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A QUARTERLY DEVOTED TO FERNS

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EDITORS

C. V. MORTON

R. C. BENEDICT IRA L. WIGGINS

CONTENTS

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American Fern Journal

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American Fern Journal

Vol. 38 JANUARY–MARCH, 1948 No. 1

An Early Ascent of Cerro de la Punta

H. A. Gleason

The recent interesting discoveries on Cerro de la Punta, Puerto Rico, together with an invitation from the editor of this journal, have induced me to write briefly of our ascent of the mountain in 1926. Our party consisted of Mel T. Cook, of the Insular Experiment Station, William P. Kramer and Charles Z. Bates, of the United States Forest Service, and myself, and we were, as far as I know, the first botanists to climb the mountain. Dr. Cook and I were at that time prosecuting an ecological survey of the island. We were not equipped to prepare herbarium specimens on a large scale and our only collections were small pieces of the various plants, mostly in a sterile condition. Except for the ferns these were identified by N. L. Britton and Percy Wilson, who had shortly before completed their Flora of Puerto Rico. Cook and I were completely unacquainted with the vast majority of the species, he being a plant pathologist and I visiting Puerto Rico for the first time. Our ecological notes had to refer to plants by numbers, and the names, later furnished us by Britton and Wilson, were then exchanged for the numbers in our final report.

Puerto Rico was, theoretically, pretty thoroughly explored by the botanists. The chance that we would find a "new" species, or even one new to the island, was nearly zero, since the ecologist does not deal with rari-

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ties, but rather with the important plants of each type of vegetation. Yet we returned from Cerro de la Punta with three undescribed species of flowering plants and a fern new to the island.

My notes here are based on my original field records—fortunately preserved—on our published report, and on a general narrative of the trip written immediately after our return. After more than 20 years one's memory is not always to be trusted. I recalled that we ascended the mountain in a rainstorm. That idea must have been a mnemonic evolution based on the muddy soil underfoot, for my notes emphasize the beautiful weather.

Every one in Puerto Rico, in the good old days, knew that its highest mountain was El Yunque, of the Luquillo Range in the northeastern part of the island. Drenched with heavy rainfall, covered below with rain-forest and above with Sierra palms and mossy forest, it has always been a botanists' paradise. According to legend, some sea-captain, approaching Puerto Rico from the north on one of those rare days when the air was perfectly clear and the whole skyline visible, reported that there were higher mountains off to the south, nearly in the center of the island. One of these is Cerro de la Punta, stated by the Geodetic Survey to be 4,426 feet high, or almost a thousand feet higher than El Yunque. I was told that there are 12 peaks in the immediate vicinity which exceed 4,000 feet and 26 which surpass El Yunque. Together they form a rugged range extending east and west, somewhat to the south of the center of the island.

I had often seen these mountains from the highway which parallels the shore of the Caribbean west of the city of Ponce. In the arid climate of the south shore they usually stand out clear-cut against the blue, rising in successive series of deep canyons and rounded shoulders covered with grass below and forest above, and beyond the forests to the rugged peaks. So far as we could learn, no botanist had ever ascended them.

Kramer and Bates made the necessary preliminary arrangements, and one day in March we four started from San Juan, drove west along the north shore to Arecibo, and thence turned south over the well-made highway to the little town of Adjuntas, where we spent the night.

Early the next morning we started by car for Jayuya. We followed the main road south toward Ponce for some 5 kilometers, reaching the highest point on the cross-island highway. There the Jayuya road turns off to the east and immediately proceeds to climb higher. It passed above the limit of ordinary forest and entered the zone of Sierra palms. We estimated the altitude at about 2,800 feet, basing our opinion on the vegetation. Just beyond its highest point the road reached the main watershed of the island and followed it for some distance along the crest. The divide is like most of the Puerto Rican mountain ridges, so very narrow and sharp that one can look down either side from the automobile, off across countless steep green hills and white limestone "haystacks" to the Atlantic on the north, and over countless brown hills to the Caribbean on the south. As soon as we reached the summit of the grade we saw unusually high mountains off to the east. We speculated on which one was the highest, because that was the one we wished to climb. It is often difficult to distinguish heights, because a low near peak often looks higher than a more distant one, but we finaly agreed on a summit which later proved to be the right one.

Leaving the divide, the road runs down a long grade to a little stream, follows its valley briefly, and turns up another stream to Jayuya. That is a little town with just two long streets paralleling the river, the mountains rising right behind it and rising again to the south just across the river.

In the town we inquired where Señor Juan Masina lived. He was one of the town magnates and apparently everyone knew him. One man jumped on the running board and guided us to the house. Señor Masina himself inspected us from his gallery and then invited us into the house. He was a powerfully built man of 65 and spoke only Spanish. He had agreed to have horses for us, but there were various social courtesies that must first be observed. We must sit down in his parlor, meet his family, chat about this and that, and have some refreshments. We were anxious to get started, but we knew it would offend our host if we appeared impatient. About eleven, with nearly half the day gone, Señor Masina's own horse arrived, followed later by four others, and we were off.

