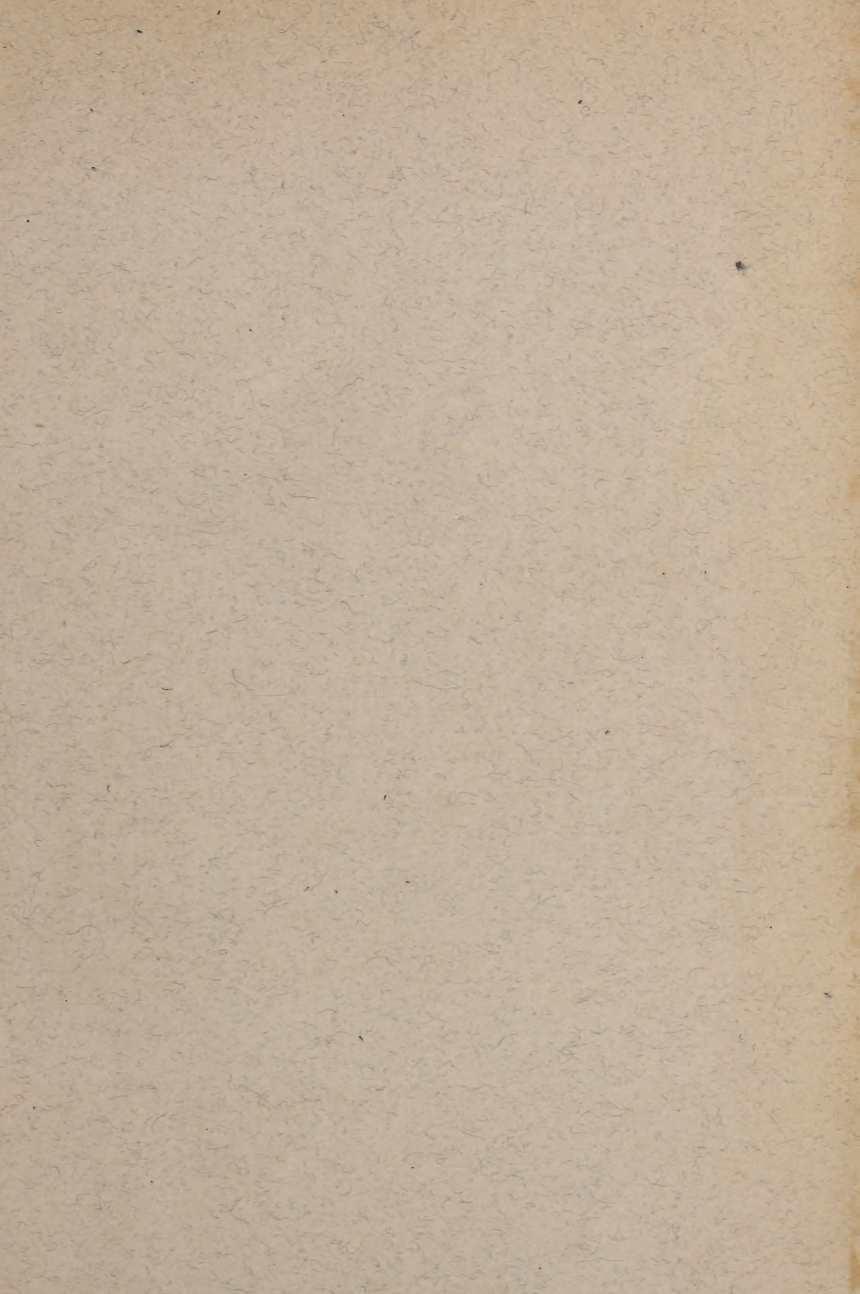


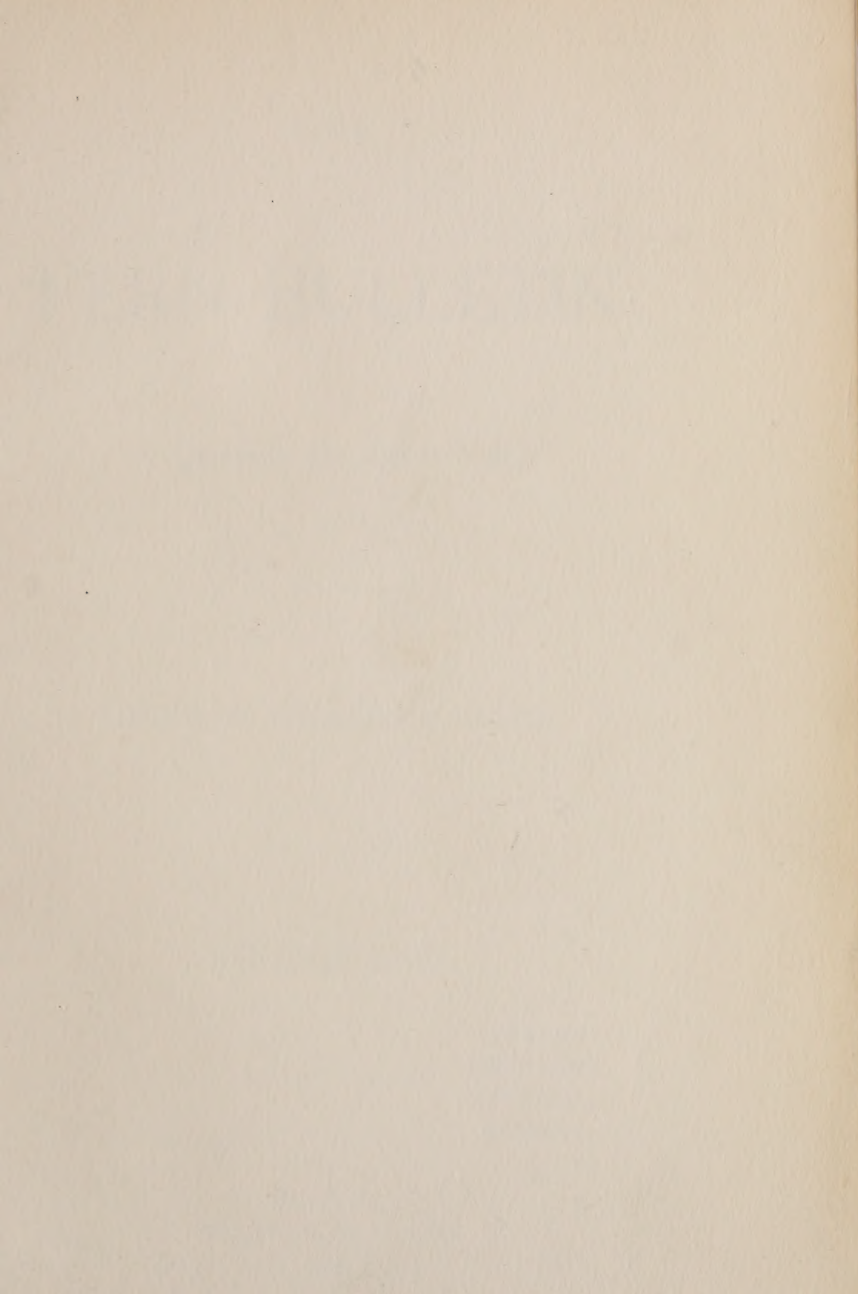
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THE
FERN BULLETIN

A Quarterly Devoted to Ferns

EDITED BY WILLARD N. CLUTE

VOLUME XVII

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A Quarterly Devoted to Ferns



Joliet, Ill.

Willard N. Clute & Company

1909



The Fern Bulletin



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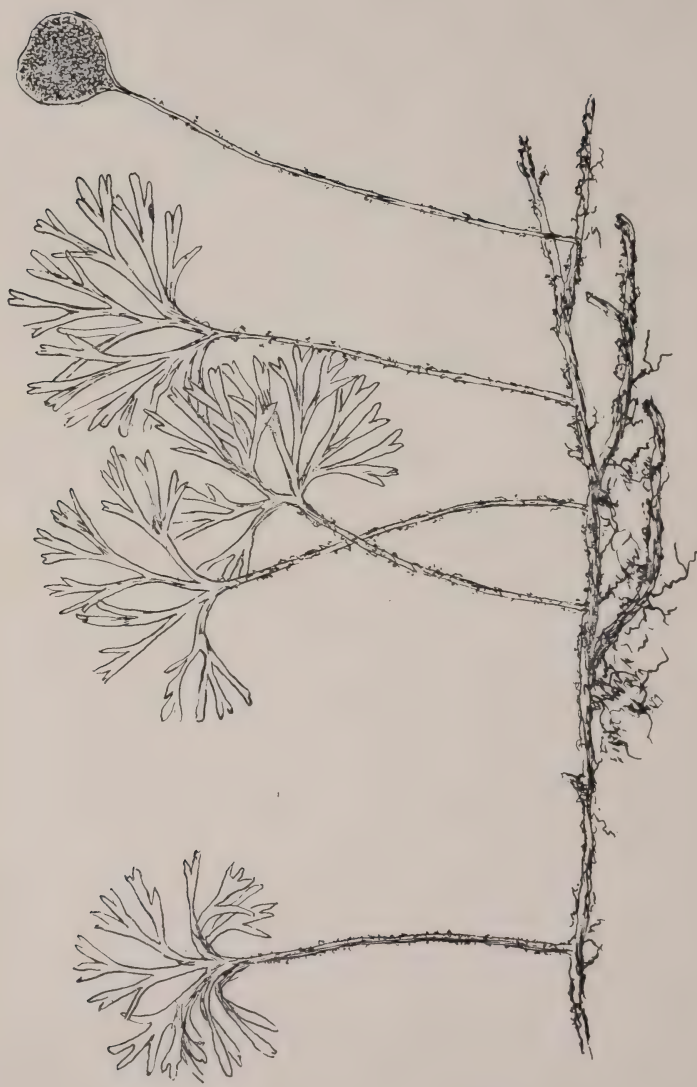
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THE FERN BULLETIN

Vol. XVII

JANUARY, 1909

No. 1

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THE FERNS OF COCHISE COUNTY, ARIZONA.

BY JAMES H. FERRISS.

The Southern Pacific in Arizona carries the tourist among a wonderful supply of wonderfully beautiful ferns. However, breathe this not upon their trains. You would be a marked passenger. To be known as a reporter upon a yellow journal would be as mild as you could expect.

Regardless of speed the train seems to creep through the desert valleys hour after hour the day long. The mountains pass slowly, they are so much farther away than they seem to be. The land is dry, perhaps dusty, and the specimens of vegetation are so far apart that to tourists, except the enthusiastic botanist, the land must seem to have been forsaken and forgotten. To the botanist it is a land of milk and honey. Also chille-con-carne and hot tamales. His sharp eyes will see a few ferns in the passes and if he turns off at Benson to take the Sonora branch there will be good entertainment all the way to the Mexican line.

The trains of the El Paso & Southwestern from El Paso to Benson hug the mountains closer and the passenger can step from the sleeper into a canyon. Thereafter traveling is largely a matter of taste or expense. Vehicles can be used from canyon to canyon but saddle horses and donkeys will go up the canyons and across the range. The one who can pack his own provisions

MAR 9 - 1909

and sleep where night overtakes him may rise early with his specimens and he will see great sights.

A happy collector is one who has a partner willing to stay with the animals. Thus the supplies may be transported into the box canyons and close to the high peaks and precipices where the rarest and best specimens are to be found. Little time is then thrown away in long walks after supplies or between camp and specimens. I have visited Cochise county on five of my annual vacations, giving a large part of my time to ferns. The first trip, 1902, I attempted to overtake Dr. D. T. McDougal, chasing Cacti. He got away into Mexico and I stopped at Nogales. Then followed trips with Frank Woodruff, ornithologist, Chicago Academy of Sciences, 1904; Dr. H. A. Pilsbry, conchologist, Philadelphia Academy of Natural Sciences, 1906; L. E. Daniels, conchologist, Indiana survey and H. S. Swarth, ornithologist Field Museum of Chicago (now of the Berkley college) 1907; and with Dr. Eltweed Pomeroy, sociologist, wife and son of Newark, N. J. in 1908.

Probably August and September are the best mountain months in Arizona, following the rainy July. Then the flowers are in bloom. This year the vacation extended from Sept. 15th to Nov. 15th. One day the snow fell upon the mountain tops heavily but every day was a delight. On a windy day we dodged all the falling pines and only lost a hat. The tent was pitched in a mountain park and nearly all the plant driers were found and found dry.

There are nine rattle-snakes in Arizona and about 50 of the squirrel kind. I have found about thirty new species of land snails, and the flowers and trees, the large animals and small, the birds and lizards are

Arizonian almost wholly—at least unlike anything eastern. Old acquaintances are more often found with the lower orders, the small snails, the fungi, mosses and liverworts. The evolutionary development from one canyon to another would delight a Darwin. It will take the conchologists twenty-five years to fairly survey Arizona and New Mexico.

Cochise county, about 150 miles square, in the southeast corner of the territory, has forty ferns I am sure of. Thirty-five of these are in the Chiricahua (cherry cow) mountains. Nearly all of these and five more are in the Huachuca (Wawchuca) mountains and four more have been reported from the latter range that I did not find. Eleven more are reported in Underwood from the territory. Thus there are probably fifty-five in the territory. Three *Selaginellas* and two *Equisetums* are also reported.

At the foot of the ranges, some 6,000 feet above the sea, upon the small shadeless foot hills will be found three of the smallest ferns, *Cheilanthes Wrightii*, *Notholaena Grayii* and *Gymnogramma hispida*, in the hot sun.

As the trail is ascended up the canyon, under the cliffs and large rocks will be found *Pellaea Wrightiana* first and then perhaps *P. intermedia*. *P. ternifolia* will follow and then *Cheilanthes tomentosa*, *C. Eatonii*, *C. Lindheimeri*, *C. Fendleri*, and *Notholaena Hookeri*. If the hillsides are open, not covered with timber, then *Gymnogramma triangularis* and *Notholaena sinuata*. In this list so far are some of the most beautiful ferns of the earth, sure. These may continue up the mountain 3,000 feet further in company with *Cystopteris fragilis*, and the *Woodsias* on the hillsides, *Cheilanthes Feei* in crevices of the rocks that are so small that

apparently no soil is possible. *Notholaena dealbata*, *Pellaea atropurpurea*, *P. ternifolia* and *Cheilanthes lendigera* will also come in around the cliffs and in the deep gulches.

If the timber has not been destroyed oaks, black walnuts, juniper and sycamores will fill the canyon in the first thousand feet, not like our oaks, etc., but they will be known. Probably a fine stream of mountain water also will cheer the collector, to disappear in the sand at the desert's rim. The shade grows more dense, the rocks more rugged, and at 7,000 feet and thereafter, the pines, spruce and other conifers come in and it is quite like a New England or Tennessee landscape. At 10,000 feet quaking asp, mountain ash, scarlet dogwood, willows, cherries, more conifers, hanging moss, more kinds of Mistletoe and meadows of tall grass and Iris.

Large perpendicular crevices from a few inches to 100 feet wide, perhaps a thousand feet long, is the home of glorious *Aspidium juglandifolium*, but now known more properly as *Phanerophlebia auriculata*. This species usually dwells midway in the mountain where the atmosphere has the most moisture, but I have found it in the lower rocks at the desert's edge. When the fern hunter sees the crevices at a distance he can make a good guess concerning *auriculata*, and up in the mountain he finds the plants nearly every day.

Asplenium Ferrissi lives in one of these large crevices in company with *auriculata* and has never been found elsewhere. I also found a variety of *Polystichum aculeatum* under similar circumstances and also but once. *Nephrodium filix-mas* and *Cheilanthes Eatoni* were found also in the last instance. In deeper shade and with more than the usual moisture I found *Asplen-*

ium monathemum in one of these crevices. Again it was found in the walls of a box canyon where the spray from a water fall tempered the atmosphere. Here too grew *A. trichomanes* and a maidenhair.

A. parvulum is also found in the walls of the box canyons but also in the dry roof of the caverns and about the base of the rocks.

Pteris aquilina is abundant above 7,000 feet along the streams and in the parks. At 8,000 feet *Nephrodium filix-mas* may be found in the bed of the stream among the rocks or in the springy nooks, and at 9,000 feet, in the last mile of the stream, will be found *Asplenium cyclosorum* with its feet in the stream, sometimes a spreading cluster eight inches in height and again under almost the same conditions it will be less spreading and four feet in height.

Pellaea marginata and its mass of lace-like foliage thrives in the deep shadow of the cliffs at 8,000 feet, but I also found it at about 6,500 feet upon the north side of a shadeless cliff in company with *Nephrodium patula*, *Polypodium thysanolepis* and *Notholaena dealbata*, all in great abundance. I found *patula* again in a deep crevice at 8,000 feet.

The Maidenheads settle about the limestone springs, or live in the spray of a water fall and seem to require a moist atmosphere.

The *Polypodiums* are found rarely, and then *falcatum* hangs down from the roof of the dry caves, and *hesperium* and *thysanolepis* cling to the face of a cliff, where long poles are needed to pinch them off. Once *hesperium* was found facing the hot sun upon an exposed mountain peak. Again a plant was found in the leaf mould and shade with *Cystopteris fragilis*, and again another in the cold springy soil at the mouth of a cavern.

Both *Notholaena sinuata* and *N. ferruginea* usually grow erect in the soil among the rocks. The latter is often found in the pockets of the rocks apparently without soil and it is then a small plant. With good soil both grow two feet in height.

With the exceptions mentioned, all are found plentifully if the ground is not too closely fed by the stockmen.

I found but one plant of *Notholaena aschenborniana*, though I may have passed it often supposing it to be *N. ferruginea*. *Asplenium glenniei* has the general appearance of an Arizona *Woodsia*. Then too, it may ripen too early for fall collectors. I never found it.

Three plants of a *Nephrodium* were found at 9,000 feet in the Chiricahuas in Nov., 1907. The foliage had dropped but the growth for the next year was different from anything I had seen and the plants now are growing nicely under Joliet glass. These may be *N. Mexicanum* but I am not sure of the determination at this writing. In Oct., 1908 I visited the same bank again and worked it over for three days without finding another plant and thus this too may be an early ripener.

A new *Asplenium* of the ebony stem group was also found in 1907, and it too remains nameless. But I did not find *Woodwardia radicans*, *Notholaena Lemmoni*, *N. nivea*; *Cheilanthes Pringlei*, *C. Alabamensis*, *C. myriophylla* and *C. microphylla*; *Pellaea flexuosa* and *P. pulchella*; *Asplenium firmum*, *A. Glenniei*, *A. septentrionale* and *A. filix foemina*; *Woodsia scopulina* and *W. Oregana*. These are reported from Arizona but perhaps some are reported erroneously.

Those I have found in Cochise County are as follows:

POLYPODIUM: *falcatum*, *thysanolepis* and *hesperium*.

GYMNOGRAMME: triangularis, and hispida.

NOTHOLAENA: sinuata, ferruginea, Aschenborniana, Hookeri, Grayi, dealbata.

ADIANTUM: capillus veneris, pedatum rangiferinum.

PTERIS: aquilina pubescens.

CHEILANTHES: Wrightii, Lendigera, Feei, tomentosa, Eatoni, Fendleri, Lindheimeri.

PELLAEA: atropurpurea, marginata, ternifolia, Wrightiana, intermedia.

ASPLENIUM: parvulum, trichomanes, monanthemum, cyclosorum, Ferrissi and an undetermined species.

NEPHRODIUM: filix-mas, patula, and a new species to the U. S.

POLYSTICHUM: aculeatum var.

PHANEROPHLEBIA: auriculata.

CYSTOPTERIS: fragilis and fragilis tenuifolia.

WOODSIA: Mexicana and Plummerae.

All of these were found in the Chiricahua mountains except *Notholaena Aschenborniana*, *Asplenium Ferrissi*, *monanthemum*, and *Cystopteris fragilis tenuifolia*. These were found in the Huachuca mountains.

Joliet, Ill.

FRUITING OF BOTRYCHIUM.

BY MRS. A. E. SCULLAR.

The following may be added to the report on the fruiting of *Botrychium* published in this magazine for July, 1908.

I am very sorry to disappoint Mr. Clute, but I am obliged to report that *Botrychium matricariaefolium* bore, on June 25th, 1908, two fertile fronds, also a few spores on the sterile frond.

Botrychium obliquum was in fruit Sept. first, 1908 but the plant was not so robust as in the preceding years, owing to the drought.

Botrychium obliquum dissectum in fruit Aug. 28, 1908 in fine condition, being in the shade. A plant of *Botrychium* that we have been watching to note the changes in the cutting of the fronds, did not come up this season (1908).

Standish, Maine.

[All of which indicates that it is not safe to prophesy unless you are dead sure! We are certain, however, that there is a reason for the failure to produce fruit and we hope continued observations of these plants will bring it out. Many plants can be made to fruit by with-holding water or by pruning the roots. Can it be that the dry season forced these species into fruiting when they would normally be sterile? Another angle of the subject develops when it is known that the young fronds of *Botrychium* are usually formed several seasons in advance. How late in their development they may be influenced by a good or bad season is a question. Any of these speculations may fall in the face of the facts and we hope the specimens may be kept under observation long enough to determine just why the plants are or are not fertile in certain years.—ED.]

NEPHROLEPIS SCHOLZELI.—This is the name of a new form of *Nephrolepis exaltata* and should properly be called *N. exaltata* f. *Scholzeli* though it originated from another named form, viz: *N. exaltata Scottii*. Its fronds are shorter than the ordinary Boston fern and nearly erect with the pinnæ much divided otherwise it is manifestly a close relative of the other sports of that species.

RARE FORMS OF FERNS.—IX.

FOUR ABERRANT OSMUNDAS.

It is difficult to say whether the unusual number of abnormal plants of the genus *Osmunda* recently reported is due to the size and conspicuousness of the plants, to their extreme abundance or to the assiduity with which they have been searched for variable specimens, but certain it is that the list of such finds is steadily growing. Herewith we illustrate four new forms which must be included. A few years ago, these abnormal plants would have been passed by as of no value, but the impression is growing that by means of such freaks we may often get a glimpse behind the scenes, as it were, and discover much that is ordinarily hidden in the methods of nature, and we therefore place these on record.

One of the most interesting of the present specimens was sent us more than a year ago, by Mr. Severin Rapp, of Sanford, Florida. It is very evidently a form of *Osmunda regalis* but differs from the type in having pinnules much narrower than usual, and with the edges beautifully wavy. The venation is also abnormal, there being only about half as many veins as usual with the single forks somewhat nearer the margin than the midvein. The lack of the usual number of veins also account for the wavy margins for it is evident that the tissues are filled out in the vicinity of the vein-tips but sunk in where the veins are lacking. The usual number of veins in the base of the pinnules makes a very pretty earlike expansion there. The most remarkable characteristic of the plant, however, is its manner of fruiting. In my specimens, the fertile portion is partly leaf-like and the sporangia are borne on the backs of the veins at the point where they fork

and some distance inside the margins. They are borne several in a cluster and form a sort of rudimentary sorus. The method is shown at *a* in the illustration. This form appears to be quite persistent. Specimens were reported in this magazine for January, 1902 and other plants were found several years later as we have stated. In reference to the slender pinnules the form may be called *Osmunda regalis* forma *linearis*. The



OSMUNDA REGALIS F. LINEARIS.

method of bearing its spores is quite anomalous among ferns of its genus and may well be the subject for further study.

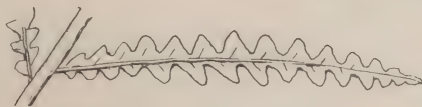
A second abnormal fruiting specimen may be referred to *Osmunda cinnamomea*. Like the form of *O. regalis* described above, it bears sporangia on the backs of the pinnules and is manifestly akin to, if not identical with, certain forms of the variety *frondosa*. The interesting thing about the present specimens is that while many of the sporangia are borne on the margins of the pinnules and at the tips of the veins, not a few are found at some distance from the margin. In the

case of the latter, a vein is given off from the surface of the pinnule and terminates in a sort of green triangle upon which the sporangium is borne. It will be noted in the illustration, which shows parts of the pinnae variously magnified, that the parts of the margin which bear sporangia are inclined to be triangular in shape. Incidentally it may be observed that the mar-



gins of the pinnules are variously lobed and this may possibly throw some light upon the origin of dissected pinnules in other forms. The present specimens were received through the kindness of Messrs. James Shepard and H. C. Bigelow of New Britain, Conn.

Some four years ago, Mr. D. Lewis Dutton found in a cedar swamp near Leicester, Vt., several plants of a curious form of the cinnamon fern having very narrow

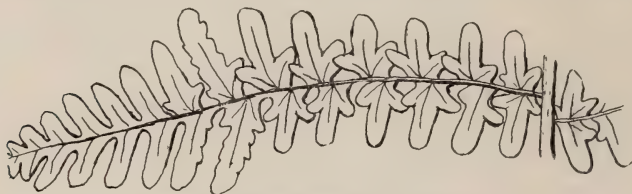


OSMUNDA CINNAMOMEA F. AUGUSTA.

fronds and pinnae with rather sharp-ended pinnules that give it a remarkable resemblance to *Nephrodium unitum glabrum* at first glance. The plants have since retained their peculiar characteristics and it is quite likely that the same form will be located in other

places where the cinnamon fern grows. When found it may be labelled *Osmunda cinnamomea* forma *angusta*.

A handsome variation of the cinnamon fern has also been received from Mr. Severin Rapp. It is allied to the variously cut and divided fronds of this species but differs from them all in producing trilobed pinnules which are evidently due to a pair of veins, stronger than ordinary, that are given off from the base of the



OSMUNDA CINNAMOMEA F. TRIFOLIA.

mid-vein. A little beyond the middle of each pinna one or two pairs of pinnae tend to become longer than the rest with wavy or lobed margins, but elsewhere the trilobed pinnae are quite uniform, and occur regularly over the basal two-thirds of each pinna. This form may receive the name of *Osmunda cinnamomea* forma *trifolia*. The types of the four forms illustrated are in the writer's collection.—*W. N. C.*

NOTES ON INDIANA FERNS.

BY F. C. GREENE.

Kosciusko County.

This county is situated in the glaciated part of Indiana and contains numerous moraines, lakes, tamarack swamps and marshy lands. The two latter localities contain several peculiar species, while the morainic uplands produce many of the species common to other parts of the state. The list is as follows:

Botrychium Virginianum, *Osmunda regalis*, *O. Claytoniana*, *O. cinnamomea*, *Onoclea sensibilis*, *Cystopteris fragilis*, *Nephrodium thelypteris*, *N. acrostichoides*, *N. cristatum*, *N. spinulosum intermedium*, *Phegopteris hexagonoptera*, *Woodwardia Virginica*, *Asplenium angustifolium*, *Athyrium thelypteroides*, *A. filix-foemina*, *Adiantum pedatum*, *Pteris aquilina*.

Most of these species are common with the exception of *Nephrodium cristatum*. A single species of the latter was found in a small tamarack swamp near Winona Lake and identified by Mr. Willard N. Clute. This species is not given in Coulters 1899 list of the Flowering Plants and Ferns of Indiana.

Eastern Greene County.

The surface rock of the eastern part of this county is mainly Huron sandstone and it is the cliffs of this formation which furnish most of the more uncommon species. Several other species besides those given in the list will undoubtedly be found upon further search. *Botrychium Virginianum*, *Osmunda claytoniana* (one plant), *Cystopteris fragilis*, *Nephrodium acrostichoides* var. *incisum*, *N. spinulosum intermedium*, *N. goldieanum*, *Phegopteris hexagonoptera*, *Asplenium angustifolium*, *A. ebeneum*, *A. trichomanes*, *Athyrium thelypteroides*, *Adiantum pedatum*, *Camptosorus rhizophyllus*, *Woodsia obtusa*, *Polypodium vulgare*.

The goldies fern, which is generally rather rare, is very common near the head of a small ravine just west of Richland Creek. The ravine is surrounded by sandstone cliffs. No less than twenty-five fine plants of this species were seen.

Indiana University Farm.

This property is located three miles east of Mitchell,

Lawrence County. The surface rock is the Mitchell limestone which furnishes many cliffs on the farm. Species noted:

Botrychium Virginianum, *Cystopteris fragilis*, *C. bulbifera* (A cliff was covered with profusion of fine specimens). *Nephrodium acrostichoides*, *N. noveboracense*, *Phegopteris hexagonoptera*, *Camptosorus rhizophyllus*, *Asplenium angustifolium*, *A. ebeneum*, *Athyrium thelypteroides*, *A. filix-foemina*, *Adiantum pedatum*.

Martin and Orange Counties.

The ferns identified in these counties were collected on a walking trip from Indiana Springs, Martin County to French Lick Springs, Orange County. Both sandstone and limestone cliffs occur but nearly all the species listed here were found in the sandstone area. Many other species could undoubtedly be found in other parts of the counties.

Botrychium Virginianum, *Onoclea sensibilis*, *Woodsia obtusa*, *Dicksonia pilosiuscula*, *Cystopteris fragilis*, *Nephrodium acrostichoides*, *N. marginale*, *N. goldieanum*, *N. spinulosum intermedium*, *Phegopteris hexagonoptera*, *Camptosorus rhizophyllus*, *Asplenium pinnatifidum*, *A. ebeneum*, *A. angustifolium*, *Athyrium thelypteroides*, *Adiantum pedatum*, *Pellaea atropurpurea*, *Polypodium vulgare*, *P. incanum*. The last species was seen in the forks of a tree about eighteen feet above the earth, on the grounds of the French Lick Springs Hotel, and having no means of reaching it, the identification is based on the habit of the species of growing in trees. (See Floyd County list).

The peculiar specimen of *Botrychium virginianum*

figured in the *Fern Bulletin*, Vol. XVI, page 66, was found on this trip in Martin County on the banks of White River.

Floyd County.

The topographic features of this county are varied, there being some rather low marshy land and cliffs of shale, sandstone and limestone. All of the species listed, with the exceptions noted, are found on the knobs.

Botrychium virginianum, *B. ternatum*, *Osmunda regalis*, *Onoclea sensibilis*, (Knobs and wet shade; banks of Silver Creek). *Woodsia obtusa* (shades; banks of Silver Creek). *Dicksonia pulosiuscula* (banks of Silver Creek). *Cystopteris fragilis*, *Nephrodium acrostichoides*, *N. noveboracense*, *N. goldicanum*, *N. marginale*, *Phegopteris hexagonoptera*, *Camptosorus rhizophyllus*, *Asplenium ebencum*, *A. angustifolium*, *A. ruta-muraria* (Coulter's list), *Athyrium thelypteroides*, *A. filix-foemina*, *Adiantum pedatum*, *Pteris aquilina* (on a dry hillside in the knobs region). *Polypodium incanum*. According to Coulter's list, this last species occurs in the southern part of this state on trees or rarely on rocks. Clark, Floyd, Perry, Posey and Jefferson.

Crawford County.

Both limestone and sandstone cliffs occur in this county but all of the following species were found in the limestone area. Many others will no doubt be found in the county.

Botrychium virginianum, *B. ternatum*, *Woodsia obtusa*, *Cystopteris fragilis*, *C. bulbifera*, *Polystichum acrostichoides*, *Phegopteris hexagonoptera*, *Camptosorus rhizophyllus*, *Asplenium ebencum*, *Adiantum pedatum*, *Pellaea atropurpurea*.

A RUNNING FERN.

Rhipidopteris peltatum.

BY WILLARD N. CLUTE.

In the tropics the fern collector must have a quick and discriminating eye if he would recognize all of the ferns. In more temperate regions we have but to scan the undergrowth in the woodlands and marshes and the vegetation on the cliffs to be sure of not missing the objects of our quest, but as we approach the equator, ferns of tree-like size begin to appear and with them smaller ferns in all sorts of places; on the trunks and branches of trees, among the mosses on moist rocks, on old walls and even on the roofs of houses. To add to the collector's confusion, many of the ferns are no longer fern-like in the usual sense of that word. They climb like vines up the stems of trees or over lower forms of vegetation, they creep about on rocks and old logs, they decrease in size almost to the vanishing point or their fronds become so thick and leathery that we may pass them by without a thought as to their true character.

One of the most curious of these species is the trailing plant once known as *Acrostichum peltatum* but now usually called *Rhipidopteris peltatum*. I have yet to find anyone who would take it for a fern at first glance. It is almost exactly like our common ground pine (*Lycopodium complanatum*) though smaller and trails over the soil in deep woodlands in much the same way. Probably the first intimation one has that it is a fern, is the finding of the strange little rounded fertile fronds covered with sporangia on their under sides, as he looks his specimen over to locate the fruiting parts.

This plant was originally called an *Acrostichum* be-

cause like all the species of that genus it bears its sporangia in a dense layer on the backs of the fronds without indusium or protection of any kind. Most of the *Acrostichums*, however, have entire or but slightly divided fronds while the present species has fronds that are flabellately much divided. This fact, together with its wide-creeping habit, has been assumed to be sufficient reason for putting it in a separate genus, yet when it fruits its entire little fronds are a very characteristic *Acrostichum* feature. Our plant is also remarkable for reversing ordinary fern procedure when fruiting, for instead of producing its spores upon fronds that are smaller than the sterile ones, as all of our common ferns do, if they differ at all, it forms the only broad fronds, it has for this purpose. Not infrequently, however, one may find pinnatifid fertile fronds which may indicate that it is slowly progressing toward a more distinctive form of fruiting part.

The rootstalk is about the size of stout twine and often several feet long. At intervals of an inch or two it sends up a frond two or three inches high and roundish in outline, but so many times divided into linear forked divisions as to present a very graceful appearance. After it has produced from three to five sterile fronds a single fertile one is developed. It does not appear to be known how many times a year it fruits, but it is certain that the sterile fronds outlast the fertile for a considerable time for here and there one finds a break in the regular arrangement of the fronds and looking closer discovers the short spur that formerly bore a fertile frond and from which it has finally fallen.

There are two other species that are regarded as belonging to the genus *Rhipidopteris*. All are natives of the West Indies or South America, being found in

rather elevated regions, and seldom in very great abundance. The specimen from which our illustration was made was collected in Jamaica at nearly a mile above sea level.

Joliet, Ill.

FERN NOTES.

BY MRS. A. E. SCULLAR.

OSMUNDA CINNAMOMEA f. FRONDOSA.—In the summer of 1906 I used a plant of Cinnamon fern for house decoration and in the autumn I planted it on the border of a pine grove, where it received the morning sun. In 1907 this fern sent up three normal sterile, two normal fertile, and two partly sterile and partly fertile fronds. The fertile portion being from the apex to near the middle of the frond. The plant differed in no way from the type in the season of 1908.

AN INTERESTING FERN COLONY.—While on a tramp in East Stroudsburg, Penna., on Oct. 23, 1908, Mr. Scoullar and I came across a limestone boulder, in a grove of oak and hickory. This boulder was about seven feet high and nine feet square. On its top was growing Polypody, on the east side, in a crevice, several plants of maidenhair spleenwort, on the west side a mat of walking fern, on the south obtuse woodsia, at the base, close against the stone ebony spleenwort, not two feet away grew maidenhair, marginal, and Christmas ferns. Beside the ferns grew Columbine, Hepatica and many other plants that I could not recognize, the foliage having been destroyed by frost. We think that our "find" more than repaid us for our long walk.

ASPIDIUM SIMULATUM.—After tramping miles about Standish, Maine, for three seasons, searching for

the *Aspidium simulatum* in "deep wet woodlands" I stumbled upon quantities of the plants, growing on the bank of a brook, in open sunlight. Its companions were marsh, cinnamon, crested, spinulose wood ferns, and a short distance away, on higher ground the New York fern grows.

OSMUNDA CINNAMOMEA INCISA.—There is a colony of *Osmunda cinnamomea incisa* growing on low ground, on the border of a wood about half a mile from our camp at Standish, Maine, that has borne no for the years 1906, 7 and 8. Is this the usual habit of this form?

BOTRYCHIUM MATRICARIAEFOLIUM TENEBROSUM.—On August 19th, 1907 I found growing in moss at the foot of a maple tree, on the bank of a brook at Standish, Maine what I thought a group of *Botrychium simplex*. There were eight plants bearing fruit. I sent one to Mr. Eaton who pronounced it *Botrychium matricariaefolium tenebrosum*. In Aug. 1908, I visited the spot and found several plants in flourishing condition. Near by are several plants of *Ophioglossum vulgatum*.

ONOCLEA SENSIBILIS F. *OBTUSILOBATA*.—At Standish, Maine there is a strip of meadow land, about three hundred feet long by fifty feet wide, extending through a hay field. It begins at the shore of a pond and ends in an alder thicket. This meadow and field were mowed during the first week of July and no cattle ever enter there. On August 29th, 1907, Mr. Scoullar, Miss Alice Paine and I, divided this meadow, each taking a portion, and searched it carefully for the *obusilobata* form of *Onoclea sensibilis* without success, until we reached the alder thicket, where we found three clumps

showing a fine grading, from the normal down. These plants were growing far back in the bushes, together with the cinamon, marsh and lady ferns, well protected by tall blackberry vines, where neither mowing machine or scythe could possibly have reached them.

Elisabeth, N. J.

MORE ADDITIONS TO THE CHECKLIST.

In publishing the Check-list of North American Fernworts it was inevitable that some inconspicuous forms should have been overlooked and that others should have been described after the part of the list which would naturally contain them was in print. It is our purpose to call attention to these as they are located and at present we add the following:

NEPHRODIUM SPINULOSUM f. ANADENIUM (Robinson) *Aspidium spinulosum anadenium* Robinson. This is said by the author to be in all respects like *N. s. dilatatum* with the exception that the indusium lacks glands.

LYCOPodium SELAGO f. PATENS (Beauv.) This plant with slightly narrower, spreading leaves is reported from Quebec and Northern Vermont. It is without doubt the plant that has given rise to the opinion that *L. Selago* runs into *L. lucidulum*. Apparently the same form was collected in Europe by Mr. Robt. A. Ware who identified it as *L. lucidulum*. Whether there is any close connection between the form and species remains to be determined.

LYCOPodium CLAVATUM BREVISPICATUM Peck. This has short spikes solitary or in pairs and is reported from Northern New York.

BOTRYCHIUM TERNATUM f. ALABAMENSE (Maxon.)
B. alabamense Maxon. Another of the ecological forms of the common grape fern.

ASPLENIUM PLATYNEURON INCISUM (E. C. Howe) is offered as a substitute for *A. ebencum Hortonae* Dav. or *A. platyneuron Hortonae* (Dav.) It may well be questioned whether the law of priority should be either expected or allowed to interfere with the name of a mere monstrous form of a fern. A plant well-known under a form name is not in any need of a change.

Polypodium vulgare var. *cristatum* Moore reported in Gray's New Manual of Botany is properly the variety *bifido-multifidum* Druery. The plant is a mere monstrous form and not in any way entitled to a place in a work supposedly dealing with normal species and varieties, but since it has been listed under an erroneous name it may be pointed out that when Mr. Gilbert made his study of *Polypodium vulgare* in America he had a set of named British forms for comparison sent by Mr. C. T. Druery. In this set were both *cristatum* and *bifido-multifidum* and Mr. Gilbert was most positive that the latter, and not *cristatum* is the form found in America.

DEATH OF J. G. LEMMON.—Prof. J. G. Lemmon died in Berkeley, Calif., Nov. 24, 1908, aged 74 years. Prof. Lemmon was one of the best known botanists on the Pacific Coast and contributed much to our knowledge of the ferns of that region. A species of *Polystichum* found near Mt. Shasta, California, and at first referred to *Aspidium mohroides* was later named in his honor by Dr. Underwood.

PTERIDOGRAPHIA.

COLOR OF FERN SPORES.—Fern students seldom trouble themselves about the color of fern spores, though familiar with the changes of color that the sporangia go through in the process of ripening. The spores are by no means the rusty-brown objects that some may be led to think they are from a hasty glance at the sporangia or sori, in fact although brown is the prevailing color, there is quite a range of color outside of this that the spores may adopt. According to "The Book of Fern Culture" the spores of the *Osmundas* are bright green, in *Pteris argyrea* they are quite black. In most of the *Davallias* the spores are yellow, in some of the *Gymnogrammas* they are nearly black while in a few *Adiantums* they are pale yellow. The shapes and markings of fern spores are subjects that as yet have been practically untouched though in allied plants, as the *Isoetes*, these points may serve to distinguish species. A study of fern spores would be a most interesting pastime for those who have a compound microscope.

LEAF SHOOTS.—This is the term which Conard adopts in his "Structure and Life History of the Hay Scented Fern" for the curious stems that arise from the base of the stipe in the fronds of *Dicksonia Pilosiuscula*. According to this author about twenty percent of the fronds produce such shoots. Occasionally a stipe will produce two shoots, one on each side. These shoots have a varying history; they may remain dormant as mere bud-like protuberances or they may grow rapidly into a true rhizome from which new fronds develop. This method of vegetative reproduction is rarely mentioned in discussing the multiplication of

ferns by other than sexual processes, and seems confined to this single species in our fern flora.

SPORE-BEARING IN THE CREST FERN.—Besides those ferns which have their vegetative and spore-producing fronds separate, such as the cinnamon fern (*Osmunda cinnamomea*) and the curly-grass (*Schizaea pusilla*), there are many others that have the two functions more or less restricted to separate fronds. Thus in many of the *Nephrodiums* the spore-bearing fronds are narrower than those which are sterile, but the presence of green tissue shows that even the fertile fronds aid in the vegetative work of the plant. One of the most conspicuous examples of the differentiation that has taken place between the two sorts of fronds is found in *N. cristatum* where the fertile are not only narrower but are taller more erect and not so long lived. The sterile spread out on the earth and last through the winter, while the fertile seldom do so. That the separation of the two is not so fixed as one might be inclined to infer, however, is shown by a frond recently sent from Kutztown, Pa., by C. L. Gruber. In this, although the frond is manifestly a sterile one in form, it is quite well supplied with sporangia.

WRITINGS OF ALVAH H. EATON.—In *Rhodora* for December 1908, Miss M. A. Day published a list of the writings of the late A. A. Eaton, consisting of 52 titles covering a period of about ten years—the period in which the study of our ferns has proceeded with the greatest activity. The majority of Mr. Eaton's contributions to science appeared in the *Fern Bulletin*, but he also published in *Rhodora*, *Torrey Bulletin* and *Proceedings of the Biological Society of Washington*. In the same number of *Rhodora* also appears a tribute

to Mr. Eaton's memory from the pen of his former associate, R. G. Leavitt.

POLYPODIUM AUREUM MANDIANUM.—At the recent flower show in Chicago a much divided form of the common golden polypody (*Polypodium aureum*) was shown under the name of *Polypodium aureum Mandaianum*. The form is named for the originator, W. A. Manda, who claims it to be a sporeling from *Polypodium aureum glaucum*. The *glaucum* in this combination is apparently the trade name for what scientists know as *Polypodium aureum arcولاتum* H. B. K., or if you choose *Phebodidium aureum arcولاتum*. The new form, then, is properly named *P. aureum arcولاتum Mandaianum* or *P. aureum f. Mandaianum*. As the study of fern forms is receiving increased attention, it is very desirable that the new forms originated be placed on record under their proper names. Considered from the purely decorative view-point, the new form is a very handsome plant.

FERN MYCORRHIZAS.—There is a growing list of plants known to botanists in which the older parts of the root are inhabited by threads of fungi which act like root hairs in securing food materials for the plant. Such associations are known as mycorrhizas and are quite common among the heaths, conifers, orchids and many others. Among the true ferns, however, at least among the Polypodiaceae, mycorrhizas have until recently been unknown, though it is possible that they will be found to be not uncommon when the roots are more extensively studied. At present the only member of the Polypodiaceae known to have mycorrhizas is the boulder fern (*Dicksonia pilosiuscula*), although a species of *Cyathea* has been reported in a rather indefinite way as possessing them.

HAIRS OF DICKSONIA.—The boulder fern (*Dicksonia pilosiuscula*) is frequently called hairy dicksonia, fine-haired mountain fern and other names of similar import to indicate its vestiture of hairs; indeed, the specific name here used also refers to the fact that the fronds are hairy. Going further we find that these hairs, or rather one of their qualities, is responsible for several other common names of the plant for the ethereal oil which they secrete gives it the fragrance which has caused it to be named hay-scented fern, sweet-grass fern, sweet fern and the like. Microscopic examination of the leaf surface shows that the frond bears two kinds of hairs, acicular and glandular. The acicular hairs are simply pointed, but the glandular ones are terminated by a bulb-like swelling from which the fragrant and volatile oil is exhaled. The glandular hairs are most abundant on plants grown in dry sunny places, following the rule for vegetation in general in this respect. According to C. E. Waters the oil distilled from this plant has a rather disagreeable odor at close quarters, but diluted with ether and exposed to the air reminds one of the usual fragrance of the fern.

THE LADDER FERN —According to a recent gardening paper, our so-called Boston fern (*Nephrolepis*) is often called ladder fern on the other side of the water. With us it is frequently called the sword fern while the Christmas fern (*Polystichum acrostichoides*) which is constructed like the *Nephrolepis* but shorter, is known to the trade as the dagger fern. Despite Shakespeare's query as to what's in a name we are inclined to think that our British cousins have the better of us as regards the cognomen of the species in question.

INDEX TO RECENT LITERATURE.

Readers are requested to call our attention to any errors in, or omissions from, this list.

- BENEDICT, R. C. *Notes on Ferns Seen during the Summer of 1908.* Torreyia D. 1908.
- BURNHAM, S. H. *Asplenium Ebenoides in New York.* Fern Bulletin. O. 1908.—Report of an unusually thrifty plant from Washington County, N. Y.
- BUCHHEISTER, J. C. *Fall-fruited of Osmunda.* Fern Bulletin. O. 1908.
- BUCHHEISTER, J. C. *Observations on Nephrodium simulatum.* Fern Bulletin. O. 1908.
- CLEVELAND, G. F. *Ferns of the Upper Susquehanna Valley.* Fern Bulletin O. 1908.
- CLUTE, W. N. *Botrychium Dichrosum.* Fern Bulletin O. 1908.
- CLUTE, W. N. *Changes in Fern Names.* Fern Bulletin O. 1908.
- CLUTE, W. N. *Rare Forms of Ferns.—VIII. An abnormal cinnamon Fern.* illust. Fern Bulletin O. 1908.—A fern with pinnules turned to ascidia described as forma *cornucopiaefolia*.
- CLUTE, W. N. *The Grass-like Polypody.* illust. Fern Bulletin O. 1908.
- DRUERY, C. F. *Lomaria Spicant's Variable Sporelings.* Fern Bulletin O. 1908.
- PARISH, S. B. *Botrychium Lunaria.* Fern Bulletin O. 1908.—Record of this fern from Mariposa, Calif.
- PLITT, C. C. *Notes on Equisetum hyemale.* Fern Bulletin O. 1908.—Notes on spore shedding and on the production of roots and shoots.

ROOD, A. N. *Lycopodium Lucidulum porophilum* in Ohio. Fern Bulletin O. 1908.

SCHAFFNER, J. H. *The Air cavities of Equisetum as Water Reservoirs.* Ohio Naturalist N. 1908.

SLOSSON, M. *Notes on Some Hybrid Ferns.* Fern Bulletin O. 1908.—Various hybrids between species of *Nephrodium* (*Dryopteris*) in Eastern America discussed.

Nephrolepis Scholzeli illust. Gardening D. 15, 1908.—A crested form of *N. exalta Scottii*.

Polypodium aureum Mandaianum illust. Gardening D. 15, 1908.—A multifid form of *Polypodium aureum areolatum*.

THE COAL FERNS.

