation, transplanting small plants, etc. Please contact Michelle Bundy at 206-870-5363 or Steve Hootman at the RSF office.

Dryopteris juxtaposita Continued from pg. 3

pered to the apex can number up to 25 pairs on a frond and are somewhat distant but occasionally become contiguous in more foliose fronds. The pinnae display a small black mark at the point of attachment to the rachis, a trait shared by *D. affinis*. The pinnae are herbaceous and elongated, being triangular lanceolate themselves with tips that curve toward the frond apex. The pinnae display up to 20 pairs of wide pinnules that are longer than broad. The basal pinnules are the largest and curve out toward the pinnae apex. The pinnules are for the most part attached narrowly with a stalk, but widely attached toward the tip. They are quite rectangular with truncated apices that display small insignificant teeth.

The sori are often borne on the entire frond and are small and not crowded in two rows, one on each side midway between the center and the margins of the pinnules. The basal lobes of the lower pinnules sometimes bear sori in two rows. The indusia are slightly curved at the edges and rather thin. They shrivel noticeably at maturity and are usually deciduous. Spores are dark and irregular. Gibby reports that the chromosome pairing behavior of what appears to be one species based on frond morphology is not always the same from plant to plant. As has been mentioned, there can be a good degree of morphological variation as well.

Culture: This fern is happiest nestled up against large rocks. It is quite cold hardy and rather adaptable in the garden. *D. juxtaposita* is easily grown from spores, being apogamous, but in the author's experience, it takes several years for plants to reach appreciable size. The fronds tend to arch over in the shade and are attractive and leafy. It is very distinct and not likely to be confused with other species in the garden.

References:

A Monograph of Dryopteris in the Indian Subcontinent (1989) Christopher R. Fraser-Jenkins, Botany Series, Vol. 18 No. 5, British Museum of Natural History, London.

A Plant Finder's Guide to Garden Ferns, 2000, Martin Rickard, Timber Press, Portland.

Cytological Observations on Indian Subcontinent and Chinese Dryopteris and Polystichum, (1985) Mary Gibby, Botany Series Vol. 14 No. 1, British Museum of Natural History, London.

2000 - 2001 Spore Exchange

To order: Please print your selection in alphabetical order, including the number of the item. Include 50 cents for each fern requested (check payable to the Hardy Fern Foundation) and a self-addressed stamped envelope. No charge for overseas members, but please enclose an International postal coupon (2 for larger orders) and an envelope. Maximum order 25 per year.

Mail requests to:
Shannon Toal
4717 SW Graham St.
Seattle, WA 98136

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3 RSBG, Bundy, Michelle
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20 Gassner, Wolfram
21 Taylor, Jeanie
22 Stamm, Carolyn
23 Swell, Nancy

Num	Genus	Species	Var or CV	Wild Coll.	Year	Donor
1	Adiantum	aleuticum	Subpumilum		0	2, 13
2	Adiantum	pedatum			0	3
3	Adiantum	venustum			0	3
4	Arachniodes	miqueliana			0	12
5	Arachniodes	simplicior			0	3
6	Arachniodes	simplicior	Variegata		0	3
7	Arachniodes	standishii			0	23
8	Asplenium	billotii			0	6
9	Asplenium	foreziense			0	6
10	Asplenium	kobayashii			0	1, 6
11	Asplenium	monanthes			0	2
12	Asplenium	trichomanes			0	2
13	Asplenium	trichomanes		Qu. Char. Isl.	0	19
14	Asplenium	x pinnatifidum			0	11
15	Astrolepis	sinuata			0	9
16	Athyrium	filix-femina	Rubellum		0	13
17	Athyrium	niponicum			0	1, 13
18	Athyrium	niponicum	Pictum		0	1, 5
19	Athyrium	niponicum	Pictum, Tall		0	1, 5
20	Athyrium	otophorum			0	1, 3, 14, 13
21	Athyrium	thelypteroides			0	13
22	Athyrium	wardii			0	6
23	Athyrium	yokoscense			0	6
24	Blechnum	cordatum			0	3
25	Blechnum	fluviatile			0	1
26	Blechnum	niponicum			0	2, 6
27	Blechnum	penna-marina			0	7
28	Blechnum	spicant		WA State	0	1
29	Blechnum	spicant			0	2, 4
30	Blechnum	spicant	Crispum		0	1
31	Blechnum	spicant	Ramosum		0	6
32	Blechnum	spicant	Rickard's Serrate		0	1
33	Blechnum	wattsii			0	3
34	Bommeria	hispida			99	9
35	Botrychium	multifidum		WA State	0	1
36	Ceterach	officinarum			99	14
37	Cheilanthes	buchtienii			0	9
38	Cheilanthes	fragrans			0	20
39	Cheilanthes	gracillima		WA State	0	1
40	Cheilanthes	intertexta			0	9
41	Cheilanthes	lendigera			99	9
42	Cheilanthes	lindheimeri			0	9
43	Cheilanthes	tomentosa	Large Form		99	9
44	Cheilanthes	wootonii			0	1
45	Cheilanthes	argentea			0	6
46	Cryptogramma	acrostichoides			0	20
47	Cryptogramma	crispa			0	7
48	Cyrtomium	caryotideum			0	1
49	Cyrtomium	falcatum			99	13
50	Cyrtomium	fortunei	var clivicola		0	20
51	Diplazium	pycnocarpon			0	13
52	Doodia	media			0	1, 3
53	Dryopteris	aemula			0	6
54	Dryopteris	affinis			0	20
55	Dryopteris	affinis	Cambrensis		0	15
56	Dryopteris	affinis	Pinderi		0	1
57	Dryopteris	arguta			0	1, 6
58	Dryopteris	bissetiana			0	15, 20
59	Dryopteris	blanfordii			0	20
60	Dryopteris	celsa			0	3, 13
61	Dryopteris	championii			0	1
62	Dryopteris	corleyi			0	6
63	Dryopteris	cycadina			0	13
64	Dryopteris	cystolepidota			0	3
65	Dryopteris	dilatata			0	3
66	Dryopteris	dilatata	Jimmy Dyce		98	2
67	Dryopteris	erythrosora			0	1, 3, 5, 7,
68	Dryopteris	filix-mas	Linearis		0	1, 7, 15

