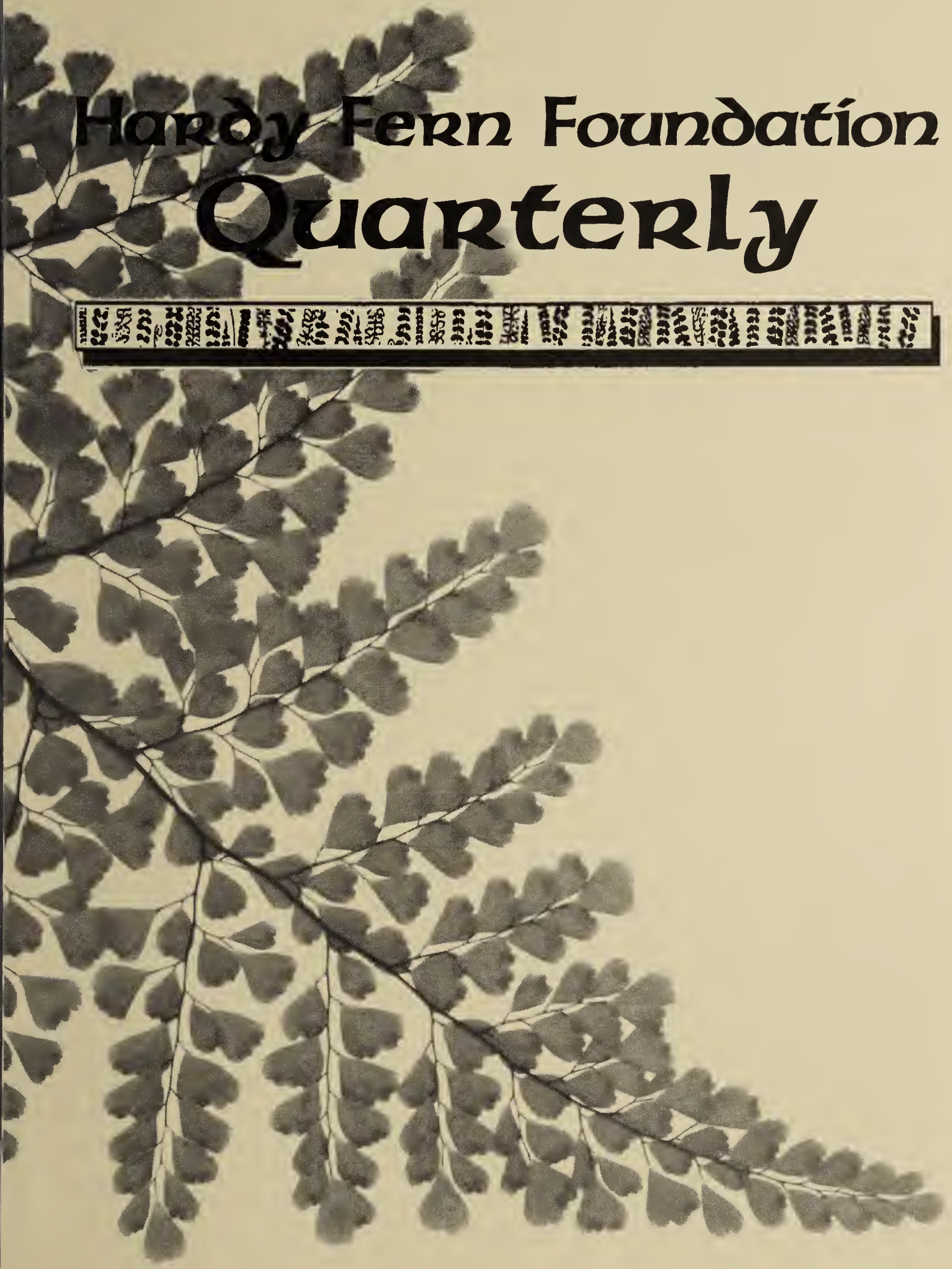
Hardy Fern Foundation Quarterly



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.

THE HARDY FERN FOUNDATION

QUARTERLY

Volume 8 • No. 4 • Editor Sue Olsen

President's Message

Anne Holt

We hope that you all have had a grand, relaxing summer and that the fall rains will reinstate green color into our gardens. Ferns have survived our heat very well making them valuable additions to the landscape. Now is a good time to plan for future fern plantings, expanding the varieties of ferns that you may now have.

At the September Board meeting volunteers packed and shipped ferns to our Satellite Gardens. The following week ferns were shipped to members who ordered them. We are awaiting fern evaluations from our Satellite Gardens--a valuable bit of information in order to keep track of growing conditions and plant hardiness.

Plans are underway to relocate the ferns at the Rhododendron Species Botanical Garden. Remember that your HFF membership entitles you to one free admission to the RSBG annually.