THE COAL FERNS. It has long been believed that the bulk of our Coal Measures consists of the remains of ferns, but discoveries made within the past few years show that these guesses at the past history of these deposits have been all wrong. While it seems reasonably certain that plants with true flowers were not in existence when the coal was formed yet the pines, or rather certain relatives of the pines were most abundant. Ferns were plentiful, to be sure, but many of the plants we have been calling ferns, and which, to judge from appearances only, are very fern-like turn out to be more nearly related to flowering plants or at least to the Gymnosperms, as the pines and their allies are called. These latter plants bore seeds, and are therefore certainly not ferns, while they are so fern-like in structure that any botanist would hesitate to call them true gymnosperms. They have therefore been placed in a class by themselves as Pteridosperms. A rather full account of them may be found in the Report of the Smithsonian Institution for 1907.

EDITORIAL.

Very soon after the October number of this magazine was issued, the indexes for volumes 12, 13, 14, 15 and 16 were printed and the work completed to date. It has been a long, hard pull to get those delayed numbers out in addition to our other work, but we have somewhat stubbornly refused to do as most other publications would do under like circumstances and combine two or three issues in one. There is no immediate prospect that we shall again get very far behind our dates, though it must be remembered that the production of fern literature is not going on at the rate it formerly did and unless we have plenty of contributed material the issues must wait until the editor gets time to fill them. Our readers can all call to mind magazines that are thick when articles are plenty and thin when they are not, but this publication always consists of 32 pages and does not purpose making any change. It is therefore up to our contributors to do their share. If those who do not like to publish in *Fern Bulletin* would only publish in some other magazine so that we could copy their articles it would not be so bad, but to have no chance to even purloin from other publications is the limit. This magazine will continue to appear if everybody else ceases to write about ferns, but we would appreciate more contributions.

* * *

The recently issued indexes have been sent to all that have indicated a desire for them. Any other subscriber who would like them has only to make his wants known and they will be sent postpaid. We did not print a very large surplus and it would be well to order soon.

At the recent election of the American Fern Society, one of the members, by canvassing, secured more votes for a certain office than either of the regular candidates but as pluralities do not elect under the constitution the Advisory Council was obliged to make a selection and very naturally and properly, elected the regularly nominated candidate who polled the higher number of votes. At first glance it might seem that the election should have gone to the person securing the most votes but it is quite conceivable that the votes given the other two candidates would not have been distributed as they were had all the members been aware that a third candidate was in the field, therefore the regularly nominated candidates were accorded the preference. In early days, the American Fern Society required the officers to annually nominate two candidates for each office, and although these officers invariably selected the best people in the society as candidates, it was pointed out that these officers by placing in nomination members who were not well known might make it possible to keep themselves in office almost as long as they pleased. Aside from this rather remote danger the officers had the ungracious task of renominating themselves for office. The Advisory Council was therefore instituted and since the society had grown so large that it was impossible for all the members to be acquainted with one another, the new Council was made to consist of the past presidents with the idea that they not only ought to know most about the members, but ought also to have the affairs of the society most at heart. For some years, this plan of nominating candidates has worked very well, but there have always been a few individuals to object to a rule that would prevent the nomination of indepen-

dent candidates. We should not lose sight of the fact that the nomination of independent candidates is usually the beginning of a civil war over some point at issue and that it is the desire of the better element in the society to avoid politics of all kinds, yet in a spirit of absolute fairness, it is probable that provision should be made for the naming of an independent candidate when occasion seems to demand it. Under these circumstances a clause might be inserted in the constitution stating how such nominations should be made. Such candidates should not be selected from those who have recently joined the society and they should be nominated by several old members in good standing, for the society should not waste its votes on such candidates unless there is some appreciable demand for their election. The names of such candidates should be added to the regular list of nominations sent out and all still hunting for office should be emphatically discountenanced. The editor of this magazine, though president of the Advisory Council and firmly of the opinion that the council is able to select members who will make excellent officers, will willingly support a proposed amendment as outlined above if it appears that any considerable number of the members desire it.

* * *

Those who have complete files of this magazine may be interested in hearing that a set recently changed hands for a consideration of \$25.00. This may be understood to be a "gilt-edged" price, but the set was in excellent condition and its rarity warranted the price. It is to be observed, also, that this was for a complete set. The volumes sold separately would not have brought half as much. There are various libraries in this country and the Old World that would be willing

to pay well for certain odd volumes to complete their files, but these sold out of a set would take from it its chief value. All the numbers of this magazine previous to volume IX are worth more than face value and should be preserved. If for sale, we can usually find a purchaser for them.

BOOK NEWS.

A new book of interest to fern students has appeared in the John Lane Company's series of Handbooks of Practical Gardening. This is "The Book of Fern Culture" by Alfred Hemsley. The author is a practical fern-grower of many years experience and gives us a most business-like treatment of the subject in hand. The book is written from the standpoint of the gardener, rather than from that of the scientist and while intended primarily for British readers is not confined to native species but embraces all the ferns commonly cultivated either at home or abroad. The usual directions regarding watering, potting, propagating, etc., are given and then the various groups of ferns such as the filmy ferns, climbing ferns *Adiantums*, etc., are taken up and the various specimens commented upon. The names used are in general the ones commonly employed and little attention is paid to the quarrels of the nomenclaturists. Some twenty-five excellent illustrations of specimen ferns are included in the book. The paper and press-work are very good, but the proof-reading has evidently been done by persons unacquainted with scientific terms. (New York. The John Lane Co. 1908. \$1.00 net).

We have recently received from Dr. C. Brick, St. Georgskirchhof 6I, Hamburg, Germany, a reprint of all

references to ferns published in 1906. This covers nearly a hundred pages most of it in German, and is divided into (1) references to Text-books, (2) Prothallia and sex-organs (3) morphology and physiology (4) Sporangia and spores (5) Systematic and geographic further divided into references to the literature of each country (6) cultivated ferns (7) variations (8) fern diseases (9) uses (10) articles relative to plant names (11) a list of all new species and varieties named in 1906. Nearly five hundred articles about ferns appeared in 1906 and about the same number of new species and forms were described. As might be expected the two Americas and the Philippines furnished most of the material for this work. Dr. Brick's publication is exceedingly valuable and it would be a good thing if it could be placed on sale in this country. Possibly the Fern Society might secure copies at reduced rates for its members.

THE AMERICAN FERN SOCIETY

President, Prof. E. J. Winslow, Elmira, N.Y.

Secretary, Prof. S. L. Hopkins, Central High School, Pittsburg, Pa.

Fern Students are cordially invited to join the Society. Address either President or Secretary for further information. The Fern Bulletin is sent free to members. The Annual Dues are \$1.00, and should be sent to Miss Nellie Mirick, Treas., 28 East Walnut Street, Oneida, N. Y.

—Hon. O. M. Oleson, Ft. Dodge, Iowa, was named as vice-president of the Society by the Advisory Council in deciding the tie for this office at the last election. Prof. L. S. Hopkins was also elected Secretary.

—The Annual Report for 1908 is already under way. Since no report for 1907 was printed, this will contain the reports of officers for 1907 also.

ALL THE AMERICAN FERN BOOKS AND SOME OTHERS

Ferns of Kentucky, Williamson (Out of Print.)	
Ferns of North America, D. C. Eaton, 2 vols. (Out of Print.)	
Fern Collector's Handbook, Sadie F. Price. (Out of Print.)	
Ferns in Their Homes and Ours, Robinson. (Out of Print.)	
Ferns of the West, Marcus E. Jones, paper.....	\$.50
Ferns and Fern Allies of New England, Dodge.....	.50
New England Ferns and their Common Allies, Eastman.....	1.33
Our Native Ferns, Underwood, 6th Ed.....	1.08
Ferns, Waters.....	3.34
Our Ferns in Their Haunts, Clute.....	2.00
How to Know the Ferns, Parsons.....	1.60
Fern Allies of North America, Clute.....	2.00
Fern Collector's Guide, Clute.....	.54
How Ferns Grow, Slosson.....	3.34
Ferns and How to Grow Them, Woolson.....	1.18
Fern-wort papers. Paper.....	.25
Ferns of the Upper Susquehanna, Clute. Paper.....	.15
Boston Meeting Papers. Paper.....	.25
Index to Vols. 1-10 Fern Bulletin. Paper.....	.25
North American Pteridophytes, Gilbert. Paper.....	.25
Ferns of Iowa, Fitzpatrick. Paper.....	.20
Mosses and Ferns, Campbell, 1st Ed.....	4.00
Mosses and Ferns, Campbell, 2nd Ed.....	4.50

FOREIGN WORKS

Ferns of Nicaragua, Shimek. Paper.....	\$.50
The Fern Allies, Baker.....	1.25
A Fern-book for Everybody, Cooke.....	.50
Book of Fern Culture, Hemsley.....	1.08
Wayside and Woodland Ferns, Step.....	1.75

Any of the above, to which a price is attached will be sent postpaid upon receipt of price. Out of print books may occasionally be obtained second hand nearly as good as new. The Fern Bulletin may be clubbed with any book listed at a dollar or more for 50 cents additional. A year's subscription will be given free with every order amounting to \$5.00 or more.

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Vol. XXIII

No. 2

The Fern Bulletin

A Quarterly Devoted to Ferns



April

Joliet, Ill.

Willard N. Clute & Company

1909



The Fern Bulletin



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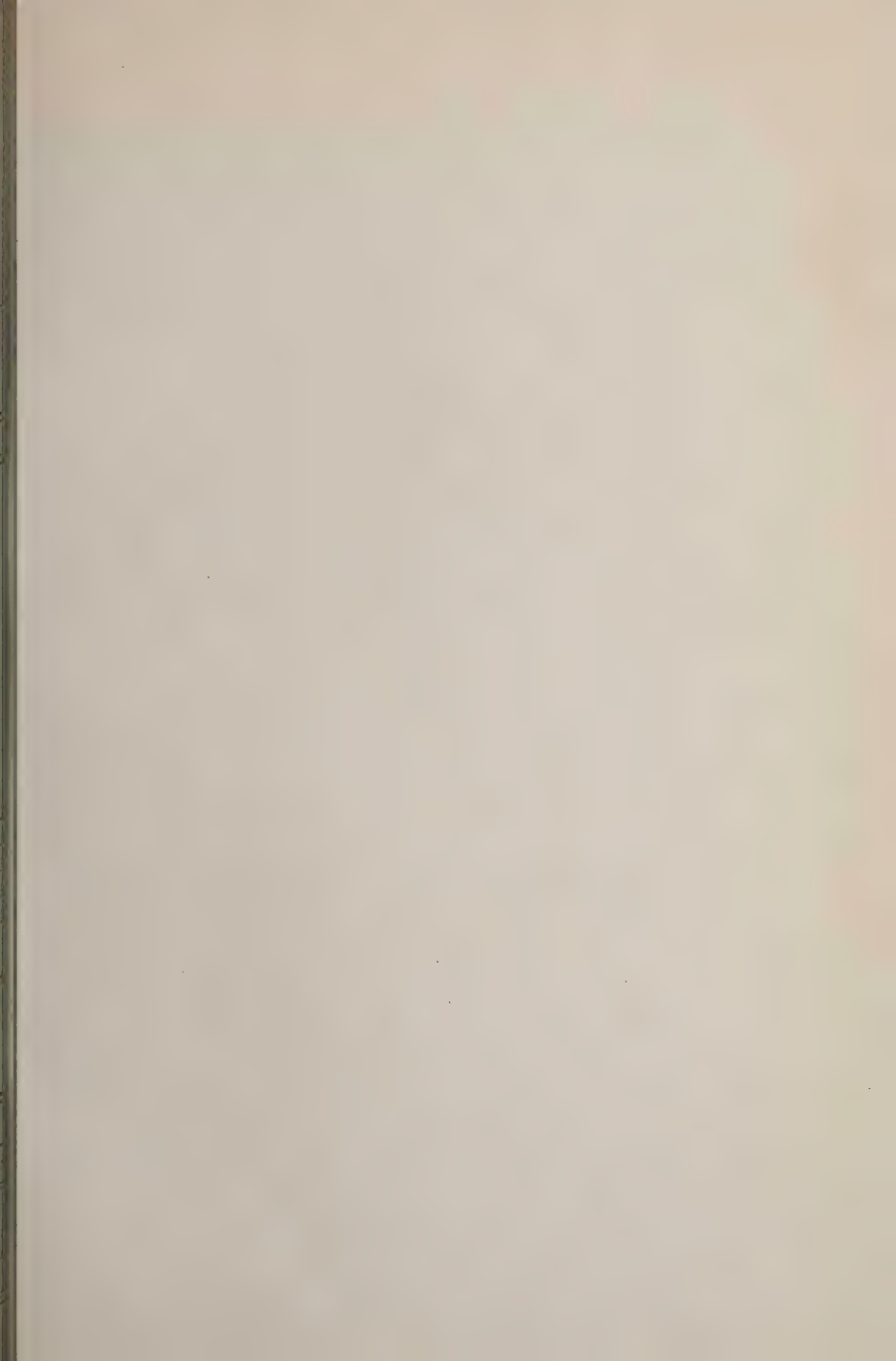
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THE DWARF SPLEENWORT.—*Asplenium pumilum*.

THE FERN BULLETIN

Vol. XVII

APRIL, 1909

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NOTES ON NEPHRODIUM HYBRIDS.

By E. J. WINSLOW.

On the Fourth of July, 1905 I was in Barton Landing, Orleans County, Vermont, and, driven to botanizing to get away from the noise, I ventured to try what I then considered a rather unpromising strip of swamp stretching along one side of the intervale just below the village. The swamp was quite heavily wooded, very wet, and in quite a primeval condition with fallen trees in all stages of decay and a rich growth of plant life.

I noticed with some curiosity frequent clusters of *Nephrodium marginale* which usually grows in drier situations, and many plants of *N. cristatum* that seemed unusually broad and lax but did not quite fit the conception I then had of *N. Clintonianum*. One plant that I collected struck me as intermediate between *N. marginale* and *N. cristatum* and I wrote Mr. A. A. Eaton mentioning it as probably a hybrid.

Circumstances prevented any further exploration in that vicinity until the summer of 1907. By that time I was fully impressed with the interesting character of some of my previous collection and took the first opportunity to visit the swamp prepared to make a good representative collection. I divided this collection into two parts and carried one to North Easton and laid it before Mr. Eaton. He pronounced most of my cristatums,—"*Clintonianum*," suggested that two or three

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were probably *Clintonianum X marginale*, and laid several aside for further study.

In 1908 I again searched the swamp collecting all the odd forms of *Nephrodium* and making a careful study of them. I now found several plants of *N. cristatum X marginale*, and one very striking form with the proportions of a small *cristatum*, the cutting of *Boottii*, and the texture and smooth light colored indusia of *spinulosum*. This I soon identified as *N. cristatum X spinulosum*.

Among the plants were thirty-five or forty of a form quite common and classed doubtfully as "*Clintonianum-Boottii*." It had the form and general aspect of *Clintonianum*, but the cutting of *Boottii*. Later a close examination showed that, while some of those were characterized by a glandular indusium like of *Boottii*, most of them were entirely smooth. This suggested that they were *N. Clintonianum X spinulosum* and *N. Clintonianum X intermedium*. I had read Mr. Philip Dowell's article on hybrid ferns in the *Torrey Bulletin* for March, 1908, but did not have it with me in Vermont. On returning to New York State I immediately looked it up, and got into correspondence with Mr. Dowell, and sent him some of my collection. He confirmed most of my identifications and pronounced that doubtful hybrid, collected in 1905, *Clintonianum X marginale*.

As *N. Goldianum* was not found in this swamp, the possible hybrids in this group number ten in place of the fifteen suggested by Miss Slosson in the *Bulletin* of October 1908. If you allow some rather questionable forms to be named *N. Clintonianum X cristatum*, and some *intermedium X spinulosum* about which I am fairly confident, nine of the ten were taken from an

area not over 40 by 80 rods, all but two of them several times. The missing number is *N. marginale X spinulosum*, Miss Slosson's *Pittsfordense*. The parent plants were abundant in close proximity, and with another chance I should look for this with considerable confidence of success.

Recorded collections indicate that *Nephrodium* hybrids are of rather frequent occurrence in suitable localities; that is in wooded swamps. Last fall, while in the midst of study on the Vermont collection, I received a fine frond of *N. Clintonianum X Goldianum* collected by Mr. Trundy in Farmington, Maine. *N. cristatum X marginale* is very commonly reported from the New England and eastern Middle states. While *Boottii* is so common as to place its hybrid origin in question. In some localities it is more common than *cristatum*. This suggests that it reproduces itself. I am satisfied that such is the case for I have raised plants from spores of *Boottii*, not to the fruiting stage but to fronds one foot in length. I hope to have more to say about this later.

While the recognition and description of several of this group of hybrids by Prof. Dowell and Mr. Benedict, (*Bulletin of the Torrey Botanical Club*, Vol. 36, No. 1.), adds greatly to the fern collector's interest in and comprehension of the genus, of course it does not exhaust this field for study, but raises as many questions as it settles besides leaving many old ones unanswered. For instance those suggested by the varying form of *N. cristatum* and *N. Clintonianum*. As *N. cristatum* is frequently associated with *N. spinulosum*, why is *N. cristatum X spinulosum* so rarely found? I believe it is sometimes taken for *N. Boottii*. Since working out my Vermont collection I have carefully

examined all my *Boottii* and found one splendid frond of *N. cristatum X spinulosum* collected last June at Lowman, N. Y. It has exactly the appearance of *Boottii*, but its identity is easily discovered by an examination of the sori. The indusium of *spinulosum* is distinguished from that of *spinulosum intermedium* not only by its smoothness but by its lighter color. My Vermont specimen of this same hybrid was not at all like *Boottii* but totally different from anything I ever saw.

In the Barton Landing swamp while *N. Clintonianum* is common, typical *N. cristatum* is much less so, and it is interesting to note that *Boottii* is also rather uncommon. But I found about three plants each of

N. Clintonianum X spinulosum and *N. Clintonianum marginale*. However several elements of doubt are here involved. Many of the *Clintonianums* seem to me to approach *cristatum* and some of those called *cristatum X marginale* may be *Clintonianum X marginale*.

N. Clintonianum X spinulosum and *N. Clintonianum X intermedium*, which I did not distinguish from each other while in Vermont, were about as common as *N. Clintonianum*. But I found later that I had collected about three of the former to one of the latter. That is about 30 of the *spinulosum* hybrid and about ten of the *intermedium* hybrid besides some that were sent to Mr. Eaton before making the distinction. It is my impression that *N. spinulosum intermedium* was fully as common as the species. I believe these two hybrids will prove to be rather common. I suspect many of them may be found in herbaria among the *Clintonianums* and *Boottii*. Mr. Eaton had for several years collected unusual forms of this genus and more than suspected the hybrid origin of some of them. He fre-

quently mentioned in his letters a very broad form of *Boottii*, and once spoke of finding several sheets of it in the Gray Herbarium among the *Clintonianums*, and again he says, "Gilbert makes it the type of his var. *multiflora*." Later I sent Mr. Eaton a duplicate of what I have recently determined to be *N. Clintonianum* X *intermedium* and he identified it as *N. Boottii* var. *multiflora* Gilbert. I have seen heavily fruited specimens labelled "var. *multiflora*" which were not the *Clintonianum* hybrid, but I have not seen any of Gilbert's material.

Another interesting question concerns the position of *N. thelypteris* *N. norcboracense*, and *N. simulatum* in the genus. Although *N. thelypteris* was common in the locality just described, no hybrid of that species was found and as far as I know none has ever been reported. This adds a little emphasis to the fact, which every observer of the group must appreciate, that the evergreen *Nephrodiums* bear to each other an entirely different relationship from that which they bear to the herbaceous *Nephrodiums*. (See Davenport in *Rhodor*a Vol. IV. page 10.) *N. Clintonianum* is getting to be pretty generally accepted as a species, and judging by the ease with which its hybrids are recognized *N. spinulosum intermedium* deserves the same consideration. Then how can we do less than to make a genus or at least a sub-genus distinction between those species and the *thelypteris* group?

One question more. There are two distinct forms commonly called *N. spinulosum dilatatum*, one is collected at high elevations, the other in swamps or wet woods. I call them the swamp form and the mountain form. The mountain form is probably the true *dilatatum*. It is well shown in Waters' *Ferns*, page 220.

The swamp form is perhaps a rather extreme form of the species. I have a swamp *dilatatum* with glandular indusia, collected in Lowman, N. Y. I had labeled it *N. spinulosum fructuosum* Gilbert. I now believe it to be a *spinulosum X intermedium* hybrid. I have not seen Gilbert's material but from the localities given I judge that his specimens were collected on low ground; and he says—"not as glandulose as var. *intermedium*."

I shall look with interest for data and suggestions from fern students bearing on any of these questions.

Elmira, N. Y.

COLLECTING IN THE EVERGLADES.

BY CHARLES T. SIMPSON.

Late in the Autumn of 1903 A. A. Eaton, John Soar and Charles F. Simpson the well known writer on mollusks, made a collecting trip to Southern Florida. The following letter was written to a friend and not intended for publication but it gives a more vivid impression of botanizing in that part of the world than pages of the usual perfunctory description and we have accordingly obtained permission to publish it.

"Eaton, Soar and I returned home from a collecting trip as far as Long Key, in the Everglades, a week ago. I have not had life enough to write to you since, though I sent a package of ferns by mail, and a postal card. We had a terribly hard trip following our former road to near the end of the Homestead settlement and then taking a new road broken by the engineers of the East Coast Railroad, to haul supplies over.

For eleven or twelve miles there is no settlement, an awful desolate country without a cap full of soil. Nothing but the old coral reef, evolved into sharp

corners and pot holes. We broke our buggy and tore the shoes from our newly shod horses and could only travel by tying up their feet in gunny sacks, which they would cut through in a quarter of an hour.

In a hammock at about the last point of civilization we found a new *Asplenium*, a beauty with hard, glossy fronds and a new *Polypodium*, which does not agree with *angustifolium*, *pectinatum* perhaps. We stopped at Camp Jackson, on the border of the Everglades the second night. Leaving the team and driver, we pushed on afoot the next morning, wading the glades, through the saw grass and muddy water which gradually became knee deep. Finally we reached the channel, a clear, deep looking stream, thirty or forty rods wide.

Eaton waded in, and when about waist deep, stepped on a fourteen foot alligator. The gator got up and apologized and offered his seat. Eaton sat down, then Eaton arose and came back looking very white and until the trip was at an end, was trying to explain why he came back. We then went up higher and crossed where the stream was shallow. Before us lay Paradise Keys, the most lovely bit of tropical scenery I have ever beheld. It might have covered a hundred acres—a low rounded dome of giant trees, and rich tangled vegetation, punctuated here and there with magnificent royal palms, singly or in groups, rising from 60 to 120 feet in height, their beautiful plummy heads swaying low in the morning breeze.

We left our baggage, provisions and blankets under a very lofty royal, and began to search the hammock. A loud shout from Soar called us and we found on the trees great numbers of *Oncidium luridum* var. with leaves five inches wide and $2\frac{1}{2}$ feet long, thick and lea-

they with scapes of variegated flowers 6 feet high, by far the noblest orchid in Florida and one of the finest in the West Indies. Eaton found another epiphytal orchid, genus and species unknown, and we again went crazy. When we at last went back after killing a big rattlesnake that Soar stepped over, we could not find the tree where we left our things, so thick was the forest, and we were delayed a couple of hours before we found them. We then concluded to go back to Camp Jackson, as we had a big load, each man having from 50 to 60 pounds, the great *Oncidium* being quite heavy. After passing the channel, Soar was taken very ill. Eaton generously took part of his load, but Soar still lagged behind. Eaton then pushed ahead and left his load on some low shrubs, and returned for Soar's load. We then tried to reach a low key in the glade, and camp, as it was nearly dark and Camp Jackson a long way off. Eaton pushed ahead, I followed, and poor Soar staggered along in the rear. From where Eaton hung up his baggage, to the Keys, the bottom was rocky, full of pot holes and the sharp points covered with a thin deposit of slippery mud. Here and there was water. The saw grass was thick enough to conceal the pitfalls and in going this distance I fell seven times at full length. In the darkness I lost my sack of orchids and baggage. When I reached the hammock, I called for Eaton but got no reply. Fortunately I stumbled on his stuff, and at once set to work at building a fire. My matches were damp, although in an upper pocket, and the paper containing them was wet. After striking nearly all of them, I got a light although the leaves and twigs were damp. Eaton came with a dry piece of pine and we soon had a fire. We called to Soar, and finally got a reply. When he

came in he was very pale, and at once became very sick and was sick most of the night.

We had a miserable place, an irregular rock, eight or nine feet long, 5 or 6 feet wide with a pot hole in the middle, and not more than a foot above water, and quite wet, and we slept but little. Soar was a little better the next morning and he and I made our way to Camp Jackson, while Eaton went back and got the stuff he left in the glades.

Not far from Camp Jackson I discovered a lovely little fern in a pot hole in the pine woods, a *Davallia*. In a hammock on our right we found a new *Tectaria*, smaller and simpler than *trifoliata*, a *Polypodium* close to *phylliditis*, with shorter, broader fronds, and a longer stipe, a peculiar *Trichomanes* looking like a liverwort and a dwarf *Nephrodium*, perhaps. Eaton found here an *Oncidium* with long narrow leaves and a five foot scape of very pretty flowers, partly epiphytic and partly terrestrial. We had seen this before but not in bloom. Eaton also found several terrestrial orchids, new to the United States, probably a number of these are already described from the West Indies.

Eaton is a splendid man, jolly, energetic and made of steel, full of resources and an excellent collector. Soar and I are pretty well used up. It was a hard trip for a man nearly 58, and I doubt if I could go through it again. But all the fatigue and hardship will soon fade away while the memory of lovely Paradise Key will remain as long as I live.

Eaton found a few plants of *Cheiroglossa palmata*, on a former trip at Snapper Creek. It has been cold here, two frosts, one of which nipped some of the leaves and undergrowth of small plants that are strictly tropical. We found marks of the frost at Camp Jackson."

Lemon City, Fla.

THE NEW YORK FERN.

BY ADELLA PRESCOTT.

The New York fern (*Nephrodium noveboracense*) was one of my first discoveries after I began the study of ferns. In the light of further knowledge and experience my delight seems quite disproportionate to the cause for I am sure that nothing less rare than the moonwort or curly grass would afford me equal pleasure now. Of course the Christmas fern and maiden-hair were old friends but this was the first of all those that "look just alike" that I was able to identify from the description in the book.

There are many ferns more striking in appearance than the New York fern, and the stroller in search of ferns for a background for her bouquet of wild flowers will do well to pass it by, for it wilts quickly when cut and rarely revives even under favorable conditions, but to the fern-lover the delicate fronds have an unfailing charm in the delightful *ferny* odor which in this species is unusually rich and strong.

This fern loves shady hillsides and seldom remains long when the shading trees are cut away. I have found it growing on the hilltop in full sun, but with dwarfed and stunted fronds. The crociera of the New York fern resemble those of the marsh fern but the stipes are shorter and the mature fronds thinner and more delicate.

In shape they are broadly lanceolate and taper from above the middle to the pointed tip. Below the middle the pinnae grow farther and farther apart, and are gradually reduced in size until the lowest are mere green ears, and this peculiarity was what convinced my delighted eyes that I had really identified a fern. And

indeed this is the quickest and surest means of identifying it, for while it has the round fruit dots common to all *Nephrodium* and bears a superficial resemblance to the marsh fern which sometimes confuses young collectors (especially as the habitats of the two ferns often overlap) yet one glance at the lower pinnae will settle the question for none of our other ferns possess this peculiarity in so marked a degree.

The New York fern is found from Newfoundland to North Carolina, Arkansas and Minnesota. It has a slender creeping rootstock and its delicate yellow green fronds with their pinnatifid pinnae seldom reach a greater height than two feet. The fertile fronds differ but little from the sterile though sometimes heavily fruited fronds are slightly taller and narrower.

The books say it is easily cultivated, but I have failed to establish a plant in my garden though I have tried several times to do so.

New Hartford, N. Y.

ASPLENIUM BRADLEYI IN NORTH ALABAMA.

BY DR. E. L. LEE.

It may be of interest, to some Fern students, to know something of the ecology of *Asplenium Bradleyi*, as it is found near Bridgeport, in North Alabama. This fern is accredited, by Dr. Mohr, our former State Botanist, to the Cumberland range of mountains with its spurs and ridges stretching across the states of Kentucky and Tennessee, and breaking up in minor spurs and ridges in the northern counties of our state. The general direction of these mountains is nearly that of the river, —north-east, as viewed from our place. This mountain range with its ridges from the Kentucky line to

Alabama is from 2200 feet above sea level at the line to 1600 feet at our place. This long range of mountains is capped by sandstone cliffs, from twenty to two hundred feet thick, as described in Safford's Geology of Tennessee. It is in this sandstone that *Asplenium Bradleyi* is found, at a uniform height of sixteen hundred feet. Its habitat was ascertained by Mr. Bradley at Coal Creek in Walden's Ridge, and near the Cincinnati Southern Railroad, in East Tennessee. That point is about eighty or ninety miles from our place. At that place plants are normal at least and ought to be at their best.

Asplenium Bradleyi is described in our works on ferns as being eight to ten inches high, and growing preferably on limestone rocks. At our place it grows only in the seams of the sandstone cap. Have never found a plant growing on the rocks, but out of the closest seams on the face of the cliffs up to a height of fifteen feet from the ground. A majority of these plants are found on the naked face of the cliff, where they are exposed to the hot sun, at least half the day, but they like to grow under shelving rocks, in what our people are pleased to call "rock houses;" that is, where the brow of the cliff hangs over a perpendicular, some ten or fifteen feet, or where the stone near the ground is eroded by the elements and makes a natural shelter. But the plant grows out of those narrow seams just the same way, in the rock houses. These little plants, after leaving the seams spread their fronds against the face of the rocks like little stars, or rosettes. They can easily be covered with a common tea cup. Where they grow under shelving rocks no rain can reach them. If the rocks dip to the center of the mountain, as they do as often as to the outside they

cannot be watered by seepage, and in no other way that I can see unless by capillary attraction and by the fogs that hang around the mountain tops during the early hours of the morning. These dwarfed plants grow thus in the seventy-five miles from Coal Creek to this place; and this place is no exception to the rest of our state, and the Western portion of Georgia. All the stations found by Dr. Mohr are reported "plants very small." You may say this is due to environment, want of proper nourishment, want of moisture, and exposure to the hot sunshine, any one of which would kill a common fern, and all together kill an uncommon one. The top of the limestone here is about 1200 feet. From Coal Creek it has left the limestone and crawled up the mountain some 400 feet, and set up house keeping with the sandstones as a cliff dweller.

Bridgeport, Ala.

RARE FORMS OF FERNS. — X.

LYCOPodium ALOPECUROIDES ADPRESSUM POLYCLAVATUM.

Although the *Lycopodiums* are certainly not ferns, they are closely enough related to these plants to warrant their inclusion in a series of this kind and we select for illustration in this number the plant named some years ago, *Lycopodium adpressum polyclavatum* or perhaps more properly *Lycopodium alopecuroides* variety *adpressum* forma *polyclavatum*. This plant with the long name is simply a monstrous form of one of the club-mosses that is found along the Atlantic coast, from Massachusetts to Texas. In the south the plant is usually tall and stout with spreading leaves; further north its height diminishes until it often re-



sembles large forms of *Lycopodium inundatum*. In any region where it grows a lack of moisture, or exposure to sun, may cause the leaves to be less spreading and thus provide the extremist with an excuse for dubbing it a new species as *L. adpressum*, and if some slip in its internal make-up should cause it to develop several half-fertile, half-sterile fruiting spikes—a sort of fasciation, probably—then we have the added excuse for giving it the form name. As to the plant itself, being but an abnormal fasciated form, it is likely to be found anywhere where the normal plants grow. Until recently it was known from Southern Staten Island, only, but Mr. Severin Rapp has since found it at Sanford, Florida and it is doubtless growing at many places between these two points. Those who do not despise the variations exhibited by plants should be on the watch for it.

In the writer's opinion, the normal plant is itself a mere ecological form; a northern extension of the well-known southern fox-tail club-moss (*L. alopecuroides*). As long ago as 1878 it was recognized by Chapman as being different from the type of *alopecuroides* and he called it *L. inundatum* variety *elongatum* and also *L. inundatum* variety *adpressum*. In 1900 Lloyd and Underwood, putting a finer point on all the *Lycopodiums* called it *Lycopodium adpressum*. Then a year later Maxon, browsing around in some ancient literature discovered that Desvaux had used the name *adpressum* for a form of another species of *Lycopodium* about a hundred years earlier and our plant was forth-with christened *Lycopodium Chapmani*. If the matter were worth while we might challenge Maxon's right to change the name so long as *adpressum* and *adpressum* are not spelled alike—upon such slender hairs

does the fate of specific names often depend—but a club-moss by any other name would smell as distinct, so what's the use? As to who it was that first called it *L. alopecuroides* f. *adpressum*, history such as we have at hand is silent. Possibly it was the present writer. It does not matter. The specimen illustrated was collected near Sanford, Florida by Severin Rapp.—*W. N. C.*

THE DWARF SPLEENWORT.

Asplenium pumilum.

BY WILLARD N. CLUTE.

Those who have confined their fern studies to a limited region often have an erroneous conception of the range in form of genera that makes collecting in any distant country a series of surprises. Sometimes the impression of a genus is correct, as when we assume from experience with the cinnamon fern, the interrupted fern, and the royal fern, that all the *Osmundas* are large, but we are as likely to go astray in our judgment as we do when we infer from a few diminutive specimens that all the filmy ferns are as small and delicate. In general the smaller the genus, the greater is the likelihood that the species composing it are all quite similar; indeed one of the reasons brought forward for separating our common boulder fern (*Dicksonia pilosiuscula*) from the other *Dicksonias* was that it differed from the others so much in size and habit.

In any large genus, however, it is usual to find a wide range in the size, shape and cutting of the fronds. The species are likely to begin with entire fronds, shade into pinnatifid or pinnate species and end with

forms that are often many times compound. So, too, in the matter of size, there are species, small and inconspicuous, almost lost among the other herbage of their haunts and others that reach sizes that render it impossible for them to escape notice. After one has spent a day collecting polypodies so small that it is necessary to carefully examine the mossy tree-trunks upon which they grow in order to find them at all, it is an impressive contrast to find on the way home some species such as *Polypodium crassifolium* with fronds like broad-swords.

Nor do size and delicate cutting have any necessary relationship. The large fronds are as likely to be deeply cut as are those of small species but no more so. In the case I have mentioned both forms happen to have entire fronds, though one is possibly fifty times larger than the other. Size very frequently depends upon habitat. In ground inhabiting species, there is usually no reason for a diminution in size, but those species which live upon trees, must keep their proportions within the bounds which their habitat places upon moisture, light and root-hold.

Some thoughts of this nature must pass through the mind of anyone who examines any extended series of tropical *Aspleniums*. At one end of the list is the great simply pinnate fronds of *Asplenium marginatum* like a gigantic *Asplenium angustifolium*, taller than a man and at the other is the little *Asplenium pumilum* chosen to illustrate this article. Although so small our fern does not grow on trees or rocks, but is to be found among the grasses and herbs on shrubby half open hillsides. The variation in the fronds presented by the fertile, and therefore presumably mature, plants would delight those botanists who thrive by making distinc-

tions between tweedledum and tweedledee. A set of specimens could be selected that would make an unbroken series beginning with entire fronds and ending with pinnate forms with pinnatifid pinnae. In drawing up a description of the species, the scientists have fortunately described the larger forms. Had they by chance first discovered only the small forms and described them, it is likely that the larger ones would have been considered distinct.

Like a large number of our spleenworts, the present species has black stripes with a tendency to become green as they approach the blade of the frond. The largest specimens are usually less than five inches high and being so inconspicuous, have failed to attract much notice. The species, however, is pretty widely distributed, being found in the West Indies, Mexico, Columbia, East Africa and India. The specimens illustrated were collected near Gordon Town, Jamaica, by the writer in 1900.

THE FAMILIES OF FERN-LIKE PLANTS.

There was recently published in this magazine (Vol. 16, p. 70) an outline of the families of fernworts suggested by Prof. Chas E. Bessey. The arrangement there presented is undoubtedly a step in the right direction, but we are as yet so much in the dark as to what are, and what are not, essential differences in the plant world that there is still room for speculation upon the subject. In the *Ohio Naturalist* for February, 1909 Dr. John H. Schaffner has tried his hand at a re-arrangement of the great plant groups. In this the author divides the plants into seven groups which he calls Protophyta, Nematophyta, Bryophyta, Pteridophyta Homosporae, Pteridophyta Heterosporae

Gymnospermae and Angiospermae. The first two represent what we are accustomed to call the thallophytes, the next includes the mosses, and the last two represent the conifers and flowering plants. We reprint the part of the list devoted to the ferns and fern allies which will be very useful for comparing with Prof. Bessey's arrangement. It will be noted, as an excellent illustration of the way in which scientists differ regarding classification, that Prof. Bessey makes a dividing line of the origin of the spores, whether Eusporangiate or Leptosporangiate, while Prof. Schaffner bases a division upon the difference in size of the spores. This latter separation removes the Selaginellaceae from their usual position beside the Lycopodiaceae and places Isoetaceae farther away from the true ferns than in Prof. Bessey's list. It seems here to be a case of "paying your money and taking your choice." In a later paper by Prof. Schaffner (*Ohio Naturalist*, Vol. 9, p. 495) the plants are divided into sixteen groups the Pteridophytes are again rearranged, this time the *Lycopodiums* and *Selaginellas* are placed together in the Lepidophyta, the *Equisetums* and certain fossils have the Calamophyta, while the ferns, *Isotes*, Marsiliaceae and Salviniaceae are placed in the Ptenophyta, this last a new word coined to include the plants named. No mention is made of the Ophioglossaceae but these would of course be included with the ferns. The earlier list relating to the Pteridophytes is here printed.

IV. PTERIDOPHYTA HOMOSPORAE.

FILICES. Ferns. 4,000 living species.

Sporophyte herbaceous or tree-like, usually with a horizontal rhizome, simple or branched; leaves usually large, alternate and mostly compound, rarely grass-

like; sporangia borne on the under side of the leaves or on simple or branched sporangiophores; eusporangiate or leptosporangiate; sporophylls not forming cones. Gametophyte comparatively large, tuber-like without chlorophyll and subterranean, or developed as a flat, simple or branched thallus, hermaphrodite or unisexual; spermatozoids multiciliate.

EQUISETEAE. Horsetails. 25 species.

Sporophyte perennial, herbaceous, with a rhizome, and with jointed, mostly hollow, simple or branched, aerial stems which are either annual or perennial; vascular bundles in a circle; leaves reduced to sheaths around the joints, the sheaths toothed; sporangia borne on small peltate sporophylls arranged in whorls on a terminal cone; eusporangiate; spores with four narrow, strap-like, hygroscopic appendages. Gametophyte a small green thallus, usually unisexual; spermatozoids multiciliate.

LYCOPODIEAE. Lycopods. 155 species.

Sporophyte perennial, herbaceous, with or without a rhizome, the aerial stems upright or trailing; branching monopodial or dichotomous; leaves small, without a ligule, scattered on the stem, into two to many ranks; sporangia solitary on the upper surface of the leaves or in their axils, eusporangiate; sporophylls in bands alternating with the sterile leaves or arranged in spirals in terminal cones; spores small, not appendaged. Gametophyte small, sometimes subterranean, with or without chlorophyll, hermaphrodite; spermatozoids biciliate.

V. PTERIDOPHYTA HETEROSPORAE.

CALAMARIEAE. Fossil.

Paleozoic plants, sometimes of tree-like aspect and dimensions, with hollow-jointed stems with a circle of

collateral vascular bundles; stems increasing in diameter by a cambium zone; heterosporous, the sporophylls in cones.

SPHENOPHYLLEAE. Fossil.

Paleozoic plants of tree-like aspect and dimensions, with solid jointed stems with a central triarch vascular bundle; leaves wedge shaped, comparatively small; probably heterosporous, the sporophylls in cones.

HYDROPTERIDES. Water-ferns. 75 species.

Sporophyte with a horizontal rhizome or floating on the surface of the water; leaves alternate or whorled; microsporangia and megasporangia borne together enclosed in sporocarps, leptosporangiate. Gametophytes developing entirely within the spore walls or protruding only slightly, very short lived; spermatozoids large, spirally coiled, multiciliate.

ISOETEA. Quillworts. 60 species.

Sporophyte with a short tuberous stem with a peculiar type of secondary thickening and with long, erect, grass-like leaves which have a ligule; roots dichotomous; microsporangia and megasporangia large, borne singly, sunken in the expanded bases of the leaves, eusporangiate. Gametophytes very much reduced; spermatozoids spirally coiled, multiciliate.

SELAGINELLEAE. Selaginellas. 500 species.

Sporophyte dorsiventral or erect, with monopodial or dichotomous branching and dichotomous roots; leaves small, opposite or spirally arranged, ligulate; cells often with a single chloroplast; sporophylls in bisporangiate cones, the eusporangiate microsporangia and megasporangia single in the axils of the sporophylls. Gametophytes small and short-lived; spermatozoids very minute, biciliate. Some fossil species de-

veloped as large trees with secondary thickening by a cortical meristem.

The Gymnospermae which follows the ferns, is made to include the Pteridospermae or fern-like seed-plants, the Cycadeae or sago palms, the ginkgo and our well-known cone-bearing trees.

HOW TO MAKE BLUE PRINT PAPER FOR FERN PRINTS.

BY JAMES SHEPARD.

First prepare two separate solutions in separate bottles. For solution No. 1 dissolve one ounce of red prussiate of potash in eight ounces of water. The potash is not quickly soluble and it will dissolve quicker if pulverized. For solution No. 2 dissolve one ounce and eighty grains of ammonia-citrate of iron in eight ounces of water. The iron dissolves quickly. Always use the same bottle for the same solution. The solution will keep only a short time when mixed, but the potash alone will keep good indefinitely and the iron keeps fairly well except in warm weather. Both solutions better be kept in the dark.

The most important of all is to get good paper for coating with the solutions. The paper must be smooth firm and hard or sized so that the solution or coating will stay on the surface and not strike in. Good results are obtained with a paper called Mikado Bond, also with "Parson's Defundum, Linen Ledger." These names may be seen as "water marks" by looking at the paper before a light.

For coating the paper, make a solution consisting of an equal part of solutions Nos. 1 and 2. Then with a sponge or brush coat the entire surface of the paper

evenly on one side with the solution and hang the paper in a dark place to dry. In order to cover all the surface, it is best to draw the sponge or brush back and forth across the paper rapidly until the paper is covered and then go over the paper the second time cross brushing the strokes of the first application. The quicker the coating can be evenly applied the better the result. Too much rubbing of the paper or taking too much time in covering the surface tends to work the solution into the paper instead of staying on the surface only. If the solution strikes into the body of the paper it will not wash out after printing so as to give the white that is necessary for a good print. It is not necessary to coat the paper in the dark, as the coating does not become sensitive until it begins to dry. It is best to coat only enough paper to last a short time as fresh paper always gives the best results. As soon as the paper is dry, it is ready for use or for storage, well protected from the light.

New Britain, Conn.

TRAVELING FERNS.

Among the fern lovers' most delightful experiences is always numbered his first sight of the curious little walking fern. The ordinary observer, used to our common ferns, would never think of classing the long tapering, entire fronds of this species with the others, but the botanist is always on the lookout for it. Its rarity, too, adds to the charm of finding it, for the plant rather prefers calcareous rocks and is not to be found in every locality. On damp, shaded, limestone rocks, however, it is fairly common, often covering the slopes of mossy ledges. Like most ferns it bears numerous spores, but the plant does not depend upon spores alone

for its propagation. The slender tips of the fronds bend over, touch the ground, take root and the walking fern has taken another step and also produced a new plant. In consequence of this fact, the walking fern is justly celebrated, but it is not the only fern that seems to have a suspicion that spores cannot always be depended upon and has adopted other ways of getting on in the world. The process of producing ferns from the spores is a long and tedious one and several ferns have found a quicker way. That lusty giant the ostrich fern (*Struthiopteris germanica*) sends out long subterranean stolons that come up at some distance from the parent plant and produce new ferns to continue the race. Still another method has been adopted by the bladder fern (*Cystopteris bulbifera*). Instead of either rooting fronds or stolons, (which may be considered only another form of rooting frond) this fern bears small bulblets on the under side of the pinnae. These finally drop to the ground and a new fern is the result. That the bladder ferns method is capable of being improved upon is shown by an exotic fern rather common in cultivation. This has gone a step further and produces a row of small ferns on the rachis of each frond. In the course of time the fronds become prostrate and each row of ferns is ready to set up in business for itself. There is another class of ferns that multiply by division. This is a division not of the crown of fronds but of the underground rootstock or rhizome. All these are great travellers but not after the manner of the walking fern. A good example of this class is the brake or bracken (*Pteris aquilina*) whose slender rhizome dodges under roots and stones to send up a new fern, perhaps six feet away. Here and there the rhizome branches and the new ferns

spring up in all directions. In much the same way the sensitive fern (*Onoclea sensibilis*) progresses except that it grows slower and the rootstock is nearer the surface. The branching rhizomes of the common polypody (*Polypodium vulgare*) creep along on the surface and as befits a fern whose fronds survive the winter, are clothed with rusty scales. Shirley Hibberd writes in the "Fern Garden" concerning this fern "You may cut or pull to pieces this tuft almost ad lib., provided each separate portion has its own roots reserved to it." Each piece will form a new fern. The common maidenhair (*Adiantum pedatum*) grows in the same way. Plant a single frond with its bit of rootstock in the spring and before summer has passed it will increase to a dozen or more. It is generally true that those plants which produce a circle of fronds from a central crown do not move about; the wanderers are for the most part those species that send down roots, push the rhizomes outward and send up fronds at intervals all summer.—*H. N. C.* (Reprinted from *Linnaean Fern Bulletin* No. 1. pages 9-11).

SCOLOPENDRIUM VULGARE.

This is one of the rarest of American ferns and the possibility of finding it in some locality from which it has not before been reported may lend zest to the botanical outing. One of its best known stations is a few miles from Syracuse, N. Y., where it grows in the chinks of limestone that everywhere crops out of the ground in that region. The writer collected it there this summer in the shady depressions of a rich woodland, its fronds almost hidden in the lush growth of other vegetation. Its immediate neighbor of the fern

tribe was *Cystopteris bulbifera* but within a radius of a few rods were sixteen or eighteen different species, among them *Dryopteris Goldiana* one of the noblest of our American ferns. The fronds of *Scolopendrium* before the sporangia are developed might easily be passed by an inexperienced collector without being suspected of being ferns. They are long, narrow and entire with a heart-shaped base and grow in tufts with a rather short chaffy stipe. Investigation directed to the roots will usually show the crossiers of the infant fronds and the shrivelled fronds of last year lying on the ground, their backs showing the prominent lines of discharged spore-cases. To some the species may seem lacking in the characteristic beauty of the fern but like all of nature's handiwork, it grows in interest with acquaintance.—C. F. S. (Reprinted from Linnaean Fern Bulletin, Vol. 3, No. 12, page 1.

INDEX TO RECENT LITERATURE.

Readers are requested to call our attention to any errors in, or omissions from this list.

CLUTE, W. N. *Additions to the check-list.* Fern Bulletin, Jan. 1909.

CLUTE, W. N. *A Running Fern.* Illust. Fern Bulletin, Jan. 1909.—*Rhipidopteris peltatum* discussed.