He led the way and we followed, through the main street of the town, with the whole population out to see us, across the river by a shallow and very rocky ford, and farther by a local road. It was much better than the average Puerto Rican road, but impassable for an automobile. I know bull-carts can use it, because we met one, but I could not see how they did it. It was uphill all the way, always to the south, curving around the side of the hills, with the stream roaring through its gorge below us and our mountain peak getting always farther out of sight behind the intervening hills. Then we left the valley and climbed a very steep and narrow trail which the horses could barely negotiate, finally coming out at Masina's coffee plantation. There he had a house consisting of four rooms in a single row. He unlocked the door at one end; we entered and he locked it behind us. We passed through the second and third rooms, leaving each door locked behind us. In the fourth room he opened a double-locked cupboard and produced a bottle of native cane rum, which he guaranteed to be made by his own peóns and to be three years old. Another half-hour was lost on these conventions.

Again we started, now with two barefooted men for guides. We followed a steep and narrow trail to the south through great groves of coffee to the end of the plantation, where we estimated our altitude at 3,500 feet. It seemed almost incredible that our guides could go farther with bare feet, but they did it, over sharp rocks and through villainous saw-grass where we were frequently in trouble ourselves. Our route was at first through palm forest, until we came to a steep slope, bare of trees but covered with a tangle of ferns and saw-grass. The ground was wet and slippery and we had to climb on all fours. Above it was another fairly level ridge covered with mossy forest, and then the first peak came in sight. It was perfectly conical, with sides steeper than anything we had seen before. We scrambled up, over cushions of moss, holding on to the dwarf trees, slipping on the wet soil, and there we were on the first peak, only about 30 feet across. The highest peak was a short distance farther south and perhaps a hundred feet higher. A narrow ridge led to it, and we were soon on the highest point of the island. There we were fortunate in our weather and we could see nearly all of Puerto Rico. The whole southwest shore was in plain sight, from somewhere east of Ponce almost to Mayaguez on the west; a great section of the north shore, except a portion hidden behind Tres Picachos mountain; and finally a dim view of El Yunque, far off to the northeast.

Cook and I collected samples of every kind of plant that we saw. I wish we could have collected more and better specimens.

Eventually we were back at the coffee plantation, where Masina was waiting for us with more cane rum and excellent coffee of his own production. We had to reach Jayuya before the early tropical night closed in, because it would have been impossible for our horses to travel that steep and rocky road after dark. There we said goodbye to our host and an hour later were back in Adjuntas, having used a long day to spend about an hour on the mountain.

Both summits are essentially alike in vegetation and support about the same species. They are covered with mossy forest two to five feet tall and rather sparse, so that one may walk easily among the shrubs. The forest is mingled with mats of grass *Isachne angustifolia* Nash and thickets of *Dicranopteris rubiginosa* (Mett.) Maxon. Orchids grow up through the shrubbery, and a little bamboo trails over them. Sierra palms ascend in a long wedge to within a hundred feet of the top, while the mossy forest descends some distance along the ridges. This forest is quite different from that of El Yunque, probably in response to the decreased rainfall, wind, and atmospheric humidity. The shrubs are fewer in number; one walks between them instead of crawling beneath them; they are erect, not bent away from the tradewinds, and of various heights, not windshorn to the same level. Mosses and liverworts are almost lacking on their branches, or form a thin layer in the most protected spots.

Ferns are numerous, but according to my notes *Dicranopteris rubiginosa*, new to the island, is the only one sufficiently abundant to be considered an important component of the vegetation. During our short stay we collected *Odontosaria uncinella* (Kunze) Fée, *O. aculeata* (L.) J. E. Smith, *Polypodium sectifrons* Kunze, *P. loriceum* L., *Histiopteris incisa* (Thunb.) J. Smith, *Struthiopteris polypodioides* (Sw.) Trev., *S. lineata* (Sw.) Broadh., *Elaphoglossum rigidum* (Aubl.) Urban, *Rhipidopteris peltata* (Sw.) Schott, *Hymenophyllum lineare* Sw., *H. crispum* HBK., *Trichomanes rigidum* Sw., and *T. crispum* L. At least three of our flowering plants were novelties and have since been described by Britton and Wilson as *Ilex portoricensis*, *I. Cookii*, and *Didymopanax Gleasoni*; a fourth is considered to represent an undescribed species of *Xolisma*.

NEW YORK BOTANICAL GARDEN.

[In a recent paper, "Puerto Rican Fern Notes" (Proc. Biol. Soc. Washington **60**: 123–130. 1947), Dr. Maxon recorded among numerous additions to the fern flora some eight species recently collected in Jayuya district by F. H. Sargent, of the U. S. Geological Survey. These include a new species of *Elaphoglossum*, a new variety of *Hymenophyllum elegantulum*, and the first West Indian record of *Dicranopteris rubiginosa*, which Dr. Gleason mentions as abundant but quite possibly is of local occurrence, as it was not found by Mr. Sargent. It was pointed out that the region is one of exceptional interest botanically.—ED.]