Plans are underway for the Northwest Flower Show in February where the HFF will once again share display space with the Rhododendron Species Botanical Garden.

Board member Glen Youell will be coordinating this display. She will need help, so please feel free to volunteer by calling Mrs. Youell at 425-885-6382 or write her at 3459 122nd Place N.E. Bellevue 98005. Volunteers who help staff the booth will receive free admission to the wonderful show.

Share your HFF newsletter with a friend or neighbor. There is much information in these newsletters. We have had many requests for extra copies of the propagation issue. These are available for $8.00 plus $1.00 postage. Send your check payable to HFF to 2003 128th Ave. S.E., Bellevue, WA 98005.

Welcome New Members:

Brian Aikins

Teresa Lester

Dr. Ray Nolan

Timothy A. Kessenich

Roberta Koblank

Keith Kreges

Hans Prins

Kay H. Smith

THE HARDY FERN FOUNDATION

QUARTERLY

The Hardy Fern Foundation Quarterly is published quarterly by the Hardy Fern Foundation,
P.O. Box 166
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Articles, photos, fern and gardening questions, letters to the editor, and other contributions are welcomed!

Please send your submissions to
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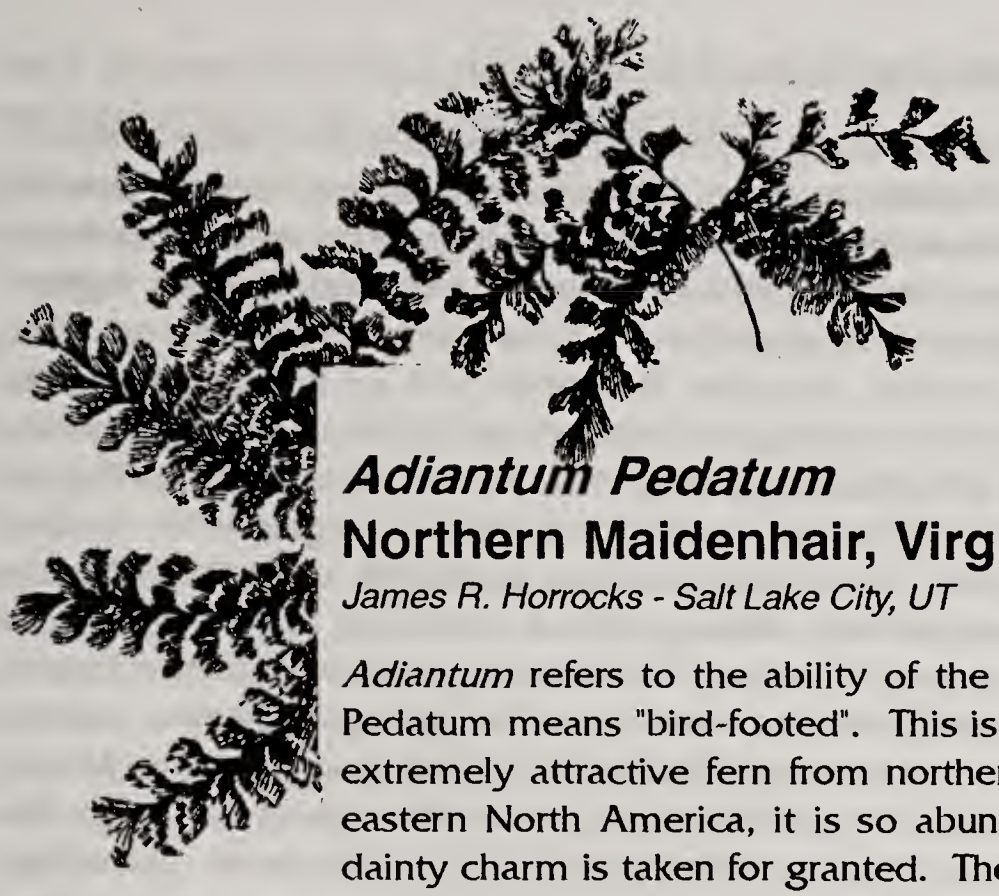

Adiantum Pedatum

Northern Maidenhair, Virgin's Hair

James R. Horrocks - Salt Lake City, UT

Adiantum refers to the ability of the fronds to repel water. Pedatum means "bird-footed". This is a very well know and extremely attractive fern from northern latitudes. In north-eastern North America, it is so abundant in places that its dainty charm is taken for granted. The author has stood in a heavily forested area outside Montreal, Quebec where there were literally acres of Northern Maidenhair growing almost to the exclusion of any other ferns.