CLUTE, W. N. *Rare Forms of Ferns.* IX. *Four Aberrant Osmundas.* Illust. Fern Bulletin, Jan. 1909. *Osmunda regalis* f. *linearis*, *O. cinnamomea* f. *angusta* and *O. cinnamomea* f. *trifoliata* illustrated and described.

FERRIS, J. H. *The Ferns of Cochise County, Arizona.* Fern Bulletin, Jan. 1909.

GREENE, F. C. *Notes on Indiana Ferns.* Fern Bulletin, Jan. 1909.—List of ferns from Kosciusko, Greene, Martin, Orange, Floyd and Crawford Counties.

LIVINGSTON, B. E. *A Repeated Cycle of Assimilation.* Plant World, Mr. 1909.—Account of a fern which has lived for a long term of years in a sealed bottle containing some moist soil.

PEASE, A. S. *Cryptogramme Stelleri in New Hampshire.* Rhodora, Mr. 1909.

SCOULLAR, MRS. A. E. *Fruiting of Botrychium.* Fern Bulletin, Jan. 1909.—Report on the species of *Botrychium* whose fruiting seasons have been noted for some years.

SCOULLAR, MRS. A. E. *Fern Notes.* Fern Bulletin, Jan. 1909.

PTERIDOGRAPHIA. Fern Bulletin, Jan. 1909.

Coal Ferns, The

Crest Fern, Spore bearing in

Dicksonia, Hairs of

Eaton, A. A., Writings of

Fern Mycorhiza

Ladder Fern, The

Lemmon, J. G., Death of

Leaf Shoots

Nephrolepis, Scholzei

Polypodium Aurcum Mandianum

Spores, Color of

EDITORIAL.

For six summers the editor of this magazine has made a tour of some of the eastern chautauquas talking on various phases of nature, getting acquainted with a lot of intelligent people interested in the out-door life and having a good time generally. This summer, however, he goes to the University of Illinois to take charge of some classes in botany for teachers, hoping to contribute his share toward making the teaching of botany a live and urchin-attracting subject. There is no more delightful study than botany, provided one knows how to get the delight out of it; but one must know how. Other botanical courses at the University will be under Dr. H. A. Gleason, an out-door botanist, an enthusiast, and a teacher of ability. If the editor was not listed on the teaching force of the University he would advise all who intend to brush up in botany, to go there—perhaps he may suggest that they investigate the merits of the session, anyway. Eastern teachers desirous of seeing the best of the prairie flora, especially, will find this an excellent opportunity to combine pleasure and study.

* * *

A note from Dr. Brick informs us that his report on ferns mentioned in the January issue is not for sale. Only fifteen copies of this remarkable report are made and these are used in exchange for other publications on ferns. The editor of this journal considers himself fortunate in owning a full file of the reports. The items in these reports are, of course, reprinted from other journals, but what ones the reports do not state. It is to be regretted that it is not possible to have a larger edition of the report, since few students will care

to subscribe for the other publications in which the notes appear, yet all would be glad to purchase the collected notes.

* * *

"Lest we forget," we mention again that a few more notes and articles for publication would be acceptable. Those who were busy with our common ferns, ten years ago, have turned their attention to other things but that is no reason why the beginners among our readers should conclude that everything worth while has been written. Those who find present numbers too technical should get the early numbers. It is astonishing how many useful points they contain for beginners in the study.

* * *

Dr. E. F. Bigelow expects to hold a summer school for the study of nature at Sound Beach, Connecticut, for four weeks beginning June 21st. This is in furtherance of the general plan for advancing the interest in the out-door world taken up by the Agassiz Association. Dr. Bigelow has had considerable experience in such work having lectured on similar lines to large audiences in many parts of the country and having conducted at least two schools of this kind. It looks as if Sound Beach would be a good place to put in a month this summer.

* * *

In this issue we reprint a second installment of matter from the early numbers of this magazine. This is at the request of a large number of subscribers who have been obliged to give up all hope of ever securing a complete set of the magazine but who wish to possess the articles which they contained. We are sure that

those fortunate enough to have a complete file will not object to our devoting a few pages in several issues to this work, since it will not impair in the least the value of their own sets. The plan is to republish from time to time the articles that are still of value in the first four volumes omitting the shorter notes, news items, etc. We do not contemplate printing extracts later than volume IV unless there is a considerable demand for them since a large number of subscribers possess sets beginning with volume V.

“The New Gray’s Manual” has at last appeared and as far as the flowering plants are concerned is likely to prove more useful than any other manual at present obtainable. The nomenclature is in accordance with the Vienna rules and the interpretation of species is fairly conservative. The nomenclature of the Pteridophytes, however, is a distinct disappointment since it follows no rule for such matters that we can recall. To be sure the rules for naming the ferns have not yet been distinctly formulated by a botanical congress, but even so, it is not likely that *Aspidium* will ever again be used for our ferns that formerly went by that name. *Nephrodium* or *Dryopteris* is almost certain to prevail. Nor would one longer think of putting the sensitive and ostrich ferns in the same genus. It may also be pointed out that the treatment of varieties, forms and sub-species leaves much to be desired, no hint being given either by text or typography, that will enable the student to distinguish between good varieties and mere ecological forms. Some of these latter are also quoted with all the pomp and ceremony attendant upon the citation of distinct species. Up-to-date fern students will scarcely consider this book a

safe leader. For flowering plants, however, it is sure to be the standard and everyone will, of course, want a copy.

BOOK NEWS.

George Lincoln Walton has written a "Practical Guide to Wild Flowers and Fruits" which attacks the problem of finding the names of plants in a somewhat different way from the other books on the market. While color is the basis upon which the main groups are divided, the lesser groups are keyed out according to the arrangement of their leaves, size of the plant, shape of the flowers, etc. Technical terms are conspicuous by their absence. Naturally only the more showy flowers and fruits are included in the book. There are nearly a hundred drawings in the book, but few illustrations. The book is published by Lippincott, at \$1.50 *net*.

Some time before his death the late Marshall Ward began a series of books on trees, devoting a single volume to leaves, another to buds and stems, etc. Three of these volumes appeared before his death, another devoted to fruits has just been issued and another which he left in manuscript will appear later. The present one on fruits is an excellent presentation of the subject and astonishes one by the great variety in the fruits which it makes apparent. While written especially for British readers it will be found useful on this side also. The second part of the book is devoted to short descriptions of the woody plants of Great Britain but the key to these plants is too complicated for real use. A large number of illustrations add to the usefulness of the book.

THE AMERICAN FERN SOCIETY

President, Prof. E. J. Winslow, Elmira, N.Y.

Secretary, Prof. S. L. Hopkins, Central High School, Pittsburg, Pa.

Fern Students are cordially invited to join the Society. Address either President or Secretary for further information. The Fern Bulletin is sent free to members. The Annual Dues are \$1.00, and should be sent to Mr. F. G. Floyd, Treas., 325 Park St., West Roxbury, Mass.

The Annual Report of the American Fern Society for 1907 and 1908 has just been printed and mailed to members. It contains the reports of officers, list of members and biographical notes of those members who passed away during the two years mentioned. Fern students who are not members of the Society may obtain a copy of the report by addressing the Secretary.

Owing to a pressure of other work, Miss Nellie Mirick, who has been our treasurer since 1906, was obliged to resign in January and President Winslow appointed in her stead Mr. F. G. Floyd, 325 Park St., West Roxbury, Mass. Miss Mirick was third in the list of treasurers and administered the office in a very acceptable manner. We shall all regret the necessity which required her to relinquish the office.

While exploring the summit of Jay Peak, Vt., on July 17, 1908, I collected a quantity of a dwarf form of *Lycopodium annotinum* growing in the scant soil among the bare rocks. I thought it might be var. *pungens*, but Mr. Clute reports that it is not exactly that variety, but an interesting intermediate form. Of course its dwarfed condition is accounted for by the high altitude (4100 ft.) an exposed situation, but a great many interesting varieties might be similarly explained. I will send specimens, as long as it lasts, to members of the Fern Society upon request accompanied by stamped envelope.—E. J. Winslow, 855 Grove St., Elmira, N. Y.

ALL THE AMERICAN FERN BOOKS AND SOME OTHERS

Ferns of Kentucky, Williamson (Out of Print.)	
Ferns of North America, D. C. Eaton, 2 vols. (Out of Print.)	
Fern Collector's Handbook, Sadie F. Price. (Out of Print.)	
Ferns in Their Homes and Ours, Robinson. (Out of Print.)	
Ferns of the West, Marcus E. Jones, paper.....	\$.50
Ferns and Fern Allies of New England, Dodge.....	.50
New England Ferns and their Common Allies, Eastman.....	1.33
Our Native Ferns, Underwood, 6th Ed.....	1.08
Ferns, Waters.....	3.30
Our Ferns in Their Haunts, Clute.....	2.00
How to Know the Ferns, Parsons.....	1.60
Fern Allies of North America, Clute.....	2.00
Fern Collector's Guide, Clute.....	.54
How Ferns Grow, Slosson.....	3.25
Ferns and How to Grow Them, Woolson.....	1.17
Fern-wort papers. Paper.....	.25
Ferns of the Upper Susquehanna, Clute. Paper.....	.15
Boston Meeting Papers. Paper.....	.25
Index to Vols. 1-10 Fern Bulletin. Paper.....	.25
North American Pteridophytes, Gilbert. Paper.....	.25
Ferns of Iowa, Fitzpatrick. Paper.....	.20
Mosses and Ferns, Campbell, 1st Ed.....	4.00
Mosses and Ferns, Campbell, 2nd Ed.....	4.50

FOREIGN WORKS

Ferns of Nicaragua, Shimek. Paper.....	\$.50
The Fern Allies, Baker.....	1.25
A Fern-book for Everybody, Cooke.....	.50
Book of Fern Culture, Hemsley.....	1.08
Wayside and Woodland Ferns, Step.....	1.75

Any of the above, to which a price is attached will be sent postpaid upon receipt of price. Out of print books may occasionally be obtained second hand nearly as good as new. The Fern Bulletin may be clubbed with any book listed at a dollar or more for 50 cents additional. A year's subscription will be given free with every order amounting to \$5.00 or more.

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THIS IS WHAT HAPPENED

The day after we advertised that last set of Fern Bulletin beginning with volume VI it was sold, of course. Don't ask us for Vol. VI now—it is too late. But we have several sets of this volume which lack only the January number. These are for sale at \$1.00 a volume or we will give one absolutely free with an order for volumes 7 to 17 (11 vols.) at \$7.00. With this we also include the ten-year index. This is a reduction of \$2.25, and you had better hurry at that. If you have some of the later volumes deduct 60 cents for each volume you have and we will send what you lack for the remainder. Get a full set now. There will never be another publication like it!

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Vol. XXII

No. 3

The
Fern Bulletin

A Quarterly Devoted to Ferns



Joliet, Ill.

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1909



The Fern Bulletin



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WANTS AND EXCHANGES

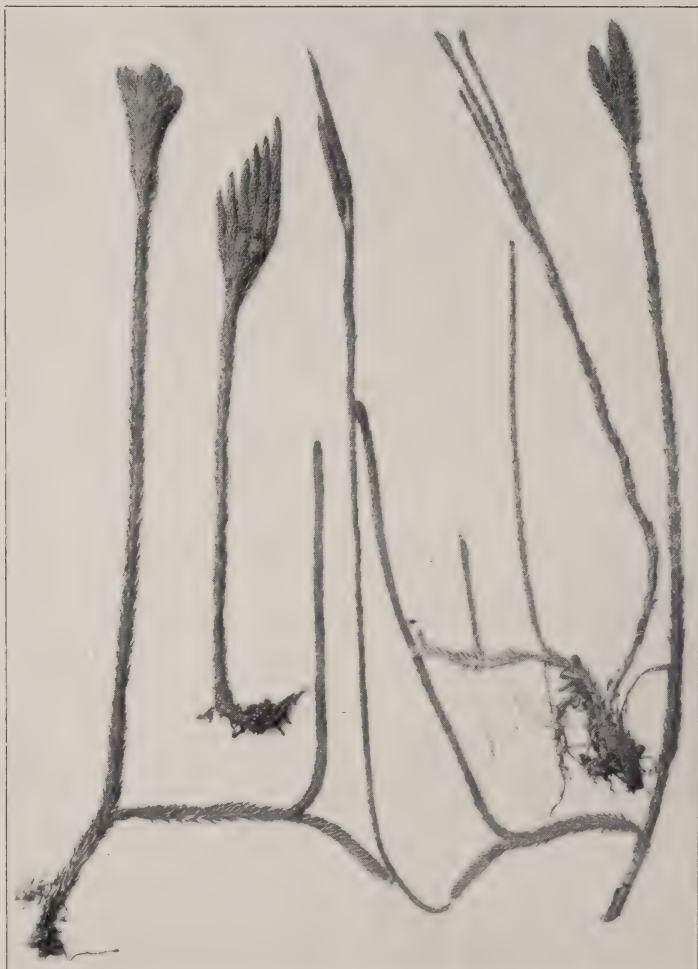
TROPICAL FERNS—If you want dried ferns from the tropics, apply for catalogue of good scientific specimens to THIENEMANN'S BUCHHANDLUNG, Gotha, Germany.

WANTED—I would like very much to have specimens of *CYSTOPTERIS FRAGILIS* from every reader of the Bulletin. Will send in return any duplicates in my herbarium. L. S. HOPKINS, Central H. S., Pittsburg, Pa.

EXCHANGE—Will exchange walking fern or some Berkshire orchids for fresh specimens of *LYGODIUM PALMATUM*, Hart's tongue, *ASPLENIUM RUTA-MURARIA*, *A. ABENOIDES*, *A. MONTANUM*, *PELLAEAE*, *SCHIZAEAE* and others. Write first. W. I. BEECROFT, Cheshire, Mass.

WANTED—Numbers 2, 3 and 12 of the first three volumes of *FERN BULLETIN* at any price. **FOR SALE**—Numbers 2 and 4 of Vol. IV, *FERN BULLETIN*; also No. 8, (early no.) H. E. RANSIER, MANLIUS, N. Y.

PHILIPPINE FERNS or cash offered for Nos. 2 and 3, Vol. 1, of *FERN BULLETIN*. D. LEROY TOPPING, Treasury Bureau, Manila, P. I.



LYCOPODIUM ADPRESSUM F. POLYCLAVATUM.

THE FERN BULLETIN

Vol. XVII

JULY, 1909

No. 3

THE FERN FLORA OF PENNSYLVANIA.

BY W. A. POYSER.

The Keystone State is in shape a parallelogram, lying almost entirely between 42° and $39^{\circ} 43' 26''$ north latitude, and between the irregular W-shaped Delaware river and $80^{\circ} 31' 36''$ west longitude. It is about 160 miles long from east to west, giving an area of 45,215 square miles. In the northwestern corner a triangular section extends to $42^{\circ} 15'$ north, forming part of the western boundary of New York, and giving Pennsylvania about 45 miles of coast on Lake Erie.

The Appalachian system of mountains crosses the State from northeast to southwest. It here attains its greatest breadth, but none of the ridges reaches any great altitude, though a few peaks among the Alleghenies attain a height of more than 2,500 feet. The surface of the State is naturally divided into three sections, the low district southeast of the mountains, the mountainous region, and the broken hilly plateau in the west. The triangular southeastern section consists of a narrow level plain near the Delaware, with an elevation of not more than a hundred feet above the sea, merging into a higher rolling region which extends to the base of the mountains.

The Delaware river with its tributaries the Schuylkill and the Lehigh drain the eastern portion. The Susquehanna and its branches occupy the central area,

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while the greater part of the west is dependent upon the Allegheny and Monongahela rivers, the union of which at Pittsburgh, forms the great Ohio.

The climate is somewhat subject to extremes, though modified by differences in elevation. Heavy snowstorms occur in the mountains in winter and as a result, the rivers, especially in the western section are flooded in spring and early summer. This will recall one of the most disastrous floods in the history of our nation, that of Johnstown, in the southwestern portion of the State, by which 2,209 lives were destroyed on May 31, 1889.

The distribution of the fernworts is influenced generally by local conditions, by the absence or presence of the out-croppings of the various rock formations and perhaps to a certain extent by climate, especially with the species which find their southern limit of range in Pennsylvania. Nearly one-fourth of the State is wooded, the forests being fairly well distributed, though the greatest lumbering regions are in the northern part. It is to be expected, therefore, that many woodland species occur throughout. The State has been fairly well-worked, botanically, yet much remains to be recorded, at least as far as plant distribution is concerned. From the standpoint of the fern student, the flora is an extremely interesting one. The geographical position of the State is such that quite a number of northern species find their southern limit within its borders, while some southern forms just pass north of its limits, giving it a goodly admixture. Among others *Pellaea gracilis* and *Polystichum Braunii* manage to creep over the northern border on the tops of the Alleghenies, though it is stated in "The Fern Flora of New York" (*Fern Bulletin*, October,

1903,) that *Braunii* finds its limit in that State. We boast of the original station for *Asplenium ebenoides*, though it has long since been destroyed. Barring Havana Glen, Alabama, where *ebenoides* is abundant, more plants have been found in Pennsylvania than in any other State, an honor quite befitting the place of its "botanical birth." In this connection it is of interest to know that Scott was not the first to find *Asplenium ebenoides*. The Philadelphia Botanical Club has recently acquired specimens accompanied by label stating, "A fern collected by Mrs. Adams near Lancaster, Penna., in 1860." Scott's single plant was found in 1862.

Growing in crevices of the rocks along Schuylkill near (now in?) Philadelphia and not many miles from the spot where Robert Robinson Scott found *Asplenium ebenoides*, Thomas Nuttall, when the Nineteenth century was yet young, discovered the fern he afterward named *Asplenium pinnatifidum*. In apparently the same general locality it still persists, known to a few who guard it well. In 1815 Nuttall gathered a quillwort along the Delaware river shore of the coastal plain, which at the time, following the usual custom was referred to the common European *Isoetes lacustris*. Thirty years after, its distinctness was discovered and the name it now bears, *Isoetes riparia*, was given it by Dr. Engelmann. Further comments may be found in connection with the various species.

So varied and numerous have been the sources from which I have drawn the information necessary in the preparation of this flora, that it is rather difficult to make adequate expression of my indebtedness and appreciation to all. Dr. Porter's Bryophyta and Pteridophyta of Pennsylvania, barring nomenclature, has

been used as a skeleton, adding to it recent records and those omitted from that list and known to be authentic. Herbaria have been freely consulted, especially those of the Academy of Natural Sciences of Philadelphia, The Philadelphia Botanical Club, and Mr. Witmer Stone, all of which are rich in material from the eastern section of the State. Much valuable data from the western portion was contributed by Mr. Otto E. Jennings of the Carnegie Museum based upon specimens in the herbarium of that institution. I am especially indebted to the late Alvah A. Eaton for notes on the occurrence of the genera *Isoetes* and *Equisetum* in this State. My thanks are also due Mr. Harry D. Bailey of Lafayette College, Prof. Otto Hatry, Mr. C. L. Gruber, Mr. Daniel W. Hamm and Mr. W. C. Barbour, who have sent me local notes and specimens and in other ways aided me in the preparation of this list.

OPHIOGLOSSACEAE

OPHIOGLOSSUM VULGATUM L. Adder's Tongue. Wet meadows and swamps. Local. Allegheny, Bradford, Bucks, Chester, Crawford, Delaware, Berks, Lancaster, Monroe, Mifflin, Luzerne, Wayne and Tioga counties. To be expected throughout in suitable situations. Interesting ecological forms occur.

BOTRYCHIUM DISSECTUM Spreng. Dissected Grapefern. Woods and thickets. Infrequent throughout, more common in the mountains. Grows with and occasionally grades toward *B. obliquum*. Plants with double and forked fertile and sterile portions not uncommon.

BOTRYCHIUM OBLIQUUM Muhl. Common Grapefern. Woods and thickets. With *B. dissectum*, though more common. Similar monstrosities occur,

and in one case three sterile fronds were produced by one rootstock.

BOTRYCHIUM LANCEOLATUM ANGUSTISEGMENTUM Pease and Moore. Lanceolate Grape-fern. Woods. Rare. Confined to the mountain belt and apparently not recorded south of this State. Bradford, Cambria, Lycoming, Pike, Somerset. Susquehanna, Sullivan and Wayne counties.

BOTRYCHIUM MATRICARIAEFOLIUM A. Br. Matricary Grape-fern. Woods. Rare. The mountains and northern portion. Berks, Bradford, Erie, Lehigh, Monroe, Pike, Susquehanna, Sullivan and Wayne counties. (*B. Neglectum* Wood, *B. ramosum* Roth.)

BOTRYCHIUM SIMPLEX. Hitchcock. Little Grape-fern. Woods. Very rare. Monroe, Northampton and Wayne counties in the northern part of the mountain belt.

BOTRYCHIUM TENEBROSUM A. A. Eaton. Moist shades. Known only from Lehigh county. (Mr. Hamm.) My determination was confirmed by Mr. Eaton. Most southern locality for the species. (*B. matricariaefolium tenebrosus*.)

BOTRYCHIUM VIRGINIANUM L. Rattlesnake fern. In rich woods. Common throughout. Plants having forked fertile panicles are not infrequent. The variety *gracile* has been gathered in Delaware county and should occur elsewhere.

OSMUNDACEAE

OSMUNDA CINNAMOMEA L. Cinnamon fern. Swamps and wet woods. Common throughout. Though I have never found the variety *frondosa* in the field, it was produced by a plant in my garden some years ago, a year after it had been placed in position.

OSMUNDA CLAYTONIANA L. Interrupted fern. Field, woods and thicket. Common throughout.

OSMUNDA REGALIS L. Royal fern. Swamps and wet woods. Throughout, though not as common as the two preceding species (*O. spectabilis* Wild.)

SCHIZAEACEAE

LYGODIUM PALMATUM (Bernh.) Climbing fern. Wet thickets. Rare and apparently confined to the eastern part of State. Bucks Carbon, Lehigh, Luzerne, Schuylkill, Philadelphia and Wyoming counties.

POLYPODIACEAE

ADIANTUM PEDATUM L. American Maiden-hair. Rich woods. Common throughout. Immature forms of this species have given rise to reports of *Adiantum capillus-veneris* in Pennsylvania.

ASPLENIUM ANGUSTIFOLIUM Michx. Narrow-leaved Spleenwort. Rich woods. Rather rare, but to be expected throughout. Lancaster, Berks, York, Blair, Fayette, Allegheny, Erie, Clinton, Delaware, Philadelphia, Sullivan, Montgomery, Westmoreland and Monroe counties.

ASPLENIUM BRADLEYI D. C. Eaton. Bradley's Spleenwort. Crevices of exposed or shaded rocks. Very rare. Known only from Lancaster and York counties along the lower Susquehanna.

ASPLENIUM EBENEUM Ait. Ebony Spleenwort. Rocky woods, thickets and roadside banks. Common throughout. Most fruitful in dry, partially shaded situations. (*Asplenium platyneuron*. (L. Oakes.)

ASPLENIUM EBENEUM SERRATUM Miller. In similar situations and to be expected throughout. A form with deeply serrate and sometimes pinnatifid pinnae has

been noted by the writer in Montgomery county, growing on red shale.

ASPLENIUM EBENOIDES R. R. Scott. Scott's Spleenwort (*Asplenium ebencum*. X *Camptosorus rhizophyllus*). Very rare. Usually on limestone, though sometimes on other formations. If I may judge from my own experience with this hybrid in the field, I am inclined to regard its seeming preference for limestone as being due to the fact that it is only on that formation that *Camptosorus* riots in the open, there meeting *Asplenium ebencum* in its chosen haunt, equally fruitful. I have seen the walking-fern luxuriating in the grass on the north side of a limestone boulder a foot square, on a dry, open sunny slope, "rubbing elbows" with splendid plants of *A. ebencum*. This, of course, was an outpost of the main colony of *Camptosorus* which grew in a more shaded situation. When on other formations, I find the walking-fern confined to the deep woods, smaller, less "sportive" and carpeting mossy rocks where *ebencum* is a mere dwarf and seldom fruitful. While both alleged parents occur throughout the State, *ebenoides* is only known from the eastern portion. Northampton, Lehigh, Chester, Berks, Lancaster, York, Monroe and Montgomery counties. Type station in last named county.

ASPLENIUM FONTANUM (L). Rock Spleenwort. On limestone rocks. North America's claim to this species rests upon two doubtful records. It is alleged to have been gathered by Mr. J. M. McMinn along Lycoming Creek, Lycoming County, Pennsylvania, in July, 1869. Specimens were sent with other plants to Prof. T. C. Porter of Lafayette College, but it was not until sometime after McMinus' death that the species was identified. Efforts to rediscover the fern have

been unavailing. The circumstances surrounding the Ohio record are equally elusive. According to *The Fern Bulletin* (Vol. 5, No. 3) specimens from both localities are preserved in the herbarium of Columbia University and do not differ in any particular from European material. Mr. Harry D. Bailey of Lafayette College writes me that the herbarium of that institution also contains specimens from both states. My friend, Prof. Hopkins, in his Fern Flora of Ohio (*Fern Bulletin*, January, 1907) states that the record for that state is not authenticated by any herbarium specimens. I think both records due to mixing of labels, but include the species inasmuch as it will be found credited to the state in Underwood's Manual and elsewhere, though the circumstances are generally known.

ASPLENIUM MONTANUM Willd. Mountain Spleenwort. In crevices of rocks. Rare though occasionally locally abundant. Lackawanna, Monroe, Carbon, Chester, Lehigh, Northampton, Lancaster, York, Somerset, Fayette and West and Moreland counties. Forked fronds not unusual. Species rather variable and sometimes fertile when half an inch high.

ASPLENIUM PINNATIFIDUM Nutt. Pinnatifid Spleenwort. In crevices of shaded rocks. Rare, occasionally locally abundant. Recorded from Philadelphia and Delaware Counties in the southeast. York and Lancaster along the lower Susquehanna and in Fayette County in the southwest. Very variable. Rarely lacinated specimens analogous to the lacinated form of *Camptosorus* may be found.

ASPLENIUM RUTA-MURARIA (L). Rue Spleenwort, Wall-rue. On shaded limestone. Very local, and apparently restricted to the central and eastern half of

the state. Northampton, Bucks, Chester, Lancaster, Franklin, Huntingdon, Blair, Centre, Lehigh and Montgomery Counties.

ASPLENIUM TRICHOMANES L. Maidenhair Spleenwort. In crevices of shaded rocks, though occasionally in exposed situations common throughout.

ATHYRIUM FILIX - FOEMINA (L.). Lady fern. Woods, roadsides, thickets and in wet open situations. Common throughout, and as variable as it is common. Plants apparently referable to varieties *angustum*, *incisum*, *laxum*, *ovatum*, *rhoeticum*, *distant* and *rubellum* have been found by the writer. Have noted but few forked fronds. Both red and green stiped forms occur. The red is confined to deep, rich woods while the green stiped plant may be found anywhere. The two have grown side by side in my garden for three years without any apparent change in color.

ATHYRIUM ACROSTICHOIDES (Sw.) Silvery Spleenwort. Rich and wet woods. Common in the southeastern section and probably throughout. A sterile form with somewhat distant segments, deeply toothed, is occasional in deep woods.

CAMPTOSORUS RHIZOPHYLLUS (L.) Walking Fern. On rocks, preferring limestone. Local, throughout. Most variable when growing on limestone. Forked fronds not uncommon.

CHEILANTHES VESTITA (Sw.) Hairy Lipfern. On dry rocks. Said to prefer those of igneous origin. I have seen it luxuriant and abundant on red shale. Very local and only recorded from central and eastern portions. Berks, Busks, Northampton, Chester, Monroe, Lancaster, Fulton, Montgomery and Delaware counties.

CYSTOPTERIS FRAGILIS (L.) Fragile Bladder-fern. Moist, shaded rocks and in woods. Common throughout. Very variable.

DICKSONIA PILOSIUSCULA Willd. Boulder Fern. In woods, on hillsides and in fields. "During haying season, whole counties in eastern Pennsylvania are thoroughly perfumed by the fronds cut with the hay." (Clute, "Our Ferns.") My own observations do not seem to confirm this statement. A few years ago I came across two colonies of the species growing on the brink of a small quarry a few paces apart. The fronds of one were without exception, normal while of the other colony all bore numerous forked pinnae. (Not var. *cristata* Maxon). The apices were normal.

NEPHRODIUM CRISTATUM (L.) Crested-fern. Swamps and wet thickets. Common throughout.

NEPHRODIUM CRISTATUM CLINTONIANUM. (D. C. Eaton). Clinton's fern. Wet thickets and woods. Rather rare. Susquehanna, Northampton, Delaware, Chester, Erie and Lancaster counties. The type does not occur with several colonies known to the writer.

NEPHRODIUM CRISTATUM x *GOLDIEANUM*. (Benedict.) Rare, known only from type station in Delaware county, where it was collected by the writer in deeply shaded wet gully. Neither alleged parent occurs within several miles, at least numerous searches have failed to disclose them.

NEPHRODIUM CRISTATUM x *MARGINALE*. (Davenport.) Wet thickets. Rare. Collected by writer in Delaware county and in Lehigh by Mr. Hamm.

NEPHRODIUM CRISTATUM x *SPINULOSUM INTERMEDIUM*. (Dowell.) Wet thickets. Rather rare. Pike, Montgomery, Susquehanna, Berks, Philadelphia, Somerset, Allegheny, Erie, Clinton, Delaware, Le-

high and Bradford counties. (*Nephrodium Boottii* (Tuck.) of other lists. Were it possible to examine the specimens upon which these records are based, it is quite probable that some would be found to be *Nephrodium cristatum x spinulosum* (Milde).

NEPHRODIUM GOLDIEANUM (Hooker). Goldie's Fern. Wet woods. Local, but occurs throughout.

NEPHRODIUM GOLDIEANUM X SPINULOSUM (Benedict). Rare. Known only from type station in Delaware county. Neither alleged parent occurs in the immediate vicinity of the plants, and *Goldieanum* not within several miles. (Originally described as *Nephrodium Clintonianum silvaticum* (Poyser).

NEPHRODIUM MARGINALE (L.) Marginal shield-fern. Rocky woods. Common. Tripinnate forms have been found.

NEPHRODIUM NOVEBORACENSE (L.) New York Fern. Dry woods and thickets. Common, throughout.

NEPHRODIUM SIMULATUM (Dav.) Dodge's Fern. Low, wet woods. Rare. Pike, Monroe and Schuylkill counties in the eastern portion of mountain belt. Reported from Chester county in Porter's list, but specimens I have examined seem better referred to *N. noveboracense*.

NEPHRODIUM SPINULOSUM (Muhl.) Spinulose shield-fern. Rocky woods and shaded banks. Infrequent throughout.

NEPHRODIUM SPINULOSUM DILATATUM (Hoff.) Broad wood-fern. Woods. The mountains and western plateau. Local. Susquehanna, Lackawanna, Pike, Monroe, Lycoming, Potter, Armstrong, Erie, Bradford and Allegheny counties.

NEPHRODIUM SPINULOSUM INTERMEDIUM (Muhl.)

Common spinulose shield-fern. Rich, wet woods. Common throughout.

NEPHRODIUM THELYPTERIS (L.) Marsh Fern. Swamps, wet woods and thickets. Common.

ONOCLEA SENSIBILIS (L.) Sensitive Fern. Swamps, wet woods and thickets. Common.

ONOCLEA SENSIBILIS OBTUSILOBATA (Torrey). Occasional. Several efforts on the part of the writer to produce this form by mutilation have only resulted in a reduction in number of the normal fertile stems.

PELLAEA ATROPURPUREA (L.) Cliff brake. Blue Fern. On rocks, preferring limestone. Very local. Northampton, Monroe, Chester, Montgomery, Dauphin, Northumberland, Cumberland, Lancaster, Franklin, Fulton, Bradford, Berks, Huntingdon, Westmoreland, Centre and Lehigh counties.

PELLAEA GRACILIS (Michx.) Slender cliff-brake. On limestone. Known only from Sullivan and Lycoming counties in the north-central part of the mountain belt. The southern limit of the species in the east (*Cryptogramma Stelleri* Prantl.)

PHEGOPTERIS DRYOPTERIS (L.) Oak Fern. Woods and shaded rocky slopes. Local, but occurs throughout.

PHEGOPTERIS DRYOPTERIS ROBERTIANA. (Hoff.) Limestone polypody. Reported in Porter's Flora from Union City, Erie county in the extreme northwestern part of the State.

PHEGOPTERIS HEXAGONOPTERA (Michx.) Broad Beech Fern. Woods and thickets. The common phegopterid throughout.

PHEGOPTERIS POLYPODIOIDES. Fee. Long Beech Fern. Woods and thickets. Locally abundant in the central mountain belt occasional or rare elsewhere.

POLYPODIUM VULGARE (L.) Polypody. Rocks. Common.

POLYPODIUM VULGARE *f.* MARGINALE. Gilbert. Named from material collected in Lancaster county by Waters. Since gathered by the writer in Delaware county.

POLYPODIUM VULGARE *var.* ROTUNDATUM. Milde. Reported in Gilbert's Monograph (*Fern Bulletin*, April, 1906) as having been found in Lancaster county.

POLYPODIUM VULGARE *var.* ALATO-MULTIFIDUM. Gilbert. Type collected by Edw. R. Heacock near Maunch Chunk, Carbon county, growing on red sandstone.

POLYSTICHUM ACROSTICHOIDES (Michx.) Christmas Fern. Rocky woods. Common.

POLYSTICHUM ACROSTICHOIDES INCISUM Gray. To be expected with the species. I have found it in situations that had apparently not been disturbed for years. (*P. A. Schweinitzii* (Beck) Small.)

POLYSTICHUM ACROSTICHOIDES CRISPUM. Clute. With the type reported from Allegheny county and no doubt occurs elsewhere.

POLYTICHUM BRAUNII (Spenner.) Braun's Holly Fern. Very rare. Finds its southern limit in Lycoming and Sullivan counties in northern part of the State.

PTERIS AQUILINA (L.) Bracken. In field, wood and swamp. Everywhere. (*Pteridium aquilinum* (L.) Kuhn.

PTERIS AQUILINA PSEUDOCAUDATA. Clute. Sandy wastes. Tinicune in Delaware county in the extreme southeastern corner of State which presents conditions similar to those in southern New Jersey where I find this form abundant.

STRUTHIOPTERIS GERMANICA. Willd. Ostrich Fern. Alluvial woods along streams. Local, but occurs throughout. (*Matteuccia struthiopteris* (L.) Todor).

WOODSIA ILVENSIS (L.) Rusy Woodsia. Cliffs. Very local and mostly confined to eastern half. Luzerne, Lycoming, Huntingdon, Bucks, Monroe, Northampton, Blair, Chester and Pike counties.

WOODSIA OBTUSA (Spreng). Obtuse Woodsia. Wooded rocky slopes. Common.

WOODWARDIA ANGUSTIFOLIA Sm. Narrow-leaved chain Fern. Shaded swamps. Rare in Pennsylvania, though quite common in the pine barren swamps of southern New Jersey. Bucks, Delaware and Monroe counties. (*W. areolata* (L.) Moore.)

WOODWARDIA VIRGINIA (L.) Sm. Common chain Fern. Swamps, open or shaded. Very local. Susquehanna, Pike Monroe, Northampton, Bucks, Centre and Delaware counties.

SELAGINELLACEAE

SELAGINELLA APUS (L.) Creeping Selaginella. Wet meadows and swamps. Abundant in the southeastern section, common or local elsewhere.

SELAGINELLA RUPESTRIS (L.) Rock Selaginella. On rocks. Scarce. Recorded from Pike, Monroe, Northampton, Bucks, Berks, Chester Lancaster and Philadelphia counties. All in the eastern half. Probably in the west, though I find no record.

MARSILIACEAE

MARSILIA QUADRIFOLIA (L.) European Marsilia. Pepperwort or Water clover. Credited to Delaware county in Keller and Brown's Flora of Philadelphia and vicinity. Undoubtedly an introduction.

LYCOPODIACEAE

LYCOPODIUM ALOPECUROIDES (L.) Fox-tail. Moist wastes. Rare and local. In Delaware and Bucks counties in the southeast. Porter's List credits it to Erie county in the extreme northeastern corner of the State, but there is good reason to doubt the record. Mr. Harry D. Bailey of Lafayette College writes me that the specimens on which this record apparently rests, are accompanied by an unsigned note, stating in part, "There is some doubt as to this being an Erie specimen, but I think it is."

LYCOPODIUM ANNOTINUM (L.) Stiff Club-moss. Very local. Confined to the mountains and reaching its southern limit in Somerset county. Monroe, Tioga, Sullivan, Centre, Huntingdon, Cambria, Bradford and Somerset counties.

LYCOPODIUM CHAPMANI Lloyd and Underwood. Chapman's Club-moss. Rare. Bucks and probably Delaware county.

LYCOPODIUM CLAVATUM (L.) Common Club-moss. Woods. Locally abundant in the northern portion of the mountain belt. Infrequent or rare elsewhere.

LYCOPODIUM COMPLANATUM FLABELLIFORME. Throughout, though most abundant in the mountain counties.

LYCOPODIUM INUNDATUM (L.) Bog Club-moss. Borders of swamps and wet wastes. Rare. Monroe, Tioga, Sullivan, Centre, Huntingdon, Cambria and Somerset counties in the mountain belt. Not recorded south of Pennsylvania.

LYCOPODIUM INUNDATUM BIGELOVII. Tuckerman. Reported from Delaware county in the southeastern corner. I am inclined to doubt this record as specimens examined seem better referred to *L. Chapmani*.

LYCOPODIUM LUCIDULUM (Michx.) Shining Club-moss. Low, damp woods. Common throughout. I have succeeded in growing this species in a small jardinere partially filled with water for six or seven months. After several months it has a tendency to bend over the edge of the receptacle and downward as if in search of soil.

LYCOPODIUM OBSCURUM (L.) Tree Club-moss. Rich woods and wet thickets. Rather local, but occurs throughout.

LYCOPODIUM SELAGO (L.) Fir Club-moss. Rare. Top of a mountain at the Delaware Water Gap in Monroe county. The only record.

LYCOPODIUM TRISTACHYON (Pursh.) Woods. Rare. Fayette, Huntingdon, Monroe and Wayne counties and probably elsewhere in the mountains.

EQUISETACEAE

EQUISETUM ARVENSE (L.) Field Horsetail. Roadsides, railroad banks, thickets, woods and swamps. Everywhere. The varieties, *decumbens* Meyer, *diffusum* Eaton, *nemerosum* A. Br., and *pseudosilvaticum* Milde have been collected.

EQUISETUM FLUVIATILE (L.) Water Horsetail. Open swamps. Local, but likely to be abundant when found. Tioga, Luzerne, Lehigh, Monroe, Northampton, Bucks, Bradford, Erie and Delaware counties. Is to be expected in suitable situations throughout.

EQUISETUM HIEMALE AFFINE (Eng.) Scouring Rush. Waste places. Rather local, but to be expected throughout. Northampton, Bucks, Delaware, Chester, Lancaster, Erie, Lehigh Berks, Bradford and Crawford counties.

EQUISETUM HIEMALE ROBUSTUM (A. Br.) Great

Scouring Rush. Waste places. Rare. Occurs in Delaware and Bucks counties. Probably the most eastern stations, though according to Eaton's Monograph, it is accredited to New Jersey by Milde.

EQUISETUM LAEVIGATUM (A. Br.) Smooth Scouring Rush. Reported from Northampton county, but probably a mistake for *Equisetum hiemale intermedium* A. A. Eaton which extends across New York and New England, but has not yet been recognized in this State.

EQUISETUM LITORALE (Kuhl.) Shore Horsetail. River banks. Rare though likely to be abundant when found. Northampton, Bucks, Delaware, Lancaster, York, Allegheny and Dauphin counties. Apparently not reported south of Pennsylvania.

EQUISETUM LITORALE ELATIUS (Milde.) Rare. Occurs at Safe Harbor, Lancaster county, along the lower Susquehanna according to Eaton's Monograph (*Fern Bulletin*, April, 1902.)

EQUISETUM PRATENSE Ehrh.) Shade Horse-tail. Sandy thickets along streams. Rare. Reported from Clearfield county, in central part of the State.

EQUISETUM SCIRPOIDES (Michx.) Dwarf Scouring Rush. Open woods. Credited to the State by various contemporary botanical works. I have been unable to locate specimens or definite records. The species is said to range from forty degrees northward, and should be looked for in the northern section of the mountain district.

EQUISETUM SILVATICUM (L.) Wood Horse-tail. Swamps and wet woods. Local, but occurs throughout.

EQUISETUM SILVATICUM SEROTINUM (Milde.) Swamps and wet woods. Erie and Huntingdon coun-

ties and should occur elsewhere together with other ecological forms.

EQUISETUM VARIEGATUM (Schleich.) Variegated Scouring Rush. Rare. Reported from Erie county in the extreme northern corner.

ISOETACEAE

ISOETES DODGEII (A. A. Eaton.) Dodge's Quillwort. Gravelly flats. Rare. On Delaware river shore in Bucks county, Lehigh river at Bethlehem, and in York and Bradford counties. Not recorded south of Pennsylvania.

ISOETES ECHINOSPORA BRAUNII (Englm.) Braun's Quillwort. Local. In lakes of the northern mountain district and probably elsewhere. Wayne, Lackawanna, Carbon Crawford and Erie counties.

ISOETES ECHINOSPORA ROBUSTA (Englm.) Rare. Recorded from Bucks county.

ISOETES ENGELMANNII (A. Br.) Englemann's Quillwort. Local. In lakes and streams. Monroe, Lehigh, Bucks, Delaware, Wayne, Lancaster, Susquehanna and Philadelphia counties.

ISOETES ENGELMANNII FONTANA (A. A. Eaton.) In spring water a few inches deep at McCall's Ferry, Lancaster county. Type station.

ISOETES ENGELMANNII GRACILIS (Englm.) Rare. Delaware and Buck counties and should occur elsewhere with the type.

ISOETES VALIDA (Englm.) Rare. Type locality in Lancaster county. Lebanon and Huntingdon counties.

ISOETES LACUSTRIS (L.) Lake Quillwort. Credited to Delaware county in The Flora of Philadelphia and vicinity (Keller and Brown). This was considered by Mr. Eaton as "Surely a mistake."

ISOETES RIPARIA (Englm.) River bank Quillwort. On the Delaware river shore of the southeastern plain in Bucks, Philadelphia and Delaware counties. Originally collected by Nuttall near Philadelphia and until recently was considered peculiar to the Delaware. As *Isoetes saccharata* is known to grow on the New Jersey shore of the Delaware, its discovery in Pennsylvania is to be expected.

Philadelphia, Penna.

LYCOPODIUM ADPRESSUM FORMA POLYCLAVATUM FROM SOUTH CAROLINA.

BY W. C. COKER, PROFESSOR OF BOTANY UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL.

This peculiar form of lycopod was first described from Staten Island, N. Y. by McDonald and Clute in the *Fern Bulletin* vol. 9, page 8, 1901, and has recently been again reported by Clute from Florida (*Fern Bulletin* vol. 17, page 45, 1909.) While collecting at Hartsville, South Carolina, on the upper edge of the coastal plain in August, 1908, I found a number of good specimens of this rare and interesting form. The plants were all growing together within an area of a few square yards near the edge of an artificial lake. From the accompanying photograph of five of these plants it will be seen that the characteristic proliferation at the top of the upright fruiting stems varies all the way from slender and quite separate branches to broom like confluent expansions that resemble fasciations. All or nearly all of these proliferations were sporebearing.

Is this peculiarity the result of some peculiar environment or accidental injury? It would seem at least possible that it is due to the cutting off of the

tips of the fruiting branches during active growth, as for instance, by some browsing animal. It would be interesting to try the results of the removal of the tips of the upright stems at different stages of growth.

June 15th, 1909.

Since writing the above, I have made another visit to Hartsville and made a further search for these forms, which resulted in the finding of an indefinite number of them. In two large areas in damp open flats near the edge of the same lake where the first collection was made *L. adpressum* was so abundant as to be almost the dominant vegetation over hundreds of square yards. Here, mixed with the typical form, the polyclavate plants were so abundant that the number secured was determined only by the patience of the collector. In this particular area *L. Carolinianum* is also found in large quantities overlapping to some extent the territory of *L. adpressum*.

It is interesting to compare the situations most affected by the three species, *Carolinianum*, *adpressum*, and *alopecuroides*, all of which are abundant at Hartsville. According to my observations *adpressum* is intermediate in its requirements between the other two, *Carolinianum* seeming to prefer a firmer somewhat dryer substratum than does the former, while *alopecuroides* is found in wetter situations than either, being happier in the sphagnum covered margins of branches, swamps and bays. *Alopecuroides* is perhaps most often associated with sphagnum, while *adpressum* is rarely so, and *Carolinianum* never.

In this journal for April, 1909, page 47, Mr. Clute gives it as his opinion that the normal plant of *L. adpressum* is "a mere ecological form; a northern extension of the well-known southern fox-tail club-moss *L. alopecuroides*." Now it is not easy to see how Mr.

Clute can hold this opinion when we consider that *adpressum*, like *alopecuroides* itself is more a southern than a northern form, that they grow abundantly in the same territory over a large part of the south, often intermingling, and that it is never difficult to distinguish them in the field. The easiest way to separate the two in the field is by the arching, more or less clambering stems, and more flaccid texture of the former. Usually of course, the long and widely spreading leaves and sporophylls of the shoots, which gives them a not remote resemblance to the tail of a belligerent cat, will distinguish *alopecuroides* at a glance; but this character is not always so pronounced.

The difficulty of separating *adpressum* from forms of *inundatum* where the two meet in the middle and northern states is admitted, but much experience with *adpressum* and *alopecuroides* leads me to believe that they have a good title to specific distinction.

July 26th, 1909.

[It has fallen to the editor's lot to collect the so-called *L. adpressum* in numerous localities. He has brought in specimens from Long Island, N. Y., that puzzled Underwood to distinguish from *L. alopecuroides*. In all the locations where has seen "*L. adpressum*" growing it has been dryer than in the spots that produced *L. alopecuroides*. He is constrained to believe therefore, that *adpressum* is a form of *alopecuroides* due to a lack of moisture, and he is strengthened in this conclusion by the statement made above by Dr. Coker as regards the habitat of the two forms. Cold, as well as dryness has a dwarfing effect upon plants, and it may be assumed that this will account for the absence of *alopecuroides* forms from northern regions.—ED.]

PRONUNCIATION OF FERN NAMES

BY ADELLA PRESCOTT.

I had always supposed that any difficulties with the pronunciation of botanical names were due, partly to my ignorance of Latin, and partly to natural dulness, but when I found people who were neither dull nor ignorant, speaking with a careful precision that I well understood words that had often been stumbling blocks in my own ferny pathway, while others slurred them in a way that reminded me of the college professor who always wrote the *e* and *i* in words like *receive* exactly alike, placing the dot midway between them, I concluded that *some* of the difficulties, at least, were inherent, and not to be ascribed to the deficiencies of the students.

Having reached this conclusion I appealed to the editor of the *Fern Bulletin* for aid, to which he blandly responded that he would like to have me work out the problem myself and send the solution to the *Bulletin!* So I send these few hints hoping they will make the road to Fernland a little smoother for those who are just beginning to walk therein.

One thing that we unscientific folk miss (unless we are careful to look it up) is the helpful meaning of scientific names; for these names are not given arbitrarily but because they are descriptive, or at least suggestive, of the character of the plant. Most of them are formed according to the analogies of the Latin or Greek—mainly, I think, the Latin—and while the correct forms may always be found in a good manual it is not always convenient to look them up and the following rules may be found helpful, though perhaps not without exception.