Reclassifications of the Polypodiaceae

C. A. WEATHERBY

At least as to its larger units, the classification of the ferns until recently placed together in the Polypodiaceae is in a state (one is tempted to say a sad state) of flux. The characters of the sorus on which the older systems were based, though not altogether abandoned, are reduced to a position of minor importance. Their place has been taken by a number of vegetative, anatomical and other characters revealed by the morphological work of the last half-century. Unfortunately, there is as yet no general agreement as to which of these characters are most significant, or as to what they signify. Furthermore, modern classification seeks to place together in one group all the members of a single line of descent followed back as far as it can be followed without becoming lost in paleontological twilight. Since lines of descent are of necessity more or less conjectural, this opens further areas of disagreement. The same set of characters may indicate to one investigator a dicksonioid, to another a schizaeoid ancestry. This, of course, is not to say that differences of opinion as to the grouping of genera are anything new; the point is merely that the new approach has, so far, produced no more assurance than the old.

In the past ten years we have had five reclassifications of the Polypodiaceae. Christensen (1938)[1] retained the family in its old sense, but divided it into fifteen subfamilies, "perhaps better treated as families," five of them wth subordinate tribes. Ching (1940)[2] recognized 32 families instead of one, ten of them subdivided, many of them merely Christensen's subfamilies or tribes raised to family rank, but some of them new and others with some shifting about of genera. Dickason (1946)[3] accepts Ching's families, but arranges them in two series according to the position of the sorus on the vein. Holttum (1947)[4] is content with five families, one with eleven subfamilies. Copeland,[5] publishing almost simultaneously, has nine families without formal subdivision. No two agree as to the order of families or their limits.

In how far some of this activity in rearrangement has contributed to our real knowledge and understanding of ferns may be left to the decision of time to come. There are, however, larger areas of agreement and, we may hope, therefore, of actual advance in knowledge, than the above would indicate. All hands believe that Polypodiaceae and the formerly great genera *Dryopteris* and *Polypodium* should be broken up. Phylogeny tends to deal chiefly with the higher categories, shifting genera into patterns varying with the concepts of the individual investigator, but not modifying the genera them-

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[1] In Verdoorn, Man. Pteridology, 522-550 (1938).

[2] Sunyatsenia, **5**: 201–268 (1940).

[3] Ohio Journ. Sci. **46**: 73–108 (1946).

[4] Journ. Linn. Soc. **53**: 123–158 (1947).

[5] Copeland, E. B. Genera Filicum (Annales Cryptogamici et Phytopathologici, vol. V). Chronica Botanica Co., Waltham. Mass. (1947). Pp. xvi + 247, *10 pl.* $6.00.

selves to anything like the same degree. In breaking up *Dryopteris* everyone has accepted Christensen's sound and thorough division; and there is a fair amount of unanimity as to the components of *Polypodium.* In general, as Copeland points out, there is no great difference in the number of genera recognized by the various authors nor in their limits. So far, then, and so far only, as genera are concerned, it is possible to get from any one of the new treatments which is sufficiently detailed, a fairly accurate idea of the result of accepting any of the others.

We may especially consider the two most recent treatments. Holttum splits off from the old Polypodiaceae four relatively small families: Polypodiaceae proper; Grammitidaceae (simple-or pinnate-leaved small ferns hitherto referred to *Polypodium,* represented by *P. gramineum* of Jamaica); Thelypteridaceae (our marsh fern and its relatives); and Adiantaceae, including the gymnogrammoid and cheilanthoid ferns and *Vittaria.* All the rest are put into a single large family, Dennstaedtiaceae, on the ground that they are all descended from dennstaedtioid ancestors. The Polypodiaceae are placed first, the Adiantaceae last. Holttum's paper is a closely reasoned and well-documented argument for this arrangement.[6]

Copeland's work is a complete practical application of his views rather than an argument for them. He lays down his main principle in his preface—that noted above

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[6] Its effect is somewhat blunted by such an incautious general statement as that in *Thelypteris* the scales "all have many slender hairs"—not true of the type species nor, according to Christensen, of *T. patens.* Copeland is more cautious and more accurate.

On the other hand, Holttum's use of certain hitherto little-noticed characters—as the grooved or convex upper surface of the costule in distinguishing *Dryopteris* and *Thelypteris*—deserves careful consideration.

of combining in one unit all groups believed to be in the same line of descent, even though they may be in some features very diverse. He compares such a unit to a human family, all the members of which are descended from a single ancestor, but may be too unlike physically to be recognized as relatives or to be covered intelligibly by a single description. Copeland frankly accepts such indefinable groups, as does Holttum.[7] To the old-fashioned taxonomist, this looks a good deal like reducing systematics to a philosophical abstraction. If Copeland's emphatic denial that this is the case is valid, it is because he himself has kept his feet on the ground. He is not unmindful of the practical side of taxonomy. His genera "must be natural," but also "should be convenient"—that is, practicable. Once the main line of descent is laid down, he recognizes genera when lines of demarcation are clear enough to be readily made out and refuses to recognize them when there is any large amount of intermediacy. Whatever happens to families, genera which cannot be defined are not admitted—good old-fashioned doctrine. On this basis, then, of practicable genera grouped around probable lines of descent, he has given us, in a handsome book, a singularly readable and persuasive account of all known genera of ferns, with descriptions, keys and full synonymy,[8] enlivened and illumined by critical and often pungent comment.