Adiantum pedatum or its varieties are not only found in North America, but also in Japan, China, Manchuria, and the Himalayas. There has been considerable controversy as to whether certain varieties or subspecies are merely just that, or whether they are separate species. Cathy Paris, at the University of Vermont has determined through cytological investigation that *A. aleuticum*, rather than being a variety of *A. pedatum*, is actually a distinct species. However, they are so close that some botanists are still reluctant to wholly accept that. The author recently had a conversation with Dr. Michael Windham at the University of Utah in which Dr. Windham, even though he seemed to accept Paris' reclassification, still had a hint of reservation. What we may be seeing here is a transitional phase from one species into another since they are so closely related. There may even be a little hair-splitting going on here. David L. Jones writes: "Ferns are a very complex group of plants with numerous variations in important features such as venation, frond architecture, scale morphology, sporangia, sori, and spores. This makes them difficult to classify. No less than six classifications have been proposed since 1938 and the situation is still in a state of flux as no system has been adopted universally." Dr. John Mickel poses: "How, then, do we classify them? With difficulty, with controversy, and even, it must be admitted, with occasional revision." The author has often entertained the idea that the adaptive radiation of a particular genera-species complex is perhaps more of an occilation about a mean than as some branching, upward progression. The *pedatum-aleuticum* problem reminds me of the *Dryopteris atrata-hirtipes-cycadina* complex of the Himalayas and Asia which is quite another botanical nightmare. Joan Gottlieb sums it up: "...it is worth noting that taxonomy is a human construct -- a tool created by and for the convenience of taxonomists. Plants "feel" no obligation to fit into neat, nomenclatural nooks."

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Adiantum Pedatum continued from pg. 71

In dealing with Adiantum pedatum, it should be noted that the species proper is essentially an eastern species as far as North America is concerned. Species *aleuticum* or variety *aleuticum*, if you prefer, is rarely found in eastern North America, being disjunct locally where it frequents low calcium soils derived from ultra-mafic rocks such as serpentine. In the west is seems to be more tolerant of other soils, such as granite or those soils built up from metamorphic rocks. Complicating matters, though, is that certain habitat forms of *pedatum* (subspecies *pedatum*) intergrade with *aleuticum* and can cause much confusion. Lellinger warns us that "...individual specimens may not agree with the key characters in every respect." It is probably safe to say that from the Rocky Mountains westward, we are probably dealing with *A. aleuticum* for the most part. However, there is a very rare variety 'Subpumilum' from Vancouver Island, British Columbia and possible coastal Washington that poses still another controversy as to whether it is a subspecies of *pedatum* or *aleuticum*. Dr. John Mickel recently treated *A. pedatum* as a distinct species with few or no subspecies. He assigns most other varieties or subspecies to *A. aleuticum*, including 'Subpumilum'.

Adiantum pedatum proper, which we may treat as the "normal, botanically typical garden plant" as Richard Rush puts it, is a denizen of moist, rich, well-drained wooded areas and, as has been mentioned, is found in much of eastern North America. It is a true northern plant, as attempts to grow it in warmer, hot climates prove disappointing. In general structure, *A. pedatum* and *A. aleuticum* are very similar, but *A. aleuticum* has long triangular pinnules with more deeply cut sinuses in the margins. Some look as though they had been carefully cut with a pair of scissors. *A. pedatum* is much less so and with rounded pinnules at the tips. If a typically mature frond of *A. pedatum* is layed out flat, it forms a more or less rounded outline, but in *A. aleuticum*, the outline would be more crudely triangular, as the longest pinnae is usually substantially longer than the rest. However, there is enough variation in both species to make even this distinction not totally reliable. In my garden, the two species grow in close proximity and the differences are quite noticeable. Interestingly, *A. pedatum* has crossed with *A. aleutichum* to form the rare hybrid *A. viridimontanum*, which is found in the Green Mountains of Vermont.

Description: The rhizome is short-creeping, with light-brown scales, spreading horizontally and branching to form dense colonies at times. The rhizome is usually just below the surface of the soil, rarely found on top as in *A. venustum*. The rhizome sends out a profusion of black wiry rootlets. The smooth, glossy stipe stands erect from six to eighteen inches high, forking into diverging curved rachises, which are also smooth and glossy. From the upper side of the branching rachis, 5 to 9 pinnae arise, giving the fronds a circular, fan-shaped appearance. The entire fronds can be up to 24 inches tall and eighteen inches across. The short-stalked pinnules or segments are obliquely triangular to oblong with a major vein running along the lower margin from which many forked veins arise. There is no midvein. The upper margin is incised, the lobes being partly tipped with lunate to oblong indusia which are actually reflexed lobes. The sporangia

are at the end of the prominent dichotomous veins and are of course covered by the false indusia. The spores are dark brown.