The letter *c* at the end of a word is always sounded,

as *cul-ga-re*, *O-ni-den-se*; and when the *e* is followed by *s* it has the long sound as in the familiar word *Andes*.

In words that end in *ides* the *i* is long as in *cb-cn-o-ides*, while *a* at the end of a word has the sound of *a* in father as *bulb-ij-cr-a*. *I* ending a final syllable has the long sound, but ending an unaccented syllable has the sound of *e*; as in *Boottii* pronounced *Boott-e-i*.

Among consonants *c* and *g* are soft before *e i* and *y* and hard before *a o* and *u*. The soft sound of *c* is like *s* as in *in-ci-sum*, and the hard sound is like *k* as *cau-da-ta*. The soft sound of *g* is like *j* as in *frag-il-is* and the hard sound like *g* in *an-gus-ta-ta*.

The letters *ch* are hard like *k* as in the familiar orchid; and initial *p* before *t* is silent as in *Pteris* pronounced *te-ris*.

Words of two syllables always have the accent on the first. If the syllable end with a vowel it is long as *fra-grans*; while if it end with a consonant the vowel has the short sound as in *sim-plex*. I do not consider this rule of much importance as very few botanical names are so short. As at least one vowel is essential to every syllable in every word there will be as many syllables as there are single vowels or single vowels and diphthongs.

In conclusion let me say: Never pass a new word till you have established a "speaking acquaintance" with it, (which is quite a difficult thing from simply knowing it "by sight") and ere long you will find the combinations of many syllabled words slipping smoothly from your tongue to the envy of the uninitiated who think "*polystichun acrostichoides*" is a rare exotic though in its every day guise of "Christmas fern" is may be a familiar friend!

New Hartford, N. Y.

it might be caused by a late frost, but in following years the plants produced the same forms. I sent fronds to W. N. Clute and he considered it a form worthy of a name and called it forma *angusta*. Since first discovering it I have found plants scattered to a considerable extent through the swamp. It grows among plants of the normal type, there being more of the normal form than of forma *angusta* in any given area. I have this season found it in an open dry ledgy pasture several miles from the first station. The tips of the fronds in the open sunlight present a rusty brown shade. I have found plants that the lower portion of the fronds were normal and the tips contracted into the *angusta form*. I have a supply of material and any member wishing a frond may have the same by sending six cents to pay postage.

Brandon, Vt.

INDEX TO RECENT LITERATURE

Readers are requested to call our attention to any errors in, or omissions from, this list.

- BENEDICT, R. C. *The Type and Identity of Dryopteris Clintoniana*. Illust. Torrey, JI., 1909.
- CLUTE, W. N. *The Dwarf Spleenwort*. Illust. Fern Bulletin, Ap., 1909.
- CLUTE, W. N. *Traveling Ferns*. Fern Bulletin, Ap., 1909.—Reprint.
- CLUTE, W. N. *Rare Forms of Ferns*.—X. Illust. Fern Bulletin, Ap., 1909. Discussion of *Lycopodium alopecuroides adpressum polyclavatum*.
- LEE, E. L. *Asplenium Bradleyi in Alabama*. Fern Bulletin, Ap., 1909.
- PRESCOTT, A. *The New York Fern*. Fern Bulletin, Ap., 1909.

- PEASE, A. S. *Cryptogramma Stelleri* in *New Hampshire*. Rhodora, March, 1909.
- SAUNDERS, C. F. *Scolopendrium vulgare*. Fern Bulletin, Ap., 1909.—Reprint.
- SHEPARD, J. *How to Make Blue Print Paper for Fern Prints*. Fern Bulletin, Ap., 1909.
- SIMPSON, C. T. *Collecting in the Everglades*. Fern Bulletin, Ap., 1909.
- WINSLOW, E. J. *Notes on Nephrodium Hybrids*. Fern Bulletin, Ap., 1909.
- STONE, G. E. *The Power of Growth of Ostrich Ferns*. Torrey Bulletin, Ap., 1909.
-

THE FILMY FERNS AND MOISTURE.—One of the principal offices of the roots, stems and veins of ferns is supposed to be the supplying of water to the fronds, but the studies of Forrest Shreve lead him to conclude that the filmy ferns are not in this class. In a paper before the botanical section of the American Association for the Advancement of Science at the Baltimore meeting he stated that in the Hymenophyllaceae the leaves are the principal absorbing organs. Since most of the filmy ferns are inhabitants of tropical rain-forests living for the most part on the branches of trees remote from soil water, this is not unnatural. According to Shreve most Hymenophyllaceae can stand total submergence in well aerated water for a month, and will live and thrive without liquid water if kept in air of over 90 per cent. humidity. Even single leaves or parts of leaves will grow under such conditions. Very few filmy ferns can endure for any length of time a humidity as low as 70 per cent. though some hairy forms are able to do so.

EDITORIAL

The delay in issuing the present number is due to the fact that the editor has again been away from home. He realizes that this is a pretty good reason, but a rather poor excuse. He feels, however, that if he was always on time, it would cast more or less reproach on the other botanical publications, most of which appear occasionally. After all, we are all a bit inclined to fall behind in various things, though our intentions may be of the best. It is noticed in going over our subscription list that one or two have also been delayed in sending in their subscription. As a sort of a reminder of the fact we enclose bills for their perusal which will be found facing the frontispiece. Since delays are said to be dangerous we trust that they will take no unnecessary risks. And since 1909 is nearly gone, we suggest the precaution of renewing for 1910, as well.

* * *

When the Linnaean Fern Chapter of the Agassiz Association, which has since metamorphosed into the American Fern Society, was organized, its members were anything but skilled in fern matters and one of the main ends which it was hoped the organization of a society for fern study would accomplish, was the facilitating of exchanges between fern students. A large number of people have been helped to increase their collections in this way and the most altruistic spirit has prevailed. In a large number of cases, members have been glad to collect, press, label and pack the rare ferns of their region only asking that members who desired them should pay for their transportation. In view of the proposed Fern Exchange it may be added that the editor hopes the members who patronize

the exchange will continue also to keep up the good old practice of giving. The beginning members of our Society want all but the very commonest ferns. Indeed, we would not be surprised if an offer of the common polypody would find many applicants, for we do not all live in regions where the common polypody lives up to its name. So whether you exchange or not, don't forget to make the Society of use to new members, by offering them the interesting species of your region. Mention what you have to offer to the editor, name the amount of postage on each specimen, and he will do the rest.

BOOKS AND WRITERS

Volume 13, part 1 of "Contributions from the United States National Herbarium" is devoted to a second installment of studies of Tropical American Ferns by William R. Maxon. Several new species of Guatemalan ferns from the collection of Baron von Turckheim are described with notes on other species. In some observations on the bipinnate species of *Cyathea* one new species is described and in a revision of the West Indian species of *Polystichum* are several more descriptions of new species and various new combinations. All the new species of the revision are illustrated, a very commendable feature. It is not too much to say that all new species described nowadays should be accompanied by a satisfactory figure, otherwise we are warranted in assuming that the novelty claimed exists only in the imagination of the describer. We regret to note that this revision as usual has resulted in new names displacing several well-known old ones.

Of the sixty-one species of ferns and fern allies found in Great Britain, no less than forty-eight are

also found in North America. This singular duplication of our fern flora on "the other side" makes the literature of the ordinary British ferns of unusual interest to us. It was not so long ago, when for want of popular handbooks of our own on the subject, we resorted to such interesting little British guides as Cooke's "Fern book for Everybody" and Moore's "British Ferns," and even in view of the flood of recent American books on ferns, these foreign works have not lost their value and each new volume is welcomed by a considerable audience in America. The latest of these is a book by Edward Step entitled "Wayside and Woodland Ferns" the last of a series of volumes on plants treated in a similar way. In the present volume the author gives us a colored plate of every species as well as a photograph of the plant in its surroundings. The colored plates are not very remarkable but the photographs are excellent. There are also several illustrations of parts of fronds, sori, rootstocks, etc. Along with the plates is more or less matter of popular nature covering some 120 pages and giving information as to where the ferns grow, their reputed properties, folk-lore, etc. Each species is also described in untechnical language. The book is small enough to go into an ordinary pocket and is designed to accompany the fern collector on his rambles. It is published by Frederick Warne & Co., New York at \$2.35.

Early in the Autumn, Messrs. Ginn & Co. will bring out a small volume entitled "Laboratory Botany for the High School" by Willard N. Clute. In this book which is designed to cover a year's work in high school botany the author has departed considerably from similar manuals now in use. Instead of outlining what the

student is to see, or of giving general directions for the study of certain subjects, we have here a series of definite questions on the subject to be studied. Even with the best of present manuals, the teacher has been obliged to make outlines of his own if he expected his students to go thoroughly into the work, but the questions in this book will relieve the teacher of this task. At the same time the sets of questions are so flexible that new questions may be added or others eliminated at will. Preceding each study there is more or less information for the teacher, telling where to get the materials needed, how to prepare and preserve them and how to present the subject to the pupils. With such a book botany will almost teach itself, leaving the teacher free to assist backward pupils, to set up and take down experiments, etc. The first part follows the usual half year course in botany, beginning with cells and seeds and running on through stems, leaves, flowers, fruits, etc. The second part, which is designed to cover the second half year of botany takes up the "spore plants," beginning with the simplest. Here again may be noticed a departure from the usual, for instead of a series of types to illustrate evolution there is offered a study of evolution illustrated by typical examples. Other unique features of the book are glossaries of different terms following each section, outlines for the study of floral ecology and a key for outdoor study of trees. A series of thirty-six experiments in plant physiology is designed to acquaint the pupil with the main facts relating to this subject by the use of the simplest materials. The book is written by a high school teacher for high school teachers and it is hoped that all live botany teachers will at least investigate its merits and methods.

THE AMERICAN FERN SOCIETY

President, Prof. E. J. Winslow, Elmira, N.Y.

Secretary, Prof. S. L. Hopkins, Central High School, Pittsburg, Pa.

Fern Students are cordially invited to join the Society. Address either President or Secretary for further information. The Fern Bulletin is sent free to members. Annual Dues are \$1, and should be sent to Mr. H. G. Rugg, Treas., Hanover, N.H.

The wife of Henry Merrill died May 13th, after a long illness.—H.

Prof. E. J. Winslow will take up his residence in Auburndale, Mass. about Sept 1, where he will have charge of the science work in Lasell Seminary.—H.

Mr. Floyd has found it necessary to resign the office of Treasurer and Mr. Harold Goddard Rugg, of Hanover, N. H. has been appointed for the remainder of the year.—H.

In a circular letter signed by the President and recently sent to members is a sentence which is worth reprinting. It is as follows: "Send items of news for publication in *The Fern Bulletin* to the Secretary. Do not be over modest but report all changes of residence, botanical excursions, weddings, elections to office, etc. This will help us to get interested in each other. Do not hesitate to send to members of the Executive Committee any criticisms and suggestions regarding the conduct of Society affairs."

The following new members have recently joined the Society: Mrs. Clement B. Penrose, 182 West Cheltenham Ave., Germantown, Pa., C. M. Goethe, 2615 K St., Sacramento, Calif. The address of Mrs. M. A. Noble is to be changed to Iverness, Fla., and that of Miss H. Mary Cushman to 3301 Powelton Ave., Philadelphia, Pa. Miss Cushman will teach botany in the Girl's High School in Philadelphia during the coming school year.—C.

ALL THE AMERICAN FERN BOOKS AND SOME OTHERS

Ferns of Kentucky, Williamson (Out of Print.)	
Ferns of North America, D. C. Eaton, 2 vols. (Out of Print.)	
Fern Collector's Handbook, Sadie F. Price. (Out of Print.)	
Ferns in Their Homes and Ours, Robinson. (Out of Print.)	
Ferns of the West, Marcus E. Jones, paper.....	\$.50
Ferns and Fern Allies of New England, Dodge.....	.50
New England Ferns and their Common Allies, Eastman.....	1.33
Our Native Ferns, Underwood, 6th Ed.....	1.08
Ferns, Waters.....	3.30
Our Ferns in Their Haunts, Clute.....	2.00
How to Know the Ferns, Parsons.....	1.60
Fern Allies of North America, Clute.....	2.00
Fern Collector's Guide, Clute.....	.54
How Ferns Grow, Slosson.....	3.25
Ferns and How to Grow Them, Woolson.....	1.17
Fern-wort papers. Paper.....	.25
Ferns of the Upper Susquehanna, Clute. Paper.....	.15
Boston Meeting Papers. Paper.....	.25
Index to Vols. 1-10 Fern Bulletin. Paper.....	.25
North American Pteridophytes, Gilbert. Paper.....	.25
Ferns of Iowa, Fitzpatrick. Paper.....	.20
Mosses and Ferns, Campbell, 1st Ed.....	4.00
Mosses and Ferns, Campbell, 2nd Ed.....	4.50

FOREIGN WORKS

Ferns of Nicaragua, Shimek. Paper.....	\$.50
The Fern Allies, Baker.....	1.25
A Fern-book for Everybody, Cooke.....	.50
Book of Fern Culture, Hemsley.....	1.08
Wayside and Woodland Ferns, Step.....	1.75

Any of the above, to which a price is attached will be sent postpaid upon receipt of price. Out of print books may occasionally be obtained second hand nearly as good as new. The Fern Bulletin may be clubbed with any book listed at a dollar or more for 50 cents additional. A year's subscription will be given free with every order amounting to \$5.00 or more.

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Vol. XIII

No. 4

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The Fern Bulletin

A Quarterly Devoted to Ferns



Joliet, Ill.

Willard N. Clute & Company

1909



The Fern Bulletin



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POLYSTICHUM ACROSTICHOIDES MULTIFIDA.

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THE FERN BULLETIN

Vol. XVII

OCTOBER, 1909

No. 4

MOUNTAIN SPLEENWORT IN NORTH-EASTERN OHIO

BY ERNEST W. VICKERS.

In June, 1893, during one of his early excursions in Mahoning county, the writer was so fortunate as to discover a new station for that rare Ohio fern the mountain spleenwort. The county is one of the north-eastern Ohio counties, known as the Highland counties and belongs to the Alleghanian life zone. The matter was allowed to rest without publication until the extent of the fern's local distribution might be ascertained. Thus far, however, the station has proven to be confined to a solitary, gigantic, river-eroded rock—a sort of stone island, shaped not unlike the body of a huge unwieldy canal-boat or, better, like Noah's ark. This unique and interesting mass of sandstone stands in the Mahoning river which gives the county its name in Berlin township near Shilling's Mill.

The geologist finds in this isolated rock interesting material for study in the line of dynamic force and time. Originally a peninsular prolongation of a sandstone ridge or "hog's back" the river sweeping in on one side and a tributary stream on the other finally cut it loose from the main land. And there it stands one of the most picturesque pieces of water statuary in the whole valley of the Mahoning.

"Standing Rock" is known for many miles around

OV 30 1909

and here the visitor comes to dine out of a No. 9 shoe box and scale its almost dangerous sides. The bather may take a high dive into its pool on the deep side or the disciple of Izaak Walton may cast his lure. How often it has sat for its picture so that people far away who perchance never never saw or heard of it may have its souvenir post cards. But it is of equal if not greater interest to the botanist for its flora, being one of the three or four stations in Ohio for *Asplenium montanum*. Small tufts of the plant are found growing below the middle line of the rock, just above high water. And as ice frequently jams at this point forming gorges in the valley behind, it is probably not surprising that so few plants grow there. According to Kellerman and Werner's "Ohio Plants" 1893, *A. montanum* is credited to Elyria, Lorain county, Lawrence county, Cayahoga Falls, Summit county and Clifton, Green county.

In his "Fern Flora of Ohio" Prof. Lewis S. Hopkins says that it is represented in the Ohio State Herbarium by specimens from Summit county, and records the collection of excellent specimens at Graber's Rocks, Tuscarawas county, Ohio. Having no specimens from other stations grown under different conditions, I am unable to say whether the fronds of my collection are up to the average or not. They are at least very fertile. As the plants are not numerous nor fronds plenty I have taken specimens very gingerly being exceedingly loth to reduce the station by so much as a single plant. As I am sending some of the best fronds collected to the Editor, he will kindly make note in passing, whether he thinks the plants are growing under what is normal or typical environment. They cling by

slender foot-hold in such clefts in the rock where nothing stronger rooted could grow.

Ellsworth Station, Ohio.

[The fronds sent were not much smaller than normal. Apparently the fern finds a rock crevice quite acceptable as a home.—Ed.]

RARE FORMS OF FERNS.—XII.

POLYSTICHUM ACROSTICHOIDES MULTIFIDA.

In this journal for July, 1907, a form of the Christmas fern having bipinnatifid pinnae was described as forma *multifida*. The description there given, however, appears not to have adequately described the form or, rather, it did not indicate all the vagaries of which the specimen in question is capable. Our frontispiece gives a clearer idea of the case. Of the four fronds there illustrated, the two nearest the center are from the original plant, while the two on the outside are from new plants raised from divisions of the original. But this is not all. The owner, Mr. William A. Terry, writes that young fronds now being produced by this plant are still more finely cut, each pinna being divided into numerous stalked pinnules and even the earlike projections of the original pinnae are pinnatifid. The plants are also increasing in luxuriance some specimens already standing nearly three feet high with fronds eight inches wide. The specimens photographed were but 19 inches high exclusive of the stipes.

In this remarkable specimen we seem to have a form in the making. It is not stationary as a mere bipinnate form but responds to a changed and protected environment with still more finely divided fronds. The species is not a distant relative of *Nephrolepis exaltata*,

the exotic fern that has yielded more desirable varieties to the cultivator than any other, and it is practically certain that our native species may be induced to do something similar, or even better. The ordinary Christmas fern is valued for decorative planting, and the new form, like the species, being perfectly hardy, while *Nephrolepis exaltata* is not, will have unusual value for out of door planting. Unfortunately the fern is slow to multiply. Up to the present, all new plants have originated from divisions of the crown, but it is likely that other ways of increasing it will be found.

GRAPE FERNS.

BY ADELLA PRESCOTT.

One who thinks of a fern as a graceful plant, tall and stately like the ostrich fern or dainty and exquisite like the maidenhair or oak fern finds it hard to believe that the *Botrychium* with its short fleshy stalk and spreading horizontal blade has even a remote relationship to so elegant a family. But an examination of the fertile part of the frond will convince the most skeptical (if he has any real knowledge of ferns) that these sturdy plants are surely ferns though some degrees removed, perhaps, from the highest forms, and while they lack the stateliness of some and the daintiness of others they yet have an attractiveness all their own in the rich coloring of their substantial fronds and the sturdy common sense that makes these late comers keep close to the ground where they are soon snugly covered by the falling leaves. *Botrychium Virginianum*, the rattlesnake fern, is perhaps the tallest member of the family and, making its appearance in early summer, has something of the delicacy and grace

that we commonly associate with ferns, but the ternate grape fern or *Botrychium obliquum* does not appear until July or August—the latest to arrive of all our ferns.

Between these two extremes come several of the small *Botrychiums*—the tiny moonwort by whose magical power the shoes are drawn from the feet of the newly shod steed; the little grape fern, the lance-leaved, and others which in spite of their wide range are rarely found, either because of their diminutive size which causes them to be easily overlooked, or because they are really rare, or at least very local, in distribution. You may look for them in rich woods or old pastures where the ground is moist but not wet but it will be a red letter day indeed when you find them!

But while many of us must get our knowledge of these rare forms from books or the herbariums of more fortunate collectors we who live in the north-eastern States may quite probably find on some sandy hillside or beside some old pasture fence the common grape fern, *Botrychium obliquum*, with some or all of its varieties. It is a very fleshy plant and seems to share the mechanical difficulties of fleshy people for it is only bent over in the bud instead of being coiled in the manner characteristic of ferns. The root-stock is short with numerous fleshy roots and the stalk rises from six to eighteen inches in height—rarely the latter—and the somewhat triangular blade springs from the common stalk near the base. It is twice pinnate with stalked pinnae and lobed or incised pinnules the lowest pair of pinnae being nearly as large as the rest of the frond.

The fertile part of the frond is three times pinnate, much taller and quite erect. The pinnules of the

sterile frond are quite variable in cutting; more so than one would realize without a careful comparison of specimens though several forms are so distinct as to be regarded as varieties if not species.

Perhaps the most attractive of these varieties is *dissectum* a fairly constant companion of *obliquum* and about the same size but with pinnules much divided and ending in y shaped segments that give it a lightness and grace lacking in other members of the family. *Intermedium* has a super-abundance of pinnules that lap and overlap in the press, while *Oneidense* like a middleaged matron (of by-gone time) is plain and severe in outline scorning all suggestion of frills. All are interesting and give zest to the excursions of late summer when many ferns are past their prime.

New Hartford, N. Y.

OPHIOGLOSSUM VULGATUM IN ONTARIO.

By F. J. A. MORRIS.

In spite of what you have published on the subject. I was, till the middle of July 1909, under the same impression as most amateur botanists that the fern was rare and local. On July first I found by accident about a score of these ferns in the corner of an upland pasture. Investigation disclosed hundreds up and down both banks of a little brook near Garden Hill ten miles north of Port Hope. About July 20th I was fern hunting with an old Oxford chum near Lanark, Ontario and while examining a fine clump of interrupted fern which was surrounded by sterile fronds of the native fern, I once more, by accident spied a group

of the adder's-tongue. Further search revealed a populous colony.

Three or four days later at the Rideau ferry while my friend was inspecting some *Botrychium ternatum* on the turf-grass margin of a beaver meadow he spied the adder's-tongue and we soon ran to earth an extensive colony. We showed the plant to an old pupil of mine who is working a mica property in the township of Burgess. He said he was sure it grew "out at the mine." This we ventured to doubt, for we still clung fondly to the fair illusion of its rarity. He drove us to the mine and we found the plant in and about two moist hollows of beaver-grass. Till then our finds had been accidental and we had stumbled on a singly colony in three distinct localities, but that day we went deliberately to likely places and in two out of three beaver meadows that we examined, the adder's-tongue was growing.

That was the last week of July and we spent August in the Algonquin Park, one of Ontario's Provincial forest reserves. As there are no meadows and few clearings we no longer thought of *Ophioglossum*. At the beginning of September my friend having sailed for Liverpool I returned to the Rideau and on a visit to the little brook where we had found the *Ophioglossum* a month ago, I found the beaver grass had been mown and the *Ophioglossum* had faded yellow and was quite easily detected. It was quite sad to see how many of the spikes of the fern had been mutilated by the mowers. I found four colonies of the plant established on both banks of the little stream over a space of about a quarter of a mile. Then I spent two days at the mica mine and found four more colonies in various parts of the property.

On September 12th I returned to Port Hope and spent a fortnight in scouring the neighborhood. Briefly the results are as follows: On the outskirts of the town in rolling country extending over half a square mile which we call Monkey Mountain I have found the adder's-tongue abundant up and down and on both banks of three separate brooks as well as in the folds of the grassy valleys that traverse the district. In similar country near Quay's crossing, four miles north of the town, I have found six distinct colonies one of them numbering many hundreds of plants. In similar country six miles east of the town I have found three very large and populous colonies of this quaint little fern.

On October 3rd, while walking across country some seven miles north-east of here, I found three more stations for *Ophioglossum*. The first two containing each a few plants faded and with fertile spike in the proportion of 30 to 60 percent. Both had the plants growing on peaty hummocks of turf grass within or round the margin of marshes filled with *Nephrodium thelypteris*. The third containing some hundreds of plants in a dry hummocky pasture. Many of the plants were quite green with fruit spikes not yet fully grown.

I may add that while "old pastures" seem its favored location these are never the lush green grass of cow pastures, but upland meadows of the sheep pasture sort. The grass is more like mountain turf, often with an admixture of moss and a diminutive cyperus. The hummocks upon which it grows plentifully are usually rotted open at the top and not seldom crowned with the barren fronds of *Nephrodium thelypteris* or stunted *Onoclea sensibilis*. The adder's-tongue is us-

ually round the base and sides of hummocks. The plants that are still green and growing are always exposed in the short turf. Whenever the plant has had shelter by growing under a cedar or in sedge grass or in a clump of tall *thelypteris* it has fruited in July and faded. I gathered three such plants a week ago and their height was respectively, 9, 11 and 12 inches. The plants that are only now in season range from half an inch to four inches in height. Though thus stunted they are evidently healthy and at least fifty percent of them fruit abundantly.

Port Hope, Ontario.

BOTRYCHIUM LANCEOLATUM IN NORTHERN VERMONT

BY E. J. WINSLOW.

Last July while botanizing in the vicinity of Jay Peak, Vt., I found in the woods near the base of the mountain a single specimen of *Botrychium lanceolatum*. The plant was small but unquestionable. It was my first collection of this species, and the first I have seen reported from that part of the state. Eggleston, in the "Fern Flora of Vermont," (*Fern Bulletin* XIII, 2), says in two places that *B. lanceolatum* is only found in the lowlands of the southern part of the state. So this find almost on the Canadian line and at an elevation of upwards of 1500 feet seems worthy of note. Like most of the States, Vermont has large areas practically unexplored by botanists, and it is unsafe to say that any plant with a northward range is confined to a particular part of the state.

✓ **HYMENOPHYLLUM DENTICULATUM IN
CENTRAL CHINA.**

BY OTTO E. JENNINGS.

There was recently sent to me for identification a very pretty little fern which had been collected in August of this year by Mr. William Millward of the Nanking Methodist Mission while he was visting a summer resort, Kuling, in the mountains near Kiukiang, China.

The specimen turns out to be a rather under-sized but otherwise very typical plant of *Hymenophyllum*



denticulatum as described by Swartz in 1800 from specimens collected in Moulmein, Burma. Later, as reported by C. B. Clarke in the Transactions of the Linnaean Society for 1880, the fern had been found quite plentiful around Cherra Station in northern India, at Bhutan in the eastern Himalayas, and frequent at Khasia in Assam at an altitude of 4000 to 5000 feet. Christensen in 1906 gives the distribution of this

species as tropical Asia. It has been found in the Malay Peninsula and Islands.

From what has been said of the distribution of this plant it will be seen that our specimens are of considerable interest in that the natural range of the species is thereby extended to the north and east by about 1000 miles. The small size of the plant might, of course, explain why it has not before been reported from this region, even though it may not be uncommon there, and this possibility makes the discovery of the species of even higher interest to one interested in its distribution.

The drawings show a plant natural size with enlarged detail drawings of certain portions, as indicated by dotted lines.

Carnegie Museum Herbarium, Pittsburgh, Pa.

HUMUS-COLLECTORS AND MYRMECOPHILOUS FERNS IN THE PHILIPPINES.

The amount of study which has already been devoted to two of the most extraordinary specializations of ferns, those for collecting humus and for association with ants, spares me the necessity of entering into the details of either. Of humus collectors, we have at San Ramon, the nest-builders, *Asplenium musae-folium*, *A. phyllitidis* and *Drynaria rigidula*; *Polypodium punctatum* which makes brackets of leaf-bases interlaid and overlaid with humus and detritus which are sometimes 15 centimeters broad and almost as deep but which does not normally form round nests; *P. heracleum* and *Drynaria quercifolia*, which in their best development, form spiral brackets the supporting leaves being in a single series but imbricate; and *Thay-*

eria which makes a perfect independent receptacle of each leaf. Other Philippine humus-collectors are *Dryostachyum splendens* in Mindanao and Luzon and "*Polypodium*" *Meyerianum* in Luzon.

In its humus-collecting structures, *Thayeria* is wholly unlike any other known plant, the specialization having gone beyond the frond to the rhizome. Each leaf is a unit, a complete receptacle, wholly out of contact with the main rhizome. It is the most perfect of the humus-collecting organs developed in its group, the material being enclosed on all sides and protected from dessication with a thoroughness not attained even by *Asplenium nidus*. The specialization of the branch-end as a root-bearer in the bottom of the cornucopia is a very novel feature.

Our two remarkable myrmecophilous ferns, *Polypodium sinuosum* and *Lecanopteris* have recently been thoroughly studied by Yapp in which paper the previous literature is summarized. With regard to the anatomy there is nothing essential to add; but with regard to the significance of the bizarre form and structure of these and other myrmecophilous plants of this region, Yapp followed Treub and Goebel in a puzzling over-sight of the service rendered the plant by the ants, which insects furnish their hosts with mineral food.

Our myrmecophilous plants are, without exception, epiphytes. As such they are exposed to dearth of water and dearth of mineral food. When they protect themselves against the former by using devices to reduce transpiration, they aggravate the latter difficulty. Epiphytes have many ways of overcoming the difficulty of obtaining their mineral food, such as the maintenance of remote ground connections, the ac-

cumulation of an aerial "soil" in the mossy forest and in tree-top gardens at lesser altitudes; especial humus-collecting structures such as have just been described; the insectivorous habit in *Nepenthes* and the attraction of insects for the debris they bring or for their excreta or their carcasses as with the plants now under discussion. The plants waste none of their parts for the support of the ants, offering them only a tolerably moist shelter and this is very evidently a sufficient inducement for the ants to seek them for I have never found a healthy individual of one of those plants without its tenants. The latter are not specialized in adaptation to their specific hosts for the same ant inhabits the chambers of different plants; for instance, I have found one kind in *Polypodium sinuosum*, *Myrmecodia* and *Hydnophyllum* all in a single tree.

Although ants have not the reputation of being untidy house-keepers, the chambers which they occupy are never entirely clean. The plant can of itself, effect the quick removal of liquid ejecta; it can get rid of solid ones only as they are dissolved. I have found a fungus in an apparently healthy *Polypodium sinuosum* growing in the lining of the chamber and at first I imagined it might be analogous in function to mycorrhiza, but it is not always present and it is probably merely accidental. Both of these ferns are without roots other than such as are necessary for their firm attachment and they habitually grow on bare branches, without any mass of epiphytes; therefore they would be in special straits for mineral food if it were not for their tenants ants. Nevertheless they are conspicuous for the ready falling of their leaves conclusive evidence that they are not in practice obliged to husband their ash constituents. The fact that *Polypodium*

sinuosum can live after its chamber is plugged (Goebel) and that *Hydnophyllum* and *Myrmecoidea* can grow and develop their chambers without the presence of ants (Treub) does not prove that ants are useless to the plants any more than the power of *Drosera* to live under favorable conditions without insects is a demonstration that the plant is not insectivorous. Of the two ferns, *Lecanopteris* is the more highly developed in myrmecophily, not only in grosser, conspicuous characters, but also in the perfection of its chamber, the walls of which, described and figured by Yapp, are made up of pockets which are doubly serviceable as collectors of possible food and as increasing the absorbing area.

The doctrine that these stems are enlarged water reservoirs and chambered and the reservoir tissue removed because they are too fleshy has a fit companion in that other which interprets the leaves of *Dischidia* as protectors of the roots but does not tell us what purpose roots serve in such a place. As a matter of fact these plants are also myrmecophilous, the leaves furnishing shelter for the ants and the ants furnishing food which the roots absorb. *Dischidia* is rarely without ants and rarely without a considerable amount of debris brought by them about the root inside each leaf. There are other Asclepiadaceae, epiphytic without evident structural modifications, the roots of which are invariably in aerial ants nests. In all these cases it is likely enough that the plant derives some organic as well as mineral food from its tenants.—*From an article on Sam Ramon Polypodiaceae in Philippine Journal of Science.*

THOMAS MINOT PETERS.

The smallest fern in the United States is named *Trichomanes Petersii* and commemorates a distinguished Southern botanist about whom, however, little seems to be known. We therefore publish the subjoined sketch from "Plant Life in Alabama" sent us by Dr. E. L. Lee.

Thomas Minors Peters, of New England parentage, but a graduate of the University of Alabama was engaged in the practice of law until his death June 14th, 1888. He served his state as a representative in the legislative assembly and afterwards as State Senator. In 1869 he was appointed a judge of the Supreme Court for a term of six years. In his love of Botany he found recreation from his professional duties, and his greatest enjoyment was to wander through the adjacent mountains in search of plants. The study of Lichens, and fungi attracted him particularly, and he was one of the few Mycologists, working in the southern field along with Curtis and Ravenel. Of his zeal and activity in his line, the long list of southern fungi, of his contribution published by M. A. Curtis and Berkley bears ample testimony. He was also a close observer and accurate student of the plants of higher orders. He first brought to light the delicate and extremely rare fern *Trichomanes Petersii* described by Gray with others like it hidden in the dark recesses of rocky defiles, and the so-called "rock houses." He gave close attention to the species of *Carex* furnishing the investigators of this difficult genus with material from a region unknown to botanists. In acknowledgment of the services rendered him, Boott of London, one of the first authors on these plants presented him with a copy of his magnificent work, "Il-

illustrations of the Genus *Carex*." These classical and valuable volumes Judge Peters bequeathed to the University of Alabama, his Alma Mater together with his mycological herbarium and collection of carices all mounted and labeled. In 1880 the writer had the privilege of enjoying the company of this venerable botanist during his investigation of the forests in Laurence and Winston countries, and also received from him much valuable information on the mountain flora of the state.

PTERIDOGRAPHIA.

NEW STATION FOR MOUNTAIN SPLEENWORT.—Dr. L. G. Pedigo reports the recent finding of *Asplenium montanum* on the summit of Bald Knob in Virginia at an altitude of 4,500 feet.

A VARIANT OSMUNDA.—Through the kindness of Miss S. E. Hilt, we have received specimens of *Osmunda cinnamomea*, collected at Petersham, Mass., in which the margins of all the pinnules are revolute making a close resemblance to *Osmunda cinnamomea* f. *Angusta* recently illustrated. If this new form retains its unusual character it may prove worth naming.

SCHIZAEA PUSILLA IN NEWFOUNDLAND.—In *Rhodora* for May, E. H. Eames notes the finding of *Schizaea pusilla* in a salt marsh near the railway at Bay St. George Newfoundland. Of the other stations for this fern in Newfoundland that of Waghorne was in the vicinity of the Bay of Islands, 125 miles away and that of La Pylaie was probably on the French Islands. The discoverer of the new station reports as follows: "The plants were somewhat smaller than in

New Jersey, and as is sometimes the case they were more or less associated with *Aster nemoralis*. As particularly indicating the situation may be named *Xyris montana*, *Juncus stygius Americana* and *Bartonia iodandra* any of which may sometimes lead to other finds of this fern." The island abounds in situations of the same character, this tract alone covering many square miles.

POLYPODIUM VULGARE AURITUM.—On August 1st. in company with Mr. and Mrs. A. E. Scoullar and Mr. Henry W. Merrill, I searched several ledges in Standish for forms of *Polypodium vulgare*. We found a number of specimens of *Polypodium vulgare auritum*, eared on the lower side of the pinnae only, and it was also our good fortune to find a few specimens of *Polypodium vulgare auritum* (Merrill), eared on the upper side of the pinnae only.—*Alice M. Paine, Sebago Lake, Maine.*

THE RED-STIPED LADY FERN.—Why is so little interest shown in the *rubrum* form of the lady fern? In this locality it is the first fern to unroll its fronds. We find it growing with the type, in the same soil, and same exposure to the light. Yet while one has a green stipe and rachis the other has both of a beautiful wine color, and often the midveins and blade have the same color in a lighter shade. Three seasons ago, I transplanted a plant of each fern, which I found growing side by side in a moist woodland, into drier soil, and an eastern exposure. The type has taken on a lighter hue and the segments are broader than before. The *rubrum* remains the same retaining its color in both stipe and rachis throughout the season. The same year that I transplanted them, I potted a small *rubrum*

and have wintered it in a cool cellar. Each spring it comes up true in color but the fronds are long and drooping, covering the side of the pot and lying on the table.—Mrs. A. E. Scoullar, Sebago Lake, Maine.

SHELTER ISLAND FERNS.—Shelter Island is a small island at the east end of Long Island, New York. The country is not one particularly favorable for ferns, but no less than sixteen species are known to grow there. The following list has been sent us by Miss Lavinia E. Chester: *Pteris aquilina*, *Asplenium ebeneum*, *A. filix-foemina*, *Nephrodium thelypteris*, *N. noveboracense*, *N. cristatum*, *N. marginale*, *N. spinulosum*, *Polystichum acrostichoides*, *Dicksonia pilosiuscula*, *Onoclea sensibilis*, *Osmunda cinnamomea*, *O. regalis*, *O. claytoniana*, *Woodwardia Virginica* and *Botrychium ternatum*. Doubtless several others will be found when every nook has been searched.

THE FERTILE SPIKE OF OPHIOGLOSSUM.—After a study of the vascular system of the sporophyte of the Ophioglossaceae M. A. Chrysler supports the view that the fertile spike is to be regarded as consisting of two fused pinnae. This is true of the species of *Botrychium* in which the fertile spike has a double vascular supply. The allied genus *Ancimia* is remarkable for always having two fertile spikes on each frond, both springing from the base of the frond and very evidently transformed pinnae. In view of this the double vascular supply to the *Botrychium* spike is quite according to nature. The Ophioglossaceae have always been regarded as a very ancient and simple family of ferns, but if the new view is correct, they may now be considered rather highly specialized.

ANOTHER COMPLETE SET.—Still another complete set of *Fern Bulletin* may be recorded. Mrs. Wm. F. Brooks, New Britain, Conn., has completed her files. This is the thirtieth set to be reported.

NEPHROLEPIS MAGNIFICA.—Another form of the well known Boston fern has appeared and has been named *Nephrolepis Magnifica*. It is a course, more properly called *N. exaltata* forma *magnifica*, and appears to be but another of the many cut-leaved sports of this fern. Additional named forms may be expected until the gardening craft uses up all the superlatives.

HERBARIUM OF B. D. GILBERT.—One of the finest of private fern herbariums was that made by the late B. D. Gilbert. It was accumulated by much collecting and exchanging and the naming of the specimens had been very carefully done. Shortly after the death of Mr. Gilbert, his library and herbarium were given to the Utica Public Library where they are at present. It is to be hoped that some provision will be made by which fern students will have access to the fern collection.

FERNS OF THE MALAY REGION.—In the *Philippine Journal of Botany* for April, 1909, E. B. Copeland has begun an enumeration of the ferns of the Malay-Asiatic region. The first part is devoted to the species not included in the Polypodiaceae and Hymenophyllaceae. In this part is also included a natural and an artificial key to the families of ferns and similar keys to the genera and species are found in the text. Each species is described and its range given. One notes in a cursory examination of this part, many familiar names of genera in-

cluding *Ophioglossum*, *Botrychium*, *Marsilia*, *Salvinia*, *Azolla*, *Osmunda*, *Lygodium*, *Schizaea* and *Ceratopteris*. Often the identical species with which we are most familiar are listed. Some idea of the great variety of tree-ferns that occur may be gained from the fact that 101 species of *Cyathea* (including *Hemitelia* and *Alsophila*) are listed. Not the least valuable part of the work are the twenty-one full page plates illustrating each genus treated.

TREE FERNS.—The development of an erect trunk and consequent formation of a tree fern appears to be due to a constantly humid condition of the atmosphere being maintained as then the roots springing from the bases of new fronds are not starved. Most of the crown-forming ferns maintain life in their old caudices to a distance from the growing terminal. Some display a tendency to raise the caudex perpendicularly while others push it horizontally. Our *Lastrea pseudo-mas cristata*, a variant of the tough evergreen species *L. filix-mas* has formed in my collection an erect trunk eighteen inches high under glass and this being wetted whenever the plant is watered has at the present time no less than 28 four-foot fronds forming a good specimen of the British tree fern. By the way few tree ferns produce thorns on the caudex. Your article gives one the impression that it is a general character. What is the species referred to?—*Chas. T. Drury, F. L. S., London*. [To one who has collected among tree ferns, Mr. Drury's question about the thorns will be astonishing. *Hemitelia horrida* is so named because of its stout sharp thorns and several other species have thorns either on the trunk or on the stipes where they join it. Almost all the American *Alsophilas* are thorny or prickly as their names often indicate. Some of the prickly species that come to mind at present are *A.*

aspera, *A. armata*, *A. infesta* and *A. sessilifolia*. Of the *Cyatheas*, we may mention *C. Concinna*, *C. Tussacii* and there are plenty of others. So far as the editor's observation goes, prickly tree-ferns are by no means rare.—Ed.]

STILL ANOTHER NEPHROLEPIS.—The naming of new forms of the old Boston fern (*N. exaltata*) goes merrily on. The latest is, to give the full name, *Nephrolepis exaltata elegantissima compacta*. It is a compact form of that plant with much-divided fronds known as *Nephrolepis elegantissima*, but in reality a form of *N. exaltata* as indicated above. While the names given to plants by gardeners and florists have very little significance to the scientific botanist we shall be none the worse for keeping these trivial names in mind. Although rather cumbersome and usually gradiloquent they represent forms that are quite distinct from the view point of the cultivator.

PERMIAN FERNS.—The note on Coal Measures ferns in the January 1909 *Fern Bulletin* called to mind a deposit of Permian ferns or fern-like plants discovered in 1906 by one of the field parties of the University Geological Survey of Kansas. We were mapping the Permian-Dakota contact in Washington County, Kansas and noted a fern horizon in a layer of limestone concretions near the top of the Winfield (?) limestone. The next day we returned to the exposure with some tools and opened up the deposit. By properly splitting the limestone, whole fronds were exposed in an almost perfect state of preservation. A large quantity of the material was shipped to the University of Kansas where it was identified by Prof. E. H. Sellards and will soon be published, along with other Permian plants.
F. C. Greene.

A CORRECTION.—In my article in the April *Bulletin*, page 36, line 15 for *N. Clintonianum X spinulosum* read *N. cristatum X marginale* the typographical error arises from copying the fifth line below.—*E. J. Winslow*.

FOSSIL FERNS.—Rev. James A. Bates asks for information regarding fossil ferns. Who has studied them and where can the literature of the subject be obtained? The United States Government has issued several quarto volumes with numerous plates on the fossil flora of various coal measures but we know of no complete list of such publications. If any of our readers can supply additional information we shall be glad to publish it. It is about as easy to recognize the common genera of fossil fern-plants as it is to recognize modern genera, and various species can usually be as readily distinguished. The region immediately south of the home of the *Fern Bulletin* is famous for its coal fossils and has recently yielded new material that throws an important light on the origin of the flowering plants. Every mineral collection, hereabout is sure to contain specimens of fossil ferns which may be had for the picking up about the dumps of many mines.

MORE NEPHROLEPIS "SPECIES."—Gardeners everywhere ought to be thankful that a single variable species of fern is likely to produce forms enough to allow each grower to name one after himself. The namers of the new forms of *Nephrolepis exaltata* have not the slightest idea of nomenclature, except the fact that if one adds an i to the end of his name and adds this to the generic name of the fern in question it is supposed to be named for him. That the canons of good taste forbid that anybody should name a species or variety

for himself seems never to have entered the heads of these makers of new varieties. Since the forms in question are all mere variations of *Nephrolepis exaltata* giving names to them can be looked upon as a harmless diversion. Nevertheless it seems desirable to keep track of these names and we therefore add to the list previously published the names *N. Pruessneri* (*N. exaltata* f. *Pruessneri*) and *N. Galvestoni* (*N. E.* f. *Galvestoni*). In the language of the country newspaper "let the good work go on."

POLLINATION AND FERTILIZATION.—It is singular how long a misconception in science can linger on in out-of-the-way parts of the world. One would think that by this time the essential difference between pollination and fertilization might be understood, but thousands of Darwin's countrymen continue to confuse the two. In a recent article on reproduction in ferns by an English author the statement is made that the sperms of ferns enter the archegonia and "fertilize the seed at their base precisely in the same way as pollen fertilizes the seed of flowering plants." Since pollen in no case ever "fertilizes a seed" in any kind of a plant we fail to see where the "precisely" comes in. What pollen really does when it falls upon a stigma is to germinate producing a structure that is homologous with the structure formed by a spore in ferns; in fact, a pollen grain *is* a spore, exactly like the spores of ferns. The structure produced by the pollen grain produces sperms in its turn and these fertilize an egg which has been developed in the embryo seed. Pollination is the term used to indicate the application of pollen to the stigma while fertilization denotes the union of an egg and a sperm. Pollen grain and

sperm are so far apart that they do not even belong to the same generation, but because Darwin once wrongly used the term fertilization all loyal Britons continued to use it. Whether a fern springs from a seed or spore is of no particular significance to the collector, but if the processes intervening between asexual spore and fertilized egg are to be explained at all, it is just as well to have the matter right, and we repeat that neither sperms nor pollen grains ever "fertilize a seed."

INDEX TO RECENT LITERATURE.

Readers are requested to call our attention to any errors in, or omissions from this list.

- CLUTE, W. N. *Rare Forms of Ferns*.—XI. *A Forked Ebony Fern*, illust. Fern Bulletin Jl. 1909. A plant with five forked fronds reported from North Carolina and named *A. ebeneum* f. *furcatum*.
- CLUTE, W. N. *The Dwarf Spleenwort*, illust. American Botanist, Ag. 1909.—Reprint.
- COKER, W. C. *Lycopodium adpressum forma Polyclavatum from South Carolina*, illust. Fern Bulletin Jl. 1909.—This form reported in abundance near Hartsville and figures of some of the most remarkable given.
- DUTTON, D. L. *Osmunda cinnamomea forma angusta*. Fern Bulletin Jl. 1909.—Further notes on the range of this form.
- MARQUETTE, W. *Concerning the Organization of the Spore Mother-cells of Marsilia quadrifolia*, illustrated. Transactions of the Wisconsin Academy of Science, Ap. 1908.

- POYSER, W. A. *The Fern Flora of Pennsylvania*. Fern Bulletin Jl. 1909.
- PRESCOTT, A. *Pronunciation of Fern Names*. Fern Bulletin Jl. 1909.
- PTERIDOGRAPHIA. Fern Bulletin Jl. 1909. *Filmy Ferns and Moisture*.

FERNS FOR WINTER.

Some ferns grow much better in ferneries than others and it is well to have this in mind when selecting ferns for that purpose. Of all our native ferns there are probably none that respond so readily to this method of growing as the common polypody and the beech and oak ferns. They often grow so luxuriantly that the older fronds have to be cut away to make room for the new growth. Plant these by all means. The curious little walking leaf is always an object of interest and one of the best ferns for indoor culture. Of the spleenworts, the ebony and maidenhair spleenworts are very fine and grow rapidly. The circular tufts of the latter are just the thing for miniature rockeries. Small plants of *Nephrodium cristatum*, *marginale*, *spinulosum* and *acrostichoides* can be recommended and the two species of *Cystopteris* should not be forgotten. The common maidenhair ultimately sends up an abundance of fronds but requires some time to get started. Many species of our common ferns grow too tall and rank for the fernery unless it happens to be a large one but if one can secure a tiny specimen of some of these they are very pretty. None show a greater contrast than the broad fronds of *Onoclea sensibilis* among the much divided foliage of other species.

—Reprinted from *Linnaean Fern Bulletin* No. 7.

EDITORIAL.

Readers of this magazine should keep in mind the fact that we are always glad to replace free any soiled or torn copies sent out. It is manifestly impossible for us to see every page of any issue and occasionally the printer's devil leaves the impress of his hoof or claws on a sheet that gets past us, but any who receive copies of this kind should ask for new ones at once. Now that another volume is completed it would be well for subscribers to examine their files and if any copies are not in good condition to secure perfect ones without delay, since the numbers on hand are now made up into volumes and any odd numbers left over are sent out as sample copies. It is not necessary to return the soiled copy; ask for the new one you want.