His system produces eight families. These are arranged in a sequence almost exactly the reverse of Holttum's. Pteridaceae come first; they include the

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[7] Copeland gets around the practical difficulty by means of an artificial key to families, in which Aspidiaceae, for instance, appears in eleven different places. Difficulties in defining families are, of course, no more new than differences in taxonomic opinion; but they have not before been accepted as inevitable.

[8] A considerable number of names listed as new combinations were previously made by Ching and other authors. This is no doubt partly due to the difficulty in getting war-time literature and to the long time which elapsed between the setting-up of the book in type and its actual publication.

dicksonioid tree-ferns, *Dennstaedtia* and its immediate relatives, and the groups of *Pteris, Gymnogramma* and *Cheilanthes*—a good example of following back a line of descent. Next come Davalliaceae, a small group of tropical genera including *Oleandra.* Next are Aspidiaceae, including *Woodsia, Onoclea,* somewhat surprisingly *Elaphoglossum, Dryopteris, Lastrea* (*Thelypteris* of other authors), *Cystopteris* and *Athyrium.* Fourth are Blechnaceae—*Blechnum* (to which *Lomaria* is reduced) and seven other genera. Fifth come Aspleniaceae—*Asplenium* (the one very large genus which so far has resisted all efforts to divide it) and eight others. Then Polypodiaceae proper, including *Platycerium* and its allies, otherwise much like Diels's Polypodieae. Finally come Vittariaceae, which he regards as an exceptionally natural and well characterized group.

The workings of Copeland's method on the generic level may be conveniently illustrated by his treatment of the Cheilanthinae of Diels. The better marked traditional genera, *Cheilanthes* itself, *Pellaea, Llavea, Doryopteris, Cryptogramma* and *Onychium,* are maintained. *Notholaena* and *Adiantopsis* are reduced to *Cheilanthes*—to the present reviewer's mind, quite properly. From the aggregate thus formed, certain of the more readily recognized nexi of species are split off as genera—*Aleuritopteris* (*Cheilanthes farinosa* as type), *Aspidotis* (*C. californica*), *Mildella* (*C. intramarginalis*) and *Cheiloplecton* (*C. rigida*). The remainder are left in *Cheilanthes,* at least pending further study. The same procedure is followed in Cyatheaceae. In the fern-flora of North America, the effect is to add eight genera to those recognized in Broun's Index, through the breaking up of *Dryopteris* and *Polypodium,* and to subtract six, by the reduction of *Phegopteris* to *Lastrea, Cyrtomium* to *Phanerophlebia, Diplazium* to *Athyrium, Phyllitis* to

Asplenium, *Notholaena* to *Cheilanthes*, and *Anchistea* to *Woodwardia*. One may or may not approve of all these mergings,[9] but at least they show that, in spite of the encouragement to division given by much phylogenetic theory, the good phylogenist is no mere mechanical splitter, but may be as truly conservative as anyone, even if in a different direction.

Whether we have here the classification of the future, only the future can tell. Certainly we have currently prevalent conceptions ably and reasonably reduced to practice, against a background of wide and well-matured knowledge. Whatever happens, this Genera Filicum can hardly fail to hold a permanent place among the important works on ferns.

GRAY HERBARIUM.

Working with Fern Spores

ALBERT CHANDLER

To raise ferns from spores one begins by making mistakes. My worst came from reading, in the Bulletin of Missouri Botanical Garden, that sugar is a good fertilizer for orchid seedlings. If good for orchids, why not for ferns? Their youngsters loiter and need nudging. So I sprinkled granulated sugar—and exterminated a cherished crop. Who would suppose that damping-off lurked in the domestic sugarbowl? The Bulletin said nothing about boiling a syrup.

No matter how thinly spores are scattered, nor how irregularly they germinate, the tiny green scales will overcrowd some spots. To thin these I began transplanting with a pin, and later with a ball-pointed pen, but could not see the hairlike rootlets without a strong lens, which was in the way while transplanting. If placed upside-down or on one edge, these all died. But that

[9] To the present writer they appear, with the possible exception of *Phyllitis*, wholly reasonable.

difficulty has been mastered. Now I float such prothallia from the stone (discussed below) and then lift them from the surface of the water with a test-tube, in which they remain right-side-up. (A lemonade straw will do.) They are sucked up by thrusting the tube down into the water to a depth of an eighth of an inch around the green scale, then closing the top of the tube with my finger. The drop of water and the fernlet remain in the mouth of the vertically lifted tube until air is admitted above. When released the rootlets are underneath. I drop the infant to light on its feet.