Culture: Herbert Durand quipped: "It is a poor woodland that has no colonies of Maidenhair in the rich, moist soil of its more secluded and shaded recesses....". It might also be said that it is a poor shaded garden that has no Maidenhair to grace its more protected areas. This species does very well, as do so many other Maidenhairs, in a more shaded situation. It grows well in the low to medium light range, making it invaluable for those dark corners. The soil should be light in structure and texture and with copious amounts of leafmold. It should be kept moist and a mulch is a must and should always be used as the soil surface needs to be kept cool and damp. Northern Maidenhairs are not very tolerant of drought and can be easily lost if the soil becomes too dry, especially in areas of lower humidity. In ideal conditions, they spread slowly to form sizeable colonies, although they are not as adventurous as *A venustum*. In my garden, the fronds stand 12 to 18 inches high and about 12 to 14 inches wide, although some years, I have had fronds fan out to an incredible 20 inches in width! When I have had garden tours come through, it is the Maidenhairs that generate the most excitement and admiration. Northern Maidenhair is a beautiful addition to any collection of ferns. Out of all the ferns I have, this one is my mother's favorite. It is certainly one of my favorites as well.

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Encyclopedia of Ferns, (1987) David L. Jones, Timber Press, Portland, Page 7

The Home Gardener's Book of Ferns, (1979) John Mickel, The Ridge Press, Holt, Rinehart and Windston, New York, Page 249

Hardy Fern Foundation Newsletter, Volume 5, Number 1 Hybrid Hi-Jinks by Joan Elger Gottlieb, Page 8

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.

Ferns for American Gardens, (1994) Dr. John T. Mickel, Macmillan Publishing Company, New York

A Guide to Hardy Ferns, (1984) Richard Rush, British Pteridological Society, London

Editor's note: Jim and his fern garden have recently been featured in full-color articles in both the Deseret News - "A Hot Fern Garden" and The Salt Lake Tribune, "Ferns that flourish through the winter freeze" He is enthusiastically bringing ferns to the attention of the Salt Lake City community.

What Mechanisms are at Work in Pteridophyte Evolution?

Irving W. Knobloch Ph.D. - Professor Emeritus
2530 Marfitt Rd., Apt. 319, E. Lansing, MI 48823-6303

Having read many articles on the above subject I have come to the conclusion that there is little unanimity on this subject among scientists with most probably favoring mutations, some such as M. White (1954, 1978) in Australia favoring chromosome rearrangements with more and more giving a strong nod to hybridization especially those doing work in the pteridophytes. Personally I believe that all of the above are operable plus others sometimes included such as polyploidization. I have not mentioned natural selection as mentioned by Charles Darwin (1859) because it is secondary, as we now know, to the genetic changes that precede the selection process (mutation, rearrangements and crossing). We must remember that Darwin lived before there was much knowledge about chromosomes to say nothing of genes. Selection is important in deciding what changed organisms will survive and which shall die.

Linnaeus' early belief that species were immutable changed later (Linne' 1774) when he was able to cross species. Some taxonomists objected to hybridization as being too "messy" because their variability made it difficult for workers to place hybrids in keys. At least one authority (Stace 1975) objected to my inclusion of artificial hybrids in my list of intergeneric hybrids in flowering plants (Knobloch 1972). However Stace's book is one of the finest treatments of hybridization I have seen and he does mention pteridophyte hybrids. Stace (1991) should also be consulted. In 1975 he mentioned that "the existence of new chemicals in hybrids is as well established as new structural features (in hybrids)" I would not be surprised if someone objected to my inclusion of synthetically-produced pteridophytes in my list of 1200 or so putative hybrids (Knobloch 1996). Knobloch also published "Crosses in the Gramineae" in 1968. (OP).

P.J. Lotsy (1916) is generally credited with being the earliest and most persuasive proponent of hybridization in a time period when a belief in the fixity of species was dominant. Others who wrote about recombination were Haldane (1932), Roberts (1929), Zirkel (1935), Anderson (1949), Stebbins (1950, 1959) and many others.

I would like to bring to your attention a new book which probably will not be reviewed in your journal and it deals with a great amount of detail on the importance of hybridization. It is a 1997 book entitled "Natural Hybridization and Evolution" by Michael Arnold. The seven chapters of this 211 page book are followed by 24 pages of references covering many aspects of recombination in both the plant and animal kingdoms. He writes that "--crosses have had a major influence on the evolution of some plant and animal species complexes--which lead to the production of novel genotypes which lead to adaptive evolution". He adds that a number of zoologists have now advised that hybridization is frequent and important in animals--there are 20 known hybrid combinations in the sunfish family, 895 species of birds out of 9,672 species can form hybrids.

He warns however that frequent hybridization between rare species could possibly lead to extinctions of rare species.