* * *

The suggestion so often made in these pages that fern study in other parts of the world would be helped by another publication devoted to the subject, has at last borne fruit in the shape of *The British Fern Gazette* the first number of which bears date of September 1909. The magazine is issued by the British Pteridological Society and is edited by Mr. Charles T. Druery well and favorably known to readers of *The Fern Bulletin*. This first issue is a very attractive one, the most attractive one that could be made, we are inclined, with pardonable pride, to think, since it is the exact size of our own publication and duplicates numbers of a few years ago even to the color of the cover the possession of a frontispiece and the style of type. This, however, is said in no disparagement of the magazine, for it is quite desirable that fern literature have something like uniformity in the style of its

publications. The twenty-four pages of the first number are taken up entirely by various articles of its editor, and shadows forth the peculiar British bias regarding ferns, in that it deals almost exclusively with abnormal forms. In subsequent numbers we are promised articles from other contributors though the present one is well worth the reading as the titles of such articles as "Our Native Ferns," "The Life History of a Fern" and "Fern Hunting Episodes" will indicate. We have looked through the edition in vain for a statement of the price of subscription, but we assume that it may be somewhere near a dollar a year since the publication is sent free to members of the British Pteridological Society who pay annual dues of five shillings. We are not advised as to whether sample copies will be sent or not, but those who are inclined to investigate the matter should address the editor at 11 Shaa Road, Acton, London, W., England. Evidently the magazine is to be strictly a British one for in listing the literature of British ferns no account is made of American works that treat of British species and this publication, which has had considerable matter in past volumes relating to British ferns, is not even mentioned.

* * *

Not so long ago, a fern hybrid was considered to have only a mythological existence and Dr. Underwood is on record as insisting that *Asplenium ebenoides* is not a hybrid but a distinct species. The production of this form by the crossing of *Asplenium ebeneum* and *Camptosorus rhizophyllus* showed how wide of the mark the opinion of even an eminent fern student may be, and at the same time gave room for the suggestion that many variations of common ferns

are also hybrids. In the opinion of the editor of this magazine, the contention that an immense amount of hybridization exists in a group of the wood ferns (*Nephrodium*) must be set down as not proven. It is true that many forms that do not fit our descriptions of the species have been found and it is also true that some of them look as if they might be intermediate between two species, but if we can read anything from the recent literature of hybridization it is clear that the first cross seldom gives individuals intermediate between the two parents but that it requires the second generation to bring out the distinctions. The work of crossing ferns is an infinitely more delicate operation than crossing flowering plants and, owing to the nature of the plants in question, a generation of so-called hybrids may not be hybrids at all but mere variations. The prothallium may produce new ferns by budding, which avoids crossing at all, and even the best of crossing is largely guess-work due to the fact that prothallia from which one or the other sex-organ has been removed can develop new ones, or the eggs may have been fertilized before the sperms were removed. If we hoped to produce variable ferns, mutilating the gametophyte or prothallium would be one of the first means suggested and it is not to be wondered at that a lot of mutilated prothallia should give some variable plants. We do not insist that the wood-ferns do not hybridize but we venture the opinion that they do not do so as regularly as the description of new hybrids in the group would lead one to believe. If the variation in the wood fern is to be ascribed to hybridization, to what shall we attribute similar variation in the grape-ferns? One of the fundamental principles of any kind of organic evolu-

tion is that animals and plants vary, and we are inclined to look with suspicion on any scheme that would do away with such variation.

* * *

In the "Smithsonian Miscellaneous Collections," vol. 5, part 3, Carl Christiansen, author of "Index Filicum" has an article on "The American Ferns of the group *Dryopteris opposita* contained in the U. S. National Museum" which illustrates very interestingly the nice distinctions that now subsist between the tropical species of ferns. Every little while we have a suspicion that some of the described new species are not as important as the sounding names bestowed upon them would indicate, but it is seldom that we find an account of them that so naively admits the questionable validity of the so-called new species. We fear Mr. Christiansen lacks the yankee ability to throw dust in the eyes of his critics when proceeding to split up tweedledee and tweedledum. For instance, of his new species, *Dryopteris columbiana* he says: I now prefer to refer here this number, determined previously, by myself and Hieronymus as *D. oligocarpa* from which it differs in its longer leaf and by the shorter pubescence of the rachis. Nevertheless, I have some doubt if my proposed species can be held distinct from *D. oligocarpa*." Here our author is too modest. Instead of having some doubts he ought to be dead sure of it. A longer leaf and shorter pubescence does not make a species. Of *D. Musensis* he says "The main difference from *D. Columbiana* is in the absence of long setae on the veins above." And the author doubts if *Columbiana* is in itself a good species! Another species, *D. Melanochlæna*, based on a *single leaf* is distinguished from its nearest relative "by its coal-black

scale-like indusia, ciliate with whitish hairs." Seems to us that a species founded on the color of the indusia of a single frond or any number of fronds for that matter, is not very well founded, to say the least. *Dryopteris pittieri* "is founded upon an imperfect specimen without rhizome or stipe," and so the list goes. There can be no doubt that many of the species mentioned in this article are different from others, but that the differences are anything more than trivial variations is beyond belief. They rather belong to the category of what De Vries calls "Elementary species." Those who wish to consider them good species are welcome to do so, but for ourselves we prefer a more conservative view. When a long list of new species from the tropics are described again, however, it is well to remember what small differences the scientists are selecting to distinguish them and be governed in one's judgment accordingly.

BOOK NEWS.

A very well written account of the common objects of nature for use in nature study is contained in S. C. Schmucker's "The Study of Nature." It begins with a chapter on "what nature study is"—all such books do—and runs on to aims and purposes from the teaching standpoint. Then comes the bulk of the book devoted to the materials of nature study which we heartily commend, and the work is finished with directions for a course in nature study. In the chapter on "Helpful books" the author betrays his unfamiliarity with much of the literature of the subject. All the books mentioned, however, are useful in their own field. The book is published by Lippincotts.

Publication No. 94 of the Carnegie Institution is entitled "The Structure and Life History of the Hay Scented Fern" and is devoted to an extended study of the boulder fern which the author calls *Demstaedtia punctilobula* (Moore). The microscopic structure of the plant is very thoroughly outlined. In the synonymy of the plant there are fourteen combinations quoted from the works of sixty-one authors. Of these, *Dicksonia pilosiuscula* seems to be the favorite to judge from the number of authors who have used it. Twenty-four plates containing 270 figures add much to the value of the work. The price is 50 cents.

THE AMERICAN FERN SOCIETY

President, Prof. E. J. Winslow, Elmira, N. Y.

Secretary, Prof. S. L. Hopkins, Central High School, Pittsburg, Pa.

Fern Students are cordially invited to join the society. Address either President or Secretary for further information. The Fern Bulletin is sent free to members. Annual Dues are \$1, and should be sent to Mr. H. G. Rugg, Treas., Hanover, N.H.

Owing to delays in making up the list of candidates for office in the Society for 1910, the time for voting will not end until the first of December. The result of the vote will be announced in the January issue of this magazine, since it would make the present issue too late to wait for it. Notices of election have been sent to all members. If anyone fails to receive such notice a new one may be obtained from the chairman of the Advisory Council.

The Society is making gratifying gains in membership. We welcome to our lists the following who have joined since the July issue of this magazine was printed: Dr. G. M. Winslow, Lasell Seminary, Auburndale, Mass.; John R. Swinnerton, 2115 Chestnut

Ave., Newport News, Va.; Geo. L. Moxley, 1161 East 40 st., Los Angeles, Calif.; W. J. Dowkes, 175 Painter St., Owens Sound, Canada; Miss Kate Jones, 240 Jewett St., Lowell, Mass.; Miss Nancy Darling, R. D. 2-34 Woodstock, Vt. and Miss Flora B. Neumont, 336 N. Craig St., Pittsburg, Pa. The membership is now 162, the largest it has been in the history of the Society.

The address of S. Fred Prince is now University of Illinois, Urbana, Ill. Mrs. Emily Hichcock Terry, long connected with Hubbard House, at Smith College, Northampton, Mass., has left because of ill health and is now at Bennington, Vt., where she should be addressed in care of W. B. Sheldon, Esq.

The Society has recently reprinted the circular of invitation which may be used in soliciting others to join the Society. It also includes a proposition for a fern exchange. Extra copies of the folder may be obtained by addressing the Secretary.—C.

Secretary Hopkins has had several calls for the early Annual Reports of the Society and asks members having extra copies of any Reports previous to 1907 that they are willing to part with, to send them to him.

President S. M. Newman of Front Royal College in Virginia, has accepted a similar position in Kee Mar College, Hagerstown, Md., and should be addressed there in future.—C.

Dr. Dana W. Fellows, formerly Vice President of the Society, has been appointed a member of the Board of Examiners in the practice of dentistry for the State of Maine.

ALL THE AMERICAN FERN BOOKS AND SOME OTHERS

Ferns of Kentucky, Williamson (Out of Print.)	
Ferns of North America, D. C. Eaton, 2 vols. (Out of Print.)	
Fern Collector's Handbook, Sadie F. Price. (Out of Print.)	
Ferns in Their Homes and Ours, Robinson. (Out of Print.)	
Ferns of the West, Marcus E. Jones, paper.....	\$.50
Ferns and Fern Allies of New England, Dodge.....	.50
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Our Native Ferns, Underwood, 6th Ed.....	1.08
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Ferns and How to Grow Them, Woolson.....	1.17
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Book of Fern Culture, Hemsley.....	1.08
Wayside and Woodland Ferns, Step.....	1.75

Any of the above, to which a price is attached will be sent postpaid upon receipt of price. Out of print books may occasionally be obtained second hand nearly as good as new. The Fern Bulletin may be clubbed with any book listed at a dollar or more for 50 cents additional. A year's subscription will be given free with every order amounting to \$5.00 or more.

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A Quarterly Devoted to Ferns

EDITED BY WILLARD N. CLUTE

VOLUME XVIII

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JOLIET, ILL.
WILLARD N. CLUTE & CO.
1910.

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A Quarterly Devoted to Ferns



Joliet, Ill.

Willard N. Clute & Company

1910



The Fern Bulletin



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JAMES ANSEL GRAVES

THE FERN BULLETIN

Vol. XVIII

JANUARY, 1910

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JAMES ANSEL GRAVES

James Ansel Graves, one of the founders of the American Fern Society, once its President and for ten years its efficient and energetic Treasurer passed away, after a brief illness at his home in Susquehanna, Pa., December 28, 1909 at the ripe age of 81 years.

Mr. Graves was born in Blenheim, N. Y., Nov. 16, 1828 and his boyhood was spent in that town and in the neighboring one of Roxbury, near the head waters of the Delaware.

He received a good common school education and at the age of 18 was given his teachers certificate. His first teaching was done in the "Old Red Schoolhouse" where Jay Gould the noted financier and the brilliant John Burroughs received their early education. John Burroughs was one of his first pupils. More than fifty years after that little class had gone forth, several of them to make their mark in the world, the writer had the pleasure of introducing the now famous Burroughs to his old teacher.

For eighteen years Mr. Graves followed the work of teaching. Sometimes in later life he expressed a regret, which all who knew him shared, that he had not continued in that field. His was a mind of unusual clearness and his ability and willingness to communicate knowledge to others was one of his most winning characteristics. In later life it was his custom to spend his holidays and vacations with plant press and vasculum botanizing about the surrounding region. Often

these trips, usually in company with one or two friends, would continue for several days, the party stopping where night overtook them. On such expeditions he was sure to make friends with the farmers along the route answering their queries about plants with an enthusiasm that never failed to interest his hearers and which made him a welcome guest when he next came that way.

The last quarter of Mr. Grave's life was spent in Susquehanna, Pa., where he was engaged in the marble cutting business. Previous to this he resided at Waverly, and at Deposit, N. Y. Although not solicitous of political honors, he for a time represented the town of Deposit in the Board of Supervisors and in Susquehanna was at various times a member of the Borough Council and of the Board of Health. His common sense and unassuming ways gained him the honor and respect of all who knew him.

He was from boyhood interested in science especially in mathematics and astronomy, but it was not until comparatively late in life that botany, for which he was best known took first rank among his pursuits. He was entirely self-taught but soon got out of the manuals all they had for him and then struck out alone. He was attracted to the serious study of botany by the contemplation of an hepatica blossom and this was ever after one of his favorite flowers. He was an indefatigable collector of all kinds of plants, but the ferns, sedges and grasses were the objects of his serious study. Living plants also engaged his attention and in the grounds surrounding his home he had some hundreds of species under cultivation. His herbarium was sold some years ago to Mr. Alfred Twining of Scranton, Pa., in whose possession it has since remained.

To Mr. Graves, the American Fern Society owes much of its present prosperity. He was one of the four fern students who decided that a society for the study of ferns by correspondence was feasible and did more than his share to interest others in the project. Of the others who became charter members of the Society only four remain, our President, Rev. Jas. A. Bates, Dr. Waters, Prof. Petty and the writer.

The proposal to found a fern society came at an opportune moment. There were no popular books on ferns to be had at that time and we all realized the difficulties of studying alone. At the first election Mr. Graves became treasurer and for ten years held that office. Upon him devolved the difficult task of keeping delinquent members interested enough in the struggling society to pay their dues, and he administered this trust with rare judgment and ability. In those days his correspondence was voluminous, but it brought him into touch with a wide circle of plant students and gained him friends wherever he was known. He much preferred writing to these friends to writing for the general public. Occasionally he was induced to write for the magazines, and his name will be found among the contributors to *Mechans' Monthly*, *Fern Bulletin*, *Asa Gray Bulletin* and others. He was long connected with the Gray Memorial Botanical Chapter a society interested in the study of wildflowers, held various offices in the society and contributed much to the correspondence bulletins sent out. He was also a leading spirit in the publication of the "Flora of the Upper Susquehanna." Though he wrote little for publication his opinion was sought by many botanists and students.

Although at an advanced age, he was not troubled

to any great extent by the infirmities that often creep on as the shadows of age deepen. His hearing only, was slightly impaired. He often expressed a desire that he might pass on before he became a burden to himself or friends and it is a comforting thought that he had his wish. Toward the end, his bodily vigor failed rapidly, but his mind was clear to the last. Throughout his life he took a deep and sincere interest in the mysteries of the universe and died in the hope of transition to a higher plane where earth's riddles are solved.—W. N. C.

THE PINNATIFID SPLEENWORT IN NORTH-EASTERN OHIO.

●BY ERNEST W. VICKERS.

It is fit that my previous notes on *Asplenium montanum* should be followed by those on *Asplenium pinnatifidum* since an attempt to extend the local distribution of the former species in preparation for that writing resulted in the discovery of the latter species. My friend Almon Rood, well says: "I never was successful at finding things I searched for; always found something else and then stumbled on the thing I wanted when I was not looking for it." This is a common experience of botanist and naturalist. So on July 18, 1909 while carefully examining the almost perpendicular sandstone walls at Lauterman's falls in Mill Creek Park, near Youngstown, Mahoning County, Ohio, I failed to find *Montanum* but stumbled on *pinnatifidum*.

At this point in Mill Creek's picturesque gorge the scene becomes wild and most romantic and the lover of natural beauty as well as the botanist feels that someone has been exceedingly wise and good in setting aside this generous slice of untouched, untrained

primeval to be the pride and delight of a great city forever. For in its concentrated expression of wild beauty there is doubtless no park of equal area in the State that can surpass it. And when you add to this its varied and almost unique flora is it any wonder that the botanist makes frequent pilgrimages to it? There are exposed cliffs and ledges where some tiny spring comes forth and makes a wet trail downward where liverworts and mosses cling and grasses and ferns lean; there are rich banks where ferns and flowers jostle each other; marshy places, still pools and swift descents, level meadows and hillside tangles, sterile sandy hill-tops and grassy banks, sunny openings and deep gorges heavy in hemlock shadows; and the botanist does not need to be told what these varied and kaleidoscopically intermingled conditions mean as expressed in flora.

When I found this new fern, I was not aware that it was anything more than an interesting freak of the walking fern (*Camptosorus rhizophyllus*) which grows abundantly in the park and I afterwards found that Gray calls attention to this resemblance. By more careful examination that evening after reaching home I discovered that I had made a find as well as a mistake. On August 15, the station was revisited that its distribution and numbers might be ascertained. I found the plants growing in three closely approximate stations or spots which evidently had been one ere the advent of the white man. Numbers 1 and 2 had evidently had been cut in two by throwing the high bridge across the gorge at a point 73 feet above the water level. The water from the bridge and gutters above and perhaps the dust seems to be injuring these plants as many of them do not appear flourishing or robust

and this area seems to be shrinking. Number 1, by actual count is a straggling colony of 70 plants, and lies west of the bridge, having the poorest and most stunted plants. Number 2, east of the bridge consists of 100 or 125 individuals. Number 3 is much further eastward, up the gorge after you pass the old grist mill and falls and reach what is known as the pot hole, well known to local bathers by its wide deep pool of clear cold water hemmed in by jutting ledges and congregating hemlocks. This station has but 47 or 50 plants but they are the finest and most flourishing of the three groups. They differ from the others in having more shade—perhaps the others get too much sunshine—and in being removed from roadside dust and gutter wash.

At this point, Mill Creek flows about due west and the plants, growing on the north side, have consequently a southern exposure, none being found on the opposite cliffs where other ferns, such as *Dicksonia*, *Cystopteris*, two species of *Phegopteris*, marginal shield ferns and polypody grow so profusely. Among the rest I gathered forked fronds and fronds with abnormally large divisions beyond the middle.

Few specimens are to be had without climbing up from below or hanging down from above and this coupled with the small size and insignificant appearance of this rare fern, for it lacks beauty in the popular sense at least, will make it immune from the depredations of the ordinary fern gatherer. And barring the changes wrought in its original environment by man's mechanical operations at this point we would be willing to conclude that its perpetuity in the park flora is assured. For surely no botanist or fern collector will ever commit the deeds of a vandal among its straggling bands.

I found that my good bird-glass proved valuable aid when it came to the count. Indeed, such an instrument will often prove valuable to the botanist whether or not he is like the writer, interested in birds as well as plants, saving him many steps sometimes a climb.

So far as the writer knows, this fern has only been noted in central and northern Ohio, the present station now carrying it far to the northeast. According to Prof. L. S. Hopkins' "Fern Flora of Ohio" this species has been collected in Fairfield, Hocking, Lawrence and Logan counties.

Ellsworth Station, Ohio.

THE FRONDS OF LYCOP⁶ODIUM.

BY WILLARD N. CLUTE.

There are fifteen or twenty species of the so-called climbing fern family (*Lygodium*) in the tropics, though climbing species in other families are common enough, and but one real climbing fern in the fern flora of the United States. A few minutes study is sufficient to show that all these climbers may be divided into two groups: those in which the main stem ascends other vegetation by means of rootlets or by twining, and are thus true climbing stems, and those in which the main stem is under ground and sends up what are commonly regarded as climbing leaves. It seems absurd to call these latter, leaves, however. Those who describe our species hesitate at mentioning leaves that are forty or fifty feet long, and commonly do not give their dimensions. The error comes from trying to fit all species to one hard and fast manner of description. Having agreed, in the case of our common ferns, to call the part underground a stem and the parts that rise from it, leaves, there is nothing left to

do but to consider those peculiar fern parts that climb to the tops of the trees as leaves, also. There are several reasons, however, why we are justified in refusing them this title. No matter what the situation at present, it is certain that stems and fruiting parts came before real leaves. The leaf is essentially an expanded part of the stem designed to facilitate the work of carbon-assimilation. True leaves, as we know them, originated among the ferns and it is to be assumed that for a time they would assume more or less of the characters of both stem and leaf, but the evolution is always from stem to leaves not the reverse. Thus we find that it is not impossible to induce young sporophylls to take on leaflike parts as in the "obtusilobata" forms of *Onoclea* and *Struthiopteris*, while otherwise normal leaves may on occasion produce sporangia. As if to bear us out in the contention that the so-called fronds of *Lygodium* are not real leaves, we find frequent indications of buds on the pinnae. The production of buds is a strongly emphasized characteristic of the stem and while it is well known that many leaves, even those of flowering plants may originate buds, they usually do not do so except under extraordinary circumstances. Another stem-like character of *Lygodium* "fronds" is the fact that there is no limit to the size they may attain, while in normal leaves no such varying stature is usual. It may not be possible to prove beyond question that the aerial parts of *Lygodium* are stems, but it seems much more logical to consider them secondary stems, and the so-called pinnae as leaves. In a similar way it is permissible to call the above-ground part of theadder's-tongue a spore-bearing stem with an expanded green portion performing the offices of a leaf. It is out of the question to view these

parts as composing a single frond nor is there need for the recently suggested name of "commonstalk" for a part of the plant which is very clearly a stem. Both *Ophioglossum* and *Botrychium* are comparable to the parts above ground of the peony. The climbing parts of *Lygodium* may be likened to the aerial stems of the Solomon's seal or better to the stems of the groundnut (*Apios*), the scarlet runner (*Phaseolus*) or the bind-weed (*Ipomoea*). The "fronds" of *Gleichenia* are even more stem-like than those of *Lygodium* and in these are found buds which continue the development of the stems. The whole subject is one worth investigation by the morphologist.

A NEW LYCOPODIUM FROM NEW HAMPSHIRE.

BY SIDNEY F. BLAKE.

The original description (Fl. Am. Sept. II, 653) of *Lycopodium tristachyum* Pursh denotes a plant with appressed leaves and three spiked peduncles. The plant is further characterized by erect, crowded, very numerous branches and a subterranean stem. The spikes vary in my experience from two to eight in number, with a maximum length of 29 mm.

From typical *tristachyum* as thus defined, a form of this species which I found in southern New Hampshire during the past summer differs so decidedly in number of spikes, nature of leaves, and some other characters as to warrant recognition as a distant variety, which may be thus characterized:

LYCOPODIUM TRISTACHYUM SHARONENSE, var. nov, Type No. 515, Herb. S. F. B.; dryish good soil in woods, Sharon Hillsboro County, New Hampshire; 19 July 1909, S. F. B.

Spikes single, longer than in *L. t. tristachyum*;

branches comparatively little subdivided; lateral, dorsal, and ventral leaves all with the anterior third (approximately) of their length free, divergent; this free tip linear-awl-shaped, curved.

Stem 1 to 3 inches below ground; length of spikes (in type) 30 to 35 mm., averaging (14 specimens) 32.5 mm.; another specimen however is only 25 mm. long; length of peduncles (in type) 61 to 76 mm., averaging (11 specimens) 67.8 mm.; length of lateral leaves 5 to 6.3 mm.; length of free tip 1.7 to 2.2 mm.; of forty-three peduncles, old and new, only three bear more than one spike; of these two bear two spikes each and one three spikes.

Stoughton, Mass.

RARE FORMS OF FERNWORTS.—XIII.

AN ABERRANT LYCOPODIUM.

Some time ago, we received the aberrant form of *Lycopodium complanatum* whose fertile spikes we illustrate herewith. It will be seen that beyond the spore-bearing part of the cone-like spike there is a tuft of leaves. While such examples are by no means rare among the *Lycopodiums* they are of interest because they illustrate very well the relationship that subsists between the true leaves and those that bear spores.

In the days before the morphological study of ferns received much attention, the expanded green parts of the plant were called fronds. If anybody had an idea that they were true leaves they were not overly insistent upon the point. Not only were they called fronds, but the petiole was given the name of stipe and those leaves that bear the spores were called fertile fronds. This did well enough for ferns, where there

is usually not much difference between the vegetative and spore-bearing portions but among the *Lycopodiums* where the two functions are usually sharply differentiated, some other term had to be found. The leaves bearing the spores could be called collectively the fertile spike or the fruiting spike, but the individual leaves were named sporophylls, literally "spore leaves." That they are only leaves, however, our specimen shows for at the top we see them turned back to purely vegetative functions. In a few *Lycopodiums*, as in most of the ferns, we find the leaves doing double duty. Such species as *L. lucidulum* and *L. Selago* illustrate this.



The sporophylls of *Lycopodium* are of further interest in indicating the path along which flowers may have developed. Beginning with the ferns, where sporophylls and vegetative leaves are similar we have the two clearly differentiated in *Lycopodium*. The differentiation, however, does not stop here. In *Selaginella* the sporophylls are further distinguished as large and small sporophylls or if you please megasporophylls and microsporophylls. Connected with this further separation is the curious fact that the spores are now of two kinds: one the microspore or small spore borne by the microsporophylls, the larger the megaspore borne by the megasporophyll. Further the microspores always produce male prothallia and the megaspores, female prothallia. Here is where the relationship of flowers comes in, for the stamen is really a microsporophyll and the pollen grains are essentially spores, while the carpels are megasporophylls and the embryosacs are megaspores. As everyone knows, a

flower does not necessarily have to have petals and sepals. In fact a flower has been defined as "a branch beset with sporophylls." Under this definition, then, the *Selaginellas* may be truly said to bear flowers.

THE LADY FERN.

BY ADELLA PRESCOTT.

I have never really understood why *Athyrium filix-femina* should be called the lady fern, for while in early summer it has something of the grace and charm of the ideal high-born dame yet it early becomes disheveled and by midsummer is at best but a "decayed gentlewoman." And yet around this shabby genteel denizen of our woods and fields and roadsides cluster much of the poetry and folklore concerning ferns. It was supposed to be the species bearing the magical fern seed which (paradoxical as it may seem) not only rendered the possessor invisible but conferred on him the gift of second sight as well. It was also thought that fern seed brought by the devil at midnight would enable one person to do the work of thirty, and if this were true I am sure many a busy housewife would welcome at least one visit from his Satanic Majesty. The poets speak often of the lady fern but I fancy for the same reason that a friend of mine calls all showy flowers "petunias" rather than because of its unusual charm.

The lady fern is one of our most widely distributed species growing in deep woods and sunny fields; by dusty roadsides and in muddy swamps with equal vigor and abandon. The fronds grow in circular tufts from a stout rootstock and the stipes of the uncoiling blades show many charming tints varying from dull pink to wine red. They are from two to three feet in

height and generally rather oblong ovate in outline; twice pinnate with lobed and toothed pinnules, but they vary exceedingly in cutting and many forms more or less distinct have been described. The pinnae are set farther apart than in some other ferns and the species is noted for having pinnules missing here and there, as if in the hurry and rush of spring work Nature had occasionally skipped a stitch.

The lady fern will grow in almost any soil and is sufficiently attractive to be worthy a place in the fern garden though from its habit of early shabbiness it is well to place it somewhat in the background. It is found in the Old World as well as the New but there is some question as to whether their species and ours are identical.

New Hartford, N. Y.

PTERIDOGRAPHIA.

GAMETOPHYTES OF BOTRYCHIUM.—The average fern collector is not particularly interested in the gametophytes or sexual generation of his specimens. It is likely that many an admirer of our ferns is quite ignorant of the fact that there is such a stage as that represented by the gametophyte, and many others will not recognize the word, until told that the prothallium and the gametophyte are one and the same thing. Most advanced students understand that the gametophyte is a small, green heart-shaped structure but have little idea how much this structure may vary from the conventional shape on occasion. The gametophyte, though not uncommon, is rarely seen because the fern-lover is not looking for it. This statement, however, cannot be made regarding the gametophyte of the *Botrychiums*. These are really rare because they are subter-

ranean and tuber-like structures quite unlike the prothallium of the fern. In the *Ohio Naturalist* for November, 1909, Prof. J. H. Schaffner notes that in one locality in Northern Ohio large numbers of these gametophytes were dug up being located by the first tiny leaf growing from them. Students interested in finding them may possibly trace them in other localities by this means.

THE LADY FERN.—In the plant world we find many species in whose common name the word lady or ladies' figures are a limiting adjective. The use of the word is not the same in all cases. It may be given to signify a more delicate and dainty character as in ladies' sorrel or to associate it with the gentler sex as in ladies' tobacco. In few if any cases does there seem to be implied any sex in the plant itself. The word Lady, applies to plants has a far different significance. It was originally given in honor of "Our Lady," the Virgin Mary and almost always applied to handsome species. Occasionally we find that the ancient botanists have superposed a saint's name on the name of some heather deity given to a plant, and in many cases it was Our Lady's name that supplanted the older one. This is the case with the plant, which, as the name *Cypripedium* hints, was originally called Venus' shoe but is now known as Our Lady's Slipper or commonly lady's slipper. The lady fern does not fall into either of the foregoing classes. It received its name to denote "femaleness." The translation of the scientific name is more properly female fern than lady fern. In the floras of both Europe and America we find another species *Nephrodium filix-mas* which is always called the male fern, never gentleman fern. Occasionally the bracken (*Pteris aquilina*) is also called male fern. The

origin of these names lies far back in the history of our race and long antedates botany as a science. The ferns seem always to have puzzled the early plant collectors. Lacking flowers and seeds but apparently reproducing their kind in some mysterious way it was but a step to ascribe magical properties to the "fern seed." It was not until the middle of the sixteenth century that the nature of fern spores was understood. Before that time people seem to have imagined that there was but one kind of fern, and that the ferns we now call *Nephrodium filix-mas* and *Asplenium filix-foemina* were the male and female halves of the species.

A CORRECTION.—Through a mistake of the printer, a paragraph relating to *Cystopteris bulbifera* was omitted from "The Fern Flora of Pennsylvania" by W. A. Poyser, published in the July 1909 number of this magazine. The citation should read "On moist rocks. Infrequent throughout." The editor failed to discover the omission in time to rectify it.

PELLAEA ATROPURPUREA VAR. BUSHII.—Among the additions to the new "Gray's Manual" we note a form bearing the name at the head of this article. The plant in question is distinguished from typical *Pellaea atropurpurea* by having the "stipes and rachises essentially glabrous," a distinction which, we would be inclined to think, hardly warrants the plant being called a form much less a "var." in the sense this term is used in the manual. *Pellaea glabella* Mett. is cited as a synonym.

POLYPODIUM VULGARE F. BIFIDO-CRISTATUM.—On August 1st, 1909, while searching for *Polypodium vulgare* f. *auritum*, on a ledge situated about half a mile east of Watchic Pond, in Standish, Maine, I came across three plants bearing very curious crested fronds. One of these I sent to Mr. Clute for identification. He

wrote me, that it is the form described by Druery in "Choice British Ferns," page 120, as *bifido-cristatum*, and, that this form has not been reported before this, from this country. I have shown four other members of the American Fern Society these growing plants, namely: Miss Alice Paine, Dr. Dana W. Fellows, Henry W. Merrill and Mr. A. E. Scoullar.—Mrs. A. E. Scoullar, 144 Cherry St., Elizabeth, New Jersey..

NEPHRODIUM MARGINALE F. DAVENPORTII.—In the form bearing this name the fronds are somewhat forked and crested at the tip. It is reported from Eastern Massachusetts but is likely to occur anywhere within the range of the type. It was omitted from our recent list through an oversight, and though of no consequence it should not be forgotten inasmuch as it has recently been included in the additions and corrections to the "New Grays' Manual."

FERNS OF THE BAD LANDS.—While engaged in geological work on the Standing Rock and Cheyenne River Indian Reservation I had the opportunity of learning something of the ferns and allies of the "bad lands." On first sight the prospect of finding any ferns seemed to be pretty slim, but a search covering a considerable area revealed the following: *Woodsia obtusa* is the most widely extended species and was rather common on the sandstone capped buttes in the eastern part of the area. I also found it in glacial material along the Cannon-ball River associated with prickly pear, sage-brush, grease-wood, and juniper—a strange combination. *Filix fragilis* or *Cystopteris fragilis*—which is it?—I found on a few occasions in the deep wooded ravines which sometimes occur in the regions. Two species of *Equisetum* were seen but not identified. The species which is enclosed was very

common in the pools of stagnant water characteristic of the rolling plains of the region. I regret the shortness of this list but doubt if it could be extended very much.—*F. C. Green, New Albany, Indiana.* [The species enclosed is *Marsilia vestita*, the water-clover, found from Dakota to Texas in suitable places.—ED.]

BOTRYCHIUM DISSECTUM.—For some years there has been much discussion for and against the specific distinctness of the cut-leaved grape fern. This discussion has been mostly the arguments of theorists. On the one hand it is contended that any fern so nearly like another, in general form, time of growth, production of spores, size and habitat, as the dissected form is to the common one and which only differs in the cutting of the ultimate segments must certainly be a mere form of it; on the other hand it is asserted that since it keeps its form, is practically the same whenever found and does not apparently intergrade it must be a good species. Unfortunately the difficulties attendant upon the rearing of these plants from spores, while not insuperable are sufficient to prevent, at least thus far, any experimental proof of their specific distinctness. The prothallia are tuberous, subterranean, and symbiotic having set up a partnership with some sort of a fungus. Apparently they cannot be grown to maturity without their attendant fungi. Some faint light has been shed upon the problem, however, by a writer in *Ohio Naturalist* who notes that the very first leaf from the prothallium shows the dissected form. This would go some distance toward proving this plant a good species for it is well known that in a great number of plants which differ markedly at maturity, the juvenile leaves

are almost identical in shape. It must be pointed out, however, that British fern growers have repeatedly shown that the spores of abnormal fronds or even of abnormal parts of fronds are capable of producing the abnormality. So we are back where we started from, except for the fact that it now appears that the juvenile forms are not like those of *Botrychium obliquum* the nearest related form. Were the grape ferns as easy to grow from spores as ordinary ferns are, we should have expected to have had this matter settled long ago by experiment. If in copious sowings of spores from *Botrychium obliquum* there was found a single dissected form we should regard the fact that it is a mere form established. Some ambitious fern student with access to a greenhouse should take up this problem.

ASPLENIUM EBENOIDES.—At a recent meeting of the Germantown Horticultural Society, George Redles exhibited a living specimen of Scott's spleenwort (*Asplenium ebenoides*) which he had found in Monroe County, Pennsylvania near the Delaware Water Gap. Mr. Redles' companion, when the fern was found, Robt. F. Welsh of Philadelphia, subsequently found another plant for himself. The first specimen of this fern ever found was secured by R. R. Scott near Philadelphia in 1862 and was afterwards named by him. The original locality has long since been destroyed, but the plant may be expected to appear now and then in any region where the ebony fern and walking fern grow.

A NEW PHASE OF FERN STUDY.—A member of the Fern Society makes the following suggestion for concerted study: "Select some three or four species of general distribution and ask the members to study these critically in the field; to collect ample suites of

specimens showing the extent of variation of every sort and then publish the results. To take a specific case: *Anchistea Virginica* usually has a row of sori next the costa of the pinnae and also along the midveins of the segments. But in just one specimen that I have seen (from New York) there are in addition some rather irregular placed and somewhat abortive sori on the lateral veins of the segments. I dare say any member of the Society who sat down in a good clump of this fern would find similar specimens by looking long enough and also other peculiarities." After the Society has thoroughly worked up notes like the above they might form the basis for a series of small monographs. _____

INDEX TO RECENT LITERATURE.

Readers are requested to call our attention to any errors in, or omissions from, this list.

BENEDICT, R. C. *Studies of the Ophioglossaceae*,—*III*. Torrey, O. 1909.—Key to the "group of *B. ternatum*" with observations on the forms.

BENEDICT, R. C. *The Genus Ceratopteris; A Preliminary Revision*, illust. Torrey Bulletin Ag. 1909.—Three previously named forms raised to specific rank and another described as new.

CHESTER, L. E. *Shelter Island Ferns*. Fern Bulletin O. 1909.

CLUTE, W. N. *Rare Forms of Ferns*,—*XII*. *Polystichum acrostichoides multifidum*, illust. Fern Bulletin O. 1909.

DRUERY, C. T. *Tree Ferns*. Fern Bulletin O. 1909.—Note regarding thorns.

FOSTER, A. S. *Ferns of Paradise Park*. Muhlenbergia. O. 1909.—A list of seven species collected in Mt. Ranier National Park.

- GREENE, F. C. *Permian Ferns*. Fern Bulletin O. 1909.—Note regarding the discovery of certain fossil ferns in Kansas.
- JENNINGS, O. E. *Hymenophyllum denticulatum in Central China*, illust. Fern Bulletin O. 1909.—Extension of the range of this species to the north and east about a thousand miles.
- MORRIS, F. J. A. *Ophioglossum vulgatum in Ontario*. Fern Bulletin O. 1909.—This species reported in abundance in the vicinity of Port Hope.
- PRESCOTT, A. *Grape Ferns*. Fern Bulletin O. 1909.
- PAINE, A. M. *Polypodium vulgare auritum*. Fern Bulletin O. 1909.
- SCHAFFNER, J. A. *An Interesting Botrychium Habitat*. Ohio Naturalist N. 1909.—Reported finding of both gametophytes and sporophytes of the following species: *Botrychium lanceolatum*, *B. Virginianum*, *B. simplex*, *B. ternatum obliquum* and *B. t. dissectum*.
- SCOULLAR, MRS. A. E. *The Red-stiped Lady Fern*. Fern Bulletin O. 1909.
- VICKERS, E. W. *Mountain Splenwort in North Eastern Ohio*. Fern Bulletin O. 1909.—Report of this species from Mahoning County.
- WINSLOW, E. J. *Botrychium lanceolatum in Northern Vermont*. Fern Bulletin O. 1909.
- WINSLOW, E. J. *A Correction*. Fern Bulletin O. 1909.
- REPRINTED ARTICLES. *Thomas Minot Peters; Ferns for Winter; Humus Collectors and Myrmecophilous Ferns in the Phillipines*. Fern Bulletin O. 1909.
- PTERIDOGRAPHIA. Fern Bulletin O. 1909. *New Station for Mountain Splenwort. A Variant Os-*

munda. *Schizaea Pusilla* in Newfoundland. *The Fertile Spike of Ophioglossum*. *Nephrolepis Magnifica*. *Ferns of the Malay Region*. *Herbarium of D. B. Gilbert*. *Still Another Nephrolepis*. *More Nephrolepis Species*. *Pollination and Fertilization*.

COMPLETE SETS.

In this magazine, volume 15, page 63 is printed a list of twenty-six owners of complete sets of the *Fern Bulletin*. Since that list was printed several other sets have been completed and we add the list of owners below. There are one or two sets in existence that still lack but a few of the early numbers to be complete. We are as anxious as the owners to complete these sets and will welcome information in reference to the rare numbers. The list of owners of recently completed files follows:

BELHATTE, M. C., Paris, France.

BROOKS, MRS. WM. T., New Britain, Conn.

JENKS, CHAS. W., Bedford, Mass.

MAXON, WM. R., National Museum, Washington,
D. C.

SMITH, MRS. ANNIE MORRILL, Brooklyn, N. Y.

TEACHER OF BOTANY WANTED.

The editor of this magazine has been commissioned to secure a teacher of botany for a first-class high school. One who can teach morphological and physiological botany by the laboratory method somewhat after the plan outlined in the editor's recent book "High School Botany" is desired. The pay is good and advancement sure. Teachers interested should apply at once stating qualifications and experience.

EDITORIAL.

Our readers have doubtless noticed in the public press more or less extended references to the proposal, now before congress, to increase the mailing rate of the monthly and quarterly magazines. The annual deficit in the postal service is urged in extenuation of this proposal, but it is difficult to understand why the magazines should be charged with this deficit and the weekly and daily newspapers go as at present. Across the border in Canada the rate is exactly half of what it is in the United States and yet they have no deficit. Well informed observers are of the opinion that if all the mail sent out by the Government under franks of various kinds, was charged up to each department as it should be, there would be no deficit here. Be that as it may, one thing is certain. If the cost of mailing is raised it will increase the cost of all magazines to the reader. Those who believe they are paying enough for their magazines as it is, should do what they can to convince their congressman and senators that a raise in the mailing rate is not warranted by the facts. When the postal service was organized, the mailing rate on publications was made low for the express purpose of furthering the spread of information among the people. Any repression now is a step backward.

* * *

A second number of the *British Fern Gazette* has appeared and is quite up to the standard set by the initial number. The frontispiece is a fine photo of *Lastrea (Nephrodium) Montana plumosa* and the text is devoted to several well written articles on various abnormal forms. We learn from the editor that the magazine will be sent for five shillings a year,—about \$1.25. Those who are interested in cultivating the

rare forms, will find much in the numbers to interest them. A sample copy may be had on application to the editor Chas. T. Druery, F. L. S., 11 Shaa Road, Acton, London W. England.

BOOK NEWS.

Prof. John H. Schaffner has recently published "The Pteridophytes of Ohio" in the "Proceedings of the Ohio State Academy of Science." It is a neat little booklet of forty pages, containing several pages of introductory matter, a list of species with descriptions and their ranges in Ohio, and a good glossary. The nomenclature is that of the "American code" and the key to the genera is based in part upon the vascular bundles. Their latter while quite accurate is likely to be puzzling to the average individual who attempts to use it. The ferns are not so numerous, however, as to make this a serious difficulty. Forty-three ferns and eighteen allies are listed. The thoroughly scientific treatment must make the list of great aid in further studies of the Ohio pteridophytes.

That part of the "North American Flora" which begins the ferns (Vol. 16, part 1) was issued Nov. 6, 1909 and is a volume of considerable interest to all who follow the evolution of fern study. It is not hard to glean from this work the fact that the nomenclature of ferns moves in cycles and has returned to a semblance of that in use ten years ago. It is something of a surprise being fairly described as conservative. Underwood's *Ornithopteris* has been abandoned for the well-known *Anemia* that most of us have continued to use and under *Osmunda* we find *O. regalis* standing for the royal fern instead of the proposed *O. spectabilis*.

A similar conservatism obtains in the recognition of species. *Botrychium dichromum* which this journal has insisted, time and again, is not even a good form, has been placed at last where it belongs as *B. Virginianum*. *Botrychium tenuifolium*, insisted upon as a good species by Underwood is here united to *B. obliquum* and we predict that several others still treated as distinct will ultimately share its fate, especially *Alabamense* and *Underwoodianum*. The *Ophioglossums*—*arenarium* and *Alaskanum*—have also lost standing, just as we asserted they would ten years ago, and are now to be found as synonyms under *O. vulgatum*. *Ophioglossum pusillum*, which was later baptised *O. nudicaule* has a new name now,—*tenerum*. A step backward is the substitution of *Dicranopteris* for *Gleichenia* in an attempt to separate allied species in the old world by this means, but this is not of great significance, partly because the North American *Gleichenias* are all tropical and partly because the species are easily recognized under their disguises. The work is planned to cover all the species in North and Central America and the West Indies and as such will be a very useful work for reference. It can scarcely be recommended to one wishing to name his specimens, however, for though the keys are good and fairly accurate, and the range of the species given, the descriptions are technical and involved, being mere descriptions of all parts of the species with no attempt to single out that which is characteristic. We doubt if the authors would recognize even their best friends if described in the same way. An added defect is that this work which aims to present "descriptions of all plants growing without cultivation" in the region covered omits all mention of the forms and

sub-species of the plants listed. In this day of studies of variation, such omission is a grave one. In other ways the work seems to have been rather perfunctorily done. The vegetative parts of the ferns are referred to sometimes as leaves and at others as fronds. After a description of the blade of a *leaf* it is rather disconcerting to see the petiole described as a stipe. In other instances the words fertile fronds and sporophylls are used interchangeably. The work of this first part is by W. R. Maxon and R. C. Benedict in most cases working upon the copious notes left by the late L. M. Underwood. Several new species are described but not illustrated, a mistake, in the present age of cheap illustrations. It is not likely, however, that the defects we have mentioned will trouble many students for this first part containing only 88 pages bound in paper costs \$2.00.

The family Ceratopteridaceae, or Parkeriaceae, was founded to contain the curious floating fern of the tropics known usually as *Ceratopteris thalictroides*. By most botanists this fern is supposed to range entirely around the earth, and the variation seen in any large collection of the plants is attributed to the diverse habitats in which it is found. Ordinarily floating in brackish or fresh water, it may, by the recession of the waters during drouth, or the action of wind and wave, be left on muddy flats where it may root like other ferns. It has always been a subject for speculation among systematic botanists and different forms have frequently been recognized as good species. The latest, though probably not the last, student to discuss the plant is R. C. Benedict who in *Torrey Bulletin* for August, 1909, makes four species of it. one of which

(*C. deltoidea*) is described as new. The points relied upon for distinguishing these forms are the number of spores in the sporangia, the relative development of the annulus and the amount of development of the sterile leaves. The author well says, "a knowledge of the ecology of the various forms would also assist greatly in their classification." The reviewer believes that such knowledge would result in putting these forms back as they were before—as forms of a single species.

Minnesota is seldom regarded as a State rich in ferns, but according to the "Guide to the Ferns and Fern Allies of Minnesota" recently issued in Minnesota Plant Studies by C. O. Rosendahl and F. K. Butters there are about sixty species in the State. The Guide is issued with the object of making these plants better known to the residents of the State, for which purpose it seems admirably designed. Although covering twenty-four pages it is little more than an illustrated key, but the many illustrations are so scattered through the text that it would seem as if nobody could fail to name his plants. We are inclined to think, however, that residents of Minnesota will have to search a long time to find *Salvinia* growing wild.

There has recently come into the reviewer's hands a copy of a little book on American ferns which, though it bears date of 1907 and has gone into a second edition, is probably not even known by name to a majority of fern students. The book referred to was written by Ivar Tidestrom of the Department of Agriculture, Washington, D. C., and is entitled "Elysium Marianum" a name which gives the average reader no clue to the contents of the book. The title recalls

to mind the early works of botany and the impression is deepened by a peep into the pages of the book where the typography and treatment of the subject is, whether intentional or not very similar to the usages in the old herbals. The author is no trader in plant names but goes back to the beginning for his names. In consequence we have *Polypodium Virginianum* for our well known polypody and *Phegopteris connectilis* for the long beech fern, which, by the way is spelled *beach* fern in the book. *Athyrium pycnocarpon* is another new name given to the narrow-leaved spleenwort. The ferns, fern allies and conifers found in Maryland and Virginia are the species included in the book. Each of these is described in technical language and its full synonymy given including references to all recent works. Especial attention is given to the origin of generic names, and there is a good key to the genera. These matters take up 96 pages after which come 12 photographs of the specimens discussed. While little if anything is added to our knowledge of plants, the unique form of the book and the learning displayed in tracing the old names will make the book of interest to botanists.

For fifteen years or more, one of our members, Mrs. M. A. Noble, of Iverness, Fla., has been building up a collection of ferns for Rollins College, at Winter Park, Fla. Recently this was destroyed by fire. Not discouraged by this ill luck Mrs. Noble has gone to work to build up a new herbarium. Her request for ferns in exchange appears elsewhere. Members have here a chance to show their interest in a worthy undertaking.

THE AMERICAN FERN SOCIETY

President, Rev. Jas. A. Bates, South Royalton, Mass.
Secretary, Prof. L. S. Hopkins, Lincoln High School, Pittsburg, Pa.

Fern Students are cordially invited to join the society. Address either President or Secretary for further information. The *Fern Bulletin* is sent free to members. Annual Dues are \$1, and should be sent to Mr. H. G. Rugg, Treas., Hanover, N.H.

TO THE MEMBERS OF THE AMERICAN FERN SOCIETY:

Late in 1909, without preliminary discussion of any kind you were asked to vote on the desirability of establishing a new "official organ." The existence of an official organ of any kind is necessary only for the purpose of keeping members informed of the activities of the Society, and since this magazine has always printed news of this kind it is difficult to discover any need for a change; in fact, so little matter of interest to the Society has come in that the editor has been obliged to write more than nine-tenths of all the matter thus far published.