As a surgeon cannot completely sterilize the human eye, to make infection impossible in a cataract operation, we cannot completely sterilize fern spores. Mildew may be present upon them. We must take that chance. Any disinfectant strong enough to extirpate fungi will kill fern spores. So keep each planting separate, and at least avoid epidemics spreading from one lot to others.

Old flowerpots, upon which to sow spores, have been recommended with precise unanimity in details until a skeptic wonders whether some authors have repeated what they have read instead of reporting any extensive experiences of their own. Echo-testimony is no stronger when reverberated. You will find chunks of sandstone cleaner and easier to sterilize. If burned they harden until almost impervious to water—just right for xerophytic ferns. By the way, Purple Cliff-brake produces most minute prothalia. Even a plantlet a year old is an irregular disk only about 2 mm. in diameter upon a hair-like stalk 3 to 5 mm. long.

About St. Louis the local sandstones—Bushberg, Lamotte, and St. Peter's—serve the cultural requirements of the three sorts of ferns, those preferring acid, or lime, or tolerant of either. The last, as shown by plants thriving upon it, is usually acid, but has an alkaline reaction where overlain by strata of limestone.

A glass casserole from the dime store is a convenient container, holding a chunk of sandstone and a quarter of an inch of rainwater in an isolation ward. Tap water contains chemicals. Boil the casserole, stone and water under 15 pounds in a pressure cooker; or else boil them three successive days, for one ordinary boiling may not exterminate all fungi. And if you bottle rainwater for future use, sterilize the bottle. There is enough sugar in old wine bottles to be lethal.

Dr. L. H. Bailey advises sowing fern spores the first week of March, July, or October. With me Christmas week is satisfactory; the date has made little difference. Most germination is likely to occur in April or May. I suspect that some spores must go through an after-ripening process, like some seeds. A place near a window, reached by the sun two hours a day, will have about the right temperature and light; and if the room is warm, reduce the sunlight.

Rub a fertile leaflet between sheets of paper, obtain a brown dust of spores, and strew these thinly on the wet stone, close the casserole, and wait. Seal the edge of the cover with vaseline to prevent evaporation. Sometimes the first germination is of spores accidentally falling on the surface of the water, but it occurs most often on vertical or slanting surfaces of the stone, as if the movement of water by percolation were helpful. That may be why volunteer prothallia in greenhouses appear usually on the sides of the pots.

After germination a few of the green scales rapidly outgrow the others, becoming roundish disks almost a quarter of an inch in diameter before putting up the first stalked leaf, and this will be two, three or more months expanding to a fernlike outline. A shamrock pattern is not uncommon.

Transplanted to sterilized soil they then grow faster. I use clean coarse sand and an equal amount of leafmold from the woods, suitable to the particular species, screened through a sieve of window-screen, and never pressed down into the thumb-pot. Steam the pot and soil mixture, as steaming will not pack it down into an airless, gummy mass as boiling would.

Set half a dozen pots in a dish in which a quarter of an inch of rainwater is maintained, and cover the lot with a glass cake-cover or other Wardian case, until they are two or three inches high, and usually two or three years old, ready to be emancipated and to start upon their own adventures out of doors.

This is the laziest form of horticulture, and some species—Ebony Spleenwort, for example—are very prolific. Five minutes once a month is enough for two or three dozen casseroles. Ten minutes more will suffice for the records. I number each casserole serially, 1, 2, 3, giving each a separate sheet in a note book; then letter each transplant serially (1A, 1B, 1C, 1D) for those from casserole No. 1. Thus sheet 5B in the book designates the second independent plant from casserole No. 5, and the thumb-pot is so labeled.

After these confessions, may I pray that someone will report in detail his actual experiences and technique with agar? Experiments with this I abandoned during the war, while agar was not available.

My unsolved problem is fitful germination. Three sowings from the same leaflet, at the same time, on chunks broken from the same rock, and handled alike, may be very fruitful in one dish and sterile in both the others for month after month and forever. Such recurrences have raised a question: Unless the microscope shows every spore aborted, how much evidence, from careful tests, should be accumulated before asserting that a given fern is sterile? Have we enough skill in propagation to expect ferns to multiply like rabbits? About some of them have we been sure or cocksure? Remember the separate and combined records of Napoleon and Josephine. and flowering plants sterile to their own pollen, and the record of Sarah in the Bible.

ST. LOUIS, MISSOURI.

Diplazium esculentum in Florida

MARY W. DIDDELL

The article, "Edible Ferns," by Dr. Copeland, in the Fern Journal for October–December 1942, was of particular interest to me, as one of the ferns, *Athyrium esculentum* (which I know as *Diplazium esculentum*), has been in my fern garden for several years. Of its entry into Florida I could get no information, but its distribution in the state is peculiar, also my acquisition of it.