2000 - 2001 Spore Exchange Continued from pg. 19

Numb	Genus	Species	Var or CV	Wild Coll.	Year	Donor
69	Dryopteris	formosana			0	3
70	Dryopteris	indusiata			0	1
71	Dryopteris	lacera			0	20
72	Dryopteris	lepidopoda			0	1
73	Dryopteris	ludoviciana			0	13, 16
74	Dryopteris	maderense			0	6
75	Dryopteris	marginalis			0	17
76	Dryopteris	neorosthornii			0	6
77	Dryopteris	nipponensis			0	20
78	Dryopteris	oreades			0	12
79	Dryopteris	polylepis			0	13
80	Dryopteris	pycnopteroides			0	13
81	Dryopteris	remota			0	3, 13
82	Dryopteris	sacrosancta			0	1, 13
83	Dryopteris	sieboldii			0	1, 5, 3, 13,
84	Dryopteris	sublacera			0	1
85	Dryopteris	wallichiana			0	3,12
86	Dryopteris	corleyi			0	6
87	Dryopteris	blanfordii			0	20
88	Gymnocarpium	dryopteris			0	1
89	Gymnocarpium	oyamense			0	2
90	Hypolepis	millefolia			0	20
91	Lemmaphyllum	microphyllum			0	7
92	Llavea	cordifolia			0	9
93	Notholaena	standleyi			0	9
94	Pellaea	brewerii			0	9
95	Pellaea	cordifolia			0	9
96	Pellaea	viridis			0	13
97	Pentagramma	pallida			0	9
98	Phyllitis	hybrida			0	6
99	Phyllitis	scolopendrium	Cristatum		0	15
100	Polypodium	appalachianum			0	6
101	Polypodium	glycyrrhiza			99	1, 21
102	Polypodium	hesperium			0	2
103	Polystichum	acrostichoides			0	13
104	Polystichum	aculeatum			0	1
105	Polystichum	andersonii			0	20
106	Polystichum	braunii			0	3, 8
107	Polystichum	dudleyi		CA	99	
108	Polystichum	imbricans		Siskiyous	0	4, 15
109	Polystichum	lobatum			0	20
110	Polystichum	lonchitis		Qu. Char. Isl	0	19
111	Polystichum	mayebarae			0	1
112	Polystichum	munitum			0	4
113	Polystichum	neolobatum			0	1
114	Polystichum	polyblepharum			0	13
115	Polystichum	richardii			0	6
116	Polystichum	setiferum			0	3
117	Polystichum	setiferum	Foliosum Grand	Walton	0	1
118	Polystichum	setigerum			0	1
119	Polystichum	tripteron			0	1
120	Polystichum	tsus-simense			0	13, 3, 7
121	Polystichum	xiphophyllum			0	1
122	Polystichum	lonchitis			0	2
123	Pteris	gallinopes			0	1
124	Pyrrosia	sheareri			0	99
125	Thelypteris	decursive-			0	13
126	Thelypteris	noveboracensis			0	17
127	Thelypteris	palustris			0	17
128	Thelypteris	phegopteris			0	17
129	Woodsia	fragilis			0	20
130	Woodsia	obtusa			0	3
131	Woodsia	scopulina			0	2

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