It has been contended that if the Society owned its own magazine, the fact would in some way redound to its credit. As a matter of fact, it would do nothing of the kind. The *Fern Bulletin* was formerly owned by the Society and was only taken over by the present owner after a trial of several years had shown that it could be more economically managed by a private company. An organ owned by a Society is a constant drain upon its resources. By the present plan, the expense of this kind is fixed and does not go beyond a certain figure. The sum needed to issue the *Fern Bulletin* is larger than the entire revenues of the Fern Society. Therefore, should the Society establish a new publication it would certainly mean a smaller and much inferior one. In estimating the cost of a new publication, too, one should not be misled by the price

of the printing alone. There must also be taken into consideration the cost of cuts, stationery, mailing, wrapping, postage, etc., etc. This will increase the cost at least a third. If the revenues of the Society are used for publication, additional money must be raised to defray the cost of running the Society and publishing the annual Report. At present, after the Society's copies of *Fern Bulletin* are paid for, there is left sixty-five dollars or more for the use of the Society. Which do you prefer, an "official organ" smaller than this magazine and requiring all your revenues, or the present magazine plus a good round sum for other things? It should be remembered that under the present arrangement, the Society gets the magazine below cost, although the publisher is in no way bound to make this reduction. Can the Society by publishing its own magazine arrange for anything half as advantageous? So far as we can ascertain no Society publishing its own magazine has dues as low as ours. The members who belong to these other Societies have only to ask themselves how the annual dues compare to understand that the official organ is responsible for much of the difference. So well is this known that members of the Fern Society have been asked to pledge their dues for two or more years in advance to make the first year's issues possible. In this case, where is the money for following years to come from?

Before the Society can establish such an organ it will be necessary to alter the Constitution to provide for its editorial management. The editor will have to be either elected or appointed and the frequent changes that must necessarily occur will not conduce to the best interests of the Society.

Should such a change in the Constitution be proposed in future, it will be for the best interests of fern study in general and the Fern Society in particular, to vote solidly against it. Let us not make experiments in publication. If another company wishes to take over the *Fern Bulletin*, making the same arrangement with the Society that we have always made, we will make them a present of it provided, they buy the stock of back numbers. We wish to make it plain that we do not object to a new publication devoted to ferns, but we do most decidedly protest against the Society becoming its own publisher. In the present arrangement the Society has no liabilities beyond the cost of the magazine to each member; as a publishing concern there would be no limit to its liabilities. A careless management may plunge the Society into debts that can easily wreck it.

In reference to the statement sometimes made, that the Society has annually to make a new contract with the publisher, it may be said that the Society has never made but one contract with the publisher and that was made when the magazine adopted its present style and price. The rate was then made less than the regular price and was strictly for cash in advance. Recent advances in the cost of production have decided us to ask for an advance of one cent per copy in 1910. If the legislation relative to the mailing rate of magazines now before Congress raises this rate, as seems probable, we shall have to require another raise of the Society and of our subscribers alike. This advanced rate, however, will fall with greater force upon a new publication than upon a well established one.

Some of those who have been clamoring for a new magazine, assert that it is needed for those fern stu-

dents who do not care to write for *Fern Bulletin*, but such are apparently forgetful, of the fact that these people do not write for any other publication. Consult the index to current literature for proof of this. There has been an evolution in fern study as well as in other things. New species are not as plentiful as formerly, and ranges have been pretty carefully mapped. The advent of several fern books has made the haunts and habits of ferns well known to us and the whole subject is so well known that there is not much left to write about. Those clamorous individuals who do not write, should first prove that they can! But granting that any member does not care to publish in this magazine, there is the Annual Report in which to publish. A careful executive council ought to save a large part of that sixty-five dollars for the publishing of many excellent articles in this report..

One objection often urged against this magazine is that it has often been late. In this it shares the criticism with all the other botanical publications. On the first week in January we received copies of four prominent botanical magazines all dated *December 1st*. A magazine that does not pay its editor but is issued primarily as a hobby, must not be expected to come out on time. It comes out when the editor can get it out. Some delays in *Fern Bulletin* however, have been due to delays of the officers. Subscribers have received their copies two weeks before members of the Society received theirs but this is in no way the fault of the publisher.

The real reason for a proposed new magazine is not to be found in the foregoing. The things urged in favor of a new magazine are excuses, not reasons. The only real reason for a change is that the altitude of

the present editor on the subject of nomenclature and species-making is not satisfactory to a certain interested few. In regard to this, we fear we can promise no improvement in future. Our interests are the interests of a large circle of readers, and much as we would like to please everybody we cannot do so and continue to think for ourselves. The individual anxious to please, usually has not brains enough to do anything else. We hope we may escape being placed in this class. Our columns are always open, however, to any member of the Society. He may say what he pleases so long as it is pertinent and will pass unchallenged through the mails. We shall therefore continue as we have in the past, trusting to the good sense of the members to second us in our endeavors.

Since the last report was made the following members have joined the Society: James Shaw, Owens Sound, Ontario, Canada; Jay G. Underwood, Hartland, Vt.; Bremer W. Pond, 1039 Massachusetts Ave., Cambridge, Mass.; Rev. Father J. L. Chandonnet, Perham, Minn.; Mrs. Chas. B. Lombard, 25 Highland Ave., Newtonville, Mass.; Harriet Mulford, Auld Lang Syne, Hemsted, N. Y.; Mr. Cecil T. Bristol, Manilla, P. I.; Miss B. Muriel Bristol, Birmingham, Eng.; Francis E. Whitmore, Cortland, N. Y.

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Vol. XVIII

No. 2

The
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A Quarterly Devoted to Ferns



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1910



The Fern Bulletin



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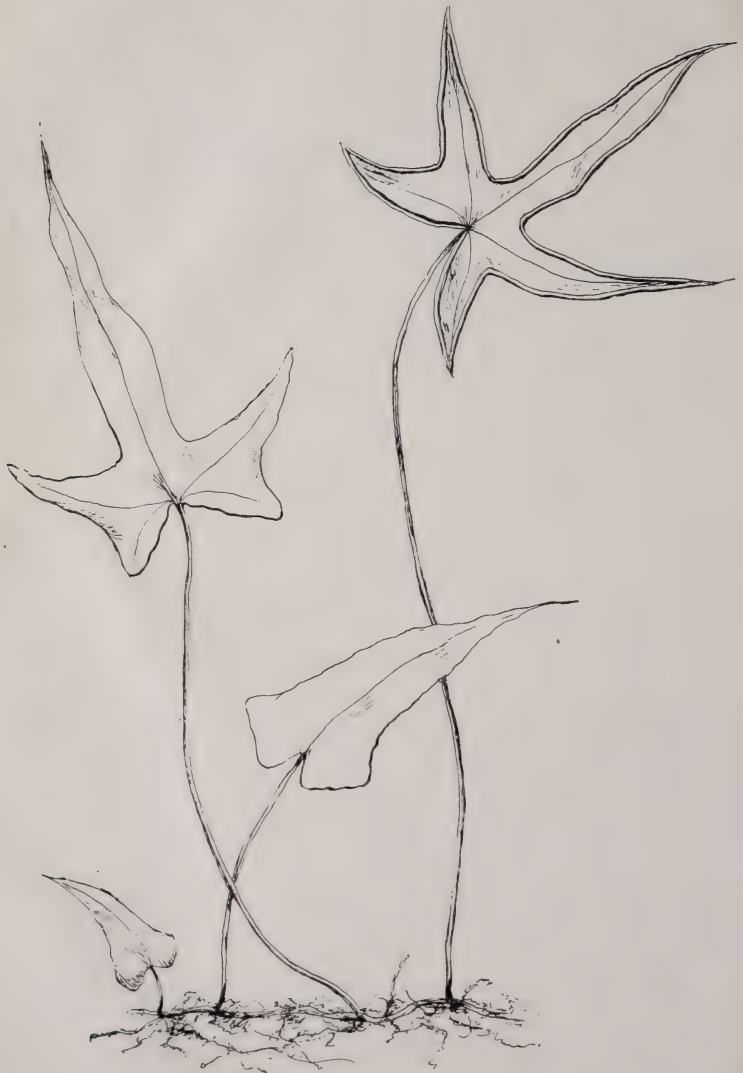
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THE FERN BULLETIN

Vol. XVIII

APRIL, 1910

No. 2

VARIATION IN *BOTRYCHIUM RAMOSUM*.

BY RAYNAL DODGE.

An address delivered at the meeting of the American Fern Society held in Boston, Dec. 30, 1909.

The way difficulties constantly increase when we attempt to investigate any scientific subject is really surprising. We continually encounter more problems than we solve, but I doubt if there are any genera mentioned in the Manual, the forms of which are more confusing, and less understood, than those of the genera *Botrychium* and *Isoetes*, not even *Crataegus* excepted. They are in a muddle and no mistake.

I have been puzzling at times, over the so-called species in *Botrychium* and *Isoetes* for ten or twelve years and have come to certain definite conclusions regarding them, but in the meantime I have met with other problems I am unable to solve.

But all through the course of the remarks I propose to make at this time regarding the genus *Botrychium*, I intend to confine my remarks exclusively to one species of *Botrychium*, *Botrychium matricariaefolium*, or as the Manual now has it, *Botrychium ramosum*. It is possible however, that you may conclude at the close of my remarks that I have failed in my undertaking, and that I have been discussing several species in lieu of one. As regards this, however, each one of my audience individually must decide.

If about the middle of June we walk along beside a brook which flows through the older woods, a maple

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swamp by preference, and as we go look carefully, about a foot or two above the level of where we judge the ice lies in winter, we will probably be rewarded by the sight of the bright yellow spore cases of *Botrychium ramosum*, at this season in full fruit. Keeping the level of the ground where we found the plant carefully in the eye and proceeding on our journey, we will succeed it is very likely in finding other plants of *B. ramosum*, perhaps a whole colony, but all at about the same distance above the level of the swamp. We may be able to find plants of *ramosum* out in the swamp or nearer the brook, but in this case they will be found growing on an elevation of some kind, a spot where there is good drainage.

Now let us not remove the plants of *ramosum* we have found, but let us rather mark the locality, and return at the end of three or four weeks. In ordinary seasons the swamp will then be pretty well dried up, and if we go out into the swamp and nearer the brook and remove the dead leaves and work with some persistency, we will probably succeed in uncovering little plants of *Botrychium* in full fruit, with their little yellow sporangia.

I have seen these little *Botrychiums*, extending along a brookside in Newbury for a hundred yards, in any spot where I choose to examine the ground very much more plentiful than plums in a pudding. A few weeks later some of these little plants will be found extending two or three inches above the dry maple leaves.

Now let us remove and take away a few of these little plants, and then we will visit the station where we discovered the larger plants of *ramosum* a few weeks ago. We will find that the plants have dis-

charged their spores and miserably wilted, but let us remove the dead leaves about the plant and we will find in nearly every instance small, immature *Botrychiums* having every appearance of those we have just collected in the swamp by the brookside. Take home these two sets of plants, and examine them microscopically or in any way you choose, and see if you can find any constant difference between them.

I have been unable to find any difference between those growing in the swamp and those found on higher ground, and after a careful reading of Mr. Eaton's articles written when he was offering these little plants to us as a new species under the name of *Botrychium tenebrosum*. I might amplify at this point largely, but as Mr. Eaton during the latter years of his life changed his base admitting that these little plants did not constitute a new species, but yet maintaining that they should not be referred to *B. ramosum* but rather to *B. simplex*, I have reached a point that serves my present purpose and will drop this part of my subject and follow Mr. Eaton into *simplex*. But before doing so I will take the time to answer a question which has probably been uppermost in the minds of some of my hearers. That is, why do these small *Botrychiums* we find in low ground, never become large plants as do the identically alike little plants we find about the base of plants of *Botrychium ramosum*.

As I understand the situation, the reason for this is that they are not placed in an environment which is favorable to an early and continuous growth. They are in fact submerged the greater part of the year. Sometimes for the entire year, and as is usual with plants when their growing season is restricted they form fruit when small.

I once planted seeds of the shepherd's purse in October. They attained a height of only a half or three-quarters of an inch, but yet they perfected seeds. Moreover I have reasons for thinking that many of these small *Botrychium*s we sometimes find in swamps are winter-killed. But I hope to return to this subject at some time in the future.

Now I have said that a favorable location for plants of *B. ramosum* is by a shaded swamp, or brookside, at some little distance above the ice line, but of course we are to understand that the continued existence of our plant does not depend at all upon elevation above anything, but merely on a fitting soil, and a proper degree of light, and heat, and moisture, and drainage. I have often found our plant in other situations than by a brookside, but with a similar environment, and the finest station for *B. ramosum* I ever saw was a mile from swamp or brook at Horse Hill in Kensington, New Hampshire. As this station for *B. ramosum* is intimately connected with the remainder of my address, and was as I feel a source of inspiration to me, I will give a brief description of it.

In June, 1896 Mr. Alvah A. Eaton informed me by letter that he had discovered a fine station for *B. ramosum* at Horse Hill. The next year I visited the station with him. I will say here that I was intimately acquainted with Mr. Eaton for many years, in fact it was I who first interested him in the study of the Ferns and Fern allies. I have made botanical excursions with him that would probably aggregate several hundred miles. I have made excursions of a similar character with many others, but Mr. Eaton, of all the men I ever was acquainted with had the keenest eyes. Nothing of an unusual character escaped his

glance as we traveled through field and wood and swamp. But the discovery of this station for *B. ramosum* was not to be credited to Mr. Eaton's sharp eyes, but rather to his assiduity and energy in making explorations, which was another of his striking characteristics.

The station was phenomenal. The plants grew in a very deep leaf mold, nearly at the foot of a somewhat steep hillside, and covered an area of about twenty-five hundred square feet, with some outlying plants. Within this area they grew almost as thickly as grass, and excepting the tall trees, swamp oak and red maple, almost to the exclusion of any other form of vegetation.

We traveled from Seabrook to Kensington with a horse and wagon. Mr. Eaton took along a pile of newspapers, and collected between eleven and twelve hundred specimens with no apparent diminution in the supply. Many of these plants were fifteen inches in height, some were eighteen inches.

I visited this station the next season, June 10, 1898 and the plants then presented a fine appearance. Mr. Eaton was with me again and together we made a circuit of the hill in search of other stations or plants of *ramosum* but we found none. This station for *ramosum* was on the southeast side of the hill, very near a road and quite near the junction of two roads, with no intervening wall or fence. All about the hill was cleared or cultivated land, so that the winds coming from any direction had a good sweep.

Directly opposite that part of the hill where the *ramosum* grew, that is on the opposite side of the road, was a farm house. The occupant of this house in the summer of 1898 largely increased his flock of

hens, having at one time about two hundred, as I learned in conversation with him.

I did not visit the hill in 1899, but as the hens used it as a foraging ground I found but very few plants there in 1900. I found none at all in 1901. To make matters worse, the timber on Horse Hill was felled in the winter of 1902-03 thus laying the station open to the sun.

In June, 1899 Mr. Eaton came to my house, with the information that he had discovered *Botrychium simplex* growing on Newfound Hill, in Hampton Falls, New Hampshire, but rather too late for collection. This was just one year from the June when as I said previously, I visited the locality for *B. ramosum* at Horse Hill and found that the plants presented a fine appearance.

Newfound Hill is directly east from Horse Hill, about a half mile distant. Between the two hills is a nearly level strip of cultivated land, through which runs the dividing line of Kensington and Hampton Falls. The hill is bare of trees with the exception of a few low and scattering red cedars, the vegetation consisting mostly of mouseear, sorrel, and low grasses. The hill covers an area of perhaps ten or fifteen acres, and its summit is about two hundred feet above sea level.

June 1st, 1900, the next year after Mr. Eaton discovered the plants of *simplex* at Newfound Hill, in company with my nephew I visited the locality. On my way I examined the station for *ramosum* at Horse Hill, and as I have previously said found very few plants there, as they had been eaten by the hens, but I found *simplex* at Newfound Hill in profusion.

The little *Botrychiums* were quite noticeable amidst

the low and scanty vegetation that covered the hillside. I made a collection of about sixty plants, and then made an estimate of the number still growing on the hillside. I concluded that there were at least five hundred plants yet remaining, mostly near the summit of the hill. I found also that all the plants were on the side of the hill towards Horse Hill. After a very careful search I failed to find a single plant on the opposite side.

For some time previous to my visit to Newfound Hill there had been a severe drouth which continued through the following week, and when I again visited the locality which I did a week later, June 8, accompanied by Mr. Eaton, the *simplex* had almost entirely disappeared. We found only three or four very poor specimens. In order to even up matters as much as possible, I divided my sixty plants with Mr. Eaton, and we consoled ourselves with the reflection that there would be plenty more there next season.

In this we were mistaken. The very year that *ramosum* disappeared from Horse Hill, *simplex* disappeared from Newfound Hill, and not one plant has since been found there. Mr. Eaton paid several unsuccessful visits to Newfound Hill in after years, but of course I do not know their precise dates. I myself visited the locality on subsequent occasions as follows: May 28, 1902, June 3, 1904, June 3 1907, always without finding *simplex*.

On the evening previous to the latter date, two years or more ago, as I happened to think of this affair and the season: *simplex* is in good condition about two weeks before *ramosum*; I decided that I would have a final search for *simplex* on Newfound Hill and take a whole day for the purpose. I started away from the

house early in the morning, arrived at the hill about 8:30, looked over one side of the hill during the forenoon, ate my luncheon, looked over the opposite side of the hill in the afternoon, covered every foot of the ground, and came away empty handed.

But the mouseear and sorrel the grasses and the savins appeared as vigorous as they did before the dry spell. On the way home I looked in on the former station for *ramosum* at Horse Hill. I found the place almost as dry as an ash heap. And Mr. Eaton has departed too. *Sic transit gloria mundi*.

The late Mr. George E. Davenport once casually remarked to me (it was at the time we both were interested in *Aspidium simultatum* and *Aspidium cristatum* x. *marginale*) that he had a few years previously found *B. simplex* growing on his grounds and he was certain that it was a late arrival. He asked how I supposed it came there and I replied, "I don't know; are the plants growing there now?" "No they have disappeared" he said. I asked him this because at that time I had never collected *simplex* and thought that possibly his statement might lead to an opportunity for doing so.

I asked if he knew of any locality in his neighborhood where *simplex* could be found and he said "I don't know of any locality for *simplex*" and then he added, "The spores must have been blown over there."

Of course all of our native vascular cryptogams were well known to Mr. Davenport, and he doubtless was familiar with all that grew on his grounds, and would soon notice new comers. Nor is there anything unreasonable in his surmise that the spores that eventually became plants of *B. simplex* were blown onto his premises.

But what was their source. We have been informed in every edition of the Manual that *Botrychium simplex* is a rare plant. All through the course of my remarks I understand *Botrychium simplex* to be the plant found growing on dry hills, first figured and described by Prof. Edward Hitchcock in the American Journal of Science, Vol VI, page 103, 1823, and not one growing "In moist woods, meadows and swamps" as we read in Britton and Brown's Flora.

I have never seen *simplex* growing except at Newfound Hill. Mr. Eaton told me that he had never noticed the plant at any other station. This of course was before he came to think that immature plants of *B. ramosum* should be referred to *B. simplex*. But I should not be guilty of much exaggeration if I were to claim that Mr. Eaton could find *Ophioglossum vulgatum* growing in the grass in almost any old field.

I have no certain knowledge that *simplex* has ever been found in North Eastern Massachusetts although I do not doubt that it has occasionally been noticed there. At the time I found plants of *simplex* on Newfound Hill I noticed that the species was very variable. I selected the typical and best looking ones for specimens which was a mistake but I noted well their general appearance.

What is the source of these spores that sometimes germinate on dry hills and vegetate into forms of *Botrychium* some of which have sterile segments with seven lobes, some with five lobes or three lobes, one lobe, no lobes at all; some with the fertile segments much branched, some with only a few sporanges, yes and some with no sterile segment at all, the plant being merely a little stalk with a few grains at the tip

end all growing apparently under the same conditions. Then they utterly vanish. The behavior and very appearance of these plants would indicate that they were growing under abnormal conditions.

The only possible source of these spores I can see, is plants of *Botrychium ramosum*, and that host of plants I once saw growing at the foot of Horse Hill, must have discharged an infinite number of spores.

As regards that form in the genus *Botrychium* that has been named *B. lanceolatum*, it is evident judging from external appearance alone, that there is much less difference between *lanceolatum* and *ramosum* than there is between *ramosum* and typical *simplex*, so that if *simplex* is one form of *ramosum* we would infer that *lanceolatum* might be another form of the same plant.

Moreover at a station where the plants are plentiful, is not at all difficult to find forms intermediate between *B. ramosum* and *B. lanceolatum* in fact I once found two fine plants of *B. ramosum* in full fruit growing in company with a hundred or more *Botrychiums* most of which were good and distinct *B. lanceolatum*.

These *Botrychiums* were growing among tall plants of *Onoclea sensibilis* in a situation that for the greater part of the year was very wet. This was Aug. 15 which is about the time when *B. lanceolatum* matures its spores in Massachusetts. But the two plants of *B. ramosum* were *two months late*.

I have no opinion as to why these *Botrychiums* did not take on the form *tenebrosum*, or why I could find only two plants of *B. ramosum* at the station. Perhaps the real relationship of these plants is governed by chemical and biological laws, too subtle for human understanding.

I have come to think then that *B. ramosum* is in all probability a polymorphic plant. Breathe ever so lightly on a matured spike and its spores drift away like dust. Driven miles away perhaps by the wind, they finally fall by the roadside, or in stony places, and come to naught; or they are carried into the lowland, where conditions are suitable for germination but not for protracted growth, and so the resulting plants are killed by the winter's frost, or they fly to the hill tops, remaining dormant perhaps until the needful amount of moisture causes them to germinate and the plants to vegetate, until they are dried up by the summer heat, and a few eventually find an environment, where they can not only germinate, but where also the ensuing plants can form a continuous growth, and such as these perpetuate the species.

Newburyport, Mass.

THE PHILIPPINE PEDATE BRACKEN.

Doryopteris Ludens.

BY WILLARD N. CLUTE.

In studying the ferns of any particular region, we seldom find the different species so much alike that it is hard to separate them; nor do we commonly have much trouble with the genera. All seem distinct enough and we commonly place a newly discovered species in its genus with considerable certainty. But the farther our studies extend, and the larger our group of species becomes, the greater becomes our difficulty in defining the genera. In most parts of North America the genus *Pteris* seems one of the most distinctly marked of plant groups to the beginner, but as soon as he enters the tropics he becomes amazed at

the unusual forms that press their claims for recognition as good members of this genus. In the beginning, especially, we find what are clearly bracken-like plants with free veins and others with the veins anastomosing, and in the latter division the meshes of the veins or areolae may or may not include a free veinlet. Along with these differences we find numerous differences of structure and outline until we appreciate the fact that the systematist has found it necessary to make several different sections of a large genus, and are not surprised that various fern students have been inclined to consider some of the groups to be good genera themselves. Our own bracken (*Pteris aquilina*) under such a ruling is no longer a *Pteris*. With four other species it forms the section *Paesia* because it possesses a second fungacious indusium. For this reason it is sometimes placed in the genus *Pteridium* in this country. This is not usually countenanced, but not so much objection is made at the separation of the group *Doryopteris* for in this group the fronds are arrow-shaped or half pedate with many anastomosing veinlets and all the plants are quite small. There are about ten different species regarded as belonging to this group. Of these, five are found in the American tropics and the others occur in the Hawaiian Islands, the Philippines and Australia—a wide distribution for a group so small. In this magazine for April 1908, we illustrated one of the common species of the American tropics named *Doryopteris pedata* and we give herewith an illustration of a species from the other side of the world. This is *Doryopteris ludens* collected in Luzon, Philippine Islands by D. Le Roy Topping to whose kindness we are indebted for the specimen from which the figure

was made. It is the only Philippine species. A comparison with the earlier illustration will show that the two species have a common resemblance but are not likely to be mistaken for each other.

JUVENILE FERNS.

BY ADELLA PRESCOTT.

Among the important questions we all are called upon at times to answer is the oft recurring one "Whom does the baby look like?" and at no time is this question more perplexing than when the infant under discussion is a fern, for often it bears so slight a resemblance to its parents that only an intimate friend of the family, familiar with all its characteristics, would dream of the relationship between them.

One of my first experiences with these deceptive juveniles was with the maidenhair. This was the one fern that I had always felt perfectly sure of for there seemed no possibility of ever mistaking it for anything else, so when in a cool, shady ravine I found some small ferns resembling maidenhair but with the rachis undivided, I immediately jumped to the conclusion that it was the rarer *Venus* hair instead of that of a common maid.

To be sure my trusted authority (Clute) questioned the finding of this fern as far north as New York and this was not only New York but Central New York at that, but might not I be the happy discoverer of a new station? But as specimen after specimen was revealed to my searching glance the conclusion forced itself upon my reluctant mind that such abundance in a place so easily accessible could hardly have been overlooked by botanists and that these were, after all, only the youthful progeny of the beautiful but com-

mon *Adiantum pedatum*. Ah well! they were very charming even though no fame attended their discovery.

About the same time I found some tiny ferns with blades perhaps an inch and a half long, tapering both ways from the middle and so frail that after they were pressed their reality was only proven by their perfection. I puzzled over them for some time, comparing them with this or that, until one day it flashed over me that they, too, were babies, resembling in "build," at least, their parent, the New York fern, and now that it is impossible for me to longer evade the disappointing fact that rare ferns are not common nor readily found I find much pleasure in the tiny forms that often set me guessing their identity.

The Christmas fern (*Polystichum acrostichoides*) is one that can hardly be mistaken unless in the very earliest stages of growth though contrary to many precedents the juvenile forms lack the grace of mature fronds; but the youthful progeny of *Athyrium filix-foemina* must seem to their lady mother like the changelings of a fairy tale so little do they resemble the parent plant. But all this applies only to those ferns that are reproduced by spores.

The young plants produced by the bulblets found on the fronds of the bulbiferous bladder ferns, or from stolons, as the ostrich fern; or from rooting tips of the mature fronds as the walking fern, are much more mature from the first than sporelings and are quite like children masquerading in their mothers' gowns.

To one whose opportunities for study in the field are limited by time or strength to places easily accessible the study of these fern children is especially alluring, for long after the possibilities of a haunt have

been exhausted both in species and varieties the search for these fairy changelings may continue with the confident expectation of finding at least occasionally a new form; and it is quite possible for one who has the desire and something less than eternal patience to raise them in pots of moist mold from spores, but I fancy very few of the millions of spores produced ever develop and fewer still reach maturity, for out of forty-six prothalli that I started in a pot only two produced fronds and they were short-lived.

New Hartford, N. Y.

RARE FORMS OF FERNWORTS. -XIV.

SOME VARIATIONS OF POLYPODIUM.

Search any species of plant long enough and we are likely to find variations from the normal. If the species varies in more than one direction we are likely to find our variations falling into distinct groups. This is especially so in the case of the common polypody where we find groups characterized by forked pinnae, lobed pinnae, or pinnae that are themselves nearly pinnate. When we approach the study of forms, however, we seldom find them distinct and clearly marked. Those of one group insensibly merge into one another. This fact was clearly indicated recently by the receipt of a parcel of some seventy-five fronds of *Polypodium vulgare* collected by Mrs. A. E. Scoullar from a single ledge facing east in Maine. In the lot there was scarcely one that would pass for normal and yet few were distinct enough to be classed as one of the named forms. Among the most interesting were those that exhibited one or more ears on the basal pinnae. Although these are all more or less alike three different forms have been singled out for nam-

ing. Typical specimens are shown in the accompanying illustration. Figure 1 is the simplest of the group with a single ear on the lower side of the basal pinnae. This is usually called the form *auritum*. It is the exact opposite of the pinnae of the Christmas fern



(*Polystichum*) where the ears are on the upper side alone. Forms of the polypody with basal pinnae lobed on the upper side only have been reported but the tendency toward lobing is strongest on the lower side and specimens eared only on the upper side are

quite unusual. It is but a step from *auritum* to *hastatum* (fig. 3) where the tendency to produce lobes has been manifested on both sides of the lower pinnae. This is one of the commonest variations of the polypody and is so well marked that it really ought to be considered the only form worth a name the others being mere immature varieties of it. Our middle figure approaches the form *deltoideum* of Gilbert. It appears to be merely a shorter and broader *hastatum*. When most distinct it has a longer tapering tip but this would seem to depend somewhat upon how much of the strength of the plant goes into the basal pinnae. A full account of all the varieties of the polypody in America appeared in this magazine for April, 1906. and illustrations of various curious forms were published in *American Botanist* for September 1903. —*W. N. C.*

THE NAMING OF FERN VARIETIES.

The question of how to name mere forms of ferns has always been a perplexing one. By "mere forms" we do not now refer to wild specimens which may or may not have a permanent character, but rather to those plants bred up by dealers and amateurs for some striking or bizarre abnormality, such as crested or forking fronds. In America it has been customary to name these plants exactly as if they were legitimate species and in recent years we have had more *Nephrolepis* "species" added to our lists than the wide world ever contained. In selecting the name by which each form is to be known, we have exhibited equally bad taste, naming the plants for the discoverer or for the place in which they were found. European fern students apparently have a better way and seem to be

evolving some system in their naming as the subjoined notes from the *British Fern Gazette* would indicate. If these names can be made to designate definite appearances they will certainly be extremely useful in bringing a given form to mind.

Much confusion exists in the naming of the simpler crested forms as regards the extent of tasselled division and its character. Broadly speaking it falls into two sections: flat fan-like division and bunch division. The flat creasting may be roughly graded thus: simply forking, *furcatum* or *furcans* when confined to two or three divisions; *digitatum* or fingered up to five or six; *polydactum* up to ten; *multifurcatum* up to a score; all these divisions terminating in points and not dividing again and all spreading out in the same plane—fan-fashion. If the primary divisions fork again we get true cristate or crested forms and, still adhering to the flat expansion, we may term them *cristatulum*, *cristatum* or, in the case of divided ferns, *percristatum* if the pinnules as well as the frond tip and pinnae are crested. When the flat mode of expansion is replaced by a sort of radiating division producing tufts or bunches they become corymbiferous—*corymbiferum*—and when these are large and heavy the *grandiceps* form is attained provided the terminal bunch of the frond is so characterized. An extreme form of this producing dense ball-like crests may be termed *globosum*. All these terms apply to fronds whose midribs are not otherwise divided than at the tips, but when these split lower down into branches this character is indicated by *ramosum*, *ramosissimum*, *ramulosissimum* or, in extreme cases *conglomeratum*. This ramose character is indicated in compound varieties i. e. in which other characters occur in conjunction

with it, either by the prefix *ramo* or the addition of the names of the more developed grades mentioned above, thus: *ramo-digitatum* or *muricatum ramulosissimum.*"

PTERIDOGRAPHIA.

MAINE FERNS FREE.—Mr. Alvin H. Trundy, Farmington, Maine, offers to collect any of the ordinary ferns and fern allies of his region for readers of *Fern Bulletin* provided the recipients will pay the postage. To take advantage of this offer requests for specimens should be sent to Mr. Trundy by the first of June. This is an excellent opportunity to secure the ferns of this part of the world. The Fern flora of Maine was published in this magazine for October, 1906.

FORMS OF LYCOPodium CLAVATUM.—The common club-moss (*Lycopodium clavatum*) is very widely distributed being found around the earth in the Northern Hemisphere and extending southward into the mountains of the tropics. Various forms have been described as species and the type is discernable in many plants that do not bear the name of *clavatum*. No doubt a great deal of this variation is due to the wide distribution and consequent differences in the habitat of the plant. M. L. Fernald and C. H. Bissell have been studying the differences exhibited by American specimens and have indicated four forms, one of which is considered new. The true *L. clavatum* is regarded as occurring from Michigan to North Carolina and Newfoundland. The plants of the Northwest frequently lack the bristle at the tip of the leaf and have been separated as the variety *integerr-*

mum. The remaining forms normally bear but a single fertile spike to a branch. In forma *monostachyon* the peduncles are usually not more than an inch long and the spikes comparatively short. In forma *megastachyon* the peduncles are two to several inches long and the spikes correspondingly lengthened. In the form *brevispicatum* found but once on a mountain summit in New York, the spikes are remarkably short and thick. This latter form is very evidently due to the dwarfing of the plant by cold, and when we discover that the form *monostachyon* is a plant of the far north and of mountain summits southward we begin to suspicion that this form also has been produced by the cold. The new form *megastachyon* is said to have a range slightly south of the preceding and to blend with it in sub-alpine situations. Evidently we have here a connected series of forms that have been modified somewhat in form by temperature and altitude.

FERTILE SPIKES IN BOTRYCHIUM.—M. A. Chrysler has adduced some further evidence to show that the fertile spike in the Ophioglossaceae is in reality two fused pinnae and incidentally has thrown some light upon the production of extra spore-bearing spikes in *Botrychium*. It appears that the normal fertile spike in both *Ophioglossum* and *Botrychium* is made up, as indicated by the vascular structure, of the two lowest pinnae fused into one. The allied genus *Ancimia* shows its relationship by always having the two fertile pinnae separate. When *Botrychium* produces more than one fertile spike it may be accounted for in two ways: either the two pinnae have failed to fuse, or else the next nearest, and normally sterile pinnae have become sporebearing. An illustration of

a sterile pinnae bearing a few sporangia was recently published in this journal. The *Botrychium* sporophyte, then, is seen to be merely a spore bearing structure with an expanded portion of one to several pinnae devoted to the work of photosynthesis. When necessary, these expanded green portions may be changed to spore-producing organs. Under this view of the case, we must regard the "frond" of the Ophioglossaceae to be half leaf, half sporophyll, with the leaf-like portion derived from potentially sporogeneous tissue. It seems to be an easy change back to spore-bearing, hence the frequency with which grape-ferns bearing more than the normal number of fertile parts are reported. The structure of the Ophioglossaceae has always puzzled botanists. It was once thought, and the idea is still held by many botanists, that *Ophioglossum* is not so far removed from the sporophyte of mosses, having simply developed roots and more green tissue, but the investigations of Chrysler seem to show that the aerial parts of *Ophioglossum* represent a true leaf and if this is true, since spore-bearing parts came before leaves, the Ophioglossaceae must represent a group of considerable complexity. In Chrysler's opinion the *Botrychiums* have been derived from fern-like ancestors and are not the simple fernworts that they are frequently supposed to be.

AN ABERRANT OSMUNDA.—In this magazine for January, 1909 four aberrant *Osmundas* were described. One of these, to which no name was given, from New Britain Connecticut was peculiar for having sporangia on the backs of normally sterile pinnules where they were supported by triangular green flaps. Mr. H. C. Bigelow, one of the discoverers, reports

that this season the plants have returned to the normal form. It is quite evident that the abnormality shown last year was in line with the form which has been named *frondosa*. It will be interesting to know if the plants exhibit the abnormality again in other seasons.

COMPLETE SET CHANGES HANDS.—The complete set of *Fern Bulletin* owned by the late James A. Graves has been purchased by the University of Illinois and will be preserved where it will be accessible to fern students in the future. This is apparently the only complete set in Illinois outside of the office of the magazine. The set of the Field Columbian Museum is nearly complete and the sets of the John Crerar Library and the Library of Northwestern University are complete from the beginning of volume 4.

STOLONS OF NEPHROLEPIS.—Rev. James A. Bates sends us a coil of slender cordlike growths taken from a specimen of *Nephrolepis exaltata* in his possession to illustrate another way in which ferns may travel. These outgrowths are often several feet long and quite numerous. Whenever they find favorable spots they may take root and produce new plants. In other species of *Nephrolepis* similar cord-like runners are sent out and form not only roots but tubers, where they come in contact with the soil. These runners are essentially stolons, really branches of the plant. The facility with which they are developed by many species of *Nephrolepis* seems due to the place in which these ferns naturally grow. In their native haunts they are usually found on old logs or the branches of trees. Near by are numerous good locations for plants if the parent plant can only reach them. Spores are

produced in abundance but reproduction by spores is a precarious business for the spores may not lodge in the proper place. Spores sent out by the plant, however, can wander on until a good location is secured, and thus the extension of the colony is accomplished.

FORMS OF *BOTRYCHUM OBLIQUUM*.—It is interesting to note that M. A. Chrysler finds the anatomy of *Botrychium ternatum*, *intermedium*, *dissectum* and *obliquum* practically identical and states that no basis is afforded for distinguishing them by this means. The late Geo. E. Davenport after studying the forms sufficiently to write a monograph on the subject, came to a similar conclusion from other indications. It has remained for later plant students to make new species founded on the cutting of the sterile segments. Chrysler also finds that the vascular systems of *B. matricariaefolium* and *B. lanceolatum* are much alike.

POLYSTICHUM ACROSTICHOIDES MULTIFIDUM.—Mr. Chas. T. Drury has called our attention to the fact that the fern whose name stands at the head of this note was cited as *multifida* in a recent number of this magazine when it should have been *multifidum*. Furthermore it turns out that the fern was originally named *multifida* though the name should have ended in *um* to agree with the generic name. The error is due to a mere lack of watchfulness upon the part of the editor and the form name is, of course, *multifidum*. While such names are not of very great significance, it is well to note that they, like all specific names, should agree with the generic name in gender.

INDEX TO RECENT LITERATURE.

Readers are requested to call our attention to any errors in, or omissions from this list.

BENEDICT, H. C. *A Peculiar Habitat of Camptosorus*. illust. Torreyia Ja. 1910.—A colony growing on the base of a gum tree like a true epiphyte.

BLAKE, S. F. *A New Lycopodium from New Hampshire*. Fern Bulletin, Ja. 1910.—A form with single spikes described as *Lycopodium tristachyum Sharonense*.

BLAKE, S. F. *Botrychium obliquum var. Oneidense in Eastern Massachusetts*. Rhodora Ap 1910.

CLUTE, W. N. *Botrychium dissectum*. Fern Bulletin Ja. 1910.

CLUTE, W. N. *James Ansel Graves*. Portrait. Fern Bulletin, Ja. 1910.

CLUTE, W. N. *The Fronds of Lygodium*. Fern Bulletin, Ja. 1910.—Discusses the morphology of the "fronds." By a typographical error the word *Lygodium* intended in the title is made to read *Lycopodium*.

CLUTE, W. N. *Rare Forms of Fernworts.—XIII. An Aberrant Lycopodium*. illust. Fern Bulletin, Ja. 1910.

CLUTE, W. N. *The Lady Fern*. Fern Bulletin, Ja. 1910.

FERNALD, M. L. AND BISSELL, C. H. *Variations of Lycopodium Clavatum*. Rhodora, Mr. 1910.—A

form of this species with short thick spikes from high latitudes described as *L. clavatum megastachyon*.

GREENE, F. C. *Ferns of the Bad Lands*. Fern Bulletin, Ja. 1910.—A list of five species.

PRESCOTT, A. *The Lady Fern*. Fern Bulletin, Ja. 1910.

SCOULLAR, MRS. A. E. *Polypodium vulgare f. bifidocristatum*. Fern Bulletin, Ja. 1910.

VICKERS, E. W. *The Pinnatifid Spleenwort in North Eastern Ohio*. Fern Bulletin, Ja. 1910.—An extension of range into Mahoning County.

VICKERS, E. W. *List of the Ferns of Mahoning County*. Ohio Naturalist, F. 1910.

PTERIDOGRAPHIA. Fern Bulletin, Ja. 1910. *Game-tophytes of Botrychium; a correction; Pellaea atropurpurea var. Bushii; Nephrodium marginale f. Davenportii; Asplenium ebenoides: A new phase of Fern Study.*

EDITORIAL.

In his address at the recent meeting of Fern Students at Boston, printed in this issue, Mr. Raynal Dodge gave expression to several extremely radical and novel ideas concerning the *Botrychiums* that may be pondered with profit by all students of these plants. That there is great variability in the whole *Botrychium* family no one will deny, unless he be one of the few committed to the recent view that every form is a good species. In the past decade the battle has been waged about *B. ternatum*, or whatever is now regarded as typical of this group, and we have seen variation after variation named as good species. Now the tide sets in the other direction and as recently noted in this publication, fern students are returning to the earlier view that *Botrychium ternatum* or *B. obliquum* is a most variable species, and the recent "species" are again being described as forms. A similar state of affairs seems to exist among the lesser *Botrychiums*. It is well-known that the describer of *B. tenebrosum*, Mr. A. A. Eaton, though positive at first that it was a good species, was finally of the opinion that it was a mere form of *B. matricariaefolium* while in the New "Gray's Manual" it is listed as a straight synonym for *B. simplex*. Concerning this latter plant there has always been more or less doubt, and we confess to some suspicion of a species that is accurately described as having the sterile portion at the base, middle or apex of the stalk. There seems good grounds for believing that this may be only a depauperate form of *B. matricariaefolium* also. The fact that it is a plant of the North and likely to be dwarfed in consequence gives color to the suggestion concerning its relationships. Certainly if *matricariaefolium*

should be dwarfed from any cause, we should expect it to look like the so-called *Botrychium simplex*. We need many more observations along these lines, however, and it is hoped that those who have access to living plants will communicate their observations to Mr. Dodge.

BOOK NEWS.

Clute's "Laboratory Botany for the High School" issued late in 1909 has recently gone to a second printing. The usefulness of the book to both young and experienced teachers by directing where to get material and how to present it in class is a feature that makes the book well received.

Great activity is being manifested by publishers in the matter of issuing botanical works. Most of these, however, are for school use. Among recent titles may be mentioned Duggars "Fungous Diseases of Plants," Fernow's "The Care of Trees" Hilgard and Osterhout's "Agriculture for Schools of the Pacific Slope," Hopkins "Soil Fertility," Bailey's "Manual of Gardening," Weed and Emerson's "School Gardens," Waugh's "Landscape Beautiful," Elliot's "Plant World," Beecroft's "Who's Who Among the Flowers," Reed's "Wild-flowers East of the Rockies" and Coulter and Nelson's "Manual of Rocky Mountain Botany."

Another title has been added to the growing list of American fern books by the publication of Beecroft's "Who's Who Among the Ferns." This is avowedly a book for the novice and attempts by picture and description to enable the beginner to name his specimens. The plan of the book is excellent. An illustra-

tion of a fern is given on one page and the description of it on the page facing it. The lower part of each descriptive page is reserved for notes. To the reviewer the great defect in the descriptive part is the fact that it is rather too brief and too general to be of much use, to a beginner but the illustrations will be an added help. These latter, it may be said in passing, are exceedingly like the illustrations in one of the popular fern books already on the market, and the illustrated "key" is a very good copy of a similar key in another book. We note that by a curious transposition of the plates, none of the flowering ferns are found in the section devoted to the flowering fern family. This will doubtless be righted in the next impression. The book is published by Moffat, Yard & Co., New York, at \$1.00 net. If one can afford but a dollar for a fern book, this is certainly the book to get. It is small enough to go into the pocket and in most cases will doubtless answer the requirements. When in doubt more authentic works can be consulted.

THE AMERICAN FERN SOCIETY

President, Rev. Jas. A. Bates, South Royalston Mass.
Secretary, Prof. L. S. Hopkins, Lincoln High School, Pittsburg, Pa.

Fern Students are cordially invited to join the society. Address either President or Secretary for further information. The Fern Bulletin is sent free to members. Annual Dues are \$1, and should be sent to Mr. H.G.Rugg, Tres., Hanover, N.H.

Members of the Society who fail to receive their magazine properly addressed should not hold the publisher responsible since he is obliged to send the magazine as directed. The correct addresses were marked in the copy for the Annual Report by the editor but for reasons best known to the officers, these changes were not made.

It was doubtless through some inadvertence that the statement was made in the recent "Annual Report" that a crisis was precipitated in the affairs of the Society by the demand of the publisher of *Fern Bulletin* for cash in advance. As a matter of fact the agreement between publisher and Society has always been upon this basis. Subscribers to the magazine pay in advance and there has never appeared to be any reason why the Society should not do likewise especially as it is not charged full price and is not asked to pay a whole year in advance but only quarterly. It would be interesting to know just why the executive council allowed that incorrect statement to get into the report.

Before the members of the American Fern Society vote for a publication to be owned by the Society, it would be well to investigate a little. Suppose you show a copy of the *Fern Bulletin* to the nearest printer and ask him what he would charge to duplicate it—same quality of paper ink and presswork and same number of pages. His reply will be something of a revelation to those who fancy that the Society can own its own publication to advantage. Every year the

members of the Society receive 128 pages of text and many illustrations at a total cost of about \$100. Does anybody suppose that the magazine can be produced for that price? If so, a little conversation with the printer will change his opinion. But there are also many other expenses to be met, such as cuts, postage, hauling, stationery and the like and the total will run up to more than the entire revenues of the Society. Under the present arrangement the Society, after paying for *Fern Bulletin* has nearly \$75 left for other uses. What advantages can the advocates of a new publication offer to offset the loss of that sum of money? And where do they propose getting the additional cash needed for publishing the Annual Report and the necessary expenses of the Society? Many of those who voted in favor of a change did so without a clear understanding of what was proposed, and even at that we have the information from the Secretary that the figures given in the Annual Report in favor of the change were exaggerated. Less than half the membership voted at all. It is very clear, then, that this proposed change is not desired by the members at large. Those who are actively interested in a change have their reasons, but they hesitate to place them in cold type.

The statement in the Annual Report that the publisher of *Fern Bulletin* contemplates combining the magazine with *The American Botanist* at the end of the 20th volume is only half the truth. In communicating this idea to the Executive Council it was distinctly stated that should the combination be made, the much larger magazine, though selling for more than the present price of *Fern Bulletin*, and containing as much fern matter, would be sent to members.

if desired, *at no increase in price*. It is therefore actually to the advantage of the Society that the combination be made. One may be pardoned for wondering why this evidence was withheld. At the time the Annual Report was being printed, permission was asked to make a statement similar to this, but space was refused. That the refusal was from disinterested motives we are not inclined to believe.

Should the Society adopt a publication of its own, what assurance have we that it would not degenerate into a mere circular of a few pages as soon as the novelty of editing a magazine wore off or still worse, cease to exist at all? In the past nine years nearly thirty thousand publications in the United States have ceased publication though every one of their thirty thousand editors began business with great hopes of success. We dare say many of them were just as wise and just as energetic as the small coterie that now wish to edit a magazine for the Society. There are only two botanical publications in America that are older than *Fern Bulletin*. One of these is backed by the University of Chicago and the other by the Torrey Botanical Club. Scores of similar publications without financial backing have died since *Fern Bulletin* was began. These things are worth considering when a new publication is suggested.

A rather extended knowledge of the vicissitudes of magazine publishing inclines us to strongly advise against an official organ owned by the Society. If others start a new publication and the Society enters into contract with them for a copy for each member there is no risk to the Society except the rather likely one that the new magazine will soon fail and necessitate the selection of another "official organ." But

most obnoxious is the suggestion that members pay dues for two years in advance in order to allow absolute novices an opportunity for experimenting in editorial work. Who will supply the money for the second year's experiments? One reason most persistently advanced in favor of an official organ is that there will be more space for the use of the Society. Just how pressing such need is may be judged from the fact that the Secretary does not look after the single page allotted to the Society now. What would he do with thirty-two pages waiting for him?

A serious omission from the Secretary's notes in the last Annual Report, was an account of the meeting of fern students held under the auspices of the Society in Boston, Dec. 29, 1909, at the time of the meeting of the American Association for the advancement of Science. This is the sixth meeting of the kind, five others having been held in Boston, New York, St. Louis, New Orleans and Forestville, Conn. At the recent meeting twelve members were present with President Winslow in the chair. The leading feature of the meeting was the address of Raynal Dodge printed elsewhere in this issue. This was discussed by several members. A committee was appointed to plan a field meeting somewhere in New England during the summer. Specimens of ferns were exhibited by Messrs. Robt. Ware, H. G. Rugg, Henry Bigelow and E. J. Winslow. The first Boston meeting was held in 1898 and though fern study was then in its infancy, nearly a hundred fern students attended the meeting and nearly twice as many members of the Society were present as attended the recent meeting. F. G. Floyd had the arrangements for the recent meeting in charge.