Unfortunately for pteridologists, this fine book does not enter our field and we shall have to mainly depend on such people as Stace (1991), Knobloch (1996), Wagner (1969), Wagner & Boydston (1958), W.H. Wagner, F.S. Wagner, A.A. Reznicek and C.R. Werth (1992), and younger pteridologists now entering the field.

The methods which have been mentioned in this article are usually assigned to microevolution and the question still remains is microevolution able to account for the macroevolutionary steps needed to form new orders and classes? Since living organisms emerged several billion years ago it is possible that the answer is yes.

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Canadian Ferns in a Scottish Garden

Alastair C. Wardlaw - Glasgow, Scotland

The setting

My 0.4-acre garden in Glasgow, near the West Coast of Scotland, is on the same latitude (56°N) as the southern shore of Hudson Bay. Yet because of the soothing effect of the Gulf Stream, our climate by my reckoning is just inside USDA Zone 9. except that we don't get the high summer temperatures of Zone 9 places in the United States. Being so far north, the daylight is long in summer, to the extent that in mid-June you can read a newspaper outside at nearly midnight. In winter, the days are correspondingly short, and too dark to work outside after about 3:30 p.m. The garden is on boulder clay, left from the melting of the mile-thick glaciers of the last Ice Age 10,000 years ago. We are about 45 metres above sea level and about 12 km from the seawater of the Clyde Estuary. Annual rainfall is around 1000 mm, fairly evenly distributed, but with May the driest month. In winter, we get some snow, but scarcely enough to need a snow shovel except for maybe two or three days in the year. We rarely get temperatures colder than -5°C in winter or hotter than 25°C in summer. Fig. 1 is my record of the weekly minimum and maximum shade temperatures in the garden for the four years 1994-97, averaged by the week. During these years the average annual minimum was -6°C (21°F) but this was distorted by a once-in-a generation (I hope!) exceptionally cold period of a few days in late 1995 when the temperature went down to - 14°C (7°F). Without that, the average annual minimum would have been about -4°C (25°F). As regards summer temperatures, the average annual maximum during these years was 24°C (75°F), with an extreme of 27°C (81°F).

Because of evenly distributed rainfall our lawn is green at all times without ever needing watering. For the same reason the grass, even at the height of summer, is rarely dry enough to sit on without a waterproof sheet. And we have a chronic problem of moss and lichen growing in it. The summer is not quite hot enough to ripen tomatoes out of doors, but we can grow plenty of other vegetables, fruit and flowers. Snowdrops, rhododendrons, daffodils and tulips are special features of the garden in the early months of the year, with roses and many herbaceous flowers, and heathers, later on. I take special delight in looking at usually about half a dozen plants in flower on New Year's Day each year. The scene I am describing is excellent for a wide range of ferns, of which I have a collection of about 400 different types. My wife, Jackie, has the sunny part of the garden for flowers and vegetables, and I have mostly the shaded areas for the ferns. We have recently acquired a greenhouse which is already crammed full of ferns and flowering plants.