Early in December, 1937, I drove down the state on a short collecting trip, and after I reached Miami went out into the Little River section to see my good friend Mrs. Peterson and her excellent collection of ferns, orchids, and other plants. With unfailing generosity Mrs. Peterson, as she showed me a plant, would ask, "Do you have this?"; and if I said "No," she would dig me out a generous root. Among the ferns she gave me was one that she called a *Dryopteris,* with the lowermost veins of adjacent segments joined together and the resultant vein running to the sinus, as in *D. gongylodes.* All the plants she gave me were carefully packed in one large bundle, and this was not opened until after I reached home.

Leaving Miami, I drove down to Royal Palm Park, arriving in the early afternoon. Mr. Atkinson, the caretaker, got in the car with me and we drove all over the Park, stopping to examine the various tropical plants, especially the ferns. As the only recorded specimen of *Dryopteris patens* within the United States was collected in this area many years ago, I was anxious to see if another could be found. So there were frequent stops to examine clumps of ferns, and as night drew near I would simply stop and, with the trowel, lift one specimen out of a group and put it in the car for future reference.

Next morning Mr. Atkinson helped me pack all my Park plants in one large parcel. This was stowed in the back of the car, and I headed for the Tamiami Trail, turning off into the little town of Everglades, where I lunched with friends and spent the rest of the day. The following day I drove home; and as I arrived after dark the packages of plants were simply taken out of the car and set inside the greenhouse. Next day I unpacked Mrs. Peterson's plants first, potting each one and setting them all to themselves, on the greenhouse bench. Then I unpacked the Park plants, potting and setting them all together in another group. A third group consisted of the plants I had collected along the road between stopping-points. After all were potted, I went back to the Park group and carefully examined the ferns, one of which struck me as familiar. Returning now to Mrs. Peterson's plants, there was identically the same species, though hers was a much larger plant. I took out Small's first Florida fern book and carefully checked through *Dryopteris*, then some of the other genera, but without finding my plant. So I wrote Dr. Small, sending him a sterile frond (there were no sporophylls), and he replied that it was a "foreigner" and he did not know it. I wrote Mr. Atkinson also, sending him a frond, but he could not relocate the plants and knew nothing of it.

The following summer I went to Tampa to do some classification and catalog work for the Cowgill Nurseries and in Mr. Cowgill's slathouse found a large colony of the Peterson-Park fern, the central plant being about six feet tall, with a caudex a foot high or more. Mr. Cowgill had got the fern along with other plants from an unreliable source and had no means of tracing its origin. As he did not know what it was, we sent a specimen to Dr. Maxon, who identified it as *Diplazium esculentum,* a common Asiatic species.

A careful examination of Mr. Cowgill's numerous plants failed to disclose any sporophylls; the mass of smaller plants of varying sizes encircling the large plant were all produced by stolons. As the caudex develops, these aerial rootlike stolons are produced at the bases of the leaves; they grow on down the stem into the ground and later develop new plants at their tips. These may appear anywhere from a few inches to several feet away from the mother plant. However, plants do not have to develop a caudex to do this, as smaller ones, a foot high or less will send out stolons from under the crown.

I brought home one of Mr. Cowgill's plants, to check with the two from Mrs. Peterson and the Park, and from these I have had literally thousands of plants, as they seem to thrive anywhere, in dry or wet soil, in sun or shade. They grew luxuriantly in the acid soil (pH about 4.85) of my place on the River, and also crept into the areas where I had added lime for the rock-ferns and there flourished just as well. The only thing that hurt them in the least was cold, the plants which had developed a caudex being killed entirely. Those with their crowns just above the ground would lose their leaves, only to have new ones grow out at the first warm spell.

As I wished to see how large the plants would eventually grow, I took up a good heavy specimen and set it out permanently in the floor of the greenhouse. Last summer, after three years' growth, it was eight feet high, over-all. Also, I saw my first sporophylls last summer, on this plant. By the spring of last year, young plants were coming up all over the floor of the greenhouse and I started systematically to weed them out, and thereafter kept the house clear of all except the main plant. A few months later, in midsummer, the sporophylls appeared, so it seems that the plant when deprived of its means of vegetative propagation starts to produce spores. Subsequent observations seem to bear this out. As my place on the River was too large for me to keep up alone and it was impossible to get help, I sold it and moved back into the edge of town in January. The new greenhouse was promised me by that time, but only now, many months later, is it under construction. So my plants have been out in the open all the year. The large *Diplazium* was set out in a sheltered place and came through the rest of the winter with only some damage to the leaves, but I have not weeded out the young plants, which are now very numerous. The parent plant has fine, healthy fronds, but has stopped producing sporophylls. The rootlike stolons not only interlace themselves about the caudex but form a dense, matted mass above ground three to four feet in diameter, this and the soil about its perimeter thickly dotted with young plants.