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Vol. XVIII

No. 3

The
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A Quarterly Devoted to Ferns



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1910



The Fern Bulletin



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ARROW-LEAVED HEMIONITIS—*Hemionitis arifolia*.

THE FERN BULLETIN

Vol. XVIII

JULY, 1910

No. 3

FERN NOTES.

BY E. J. HILL.

I. *Woodwardia Virginica*.

When looking over the Fern Flora of Pennsylvania, by W. A. Poyser, in the *Fern Bulletin* of July, 1909, I noticed that *Woodwardia Virginica* was said to be "very local" in its distribution in the State, and that all the counties named were in the eastern part of the State between the Delaware and the Susquehanna rivers. Wherever the localities may elsewhere be, I can add a station from the northwestern corner of the State, and will append some statements about its habits and associates. While passing a few days last summer at the village of Saegertown, excursions were made in the parts contiguous, chiefly in search of mosses, but other aspects of the flora were by no means neglected. The chain-fern was seen in one locality only, but was very abundant in its restricted area. It was a small swamp of white pine near the village of Harmonsburg, Crawford county, a few miles west of Meadville, and near the head of Conneaut Lake. A day had been spent in the neighborhood with a fair degree of success when near its close I came upon this swamp. Experience had taught me that sphagnous mosses nearly always grow where *Woodwardia* is found, and I was not disappointed on entering the marsh and seeing the fern to find them associated there. The ground at the base of the clumps of fern,

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and the open space around them, was a dense carpet of peat moss, pierced as it were by the stalks of the fronds. Three species of the moss rewarded the visit, the everywhere common *Sphagnum cymbifolium*, the less common but often abundant *S. recurvum*, Beauv. or *S. intermedium*, Hoff. of Lesquereux and James Manual, and *S. Embricatum*, Russ or the *S. Austini*, Nullio of the Manual. The last was especially welcome as it was the first time I had met with a species that has papillae or rudimentary fibrils on the inner walls of the hyaline cells of the leaves, which gives them a pectinate appearance, the Rammfasern, or comb-fibrils, of the German bryologists. The second species belongs to a group of peat-mosses that particularly delights in very wet localities, for, though all sphagna are hygrophytic, they show varying shades of adaptation to water or moisture, and it was most in evidence where the *Woodwardia* was most luxuriant, the wettest parts of the swamp. I have always found this fern in a peaty substratum, so that the association with *sphagnum* is a very natural one, and is almost without exception verified in the swamps which plentifully intersperse the dune region at the head of Lake Michigan, in several of which this fern grows, and where species of *Sphagnum*, especially of the cuspidate group, to which *S. recurvum* belongs, are alike abundant. Many of the labels in my moss-herbarium have written upon them, "Grows with *Woodwardia*," thus definitely recording the association. And the coupling is true not only of the swamps of the dune region in Indiana and others beyond it, but of the sphagnous swamps of tamarack and White Pine in Lake County, Illinois, where the fern also occurs.

II. *Nephrodium spinulosum*.

A day was taken to visit Conneaut Lake, a small but pretty sheet of water near the village of Edinboro, Erie County. Ferns were abundant here, but mostly of kinds common in suitable localities of the contiguous regions where trips were made. Only a couple need be mentioned. One of these was *Nephrodium spinulosum* growing in the moist woods of hemlock and yellow birch common around the lake. It was the specific form, one I do not often meet with. It might have been overlooked in the abundant representation of the variety *intermedium* had not its much darker colored sperangia called attention to it. It had the glandless indusium which is given as one of the distinctive characteristics of the specific form. Whether this very dark, almost black color of the sporangium is a common or only a local peculiarity I am not prepared to say, as experience with the form is limited. But it is quite in contrast with the brown color that characterizes the sporangia of such specimens as I have and with all recollections of it.

III. *Dicksonia punctilobula*.

The other fern to be mentioned as occurring near Edinboro is *Dicksonia punctilobula*. It interested me for two reasons, because I had rarely seen it and because of its peculiar distribution westward as far as the evidence points. A small tuft of the fern was found in a scantily wooded pasture. It was on a clayey knoll under a little hemlock tree, whose lower branches mingled with the tops of the fronds. The find was a welcome one since I had met with it but twice before in 1861 in Maine, and earlier in the August of 1909 in Genesee County, N. Y., thus after so long an interval getting it twice the same month. Here it was

growing in a small clump in a wood of beech and maple such as cover the hills of till of this region. Though often botanizing in the vicinity since 1855 I had not come across it before. Hence I conclude it must be quite rare in this part of New York. And from what can be learned by examining the lists and catalogues of plants of Western New York it is both rare and local. Only four stations are mentioned in the catalogue for Rochester and vicinity. (Plants of Monroe County, New York, and adjacent territory, Rochester, 1896). It is put down in the catalogue as "rare." An earlier one for Buffalo and its vicinity by David F. Day (Buffalo, 1883), gives only "the southern towns of Erie County." This approaches the station where it was found in Erie County, Pa., and lies between that and the locality in Genesee County New York.

The hay-scented fern, common or abundant in many places on the Atlantic slope, becomes scarcer westward, and is apparently absent from extended areas. As recorded in lists for the middle west the distribution is somewhat peculiar. According to Macoun's Catalogue of Canadian Plants it keeps well to the north in the province of Ontario and Quebec, being "found in stony pastures, open woods and rocky hillsides from the Atlantic westward to Georgian Bay." He does not give it for the northern part of Ontario, nor for that portion of the extreme southwest lying between lakes Huron and Erie and the west end of Lake Ontario. It may be that A. B. Klugh's Fern-flora for 1906, takes in this part of Ontario when it says that *Dicksonia* is "common locally as far north as Parry Sound." This station by Parry Sound, Georgian Bay, is the most western mentioned by

Macoun, though north of Lake Ontario to the eastward it ranges somewhat farther south. In about the same latitude as Parry Sound is Petoskey, Mich., the only station in the southern peninsula of Michigan named in Beal's Michigan Flora. Since he refers for authority to a much older catalogue, that of Winchell, published in 1861, it is evident that no one has since reported it from that locality. In 1878 I used several days botanizing at Petoskey and the vicinity, some of the time along Bear Creek, the stream Winchell names as the special locality, but I did not meet with it, though ferns of several kinds were plentiful in the region. And while on various occasions studying the flora along the shores of Lake Michigan in Michigan and Wisconsin, and in the northern peninsula of Michigan, aggregating in all several months, I have never come across it. One station is given by Beal in the northern peninsula, Keweenaw County, where it has been found by O. A. Farwell. West of these Michigan localities it finds a place in some parts of southeastern Minnesota, or west of the Mississippi river. As connecting these somewhat widely separated place it is likely to be found in northern Wisconsin, but the lists I find for that state with specified localities are mainly for the southern portion, so that, since these do not record it, there is no evidence that it occurs in the northern part of the state.

For the westward distribution south of the latitude of Lake Erie there is the station already mentioned for Erie County, New York and the one at Edinboro, Penn. In the *Fern Bulletin* for January, 1908, Lewis S. Hopkins reports it for Ohio, but not plentiful, the only station specifically named being Geauga County, in about the same range as the one in Pennsylvania,

and not far west of it. It may be of interest to add that it is not given in the catalogue of Ohio Plants by Kellerman and Werner, published about 1895. This may imply that it was found since that time, and may point to its discovery in places farther west where it is not yet known to occur. In the work on the "Flowering Plants and Ferns Indigenous to Indiana," by Stanley Coulter (1910) it is said of this fern "Found throughout the state in various situations; most abundant on open hillsides." One of the counties named in Steuben, which is at the northeast corner of the state, bordering therefore on Ohio and Michigan, and but a short way from the west end of Lake Erie. The three remaining counties named are Clark, Floyd, and Gibson, at the southern end of the state and on or near the Ohio river, and are the same as those given in the catalogue of 1881 by the editors of the Botanical Gazette. In the *Fern Bulletin* for January, 1909, F. C. Greene has some "Notes on Indiana Ferns," naming six counties and the farm of the State University—doubtless adding the seventh—as the basis for the notes. *Dicksonia* is given as found in three of these, all near the Ohio river, adding Martin and Orange counties to those of the previous lists. One of the counties given by Mr. Greene, Kosciusco, is in the northern part of the state, but the fern is not listed with those found there. For Illinois but one station is reported in Patterson's catalogue of the plants of the state, published in 1876. This is Wabash County in the southern part of the state, or about in the range of the five counties in southern Indiana. Paterson's list is an old one, but I have seen no mention of the fern as found elsewhere since it was issued. Dr. Lapham gives it in a list published in 1857, a bare

list, however, without localities. Some marks are appended to names of plants, as *S.* for the southern part of the state and *N.* for the northern, and as no letters follow *Dicksonia* it may indicate a range throughout, or lack of data for knowledge of the true range.

Judging from the data above adduced there is an area somewhat triangular in shape from which *Dicksonia punctilobula* does not seem to have been reported or in which it may not occur. The apex of this area is in southwestern Ontario, perhaps near Lake Ontario. The north line of the area tends westward through northern Michigan and into Minnesota, the south line along the southern side of Lake Erie and into northern Indiana, thence southwestward across the state into southern Illinois. It would be rash to assert that this fern does not grow or will not be found in this area, but if represented at all it is evidently very rare and local. Southern Michigan, northwestern Indiana, middle and northern Illinois, and southern Wisconsin have been quite well worked over by collectors and local students of their plants, probably as carefully as most of those west of New York and Pennsylvania whence it has been mentioned as growing. Its place of frequency and abundance is plainly in the east, or on the Atlantic slope. It would be of interest to know if it is gradually spreading westward, where climate and soil conditions can hardly be unfavorable to its growth, or whether it has been overlooked which would hardly seem to be the case with so distinct and beautiful a fern.

IV. *Botrychium*.

It is my practice when finding certain kinds of *Botrychium* to take a specimen unless by so doing there is danger of destroying a habitat. Reference

here is especially made to those which have gone under the names of *Botrychium obliquum* and *B. ternatum* and their varieties, which are so variously treated by different authors. It is sufficient for the present purpose to state that the collections had without forcing but rather naturally come into two groups, one of which corresponds to the *B. obliquum* and the other to *B. ternatum* var. *intermedium* as they are described in the last edition of Gray's Manual, by whatsoever name or names others may choose to call them. It hardly needs mention that there are a good many variations in the shape and size of the segments of the barren fronds and for this reason, if for no other, examples from different localities are desirable. One of these was obtained near Saegertown, Pa., and note made at the time reads: "*B. obliquum*. Upland woods, among beech trees, Aug. 31. Immature." The statement, "immature" refers to a later maturation of the spores of this group than of the other, to which my attention had of late been more particularly called. The two kinds had, however, been separated on other grounds, the time of maturation came as an afterthought, or induction from the facts observed. It had been noticed that all called *ternatum intermedium* had been obtained in August and had a more mature look, while those that were labeled *B. obliquum* so far as they were in fruit, were collected in September and October, except this at Saegertown, but so backward that it did not invalidate the observation that it was a late-fruited form.

Taking the fruiting plants of *B. ternatum intermedium* in the order of their collection, and noting the particular habitats as given in note-books or on the herbarium sheets, the first is: (1) Pavilion, N. Y.,

Aug. 16, 1875, Dry woods. The sporangia not yet open, but full, globular, and turning yellow, or about ripe. (2). Miller, Ind., Aug. 14, 1876. Dry and warm, sandy woods, sporangia opening and freely shedding spores. (3) Old Mission, Grand Traverse Bay, Mich., Aug. 8, 1878. Dry, open woods, mostly sandy. Sporangia beginning to open and shed the spores. (4). Manistee, Mich., Aug. 10, 1880. Sandy, pine woods. Sporangia opening freely. (5). Mackinaw, Mich., Aug. 15, 1881. Rocky woods. Sporangia opening. (6). Bagotville, Ha! ha! Bay, Quebec, Canada, Aug. 20, 1888. Open clayey field. Sporangia not yet opening. The specimen answers quite well to the variety *rutacfolium*. The sterile frond being rather small. (7). White Lake, Mich., Aug. 23, 1899. Capsules open and the spores about all fallen out. The plants were growing in a peaty soil, with some admixture of sand, and were somewhat crowded by low bushes. Hence they are taller and more slender than those mentioned before them, apparently because they stretched upward to meet the light. They were also more abundant than I had found them in other localities.

I have not come across *B. obliquum* so often in fruit. The time of visiting the localities mentioned above being the summer season, there was no opportunity to examine the autumnal flora. Hence the examples of this are in the Chicago region, where all *Botrychiums*, except *B. Virginianum*, are very rare. The first on my list in fruit is from Porter, Md., Sept. 17, 1908. The sporangia are opening freely and the spores falling out. It was growing at the edge of a peaty swamp, timbered with gray-birch, tamarack and white-pine. Being at the margin of the dune region,

the side of the bordering dune having an abrupt slope, considerable sand was washed or blown in to mix with the peat. A second example is from Otis, Porter Co., Ind., Oct. 22, 1908. In this the spores have nearly all fallen from the spore-cases. It was from a little colony in a forest of beech and maple, and a soil of clayey till similar to that at Saegertown. Barren specimens had been obtained from this wood once before. The segments of the barren fronds of these Indiana specimens are quite long. In those from Otis they are narrower than in those from Porter and mostly longer and more acute, and may be the variety *elongatum*, Gilbert and Haberer, being quite like the one figured in the Gray's New Manual. Among specimens supplied by others is a fruiting plant from Reno, D. C., No. 2745, collected by Agnes Chase, Oct. 9 1904, and another collected by Lester F. Ward in *vicinis* Washington, D. C., Nov. 3 1878, labeled by him *B. ternatum*, Swartz, var. *dissectum*, Willd. The divisions of this are very long and acute, and quite finely dissected. Both of these specimens from the Potomac Valley have the sporangia in about the same stage as those from Otis, Md., and belong to the late fruiting forms.

It will be seen from these data that but two of the August collections of *B. ternatum intermedium* were disposed to be late, those from Pavilion, N. Y., and Bagotville, Canada. Probably there was little very special in the habitat to lead to this. In the case of the former it was a north exposure where but little sunniness would be experienced. The roots, which in *Botrychium* run rather deep, penetrate a stiff blue clay of the decomposed Hamilton shales that lie just beneath the surface. Such an exposure and soil would

not tend to hasten growth and maturation, such as may be expected in the sandy and rock soils in which the majority of the collections were made. The case at Bagotville may be accounted for by its location far north, about 48°. It is well known that the same species mature fruit later in northern than in southern home. Plants whose times of fruiting differ by several days or even weeks in their stations farthest south have this difference in time gradually lessened as they range northward till they reach a parallel where their maturation coincides. I was especially struck by this in the case of two of our common blueberries, both in great abundance in this part of Canada, where they are gathered in large quantities for canning. In the latitude of Chicago the early blueberry (*Vaccinium Pennsylvanicum*) begins to ripen about the 20th of June; the Canada blueberry (*V. Canadense*) two or three weeks later, though not much later in anthesis. But the berry-pickers by the Saguenay river harvest them simultaneously, as both ripen in August and continue in good condition till the frosts in early September destroy them. As the two species grow intermixed there is no difference in soil conditions. Climate alone seems to account for this identity in time. The shortened summer forces this parallel development of plants whose seasons differ in lower latitudes. Nor are the ferns an exception to the rule.

It would appear from this that *B. obliquum* is later in fruiting than *B. ternatum intermedium*, or that the latter takes more naturally to a habitat which insures an earlier development. This difference in time may amount to two or three weeks or more, and if confirmed by further experience and more extended application will prove of diagnostic value in the separation

of this group of the grape-ferns into two species, or a species and its variety, if not held to be more than this. Mainly as such it is offered as a contribution to a subject confessedly attended with difficulties. Even if not absolute and wholly definite in application, it may be of relative importance and helpful in understanding them.

Chicago, Ill.

THE ARROW-LEAVED HEMIONITIS.

Hemionitis arifolia.

BY WILLARD N. CLUTE.

The genus *Hemionitis*, like the genus *Nephrolepis* seems to exist principally because nobody has discovered any other genus into which the species will fit satisfactorily, rather than because the plants composing it are distinctly set off from other plants. Commenting upon *Nephrolepis* in his "Ferns of Jamaica" Jenman says "In the technical characters of the fructification the genus does not differ much from *Nephrodium*, their peculiar likeness of habit and general aspect being, in fact, the principal generic characters. It is what is called a natural genus—that is the several species have a general aspect in common which is unmistakable whether the plants be in fruit or not."

On the one hand, as Jenman intimates, the species of *Nephrolepis* are enough like *Nephrodium* to be placed in that genus without violating many of the proprieties, but they are also so much like certain species of *Asplenium* or rather of *Athyrium* that they could as well be placed with them. A very similar condition exists regarding the species of *Hemionitis*. Their nearest relatives are the *Gymnogrammas*,

Acrostichums and *Antrophyums* and the resemblance is so close, in some cases, that even eminent fern students have never quite agreed as to the disposal of the species, placing them now in one genus and again in another. Among the synonyms of the different species of *Hemionitis* one finds a dozen or more different genera cited, showing with what diverse groups the species have been at times supposed to be allied. In this list *Antrophyum* is first with *Gymnogramma* a close second.

Most of the ferns with which the collectors in the United States are familiar have their sporangia grouped in masses at the tips or on the backs of the veins. The bracken (*Pteris*) is probably the most familiar exception to this, but even in the bracken, the sori may be assumed to be at the tips of the veins and only spilling over, as it were, along the marginal vein that unites the vein tips. In the tropics, however, and to some extent in the southwestern part of the United States, we meet with ferns whose sporangia instead of being arranged in groups, are scattered all along the veins, often in dense lines. Occasionally, too, they are found on the under surface of the frond between the veins.

In this group belongs the species of *Hemionitis*. The genus, itself, is principally distinguished by having palmate fronds, or fronds that approach that form, and reticulated veins covered with sporangia. Such specific names as *palmata*, *cordifolia* (heart-leaved), *Hederaefolia* (ivy-leaved), and *sagittata* (arrow-shaped) applied to the different species indicate something of this general and generic appearance.

As at present recognized the genus consists of about eight species, two of which occur in parts of the East

Indies, and the rest found in the tropical America. The well-known star fern, (*H. palmata*) is probably most commonly found in collections.

The species we have chosen for illustration, *H. arifolia*, is one of the Old World species, and was collected by D. Le Roy Topping at San Juan del Monte in Luzon one of the Philippines. As in most of this group there is in this species a slight distinction between the fertile and sterile fronds both in the shape and habit. The latter spreading out near the surface of the ground while the fertile rise up on longer stipes, apparently for the purpose of better shedding their spores. A general resemblance to heart-shape is seen in all the fronds, but as the mature fertile fronds appear they take on more or less of the arrow-head shape. This doubtless accounts for the fact that this species also goes by the name of *H. cordifolia* and *H. sagittata*.

As a general thing the species of this genus are confined to open sunny places. Their fronds are usually rather small, seldom more than two inches across and rather thick in texture. They are usually more or less hairy, and the fertile fronds have the under surface thickly reticulated with heavy lines of spore cases which follow the numerous veins. The species we have been discussing is the Philippine analogue of the west Indian star fern and while not as attractive in the shape of its fronds as the better known species, is a most interesting plant. An account of the star fern was published in this magazine for July, 1904 and may be referred to for comparison.

RARE FORMS OF FERNWORTS—XV.

YOUNG CLIFF BRAKES.

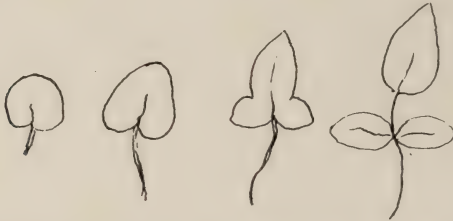
The juvenile forms of ferns are a never ending source of trouble to both beginner and advanced student—to the beginner because he cannot name them off hand; to the advanced student because the beginner expects him to be able to do so. A few species of ferns can readily be named from their baby stages, but for the majority, a mature and fertile frond is necessary for a satisfactory determination. The fern student who takes pleasure in his work rarely sends back even these immature specimens sent him for name, without a pretty close guess as to their identity, but it is no disgrace for even the best to confess to ignorance when confronted with some strange sporeling.

The beginning fern seems to have a choice of two forms for its first leaves,—rounded or forked. In general, the species whose fronds at maturity are much divided, favor the forked type of leaf and the first green blade or, at least, the second is a two lobed affair, thin and delicate but with nothing about it to indicate which of half a hundred species it may develop into. In subsequent leaves, a new pair of pinnules appear about the first and in time the regular frond is developed. With simple fronded plants, and often in those whose mature fronds exhibit a considerable amount of cutting, the first leaf is rounded and subsequent leaves are not forked.

One of the most interesting of this latter group and one that can be identified by its first tiny leaf, is the cliff brake (*Pellaea atropurpurea*) This is not entirely due to its shape, however, for the peculiar blue-green hue of the mature plant, which sometimes causes it to be known as the blue fern, is to be seen in the spore-

ling and readily identifies it. The young leaves, themselves are very characteristic the first being almost round and others running through heart-shaped and triangular forms.

There are few ferns that show so unmistakably the general pattern of the frond and the method by which it is built up. Taking the young leaves we find the heart-shaped forms with larger and larger basal lobes until one more step makes the basal lobes independent pinnae. Then the terminal pinnule and the two laterals



go on developing large basal lobes until new pairs of pinnae are produced. The logical outcome of all this would be to make a strictly ternate frond, and we may explain ternate species in some such way, but in the cliff brake, the impulse to grow at the tip is greater than that to grow laterally, so the mature frond is much longer than wide. Something of this same impulse seems to be felt in the mature pinnae and pinnules themselves, for they are commonly much longer than wide.

The fully developed cliff brake is a thick and leathery species, well adapted to endure the heat and drouth upon the rocks it selects as a home. The young leaves are, of course, very much thinner and more delicate but they nevertheless always have a more substantial look than the other sporelings with which we are acquainted.

THE BOULDER FERN.

BY ADELLA PRESCOTT.

My acquaintance with the boulder or hay-scented fern began when as a child I often crossed a rough, hilly pasture to the bit of woodland beyond. In this pasture every stump and boulder was surrounded by its pointed fronds. I called it "the fragrant fern" because of its delightful odor, not knowing that the true fragrant fern is a rare find far beyond the reach of childish hands, and often carried home broken and drooping handfuls to lay in my doll's trunk or even among my own clothing in default of other perfume. Years later, in another locality, I found it growing on a sandy hillside in deep shade holding its dwarfed fronds stiffly erect as if to make the best of trying circumstances, and still later I found it growing in deep rich soil with long, exquisite fronds gracefully recurved enjoying to the full the luxury of its surroundings.

No fern with which I am familiar is so much influenced in its attitude or "habit" by its surroundings as this; but wherever it grows, whether on the open, rocky hillside or in the rich leafmold of deep woods, it retains its beautiful yellow-green color and the fine cutting which makes the name lace-fern quite as appropriate as either of its others.

At its best it is fully three feet high, with fronds perhaps ten inches broad. It has a creeping rootstock which branches at intervals so the plants soon form dense, tangled clumps. The dark brown stipes are about half the length of the frond and the blade is twice pinnate with lobed pinnules and the lobes are also toothed, giving it an appearance of lightness and grace not exceeded by any of our other ferns. There is lit-

tle difference in appearance between the fertile and sterile fronds, and in fact the sori are so small and inconspicuous as to cause one to doubt their power of reproduction.

Fortunately for the student who loves beauty even more than rarity in ferns the boulder fern is distributed over a wide area, being found from Canada to Alabama and westward to Minnesota. It is seldom entirely lacking in any locality of the Northeastern States, but naturally is more plentiful in some parts than in others.

Botanists call this fern *Dicksonia pilosiuscula* the genus being named for James Dickson, an English botanist. I can easily understand that Dickson, who, very likely, was a common-place sort of fellow, might be very glad to attach so much grace and beauty to himself, but why "pilosiuscula" only a botanist can tell. I do not know.

New Hartford, N. Y.

[*Pilosiuscula* apparently means very hairy. If our latin scholars can further enlighten us we shall welcome the information —ED.]

A FORKING CYSTOPTERIS.—In the *Ohio Naturalist* for June, L. S. Hopkins describes a form of *Cystopteris fragilis* with forking pinnae as the variety *cris-tata*. Opinions may differ as to the desirability of giving a name to a mere forking frond, but in any event the name *cris-tata* cannot stand since a form of *Cystopteris* has been known in Europe for twenty years or more by this name. Forking fronds of *Cystopteris* have been reported from time to time but we fail to find any of them named. It might be desirable in this case, should the fern need a name, to follow the example of our British cousins and call the form *furcata*.

PTERIDOGRAPHIA.

NEPHROLEPIS ROOSEVELT.—A new sport from *Nephrolepis exaltata* or *Bostoniensis* has been registered with the Society of American Florists under the title given above. Fortunately the namer, thus far, has refrained from adding an *i* or two to the second word and thus making it in the nature of a real specific name. The great number of named forms of *Nephrolepis* that have recently appeared is simply added evidence of the fact that all plants are variable. We are inclined to take just as much stock in these *Nephrolepis* "species" as we do in a large number of the so-called species of *Selaginella* and *Botrychium* with which the synonymy of these fern-wards has been infested in recent years.

AZOLLA AND MOSQUITOES.—The war that is being waged on the mosquito pest has found a new ally in the common water fern (*Azolla Caroliniana*). From several sources come reports that when the surface of the water is covered with a growth of this plant, mosquitos cease to breed in it. It does not seem to be definitely known how the plant affects the mosquitos. Dr. Trelease of the Missouri Botanical Garden, to whom we are indebted for information on this subject, suggests that the plants growing so thickly on the surface may make it difficult for the female mosquito to deposit her eggs, or that even if eggs are deposited, the small water animals including fish may, under cover of the plant, dispose of the larvae. At any rate, recent reports from the New Jersey experiment station and from the United States Department of Agriculture, recommend this plant as a mosquito killer. *Azolla* is not very abundant in the Northern

States, but there seems to be no reason why it cannot be widely propagated. Apparently it cannot endure the Northern winter, but in the South it is one of the most abundant of plants. In many of the bayous along the Mississippi it completely covers the water, and R. S. Cocks has noted in this magazine that it frequently becomes so abundant in small ponds as to be a veritable pest and has to be carried off by the cartload. In the northern States the difficulty will be to make it grow in sufficient luxuriance to be effective. It will doubtless have to be started anew, each year. It is a handsome little plant and an addition to any water scenery.

APOSPORY IN FERNS.—Apospory as all who have studied ferns in school are aware, is the production of a prothallus or gametophyte without the intervention of a spore. In ferns reproduced by apospory, a new prothallium grows on the frond where the sporangia normally occur. A sort of converse of this is also found in ferns, where the new fern is produced from the prothallium without the union of sperm and eggs. This is called apogamy. Apogamy has been known for a long time, but the discovery of *apospory* was more recent and due to the efforts of Mr. C. T. Druery, editor of the *British Fern Gazette*. In that publication for June 1910, an account of the discovery is given, together with a list of the species in which it is known to occur. It may be said by way of explanation that apospory does not occur in normal ferns. It seems to be occasioned by the efforts the abnormal specimens make in order to adjust themselves to the conditions in which they find themselves. The first evidence of apospory was found in a form of *Athyrium filix-foemina* but the phenomenon has since been noted in forms of

Polystichum angulare, *Nephrodium filix-mas*, *Polypodium vulgare*, and *Scolopendrium vulgare*. In producing the prothallia it has been found that the sporangia begin to form but at a certain stage in their growth, the spore-case becomes aborted and the prothallium forms from its stalk. In other species, however, especially those with finely divided tips, the slender projections if pegged down on the soil will originate new prothallia. One of the most interesting things connected with this whole subject is the discovery of a form that is characterized by both apogamy and apospory. This form, in the complicated terminology of British fern growers, is called *Lastrea pseudo-mas percristata apospora*. It produces prothallia upon the fronds and new plants upon these prothallia without the need of eggs and sperms, in this way short circuiting the usual course of fern growth.

AN EVERGREEN CYSTOPTERIS.—It is well known that the delicate little bladder fern (*Cystopteris fragilis*) is one of the first, if not the first of our ferns to appear in spring. Long before the ordinary ferns have begun to unfold, the bright green fronds of this species may be found fully spread. The heat and dryness of midsummer seem more to be feared by this fern than the cold, and by August it is difficult to find good specimens. Like the slender cliff brake, the fronds are inclined to wither and disappear except in the coolest of shadiest ravines. As the weather grows cooler the fronds of *Cystopteris* may again appear, but die at the approach of winter. In the milder climate of the British Isles, there is a variety of this fern that remains green throughout the winter. It is known as *Cystopteris fragilis sempervirens* and has recently been found in Scotland.

BOTRYCHIUM RAMOSUM.—I have just returned from a tramp in some woods where late last summer I found two withered specimens of the matricary grape fern. Today I found nearly fifty plants in a moist spot of small area but was disappointed in not finding the lance-leaved also. Of course I hoped for the moonwort or at least *simplex*, but that pleasure is still before me. The specimens found today varied greatly in size, only one being really large, while many were so tiny I should have never seen them if I had not been scanning every inch of the ground. In one place a cluster of five were so close together that the fronds intermingled and no one could have been taken without disturbing the others and they varied in size from one of medium size to a tiny, tiny one. Next week I visit in Boonville and will search there for *simplex* and *lunaria* as the hillside back of the cemetery has many grape ferns. I shall take them if I find them as the ground will be cleared as fast as it is needed for burial purposes and anyway, if ferns are to grow in a cemetery a more *spirituelle* species would be more appropriate.

I have just re-read Mr. Dodge's article on *B. ramosum* (which name I prefer—it is so much more easily spelled) and will add that the small plants I found were above the ice line of the swamp but where the ground was springy though the slope was enough to let the water run off in rivulets. The well developed plant I found was three or four yards farther up the slope where the soil was much drier. I found two or three groups of plants that had every appearance of being a parent with a "pair of stairs" family of children, but not having a glass could not tell whether the tiny ones were "emarginate" or not.—*Adella Prescott, New Hartford, N. Y.*

HABITAT OF *BOTRYCHIUM SIMPLEX*.—In Vol. XIV, No. 2 of this publication I find an article entitled, "The Distribution of Batrychia," in which Mr. Winslow says that he never collected *Botrychium simplex* in the woods unless his *tenebrosum* was *simplex*. I have never collected *tenebrosum* but have collected several hundred plants of *simplex* and have found all of them in the woods. Out of four localities that I have for *simplex* one is in the edge of a cedar swamp and the others are in dry hardwood land. I do not think that it is as common as *Ophioglossum vulgatum* in my vicinity but it is by no means rare as some authorities state.—D. Lewis Dutton, Brandon, Vt.

A FRAGRANT MARSH FERN.—Miss Sarah F. Sanborn, of Concord, N. H., recently sent us a fragrant specimen of the Marsh fern (*Nephrodium thelypteris*). This fern is not usually fragrant, but the specimen under notice is very strongly so. Even in the dried condition the fern still gives out its pleasing odor. The fragrance may for want of a better name be described as "ferny." It is of the same nature as that given off by drying ferns in general, but in this case it is far sweeter and fully entitled to be called a perfume. It is very similar to the odor of the New York fern, the boulder fern and the fragrant fern. A similar odor is given out by *Asplenium fragrans* of the tropics and by various species of polypody. An especially fragrant form of the New York fern, has been named *fragrans* and if the present specimen needs a name to characterize it, it might be called *suaveolens*.

EDITORIAL.

The absence of the boulder fern (*Dicksonia*) from a triangular area south of the great lakes, discussed by Dr. Hill in this issue may possibly be accounted for by the fact that this area practically coincides with the northeastward extension of the prairie region. The boulder fern is primarily a plant of elevated and broken regions and it is quite possible that the level prairie does not form a congenial home for it. North and south of this area the region is hilly and here and there the fern is reported. It would be extremely interesting to know if this fern is ever found in true prairie surroundings and if any of our readers know of such instances we hope they will send us the information. The study of ecology is rapidly explaining the puzzles of plant distribution. A large number of factors enter into the make up of a suitable habitat. Sun and wind, cold, moisture, nature of the soil, competition of other plants, even the time of the year when the most rain falls must be considered. Doubtless the prairie region presents some features not to the boulder ferns liking and it is accordingly absent from such areas.

* * *

It has been common, in recent years, to interpret every variation from the normal in ferns as an evidence of hybridization and in consequence a considerable number of forms have been described as hybrids. To the supporters of the hybridization theory a paper by W. D. Hoyt in the *Botanical Gazette* for May must come as a rude shock. This author, after rather extended experiments, maintains that hybrids among ferns are extremely rare and he even casts doubts upon the conclusions drawn by Miss Slosson in her attempts

to produce *Asplenium ebenoides* by crossing *A. ebenicum* and *Camptosorus rhizophyllus*. More than 150 experiments in crossing were made and while abundant entrances of the sperms into the archegonia were secured in practically all cases, not a single fusion of egg and sperm was secured between ferns of different species, though when eggs and sperms of the same species were brought together, many fusions were obtained. As an indication of the thoroughness of this work it may be noted that sixty-seven attempts to secure a fusion of the sperms of *Nephrodium thelypteris* with the eggs of *N. noveboracense* were without results while ten attempts to fuse sperms of *N. noveboracense* with its own eggs, gave seven fusions. Judging from the evidence brought forth in this paper, we are scarcely justified in assuming that the various hybrids recently described in the genus *Nephrodium* are really hybrids. Until we have more definite information regarding them we shall have to return to the early conception of these plants and consider the reputed hybrids as so many forms of a somewhat variable group of plants. A significant feature of the report is found in the fact that some of the very species said to hybridize were tried without results, notably the supposed parents of *Asplenium ebenoides*.

* * *

As has been surmised the question as to what name should be applied to that group of ferns called the wood ferns was not settled by the adoption of *Dryopteris* by those who favor the "new" nomenclature and those instrumental in developing an "American code." A new name or rather an older name than any heretofore applied, has been discovered by J. A.

Nieuwland who discusses the matter in the June number of the *Midland Naturalist*. From this article it appears that a year or so before Adanson proposed the name *Dryopteris*, a certain Schmidel named the same group of ferns *Thelypteris*. In connection with this he published an illustration of the marsh fern (*Nephrodium thelypteris*) with various features so clearly outlined that even a novice should instantly recognize it. All the long list of ferns, that have recently been so actively catalogued as members of the genus *Dryopteris* must now be arranged under *Thelypteris*. The author quoted a list of a few species with synonymy to show how the game begins, but adds "As I have no sympathy for confounding names, nor feel any respect for codes, congresses or systems of nomenclature that by contradictory rules bring about such confusion, I do not want to be responsible for even the new combinations and only indicate a few for the sake of making clear the changes that may be followed by such as consider 1753 as the beginning of nomenclature in modern botany." Conservative botanists are likely to view this matter in much the same light, but those interested in the nomenclature game will no doubt rush to get under cover and name anew all the species of the wood ferns not appropriated by someone else. We who have always contended for the name by which the wood ferns are best known—*Nephrodium*—see no reason why the new name *Thelypteris* should be taken up, even if it is proven to be the oldest. We would rather compromise on *Dryopteris*, much as we dislike it, than start all over again under *Thelypteris*. Consider what the latter would mean. It would render most of our text-books out of date—the new Grays Manual, Britton's Manual, the Illustrated Flora, Small's Southern

Flora, the latest edition of the United States Dispensatory and many others. We who have consistently adhered to *Nephrodium* during the *Dryopteris* heresy have nothing to change. Even the *Dryopteris* botanists understand us, but the latter, forced by their absurd rules to adopt the earliest name, must now upset all their recent work and start in anew. The advantages accruing from the adoption of that generic name with which the scientific world is most familiar, will never become evident to those interested in nomenclature rather than in plants. But why should the student of ferns worry about the troubles of the name-tinker? All that is necessary in studying ferns is to have a name for your plants that others will recognize. By the new change of names, the marsh fern becomes *Thelypteris palustris*, that is, if one chooses to recognize the new combination. It may be said in passing that *Thelypteris* is not entirely free from entangling connections with other plants. It is surmised that upon the basis of strict priority, this name should be applied to the common bracken (*Pteris*). The name was given to the bracken before 1753, the date from which all species are supposed to date, but there are plenty of students that see no reason for accepting this date and the time may yet come when *Thelypteris* gets moved back to *Pteris* with consequent new troubles for both *Pteris* and the wood ferns whatever they may happen to be called then.

* * *

While camping with a party of his students among the sand dunes of northwestern Indiana, the editor found, on May 30th, near Glen Park, an abundance of a small *Botrychium* which is evidently the form or species named *simplex*.

The plants were growing in the open sun in a sandy spot along a railway embankment and ranged in size from half inch specimens to those several inches high. The related species of *Botrychium* do not fruit until mid-summer at least, but all the plants collected were in full fruit. Possibly the very early season may have influenced this. In the smaller specimens the sterile segment was a mere green flap, in the largest it was divided into pinnae. Great variation was also shown in the position of this sterile part and the possession of a petiole. An extensive series of specimens was secured designed to show these variations with the intention of publishing a series of drawings in this magazine. Unfortunately, an unbotanical janitor who cannot distinguish between a weed and a botanical rarity, made away with all the specimens except one. When the loss was discovered it was too late to secure more specimens, but since the plants were abundant at the station named it is hoped to secure a more complete set next year.

In view of the questions recently raised by Mr. Dodge (this magazine, pages 33-43) it may be noted that for a long time all the small *Botrychiums* in America were referred to *Botrychium simplex* and, as Prof. Eaton remarked in "North American Ferns," some of the variability noted in its description may be due to the fact that this may have been drawn to cover the whole range of plants. As it is, *simplex* is variable enough and Milde in his monograph named no less than six varieties, viz.: *Simplicimus*, *incisum*, *subcompositum*, *compositum*, *angustum* and *fallax*. It was Prof. Wood, author of "Wood's Class-book of Botany, who first separated the plant we now know as *B. matricariaefolium* or *B. ramosum* from this het-

erogeneous grape fern group. It seems apparent, however, that botanists have not yet unraveled the mystery at the bottom of the variation in *Botrychium*. In no other group of plants does there appear such regular and constant variation. Starting with the smallest *simplex* one can pick out a series of specimens that will almost imperceptibly grade into any other given species. Our naming of species and varieties in this group, then, is largely an attempt to describe certain forms and conditions which the *Botrychium* alliance may take, and each has a right to his own conception of these things.

BOOK NEWS.

The fifth, and concluding part, of Grout's "Mosses with Hand Lens and Microscope" has recently appeared and the parts bound in one volume are now offered at \$7.00.

"Our Garden Flowers," by Harriet L. Keeler is a popular work recently issued by Scribner's which describes the common cultivated plants and gives more or less information about them.

Chas. T. Druery, author of several works on British ferns has issued a new volume entitled "British Ferns and their Varieties." In addition to the text there are 40 colored plates and many other illustrations.

Greene's "Among School Gardens," published by Charities' Publication Committee, New York, gives a resume of what has been done in the movement to make school gardens a practical part of education. The book has many illustrations of real gardens and will be of great value to teachers in charge of such courses.

The University of Minnesota has recently issued a volume of more than 300 pages devoted to the Myxophyceae. It is written by Josephine Tilden, Assistant Professor of Botany in the University, and is entitled "Minnesota Algae." The title, however is somewhat misleading, since the book discusses only the blue-green algae or cyanophyceae, and takes in all these plants from the Arctic regions to West Indits and the Hawaiian Islands. Each species is described, its synonymy and range, so far as known given and most of the species are illustrated. As interpreted by the author the blue-green algae consist of two orders Coccogoneae and Hormogoneae, the first containing two families with twenty-five genera, the second five families and forty-six genera. These plants are little known to the average plant student and all require the compound microscope for study. The present work will be exceedingly useful to those working with them. It appears to be the intention of the University to issue other volumes of similar scope devoted to the green algae.

The *British Fern Gazette* completes its first year of existence with the number for June, 1910. Each number has maintained the high character of the first issue and the whole forms a volume of which the British Pteridological Society and its editor may well be proud. The last issue contains a list of the **members** of the Society, from which we note that there are 112 members, nine of whom reside in the United States or Canada. The price of the *Gazette*, which is issued quarterly, is five shillings (about \$1.25) and includes membership in the Society. Samples may be obtained by addressing the editor, C. T. Drury, 11 Shaa Road, Acton W., London.

INDEX TO RECENT LITERATURE.

Readers are requested to call our attention to any omissions from or errors in this list.

CLUTE, W. N. *Rare Forms of Fernworts.*—XIV. *Some variations of Polypodium*, illust. Fern Bulletin, Ap. 1910.

CLUTE, W. N. *The Philippine Pedate Bracken*, illust. Fern Bulletin Ap. 1910.

DODGE, R. *Variations in Botrychium ramosum*. Fern Bulletin, Ap. 1910.—Relationships of this species to the other small *Botrychiums* discussed.

DRUERY, C. T. *Naming of Fern Varieties*. Fern Bulletin Ap. 1910.—Reprinted from *British Fern Gazette*.

HOPKINS, L. S. *New Varieties of Common Ferns*, illust. Ohio Naturalist Je. 1910.—A form of *Adiantum pedatum* named *laciniatum* and one of *Cystopteris fragilis* named *cristata*.

HOYT, W. D. *Physiological Aspects of Fertilization and Hybridization in Ferns*, illust. Botanical Gazette, My. 1910.—A detailed account of numerous experiments in crossing ferns.

NIEUWLAND, J. A. *Dryopteris a Synonym*, illust. Midland Naturalist, Je. 1910.—*Thelypteris* Schmidel reported to ante-date *Dryopteris*.

POYSER, W. A. *Notes on Local Ferns*, Bartonian. F. 1910.

PRESCOTT, A. *Juvenile Ferns*, Fern Bulletin, Ap. 1910.

PTERIDOGRAPHIA. Fern Bulletin Ap. 1910.—*An aberrant Osmunda; Fertile Spikes of Botrychium; Forms of Botrychium obliquum; Forms of Lycopodium clavatum; Polystichum acrostichoides multifidum; Stomons of Nephrolepis.*

THE AMERICAN FERN SOCIETY

President, Rev. Jas. A. Bates, South Royalston Mass.
Secretary, Prof. L. S. Hopkins, Lincoln High School, Pittsburg, Pa.

Fern Students are cordially invited to join the society. Address either President or Secretary for further information. The Fern Bulletin is sent free to members. Annual Dues are \$1, and should be sent to Mr. H.G. Rugg, Tres., Hanover, N.H.

Mr. Harold Goddard Rugg, Hanover, N. H. offers specimens of *Equisetum scirpoides* to members for the cost of postage—about five cents.

Who wants a set (25 more or less) of ferns of north central Massachusetts in exchange for others next autumn? Let us all help replace Mrs. Noble's loss. (See Jan. Bulletin, p. 27). The Society has done such brotherly work in years past.—*James A. Bates, South Royalston, Mass.*

No summer meeting of fern students under the auspices of the Society will be held this summer, but several members of the Society attended the meeting of the Vermont Botanical Club at Woodstock, Vt., early in July and thus secured the advantages that come from such meetings. Those present were Mrs. Flynn, Mrs. Davenport, Miss Darling, Miss Strong, and Messrs, Rugg, Pember, Dutton, Underwood, Bissell and Winslow. Several subscribers to the *Bulletin* were also present.

A few members of the Society have not yet paid dues for 1910. Delays of this kind hamper the officers in their efforts to conduct the affairs of the Society to the best advantage, and it is hoped that all will pay up at once. The *Fern Bulletin* is sent to all members of the Society, whether they have paid up or not, but if any considerable number fail to pay promptly, the treasurer may not always be in funds for publication. Many Societies endeavor to accumulate a balance at the bank, but it has always been our policy to spend the revenues for each year in that year, for the benefit of the members. Thus we have special reasons for asking for all the dues for the year promptly.

ALL THE AMERICAN FERN BOOKS AND SOME OTHERS

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Fern Collector's Handbook, Sadie F. Price. (Out of Print.)	
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Vol. XVIII

No. 4

The Fern Bulletin

A Quarterly Devoted to Ferns



Joliet, Ill.

Willard N. Clute & Company

1910



The Fern Bulletin



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POLYPODIUM PROLONGILOBUM

THE FERN BULLETIN

Vol. XVIII

OCTOBER, 1910

No. 4

TWO NEW POLYPODIES FROM ARIZONA.

BY WILLARD N. CLUTE.

While collecting in the mountains north of Tucson, Arizona, in the autumn of 1910, Mr. James H. Ferriss discovered two colonies of a peculiar fern, specimens of which are illustrated in this number of the *Fern Bulletin*. The fern is unmistakably a polypody and not distantly related to *P. vulgare*, but it needs but a glance at the illustration to show that it is not to be referred to this species. Not only are the fronds smaller and slenderer with more pointed pinnae, but they are very thin in texture, barely half as thick as the fronds of *P. vulgare*. Being convinced of its distinctness I herewith name it

POLYPODIUM PROLONGILOBUM N. SP.

Fronds under six inches high from a creeping scaly rootstock; blade thin, inclining to oblanceolate, three inches or more long, one-third to half as wide, cut nearly to the midrib into from six to ten pairs of alternate pinnae; lower pinnules, short, narrowed at base, wider in the middle and round ended, those above ending in a long acuminate tip; apex of the frond long and slender often forming a third of the blade; sori in a double row about mid-way between margin and midrib; veins once or twice forked.

Collected by James H. Ferriss on rocks on the southern slopes of Mt. Lemmon, in the Santa Catalina Mountains, Arizona, October 1910. Type specimens in the author's herbarium.

JAN 28 1911

This fern differs from the common polypody *P. vulgare* in the short thin fronds, broadest above the middle, in the pinnules which are noticeably narrowed near the rachis, those below inclining to have rounded or blunt tips but those above ending in long slender points, and especially in the slender pinnule at the apex of the frond. The ferns, though growing in full sun are much more delicate than those of the common polypody which under similar circumstances tend to become almost leathery. The two colonies of the fern discovered were about half a mile apart and were apparently the only species of *Polypodium* in the vicinity. Many of the specimens were forked.

On the same collecting trip Mr. Ferriss obtained at Weber falls in Weber canyon on the northern side of Mt. Lemmon, a curious form of what is probably best considered a variety of the common polypody. Though growing in rich soil and a fair amount of shade on the banks of a small stream, the largest frond is only four inches long, while the average is under three inches including the stipe. Every frond is heavily fruited and as no larger forms were observed in the vicinity they are probably full grown. Though so small the veins are often twice forked. I would therefore call it *Polypodium vulgare* var. *perpusillum*. It may be described as follows: Fronds one to four inches long, one half to three quarters of an inch wide diminishing below, pinnules oblong, obtuse, about eight pairs; sori medium size, numerous, nearer margin than midrib. Type in the author's herbarium.

This plant has a superficial resemblance to *P. hesperium* but is much narrower and shorter than that form, in fact its diminutive fronds and narrow blades are its most striking characteristics.

NOTES ON THE DISTRIBUTION OF CERTAIN PLANTS IN WESTERN PENNSYLVANIA.

By OTTO E. JENNINGS.

In an interesting article in a recent number of the Fern Bulletin Professor E. J. Hill notes the occurrence of *Woodwardia virginica* (L.) J. E. Sm. in northwestern Pennsylvania, * and in this connection certain notes from the present writer may not be amiss.