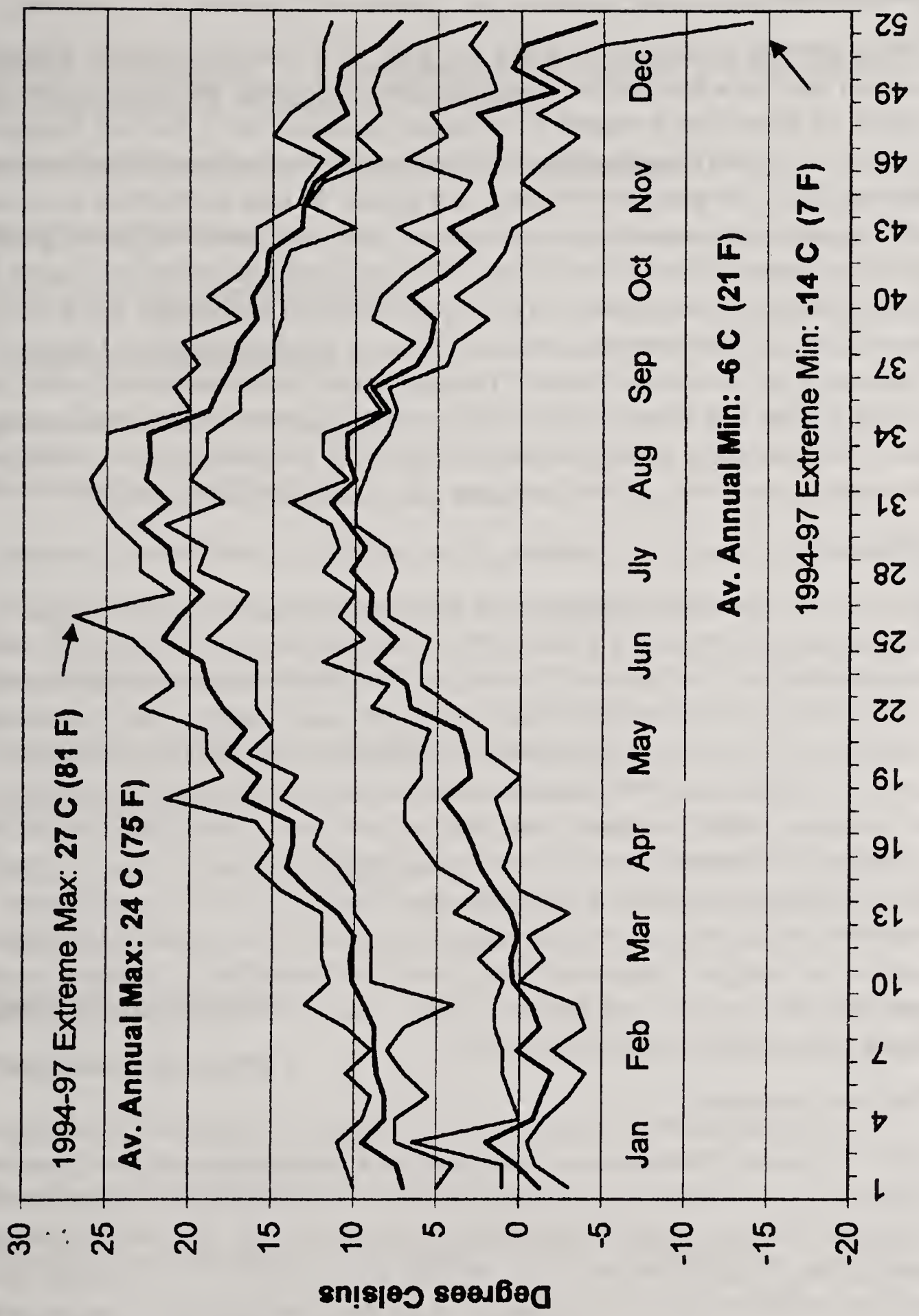

Fig 1. Weekly maximum and minimum shade temperatures in the author's garden for the years 1994-97, averaged by week number (heavy lines) and also showing the range by week number (light lines).

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Canadian Ferns in a Scottish Garden continued from pg. 77

Background

Before coming to Glasgow in 1970, we lived for 12 years in Toronto, Canada, where I also had a fern garden containing some of the local wild ferns of Ontario. About 15 years ago, I started to introduce Canadian ferns into my Glasgow garden, which has a totally different climate, and have been really surprised and pleased with how well most of them have grown. To refer to the ferns as 'Canadian' is just a convenience and a reflection of a personal interest in growing ferns from the country where I used to live. All of the Canadian species also occur in the United States, since plants do not observe political boundaries. There are 21 species of Canadian ferns that occur as natives of the British flora and which we chauvinistically consider as 'British'. Perhaps a more fundamental justification for linking Canada and Britain is that both countries are in the circumpolar zone and had 'plant-cleansing' during the last Ice Age. Thus the present floras reflect the re-colonizations from southern latitudes and perhaps oceanic sources.

Aims

For me, the challenge has been to try to collect and grow as wide a range of ferns as possible, by taking trouble with microclimates and, in some cases, with winter protection. For example, I have the two British *Hymenophyllum* species (filmy ferns) growing in humid rock clefts with plastic covers, and *Asplenium marinum* in the functional equivalent of a seashore cave. There are several species of Australian and New Zealand tree ferns, some in tubs, others planted out in situations similar to where I saw them in their native lands. With the North American fern species, there is a strong nostalgia factor too. I look at my flourishing *Polystichum munitum* and think about happy days in Vancouver where I collected the spores. Likewise *Dryopteris marginalis* and *Adiantum pedatum* conjure up images of summer hiking along the Bruce Trail in Ontario, while *Woodwardia virginica* and *Schizaea pusilla* make me think about the pitcher plants and the peat bogs of Nova Scotia.