Anyone wishing to grow this fern here for edible purposes would soon have a good-sized planting with a start of only a few plants. If I can find out how to cook it, I shall try some stewed fern—or baked or boiled or fried?—for dinner some night. Or maybe fern salad.

JACKSONVILLE, FLORIDA.

Shorter Note

THE PASSING OF A NEW JERSEY FERN STATION.—A recent visit to the wooded marsh area near West Englewood and Bergenfield, once so rich in the larger species of *Dryopteris* and rare fern hybrids, showed that a system of drainage ditches has dried it up and most of the ferns have disappeared except for a few scattered Osmundas, Sensitive, and Marsh ferns. The dumping of refuse, which at one time threatened to destroy the fern station, has been discontinued and the dump is now covered with weeds.—W. H. DOLE.

Recent Fern Literature

An important work published during the war but just now in hand is a 600-page book by the famous Italian botanist Adriano Fiori,[1] on the pteridophytes of Italy. This is an exhaustive treatise with descriptions and keys in Latin and comments in Italian, Italian common names and uses, detailed statements of distribution, habitat notes, and citations of illustrations. All the species and many of the forms are illustrated by fine drawings and sometimes photographs also. Seven families, 28 genera, 84 species, 66 varieties, 297 forms, 86 subforms, 59 lusus, and 20 hybrids are treated. The concepts are not only conservative, but might be called reactionary; thus Osmundaceae and Hymenophyllaceae are included with the Polypodiaceae in a family termed "Filices," and *Salvinia* and *Azolla* in the Marsileaceae. *Polystichum* and *Cyrtomium* are included in *Dryopteris*, *Pteretis* (*Matteuccia*) in *Onoclea*, *Pteridium* in *Pteris*, *Anogramma* in *Gymnogramme*, and *Athyrium* in *Asplenium*. Most astounding of all, the beech-fern and oak-fern are included in *Polypodium*, as *P. Phegopteris* and *P. Dryopteris*. This does not represent, as might be supposed, ignorance of the modern principles of fern classification, for Prof. Fiori had in hand the Manual of Pteridology, the Index Filicum, and other significant works. It does represent, however, a local viewpoint, based on study of the relatively poor European fern flora. If he had made even a casual survey of the genus *Polypodium* in the tropics

[1] Fiori, A. Flora Italica Cryptogama V. Pteridophyta. pp. 1–601. *f. 1–154.* 1943. Topografia Mariano Ricci, Florence, Italy.

of either hemisphere he would have realized that, large and diverse as it is, it still can not be made to include *P. Phegopteris* and *P. Dryopteris* without destroying the modern classification of ferns and reverting back to an artificial system based on the sorus only. Similar conservatism is shown by the inclusion of *Woodsia alpina* in *W. ilvensis,* of *Dryopteris Robertiana* in *Polypodium Dryopteris,* of *Polystichum Braunii* in *Dryopteris aculeata,* and *Botrychium lanceolatum* and *B. matricariifolium* in *B. Lunaria.*

However, these generic and specific concepts need not detract greatly from the work, which is valuable chiefly for its enumeration and description of the numerous southern European varieties and forms. However, the nomenclature employed does not only detract from the value of the work, but renders it useless as an authoritative guide. Fiori has disregarded the International Rules in several respects. For one thing, he does not employ the double citation of authors, required by Article 49. This is no great disadvantage in the case of the species, the authorities for which can be readily looked up, but it is for the lesser categories, there being no index to the varieties and forms of ferns, and the literature is greatly scattered. Fiori disregards also the fact that the earliest epithet in the *same* category is the valid one, e.g. *Dryopteris Villarsii* f. *nivalis* (Fée) Fiori (1943) is illegitimate because there already exists the valid name f. *meridionalis* Milde (1867) for this particular form. The fact that the form is the same as the earlier species *Hypodematium nivale* Fée (1852) has no bearing on the nomenclature. There is a plant called by Fiori *Polypodium vulgare* f. *australe* Fée, but Fée described this as a species, *Polypodium australe.* An attempt to find the author of the combination f. *australe* would be very time-consuming. Again there is a plant he calls *Dryop-*

teris austriaca var. *dilatata* Underw., but Underwood made no such combination. The reference given is to *Dryopteris spinulosa* var. *dilatata* (Hoffm.) Underw. The nomenclature is nearly inextricable in some instances. In spite of such faults (and they occur throughout) Fiori's book is in many respects an erudite and scholarly work and will be valuable to students of European ferns.

The volume concludes with an essay by V. Giacomini on the ecology and geographic distribution of the Italian ferns. The geographic classification suffers from inaccuracies, due in part to accepting literature records at face value.—C. V. M.

American Fern Society

On December 31, 1947 Dr. William R. Maxon retired as Editor-in-chief of the Journal and the undersigned, who has served as Associate Editor for a number of years, has been appointed by the Council to succeed him. Dr. Benedict and Dr. Wiggins will remain as Associate Editors.