For the last six years the present writer has been engaged almost entirely upon the study of the flora of Western Pennsylvania, with reference both to the ecologic and systematic phases of the question, and during this period more than a dozen trips of two or three days duration each have been spent in and about the great Pymatuning Swamp in Crawford County about fifteen miles southwest of Saegertown, where Prof. Hill made his headquarters. This great swamp occupies a trough along the southwest shore of a glacial moraine and is about seventeen miles long and up to a mile in width, and consists of two portions; one running west from Linesville to the Ohio State Line and containing considerable almost pure *Fraxinus nigra*—*Saururus cernuus* association, the other running southeast from Linesville with much of very characteristic *Larix laricina*—*Sphagnum* association. Towards the southeastern end of the latter, the Tamarack-Sphagnum bog, the drainage is reversed and, instead of flowing to the northwest by way of the Shenango River, flows to the southeast through Crooked Creek.

At the headwaters of Crooked Creek, near the little village of Hartstown, there are four glacial ponds, the largest being called Mud Lake, and while studying the vegetation around one of the smaller ponds the writer

* Hill, E. J. Fern Notes. Fern Bulletin, 18:65-76. July, 1910.

discovered considerable *Woodwardia virginica* growing in the shrub zone with *Rosa carolina*, *Alnus incana*, *Rhus vernix*, and some *Sphagnum*. The collection was made August 5, 1909, the spores then just beginning to be shed. This *Woodwardia* station is about eight miles southwest of Professor Hill's station.

There is also in the herbarium of the Carnegie Museum a sheet of *Woodwardia virginica* from the herbarium of Lafayette College as collected by the late Professor T. C. Porter and bearing the following inscription: "Sphagnum bog, Center Co., Pa., 4 miles n. w. of Pennsylvania Furnace, el. 1200 ft. Aug. 1875." This station for the fern is somewhat west of the center of the State and unlike our other station is not in glacial territory, but is about one hundred miles south of the terminal moraine, and is in one of the bogs in the interesting pine barrens of Center County on residual soil, derived from limestone with subterranean drainage.

The small lake mentioned on page 67 by Professor Hill as situated near the vilage of Edinboro, Erie County, is Conneautte Lake. Conneaut Lake is in Crawford County, about twenty miles to the south and west.—This is to avoid possible confusion of localities.

In the herbarium of the Carnegie Museum there are now specimens of the Boulder Fern (*Dennstedtia* or *Dicksonia*) from twelve of the thirty-one counties in the western half of Pennsylvania. One of the specimens is from Crawford County: "Conneaut Lake, east side, woods back of Harmonsburg road. John A. Shafer, July 24, 1901."; another is from Lawrence County: "Old R. R. track above Wurtemberg, on rock-cut. John A. Shafer, July 15, 1900." The other specimens are all from unglaciated and more or less hilly or mountainous counties, and the card-map on which our

specimens are checked pretty clearly shows the Boulder Fern to be more commonly collected in the mountains than in open country in this state, thus upholding Professor Hill's contentions as to its comparative rarity in the more level country towards Lake Erie.

—*Carnegie Museum, Aug. 19, 1910.*

ASPLENIUM GLENNIEI.

BY WILLARD N. CLUTE.

One of the rarest ferns in the United States, though not in the world is that species named by Baker *Asplenium Glenniei*. It is not uncommon in Mexico, but its only record from our territory is that reported by J. G. Lemmon who collected it in Conservatory Canyon in the Huachuca Mountains of Arizona in 1882. The fern has never been seen since in that region though frequently searched for but Arizona is a big state and the species may be growing in abundance in any one of half a hundred unexplored canyons.

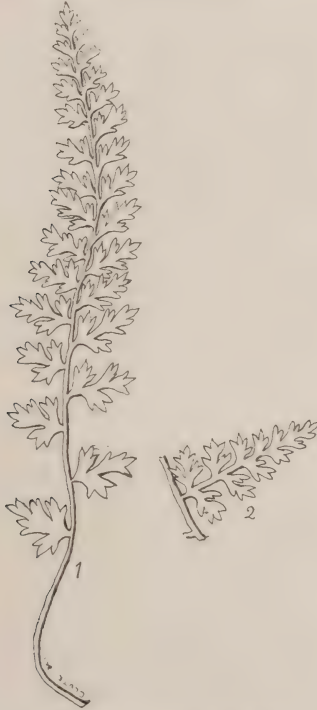
Lemmon sent his specimens to D. C. Eaton for identification and he called them a variety of *Asplenium fontanum*, a fern not uncommon in the Old World. They were distributed under this name but later were recognized as belonging to the Mexican species and now appear in our catalogues under their proper name. Fronds from a plant collected in Mexico by C. G. Pringle are reproduced in our illustration and we also republish, from the fifth volume of *Fern Bulletin*, a drawing of the allied *A. fontanum* for comparison. With the latter is a pinna from a frond of a variety often considered a species as *A. Halleri*.

Those who consult the check-lists of North American ferns, will find *A. fontanum* also listed as a member of our fern flora, but no botanist has ever seen and



ASPENIUM GLENNIEI

recognized the plant growing in this country. The report of its occurrence in both Pennsylvania and Ohio, the only reported stations, was made by a botanist long since dead and his report was based on some fronds of *A. fontanum* discovered among other speci-



ASPLENIUM FONTANUM

1. Frond natural size. 2. Pinna of "A. Halleri."

mens ten years after they had been collected. Most collectors and students are satisfied that the species was reported in this country by mistake, and that the fronds of *A. fontanum* found with other American species got there through some oversight during the ten years they had lain unnoticed. At any rate, the

species has never since been reported from this country and is no longer considered a member of our flora, though a few of the books continue to list it—a good illustration of how long a mistake may linger in the records of a science.

A FERN NEW TO THE UNITED STATES.

BY WILLARD N. CLUTE.

Now and then, in exploring out of the way places in the United States, the student may chance upon a specimen differing enough from the ordinary to be pronounced by some a new species, but our territory is now so well known that we need scarcely expect to make further finds of this kind, or indeed, to find described species not previously reported. The only exception to this must be made with reference to the southern part of our country, the Gulf States, especially Florida, and the great Southwest. Long before the careful explorations of A. A. Eaton and others in Florida had added more than a dozen new species to our list, we had pointed out the possibilities of doing so, and we would record here the opinion that there are still several more species to be reported. The proximity of the southern part of the State to several tropical islands and the lightness of fern spores generally make all the probabilities in favor of an occasional new fern becoming established there.

The same thing may be said of the Southwest, where the sharp eyes of Mr. James H. Ferriss have already located various species new to our flora and also some new to science. Such of these species as have previously been described are immigrants from Mexico, rather than from the West Indies, and it seems quite likely that when the vast stretches of territory in the Southwest which still await the advent of the fern

student have been explored various other Mexican species will be found.

This idea is further supported by the fact that in 1907 Mr. Ferriss collected specimens of *Nephrodium Mexicanum* in Long Park, Chiricahua Mountains, Arizona, about twenty miles north of the Mexican boundary. This species has not been previously reported from the United States. It was growing in a small grove of aspen on the banks of a stream in company with the bracken and a peculiar form of *Cystopteris* which I have since named *C. fragilis tenuifolia*.

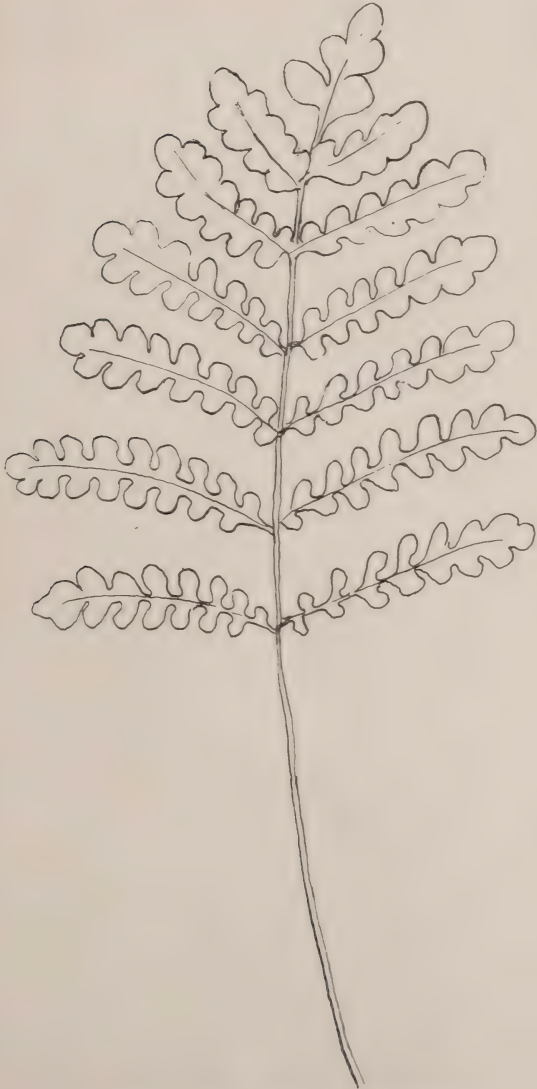
There is considerable difference of opinion regarding the status of the species called *Mexicanum*. In the "Index Filicum" Christiansen says it is the same thing as *Nephrodium patulum* of Swartz, but Jenman, who spent twenty years studying Jamaican ferns claims both species for the fern flora of that island, and gives their contrasting characteristics. Swartz, who collected extensively in Jamaica appears to be the first to have given the name *patulum* to a fern, and Hooker later made the name *Mexicanum*. The whole question, therefore hinges upon whether there are two different plants concerned. Underwood who transferred the name *patulum* from the genus *Aspidium* to *Dryopteris* reported *patula* from Arizona. This species has also been collected by Mr. Ferriss on various occasions, but it is quite a different plant from the specimens here reported as *Mexicanum* and since the tendency of fern students is toward making more, rather than fewer, species it is very likely that this will continue to be regarded as a species distinct from *patulum*. Whether *Mexicanum* is maintained as distinct or not, the specimens here referred to that species certainly are, but there seems to be no need of giving them a new name.

RARE FORMS OF FERNWORTS.—XVI.

ONOCLEA SENSIBILIS f. OBTUSILOBATA AND ALLIED FORMS.

The history of the vicissitudes that have attended upon that form of the sensitive fern known commonly as *obtusilobata*, ever since its discovery, is a most interesting commentary upon the progress of botanical knowledge in general, while it also throws considerable light upon the fundamental processes concerned in the production of such forms. The form mentioned was described by Torrey in the "Flora of New York" as a variety of *Onoclea sensibilis* and in his day was regarded much as we now regard sub-species. Indeed, many botanists considered it distinct enough to be a separate species and Schkuhr so described it under the name of *Onoclea obtusilobata*. We are all disinclined to give up an opinion once we make it our own, however, and long after it was shown that it was not a species, we clung to the idea that it was a good "variety." Now it is well-known to be a mere form that can be produced at will by anyone who cares to take the trouble.

The possibility of making exact experiments in the production of the form, lies in the fact that *Onoclea sensibilis* is not only a dimorphic species but seasonally dimorphic as well. The two sorts of fronds are about as different in appearance as two leaves from the same plant could well be, the coarse ample sterile fronds being simply pinnate or with the lower pinnae again pinnatifid, while the fertile are completely bipinnate with the pinnules rolled up into close little balls which enclose the sori. Not a few students are wont to consider these berry-like objects as the spore cases, but careful examination, when the fertile fronds are young,



ONOCLEA SENSIBILIS F. OBTUSILOBATA

will show several sori in each close-wrapped pinnule, each sorus, surrounded by its own hood-shaped indusium.

The fertile and sterile fronds are also widely separated as regards the time of appearance and it may be doubted whether there is anywhere another fern that excels it in this respect. There are various other dimorphic species in our fern flora, but in these the two kinds of fronds usually appear without much time elapsing between them. In the cinnamon fern (*Osmunda cinnamomea*), they appear almost simultaneously, but in the species under discussion the fertile fronds often do not appear until August or even later. It is thus seen that this forms an ideal species for experimentation in the production of abnormal forms.

The typical *obtusilobata* fronds are about half way between the fertile and sterile fronds in appearance, but a complete set of intergrading forms from the perfectly sterile to the completely fertile may be found. It was once thought that the *obtusilobata* forms were sterile, but careful search on the backs of the fronds will usually reveal certain whitish scales which are the indusia of imperfect sori. In some cases, also, small prothallia instead of spore-cases have been found in such sori, adding this species to the list of ferns known to exhibit apospory.

When first discovered the *obtusilobata* forms were regarded as sterile fronds that had in some way taken on the additional function of spore-bearing. L. M. Underwood appears to have been the first to suggest that the real condition is just the other way about and that the forms are all transformed from what the plant intended originally for fertile fronds. For a time a considerable controversy

waged over this subject. Such a question on its face has little of interest for the student who may wonder that a difference of opinion should matter until he learns that its proper settlement throws much light upon the origin of fern leaves in general. In view of the facts that this form may be made to prove, botanists insist that fertile fronds, no matter how they may appear at present, existed first and that the sterile fronds are all modifications of them.

It is one thing, however, to claim that the *obtusilobata* forms are produced from what were intended to be fertile fronds and quite another to prove it. This Prof. G. F. Atkinson essayed to do in the spring and



PINNAE OF STRUTHIOPTERIS GERMANICA F. OBTUSILOBATA

summer of 1894. Since it requires a certain amount of plant-food to produce any kind of a sporophyll that is incapable of making its own food, he reasoned that cutting off the sterile fronds would oblige the plant to turn the fertile fronds, already laid down, into food-making organs. Accordingly he removed the fronds from a colony of these ferns early in May and when the new crop of leaves appeared these also were cut off. A third cutting was made later and then, as expected, the *obtusilobata* forms began to appear. Others who have since tried the experiment have sometimes failed to be successful, but it is likely that their failure is due to the neglect to remove the fronds often enough.

Forms similar to those produced by the sensitive fern have been found on its near ally the ostrich fern (*O. Struthiopteris* or *Struthiopteris Germanica*) and experiments have shown that they may be produced in the same way. Like the forms of the sensitive fern they have the tips of the pinnae more expanded than the bases, following the well-known rule of development in the ferns, by which the tips are last to mature. From this it appears that often after the general plan has been decided upon for a particular leaf, there is still time to almost completely change the nature of the tip.

The production of these *obtusilobata* forms throws additional light upon that form of the cinnamon fern which has been named *frondosa*. This, also, is manifestly formed from a fertile frond and is likely due to some injury to the sterile ones. Unlike the sensitive fern these abnormal fronds cannot usually be produced the same year that the sterile fronds are removed, possibly because the fertile fronds are too far along in development at the time the sterile fronds are produced. It is likely that any effects of cutting off the sterile fronds would not show until the following year and such is the vigor of this species that the removal of two crops of fronds may be necessary to get results. Upon this point information is lacking and carefully conducted experiments by some fern enthusiast are much to be desired.

The drawing of *Onoclea sensibilis obtusilobata* presented is of a specimen from the writer's collection which closely matches the figure given by Eaton in his "Ferns of North America." Eaton gives no figure of the similar form for the ostrich fern though he was familiar with it; in fact while this form is well-known

it appears never to have been formally named. It is usually spoken of as the "obtusilobata" form of the species. Following the analogy of the sensitive fern it may be called *Onoclea Struthiopteris* f. *obtusilobata* or *Struthiopteris Germanica* f. *obtusilobata*. We illustrate a pair of pinnae from near the middle of a frond.

A HUNT FOR LONCHITIS.

Somewhere in the mountain forest of Jamaica grows an exceedingly rare fern named by the scientists *Lonchitis aurita* or *L. pubescens*. Its claim to our attention, however, is not its mere rarity, for there are many rare ferns in the magnificent fern-flora of that delightful island, but the evanescent character of its habitat and the confusion that exists regarding its specific distinctness. As regards the latter it may be said that there is, in the tropical part of the Old World a species closely resembling our own which scientists agree in calling *Lonchitis pubescens*, but whether the two plants are identical is a matter upon which opinions differ. Those who have seen our own plant, however, are firmly convinced that it is a good species.

A singular uncertainty attaches to the places in which the ferns grows. The first American plants were gathered by Plumier in Martinique nearly 250 years ago, but apparently have not been collected there in recent years. About 1880 a botanist named Nock found a plant in Jamaica at Morce's Gap on the slopes of John Crow Peak at an altitude of nearly a mile above sea level, but efforts to find additional specimens were futile, though had the plant been in the vicinity it ought to have been easy to discover it since it commonly grows to the height of a man.

Nearly twenty years went by before this fern was again seen growing by a white man. Then a government botanist searching for new plants in the unexplored virgin forest beyond New Haven Gap found it, but under somewhat trying circumstances, for he lost his way, (a somewhat disquieting thing to do in a region where the unbroken forest stretches away for miles in every direction and over the most irregular country) and after wandering about until dark, finally, almost exhausted, came out upon the trail, a long distance from home. He was then, so far as known, the only living white man who had set eyes on the plant in its native haunts and it was with unusual pleasure that the writer accepted his offer to guide him to the locality for a peep at it.

Although not so very far away from our headquarters, in a straight line, the trip, which for lack of trails had to be made on foot and by a circuitous route, occupied us from sunrise until nearly dark. Our company made a rather imposing appearance at starting. Surrounding the two white men who were the nucleus of the expedition were negroes with hampers of provisions, negroes with collecting cases and still others armed with heavy machetes for clearing a path through the forest.

As we wound slowly up the short trail leading to New Haven Gap, one of the finest mountain prospects to be found anywhere on the globe burst upon our sight. To our right rose the great bulk of Blue Mountain peak, nearly 7500 feet high while lying between and separating us from it, lay a gulf nearly a mile deep. The distance across the gulf was so short that the tree ferns on its further bank could be distinguished easily with a glass, and it was difficult to re-

alize that it would require a day's journey to reach them.

At a certain point on the trail, one of the negroes indicated the place where we should leave it in our search for the fern and here all unnecessary baggage was left, for we were now to plunge into the unbroken "bush." After our leader we went, in a wild scramble to keep up with the rest of the party; down precipitous slopes, up craggy heights to ridges so high, so narrow, and so uneven that if they had not been deeply overgrown with vegetation, no one would have thought of traversing them erect. Here and there through the trees we got glimpses of the bottoms of narrow valleys far below, but the danger of falling was not great because of the dense forest that everywhere clothed the cliffs.

In the more level spots we had time to note the plants more at length. This was an excellent example of a tropical rain forest and the trunks of the trees were almost hidden by dense growths of mosses and liverworts in which grew great numbers of small ferns, orchids and other epiphytes. Many of these plants were unknown to science and it was quite a new sensation, after the ado that is sometimes made over some single species, to look about and realize that right at hand were no doubt dozens of absolutely new and undescribed species. As a pleasing proof of this fact, I found upon my return that I had found a new species of *Asplenium* which has since been named for me.

A little further on we found the *Lonchitis*. It was growing in a "hanging sphagnum bog" which in itself was almost as much of a curiosity as was the fern. The orthodox sphagnum bog is well known to be a level boggy stretch covered with peat moss or sphagnum,

but here was a bog as steep as the roof of an ordinary house into which one sank nearly to the knees as in the usual sphagnum bog. There was nothing to keep the water from running out of such a bog; in fact, it did run out, but it was as constantly renewed from the upper side by the frequent rains. In this forest it rains, not only every day but several times a day, and occasionally for several days at a time. This is due to the fact that every moisture-laden wind from the sea is cooled as it approaches these elevated regions and is forced to part with some of its moisture.

The effect of this constant humidity upon the vegetation can hardly be imagined unless one has been in a similar region. The earth, fallen logs, dead brush, the tree trunks, and even the leaves of some trees have their appropriate colonies of plants. A sudden storm drove us to shelter under an inclined tree trunk and here we ate lunch, watching the rain-drops chase one another down the fronds of no less than a dozen different species of filmy-ferns that formed part of our shelter.

The *Lonchitis* itself was no common sight, rising up out of the sphagnum to a height of seven feet or more and clothed in a sparse coat of brownish yellow hairs. It was, however, of no particular beauty, being quite like several of the large tropical brackens to which indeed, it is very closely allied. Our guide mistook the specific name and spoke of the fern as *Lonchitis aurea*, calling it the golden lonchitis, a name which the vesture of the frond well bore out, but the correct name is, of course, *aurita*. For what reason this was given is unexplained though it may refer to the ear-like lobes of the pinnae.

The genus *Lonchitis* differs from the genus *Pteris*, to which the brackens belong, only in having its fruit-

bearing parts, or sori, extending around the sinuses as the hollows between the lobes of the pinnae are called. As is well-known, the spore-cases of *Pteris* spring from a sort of continuous vein-like receptacle along the edges of the pinnules, but stop short of the base, while in *Lonchitis* they are usually most abundant at the base though they may also extend to the apex of the pinnules in a more or less interrupted and sinuous line.

Putting a good supply of the fern in press we took a last look at the shaggy wilderness and turned upon our homeward trail. We left plenty of plants for the future collector. All he has to do is to follow our trail and get them.—*Willard N. Clute in Amateur Naturalist.*

PTERIDOGRAPHIA.

DISTRIBUTION OF DICKSONIA.—In connection with the notes on the distribution of the boulder fern (*Dicksonia punctilobula* or *D. pilosiuscula*) it may be noted that this fern is a most abundant species on all the high ridges that cross the central and western part of the State of Pennsylvania. The editor of this magazine saw an abundance of it along the Pennsylvania railway between Driftwood and Buffalo. It was especially plentiful near the summit over which the railway climbs in leaving a tributary of the west branch of the Susquehanna and continued almost to Olean. As level country is approached it disappears and as Dr. Hill notes, is rare about Buffalo. Those who have seen the fern growing at its best cannot have failed to note its preference for rough and broken country. It is quite clear that it avoids the level though a mere matter of low altitude does not affect it. Why level

country is not to its liking is a matter for the ecologist to settle. Meanwhile all who have theories to suggest should get busy

A CORRECTION.—Mr. C. D. Pendell calls our attention to a typographical error in the spelling of a lake near Edinboro Pa. It should be Conneautee instead of Conneaut. Conneaut lake is further south and has the distinction of being the largest lake in the State.

ASPLENium EBENOIDES IN NEW JERSEY.—Three new stations for *Asplenium ebenoides* in the vicinity of Newton, N. J., were found last summer by members of the Sussex County Nature Study Club. Sussex county abounds in limestone and produces much ebony spleenwort and walking fern, and it is likely that further specimens may be found. A member of the club has found twenty-seven species of ferns in a single afternoon's ramble and at another time discovered the adder's tongue.

INDEX TO RECENT LITERATURE.

Readers are requested to call our attention to any corrections in or omissions from this list.

BENEDICT, R. C. *Fern Leaves, Ferns and Fern Allies*. American Fern Journal Ag. 1910.

CLUTE, W. N. *A Hunt for Lonchitis* illust. Amateur Naturalist. Mr. 1909.—An account of a visit to the haunts of this rare fern.

CLUTE, W. N. *Rare Forms of Fernworts*.—XV. *Young Cliff Brakes*. illust. Fern Bulletin Jl. 1910.

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- DOWELL, P.—*Notes on Some Ferns Found During 1909*.—American Fern Journal Ag. 1910.—New locations for varieties of *Nephrodium spinulosum*.
- DUTTON, D. L. *Habitats of Botrychium simplex*. Fern Bulletin, Jl. 1910.
- HILL, E. J. *Fern Notes*. Fern Bulletin Jl. 1910.—Notes, principally regarding distribution, of *Woodwardia Virginica*, *Nephrodium spinulosum*, *Dicksonia punctilobula* and *Botrychium*.
- HOPKINS, L. S. *Notes on the Botrychia*. illust. American Fern Journal, Ag. 1910.
- NIEUWLAND, J. A. *Pteridium*, J. Agardh, a Homonym. Midland Naturalist, Ag. 1910.
- MARSHALL, M. A. *Lycopodium inundatum in the White Mountains*. American Fern Journal, Ag. 1910.
- MERRILL, H. W. *Polypodium Vulgare in Maine*. American Fern Journal, Ag. 1910.—Notes on the varieties of this species.
- PRESCOTT, A. *Botrychium ramosum*. Fern Bulletin, Jl. 1910.
- PRESCOTT, A. *The Boulder Fern*. Fern Bulletin, Jl. 1910.
- PTERIDOGRAPHIA. Fern Bulletin, Jl. 1910. *A Fragrant Marsh Fern, A Forking Cystopteris, An Evergreen Cystopteris, Apospory in Ferns, Azolla and Mosquitos, Nephrolepis Roosevelti*.

EDITORIAL.

It has been an open secret for a year or more that we intend to combine this publication with *The American Botanist* when it has finished its twentieth volume, that is, two years from the present date. It is a rare thing in the history of botanical publications for one to cease existence so long as its revenues are sufficient to keep it going; in fact the lack of the wherewithal to settle with the printer has usually caused the demise of such ventures. We, however, have no such reason for ceasing publication. The receipts from the journal are still in a satisfactory condition, but for several years there has been a decided lull in the amount of fern literature appearing, thus constantly rendering it more difficult to secure enough acceptable manuscript. This lull is in no respect due to a lack of interest in the subject of ferns for there are more people studying them at present than ever before, but so many books of a popular nature on the subject have now appeared that the need for such a publication is not as great as it once was. When we began publication there was not a single popular book on American ferns in existence. Robinson's book on fern growing and the earlier editions of Underwood's somewhat technical work were all that were available. Now there are at least a dozen volumes that aim to make fern study easy. When the first numbers of the *Fern Bulletin* appeared, very little was known of the distribution of the various species but the ranges have since become so well known that not much more is to be said on the subject. The haunts and habits of our ferns have become well-known and we have therefore decided to quit while the quitting is good. Of course there will continue to be more or less that is new about ferns to be published but this we purpose issuing

in our larger magazine. Our only reason for continuing the magazine to the end of its twentieth volume is one of sentiment, but sentiment has entered largely into the publication of the magazine from the first, and may as well continue to govern it. Very few scientific magazines in America have lived as long as the *Fern Bulletin* has. In the extended list of defunct publications on plants we can not find a single one that has lasted twenty years and we purpose setting a mark, while we are about it, that no other fern publication can hope to attain. But twenty years is the limit. In paying for subscriptions hereafter our patrons will please not pay beyond the end of 1912. Those who wish to have the paying over with, once for all, may send us \$1.25 and become a new kind of life subscriber whose subscription will end with the life of the magazine. Those who wish to pay for each volume as issued may, of course, continue to do so. We trust that everybody will renew and thus help us to finish with a flourish. In a few years more the back numbers of this magazine will be scattered far and wide, and when it is too late many will discover that they need complete sets. It is best to make sure of your own set at once. When we do not have to break files we will supply any back volume for 75 cents; otherwise purchasers will have to pay the added cost. Single numbers that people are now offering \$2 each for could once be had for five cents apiece. Better order now.

* * *

A few people, unacquainted with the facts, have feared that the decision of the American Fern Society to issue a publication in which to print its reports will in some way affect the publication of *The Fern Bulletin*.

tin. As a matter of fact, we supplied the Society with less than 175 copies, and this is a very small part of our circulation. The loss of this patronage would be about as much of an excuse for curtailing our energies as the loss of an equal number of postage stamps would be. The copies furnished to the Society were sold at less than the regular rate, practically at cost, and our simile of the postage stamps is not inappropriate. But we are not to lose even this patronage. Those who subscribe for *The Fern Bulletin* do not do so out of charity; they want the information it contains. It is not to be expected that those whose files of this magazine run back ten or fifteen years will stop their subscriptions now; in fact, a considerable number of Fern Society members have already subscribed and others will do so when they discover that the Society is no longer to send them the magazine, free. In 1911 and 1912 we expect to issue the same kind of a magazine we have always issued, and if anybody thinks it is not worth 75 cents, we don't want his money. After 1912 the magazine will continue as a component part of *The American Botanist* and no matter what the price of the combined magazine will be, the price to subscribers of this magazine will be what they have always paid—75 cents.

* * *

The delay in issuing this number has been caused by the necessity of our finding out in advance the intentions of the new Executive Council of the American Fern Society. We are not likely to be as late again, but owing to the amount of work that is now piled upon the editor we long ago ceased to promise to issue on time. What we do promise is to always send four issues a year of 32 pages each. This promise

we have never broken. In the history of this publication we have never economized by issuing two numbers in one and we never expect to do so. It is a cheap way of catching up, but it has never appealed to us. Eight more numbers of this magazine will be issued. Now is a good time to subscribe.

BOOK NEWS.

To those who have never given much consideration to fern sports, Mr. C. T. Druery's recent book entitled "British Ferns and Their Varieties" will be a revelation. On this side of the Atlantic fern students for the most part have been content to collect the various species and marked varieties of ferns into herbaria, and while quite aware that ferns often present variations from the normal have seldom thought it worth while to collect or even name them unless they are of decidedly symmetrical growth and likely to reproduce their characters in the wild without assistance. Those who make a hobby of cultivating any ferns, except such hardy species as will thrive without much care in out-door ferneries, are comparatively rare, while those who go in for crested and tasselled specimens are so rare among our 92 millions as to be counted on the fingers of one hand. Of course from this list is excluded those dealers whose main interest is to develop plants of bizarre form that some amateur may care to add to his stock of plants in general. Nearly the exact reverse of this is found in England. There the normal fern fronds are very little appreciated and collections of pressed specimens the exception. The great interest is found in growing and propagating all sorts of abnormal specimens both out of doors and in conservatories. As a result, several British works de-

voted to this phase of the subject have appeared, two of them by the author of the present work, but in the judgment of the reviewer this latest effort puts all the others quite in the shade, both as to comprehensiveness of treatment and the wealth and beauty of the illustrations. Certainly if one is asked to select the one best work on growing and multiplying abnormal ferns, this is undoubtedly the volume to be designated. Those who have the slightest interest in the subject will find the book invaluable. The work begins with several chapters that discuss all the details of fern culture.—rockeries, wardian cases, propagation, culture, selection, wild sports, crossing and hybrids and the like—in which the whole subject is thoroughly treated. Then follows a description of all the British ferns, some sixty in number, with the principal varieties and abnormalities named and described. In all the text there is a manifest intention to adhere strictly to the subject of British ferns, and in the discussion of hybrids and hybridizing we fail to find even a mention of the work of American students. There is also a curious persistence in considering the sexual spores of ferns as analogous to, or even homologous with, seeds. These, however, are but minor faults, and soon forgotten in the admiration for the many exquisite illustrations. There are more than three hundred figures in black and white, forty excellent colored plates, and ninety-six nature prints of the various forms themselves. On the whole the book is one that is not likely to be surpassed for some time. It is published by George Routledge and Sons, of London, at about \$2.00 net. American book dealers can probably supply it at about \$2.25 postpaid.

THE AMERICAN FERN SOCIETY

At the recent election of the Society fifty-nine votes were cast for two candidates not regularly nominated and a Judge of Elections, selected from members admitted this year, declared these two candidates elected. Although Messrs. Dowell and Hopkins do not seem legally entitled to the offices it is not likely that their possession of them will be challenged, since few people care to hold an honorary office that must be fought for to be gained. It may be mentioned in passing however, that many members are of the opinion that the legally elected candidate for president is Mr. J. B. Flett and for secretary is Miss Pauline Kaufman.

* * *

The Constitution of the American Fern Society places the nomination of all candidates in the hands of an Advisory Council consisting of the past presidents of the Society. In any association coming together for regular meetings such a restriction of the nominating power might properly be considered to be too arbitrary, but in a society like the one under discussion in which the members are not well acquainted with one another and in which a majority of the members have never been present at a stated meeting, it was felt that this restriction was well advised and the passing years have but emphasized the wisdom of this plan.

* * *

In presenting the amendment to the constitution under which the recent election was supposed to have been held, Mr. B. D. Gilbert said (10th An. Rep't. 1902) "The duty of nomination ought to be placed in the hands of an Advisory Council * * * as these gentlemen probably possess a wider knowledge of the

members and the needs of the chapter than others" and again "For the present it would seem to be sufficient to place the power of nomination of candidates for office in its hands." The intention of the person offering this amendment is thus clearly shown, and the amendment itself, backs up this idea and clinches matters by adding, after the duties of the Advisory Council have been outlined, a section (Sec. 7) which says "*Any part of the Constitution not agreeing with this article is hereby repealed.*" The original Constitution allowed independent nominations but this section put an end to the practice because the growth of the Society made it no longer possible for all the members to know one another and by the old method there was now danger of designing persons obtaining office and using it to further their own ends. Had it been desired to return to the plan of independent nominations, this could have been done by changing the constitution, but no members had the hardihood to suggest such a change. The 117 members who did not vote for an independent candidate, have been somewhat amazed to see an election carried by disregarding the constitution.

* * *

It is to be regretted that anything having the semblance of wire-pulling should enter into the affairs of the Fern Society, but conservative members find it hard to reconcile certain acts of those in authority with the facts in any other way. During the year the reputed constitution was reprinted but with the repealed clause regarding independent nominations retained, and *the clause repealing it omitted*; when attention was called to this fact the interested persons issued a circular in which the president declared the defective document to be "the authorized constitution." No one

is authorized to change the constitution unless a two-thirds vote of the whole Society favors it. Not content with paving the way for the recent unfortunate blunder, the Executive Council endeavored to usurp the powers of the Advisory Council to the extent of sending out cards soliciting nominations. Others, working with the Executive Council nominated those persons which have since been given office. Never in the history of the Society have we seen so determined an attempt by members of the Executive Council to name their own successors. We may well fear for the future of the Society when acts of this kind go unreproved.

* * *

The animus back of all this activity is, of course, the question of owning an "official organ." The Society once owned its own publication and gave it up because of the cost. We who have been through this experience have always advised against a repetition of it. But the passing of time has brought to the front, a new set of members gifted with more ambition than foresight who must try their 'prentice hand at editing at the expense of the Society. Long before these people could tell a fern from a carrot, we had settled this matter, but we must needs upset our affairs now to convince them that they do not know all there is about "official organs." The publishers of *The Fern Bulletin* have never objected to a change of publications, all that they have fought is the owning of a publication by the Society because they know how expensive such things are. Already we begin to have indications of what to expect. A member of the new council writes, "The expenditure, the past year, of \$33.60 for Annual Report was an extravagance. If the Society owned its

own journal this amount could be saved each year." So we see the kind of matter that it is proposed to run in the new publication. Another member, close to the new council writes "There is no requirement by which a journal shall consist of 32 pages or be issued four times yearly," and again: "While having no intimate knowledge of publishing, I am quite well aware, as you have pointed out, that the pitfalls that lie in the path of *even such a tiny periodical as has been proposed* are many, and cannot be wholly forseen." Members of the Society are thus squarely up against this proposition: they are to lose the 32-page *Fern Bulletin* and have in its place a tiny journal containing the annual reports. It would have been far better to have continued to send the *Bulletin* to members and develop the Annual Report into an "official organ," but it is too late now. The "independents" are in command and revenues that once went to supply acceptable matter to the members will now be used to experiment in publishing.

* * *

This is the last number of *The Fern Bulletin* that members will receive through the Fern Society, but we trust all will continue to receive it as subscribers. In fact, practically all those who are aware that the change is to be made, have already subscribed. We shall continue to publish the same kind of a magazine that we have always issued and believe it is worth 75 cents a year. Possibly, some arrangement can be made, by which those who wish may receive this magazine in place of the "official organ," but if not, we solicit your subscriptions. We shall, as usual, keep members informed of the progress of matters in the Fern Society and if a choice must be made between a dollar for the Fern Society's "official organ" and the 75 cent *Fern Bulletin* that the latter will be duly considered.

THE NEW ANNUAL REPORT

It is probable that the necessity of hustling for office prevented the secretary from getting out an adequate report, and we are charitable enough to assume that this also accounts for several little inaccuracies that occur in this officer's statements. For instance, the claim that a majority of the Advisory Council nominated an independent ticket is untrue. A majority of this Council sent out the regular nominations and did not omit from the list any name authorized by a majority of the council. The secretary's name failed to receive the endorsement of the Council. The independent nominations had the backing of only a single member of the Council who favored a new publication. Again, the secretary attempts to defend the inaccurate list of names sent out last year. The editor of this magazine marked all corrections in the list and the secretary failed to make the changes. Among those wrong last year are numbers 18, 40, 42, 102 and 108 of the present list. Several more incorrect addresses are given in the new list, but the secretary will probably deny it, so we will merely, instance Nos. 23, 54, 129 and 135. In one of these the surname does not even have the same number of syllables as the correct one. The secretary's report is a mixture of expectations, explanations, exhortations and recriminations but it is not a report of the Society for 1910. And this, alas, is the person for whom 58 votes were cast at the late election! What every member has the right to expect from the secretary is a full and unbiased statement of the work of the Society for 1910, not a report for part of a year, largely personal in nature and it is not to the credit of the Society that we fail to get it. In this connection it is pertinent to inquire by

what right the treasurer makes a report for eleven months and dubs it his report for 1910. In most financial circles a report for a year which ends December 31, would not be made on the first of that month. To the knowledge of the writer there are unpaid bills outstanding that should have been included.

DEATH OF MRS. SAUNDERS.

With much regret we record the death of Elisabeth Hallowell Saunders, wife of Charles Francis Saunders which occurred December 13, 1910, at her residence in Pasadena, Calif. Mrs. Saunders was an artist of much talent and will be remembered by our readers as the author of the characteristic illustrations that have accompanied Mr. Saunders' contributions to various periodicals for many years.

THE MEANING OF PILOSIUSCULA.—My latin is not very strong, but I do happen to know enough to interpret "*pilosiuscula*," mentioned on page 82 of the Bulletin. It does not mean "very hairy." I think there is a prefix "per" to indicate very, as "*perpusilla*." Yes, the Standard Dictionary bears me out in this and gives the English "perfervid" as an example. The ending *-usculus* is the diminutive, and the word simply means "having little hairs," which is a very apt description of the fern in question. Of course the prefix "per" sometimes means "through," as in "perfoliate." —C. E. Waters, Bureau of Standards, Washington, D. C.

ALL THE AMERICAN FERN BOOKS

Ferns of Kentucky, Williamson (Out of Print.)	
Ferns of North America, D. C. Eaton, 2 vols. (Out of Print.)	
Fern Collector's Handbook, Sadie F. Price. (Out of Print.)	
Ferns in Their Homes and Ours, Robinson. (Out of Print.)	
Ferns of the West, Marcus E. Jones, paper.....	\$.50
Ferns and Fern Allies of New England, Dodge.....	.50
New England Ferns and their Common Allies, Eastman.....	1.33
Our Native Ferns, Underwood, 6th Ed.....	1.08
Ferns, Waters.....	3.30
Our Ferns in Their Haunts, Clute.....	2.15
How to Know the Ferns, Parsons.....	1.60
Fern Allies of North America, Clute.....	2.15
Fern Collector's Guide, Clute.....	.54
Who's Who Among the Ferns, Beecroft.....	1.05
How Ferns Grow, Slosson.....	3.25
Ferns and How to Grow Them, Woolson.....	1.17
Fern-wort papers. Paper.....	.25
Ferns of the Upper Susquehanna, Clute. Paper.....	.15
Boston Meeting Papers. Paper.....	.25
Index to Vols. 1-10 Fern Bulletin. Paper.....	.25
North American Pteridophytes, Gilbert. Paper.....	.25
Ferns of Iowa, Fitzpatrick. Paper.....	.20
Mosses and Ferns, Campbell, 1st Ed.....	4.00
Mosses and Ferns, Campbell, 2nd Ed.....	4.50

Any of the above, to which a price is attached will be sent postpaid upon receipt of price. Out of print books may occasionally be obtained second hand nearly as good as new. The Fern Bulletin may be clubbed with any book listed at a dollar or more for 50 cents additional. A year's subscription will be given free with every order amounting to \$5.00 or more.

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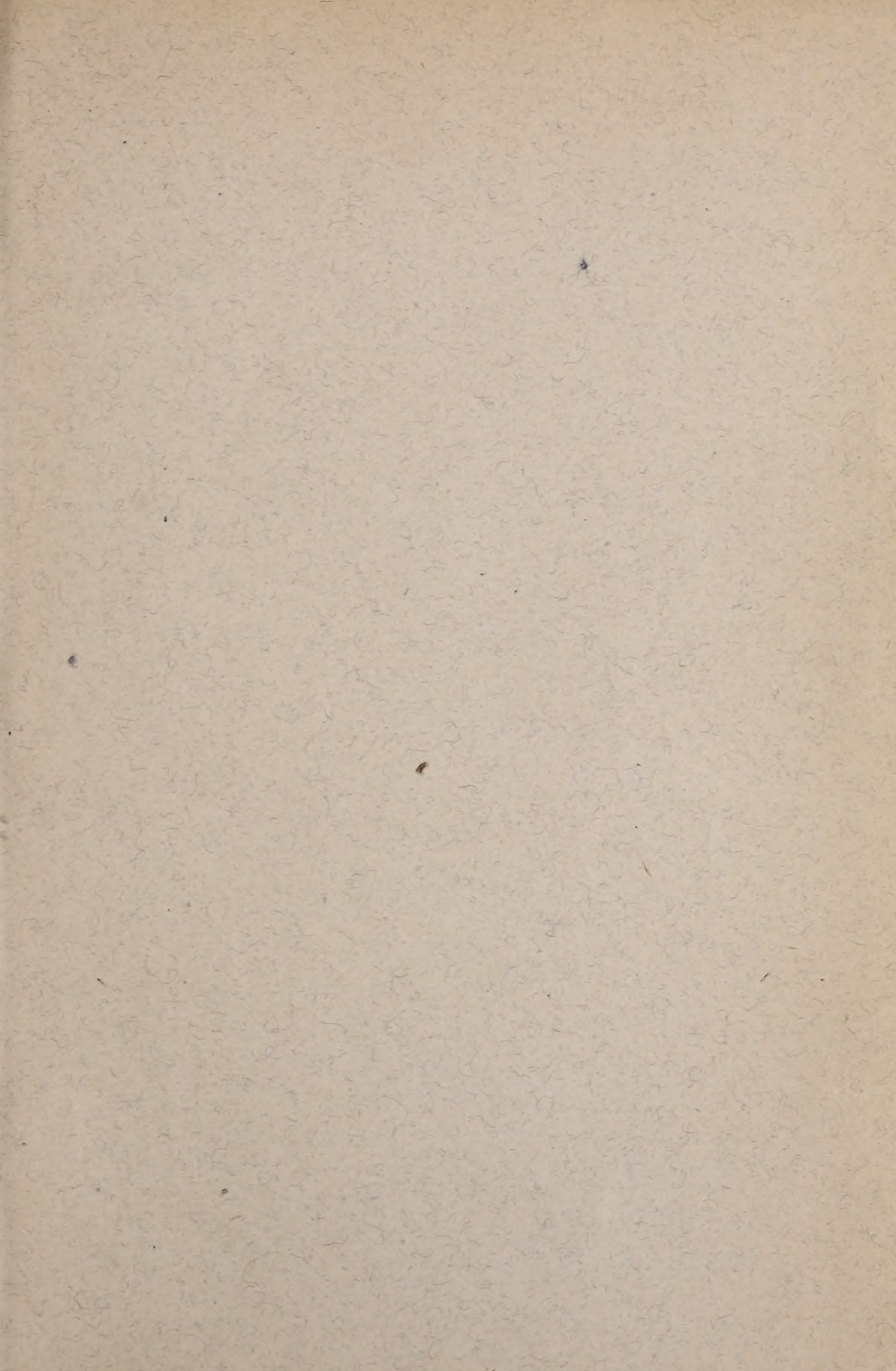
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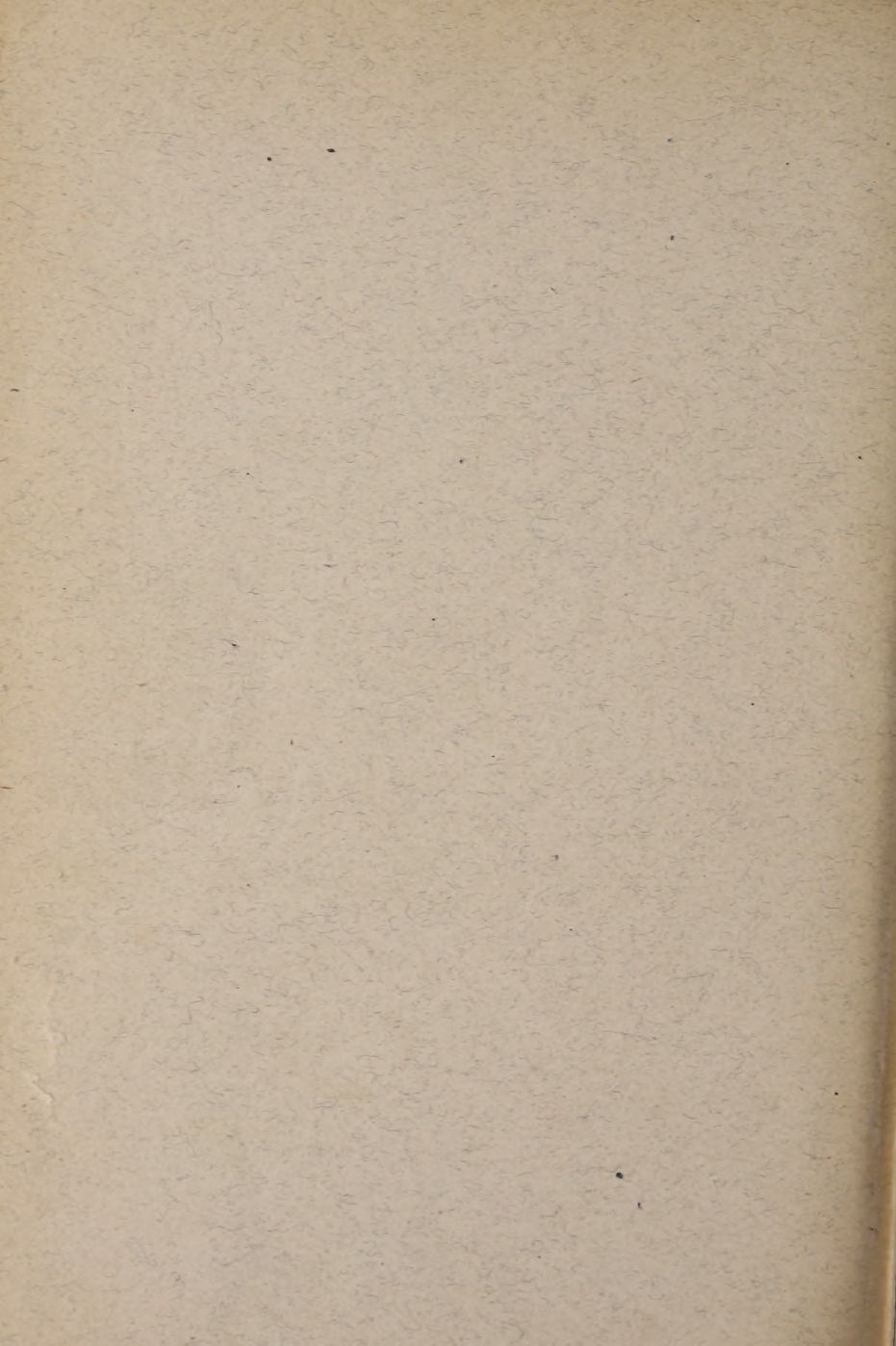
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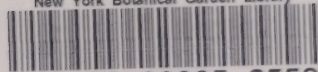
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