The fern collection

Down the years I have gone out of my way to acquire as many of the Canadian fern species as possible, by scanning the annual spore lists of the British Pteridological Society, by some collecting in the field, and by purchase of mature plants from British nurseries. Only recently have I joined the American Fern Society and the Hardy Fern Foundation, in both of which I seem to be the only Scottish member. At present, I have the following 63 species and varieties of Canadian ferns growing in Glasgow. The names in bold are the ones that are also native British species from UK sources:

Adiantum aleuticum, A. aleuticum 'Laciniatum', ***A. capillus-veneris,***

A. pedatum , A. pedatum 'Imbricatum', *A. pedatum* 'Subpumilum' ;

Asplenium platyneuron, A. rhizophyllum, ***A. ruta-muraria,*** *A.scolopendrium* ssp. *americanum,* ***A. trichomanes, A. viride;***

Athyrium filix-femina, *A. pycnocarpon, A. thelypteroides;*

Blechnum spicant ;

Cheilanthes feei ; Cheilanthes lanosa,

Cryptogramma acrostichoides ;

Cystopteris bulbifera, ***C. fragilis ;***

Dennstaedtia punctilobula ;

Dryopteris carthusiana, *D. clintoniana,* ***D. cristata, D. expansa, D. filix-mas,***

D. fragrans, D. goldiana, D. intermedia, D. marginalis;

Gymnocarpium dryopteris, G. robertianum ;

Matteuccia struthiopteris var. *pensylvanica ;*

Onoclea sensibilis ;

Osmunda cinnamomea, O. claytoniana ;

Pellaea. glabella ;

Pentagramma triangularis;

Phegopteris connectilis ;

Polypodium amorphum, P. glycyrrhiza, P. glycyrrhiza 'Longicaudatum',

P. scouleri, P. virginianum ;

Polystichum acrostichoides, P. andersonii, P. braunii, P. lemmonii,

P. lonchitis, *P. munitum, P. imbricans, P setigerum ;*

Pteridium aquilinum ;

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Canadian Ferns in a Scottish Garden continued from pg. 79

Schizaea pusilla ;

***Thelypteris limbosperma**, T. nevadensis ;*

***Woodsia ilvensis**, W. obtusa, W. oregana ;*

Woodwardia fimbriata and *W. virginica.*

In addition, I have several species where there are varietal differences between the native British and Canadian forms: *Asplenium scolopendrium, Athyrium distentifolium, Ophioglossum vulgatum, Osmunda regalis* and *Thelypteris palustris.*

Horticultural merit

Many of the Canadian ferns look extremely good in a Scottish garden and have presented few problems in cultivation. Of the larger species, the following are very decorative and distinctive, even to non-pteridologists: *Adiantum pedatum, Dryopteris marginalis, Matteuccia struthiopteris, Onoclea sensibilis, Osmunda claytoniana, Polystichum acrostichoides, P. munitum* and *Woodwardia fimbriata.*

Fig 2. L-R, front, *Cyathea australis, Dicksonia squarrosa*, Alastair Wardlaw; background, *Dryopteris dilatata, D. filix-mas, Blechnum spicant.*

Among the smaller species, and for rock gardens, I would highlight *Adiantum pedatum* 'Subpumilum', *Asplenium trichomanes* and *A. viride, Pellaea glabella, Polypodium glycyrrhiza* 'Longicaudatum', *P. scouleri.* and *Polystichum lonchitis.*

Failures and difficulties

Inevitably I have had plently of problems, from spore cultures that did not yield the named species, to unexplained failures of young sporophytes to survive or thrive. An example of the latter is *Asplenium platyneuron*, whose spores I collected in Virginia; the plant has persisted for several years but does not really thrive, possibly because our summer is too cool. I think the same happens with *Dryopteris goldiana* which does well in an unheated greenhouse, but not in the open garden. But I am very conscious of the danger of generalizing from just one or two attempts, and individual failures will not prevent further trials. Also it takes some ferns several years free from disturbance, to get properly established and they can be very vulnerable during the settling-in period. I have seen this with *Athyrium pycnocarpon.*

I was very disappointed to lose *Pityrogramma (Pentagramma) triangularis* during its first winter in Glasgow. Its distribution in western Canada overlaps *Polypodium scouleri* and *Woodwardia fimbriata* which have survived well here. I now have replacement specimens. I should also have been able to keep *Athyrium thelypteroides*, but perhaps I planted it out too early in the season, or slugs got it. Again I have a replacement. With *Asplenium rhizophyllum*, protection against slugs has been essential, and the plants are now surrounded with a cylindrical plastic wall and loosely-fitting lid and doing very well. *Schizaea pusilla* is a real challenge and I am not too optimistic about being able to keep it for long as a pondside specimen. The last one I had became overgrown with liverworts.

I would love to try some of the *Botrychium* species that are so numerous in North America, but which are horticulturally inaccessible. I did once have *B. lunaria* briefly from a European source but it was massacred by slugs. There is still a good long list of North American ferns which I hope to get in the years ahead through spore exchange and which I shall try to grow outdoors in Glasgow. These include: *Aspidotis densa, Lygodium palmatum, Phegopteris hexagonoptera, Polypodium hesperium, Polystichum kruckebergii, Woodwardia areolata* and several of the *Asplenium, Cheilanthes, Cystopteris, Thelypteris* and *Woodsia* species not already listed.

Spontaneous spreading of ferns

It amazes me how readily ferns can be grown from spores in a culture pot of sterile soil, yet how rarely they seem to spread by spores in the garden. This is a matter of concern when I am introducing exotic ferns from all over the world. Am I inadvertently going to introduce a plant that may become a serious weed?

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Canadian Ferns in a Scottish Garden continued from pg. 81

I am reasonably confident that the answer is No. The only ferns that spread readily by spores in my garden are a very few of the native British species: *Asplenium scolopendrium, Athyrium filix-femina, Cystopteris fragilis, Dryopteris filix-mas and D. dilatata.* Some other ferns spread quite aggressively by vegetative means: *Cystopteris bulbifera, Dennstaedtia punctilobula, Gymnocarpium dryopteris* and *Matteuccia struthiopteris* but can easily be kept in check by weeding. In the nearby mountains, ordinary bracken, *Pteridium aquilinum*, is a serious pest through blanketing many upland pastures with vegetation that is toxic to livestock. It seems to spread mainly by underground rhizomes rather than by spores. Paradoxically, I found bracken quite difficult to establish as a specimen plant in the garden.

One thing is for sure: the fact that some ferns grow in the wild only in North America does not mean that they will not grow on the other side of the Atlantic Ocean. So on the one hand, the conditions needed for a fern to complete its whole life cycle may restrict it to certain geographical locations. But on the other hand, if the uncertainties of the gametophyte stage are bypassed by growth in artificial culture, then the mature sporophyte may survive for many years, perhaps indefinitely, in localities where it does not naturally occur. A garden is an especially favourable locality since competition with other plants is prevented, grazing by herbivores is controlled, and water and fertilizer are applied as needed.

The extent of cultivation of hardy North American ferns in British gardens is currently being surveyed under the aegis of the British Pteridological Society by my colleague, Graham Ackers, and me. We hope eventually to publish a report which will greatly expand on the information presented here. I thank Sue Olsen for encouraging me to write this present article.

Fig 3. *Asplenium rhizophyllum* with satellite plant: herbarium specimen made when the author was living in Toronto, Canada.

Fernet

Ann Herrington - Garland, TX

Cheilanthes tomentosa

Ten energetic and enthusiastic fern seekers met at Enchanted Rock between Fredericksburg and Llano in the Texas (USA) Hill Country on Sunday morning,

April 19, in a quest for native fern sightings. Everyone went at his own pace; some of us made it to the top of the 500' granite intrusion, and some of us didn't!

We were surprised at the abundance of fern species and numbers. Several species of Cheilanthes and Pellaea were growing from vertical crevices, horizontally from under huge boulders, and occasionally hanging from the side or bottom of rocks, usually in full sun with a southwest exposure!

It became easy to spot *Cheilanthes lindheimeri* from a distance because of its habit of forming large colonies along the bases of boulders, and because of its erect fronds with brown undersides. It was easy to spot *Woodsia obtusa* because the fronds were a bright, fresh green, growing luxuriantly in rather large colonies. *Cheilanthes tomentosa* was also abundant.

The Pellaeas were a bit more difficult to spot, but finding a mass of "chicken wire" usually signaled plants of *Pellaea ovata*. The plants form masses of zigzag stems, and when the pinnae fall off, the stems are left, making the plant look like a ball of chicken wire. The other two pellaeas,

P. ternifolia and *P. Wrightiana*, sent us to Correll's "Ferns and Fern Allies of Texas" to be sure of what we had found.

We saw at least two species of selaginellas, which were underwhelming, butof interest because they are fern allies. They grow in sometimes large masses on the rocks, and make a kind of "ground cover," or perhaps "rock cover" would be more accurate.

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Fernet continued from page 83

Cheilanthes eatonii was growing in association with *Pellaea ovata* and two different selaginellas in a granite crevice with blooming wild onion and tradescantia mixed in to complete an arrangement.

At the edge of a pool at the base of the Rock we found *Isoetes lithophylla*, growing in close proximity to wild onions, which it very much resembles superficially. On close examination of the cross-section of the "leaves," however, it becomes apparent that the two plants are different. The Isoetes has a triangular leaf with hollow channels, and the onion has a leaf with one flat side and one rounded side.

The find of the day was *Cheilanthes kaulfussii*, a small fern with a pentagonal blade copiously covered with brown glandular hairs. A hand lens showed tiny oily balls on the tips of each hair, glistening in the sun.

The big quest of the day was for a sighting of the storied Blechnum reported several years ago there. A diligent four-hour search failed to turn up a single Blechnum plant, but we aren't discouraged. Indeed, that is reason enough for a return trip to Enchanted Rock.

Next month--Big Bend National Park!

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