Members will be sorry to learn that Dr. Maxon died on February 25. In recognition of his outstanding achievements in science and his services to the Fern Society over a period of more than 50 years, much of the time as President or Editor, a memorial number of the Journal is planned for later in the year, with articles especially prepared by some of the outstanding fern students. Contributions toward the publication of this enlarged number will be gratefully received by the Treasurer.

C. V. MORTON, *Editor*

Report of the President for 1947

The Society has come through the year 1947 in very good condition and with new officers faces 1948 with confidence. As previously noted, this year ended a long period of excellent service to the Society by Dr. Henry K. Svenson and his two loyal helpers Mr. William Durkin, as assistant in the work of the Treasurer, and Miss Hester Rusk as custodian of the library and herbarium. When I served as one of the Auditors, it was always a pleasure to spend a morning in Dr. Svenson's offices, where, with Mr. Walter S. Allen, my associate in auditing, the five of us had an enjoyable period of visiting and discussing matters of interest to the Society, in addition to auditing the books.

Through the work of a committee composed of Dr. Benedict, Mr. Ewan, and Mr. Morton, arrangements were made for Mr. Allen to take over the position of Treasurer and Dr. R. M. Tryon, Jr., that of Curator and Librarian. These men are now well established in office and our supplies are now duly deposited with them. Mr. Morton agreed to care for the back numbers of the Journal, and these were sent to him at the Smithsonian Institution. The Society is under a very real obligation to Dr. Benedict, as well as to Mr. Allen, Mr. Durkin, and Miss Rusk, for the hours and hours spent in sorting, packing, and shipping our material. The extra expense was handled through special contributions, so there was no cost to the Society.

During the year a modest contribution from an anonymous friend was received for the establishment of an Illustrations Fund, which has been done, the purpose being to provide additional illustrations for the Journal. Since this is a project worthy of support, there may be others who would care to add to the amount we have in hand. Such contributions, which should be sent to Mr. Allen, will be gratefully received and will be used with economy.

A word of sincere appreciation is due to Dr. Harold Rugg, who has been ever ready to help—witness his latest service in securing a splendid set of new officers and proposing Dr. Maxon as an honorary member, a proposal to which the Society was glad to give approval.

The writing of this brief report ends my "Tour of Duty." I want to express to all members my deep appreciation of the kindly spirit they have shown me. These three years have given me many pleasures: to know Mr. Weatherby better, to know Dr. and Mrs. Maxon and enjoy their gracious hospitality and delightful companionship, to work with Dr. Svenson, Mr. Morton, Mr. Ewan, and especially Mrs. Whitney, who has been my guide and mentor and who surely carries the Society in her affection; I am deeply indebted to her as is the Society.

And now to the "young men" who are taking over, good luck and fine sailing!

FREDERICK L. FAGLEY, *President*

Report of the Secretary for 1947

It is most gratifying to find a steadily continuing interest in fern study among the general public, as indicated by the addition to our membership of 33 new members from widely separated parts of the country. Balanced against this addition is the resignation of 21, and the loss of four by death, leaving a total membership of 410 at the year's end.

We feel especially keenly the loss by death of such long-time members as these two from Maine—Henry Wilson Merrill, a member since 1906, and Life Member Lester A. Wheeler, who joined in 1914. Dr. Robert H. Lombard joined in 1916 just after finishing his doctorate in chemistry at Columbia Universty. Abel Joel Grout became a Fern Society member in 1910 after some years as editor of the Moss Section of the Fern Bulletin, before the Sullivant Moss Society issued its own publication. His published works were chiefly on mosses, and his authoritative studies in that field far overshadowed his fern interests. But there could be no question of the fundamental interest and loyalty of one whose continuous membership covered a period of thirty-eight years. His contributions to the early activities of the Society have been recorded in fuller detail by Dr. R. C. Benedict and Prof. W. N. Clute in previous Journals (vol. 31: 116, and vol. 33: 6.)

The annual program meeting in conjunction with A.A.A.S. Convocation was held at Chicago this year, and is reported elsewhere in this Journal. It is indeed a happy arrangement that the Convocations are held each year in a different section of the country, affording opportunity (to attend the programs) to a quite different group of our members for whom in other years the meetings are too distant. Members from the Mid-Western States were well represented this time; and the occasion was made notable by the presence of Willard Nelson Clute, the instigator and a Charter member of the Society.

Your vote to elect to Honorary membership our outstanding member, Dr. William R. Maxon, reflects honor to the Society quite as much as some measure of the tribute we would pay to one who has contributed so untiringly to the welfare of the Society.

All those who have worked with our president, Dr. Fagley, or who have encountered his enthusiasm in the field of ferns, regret that he finds it impossible to continue as president. Best wishes to him in his other duties!

Respectfully submitted,
ELSIE G. WHITNEY, *Secretary*

Report of the Treasurer for 1947

The Fern Society has had a good year financially as shown by an increase of $356 in total assets, and a balance of $451.97 in cash on hand at the end of 1947. However the total income from membership and subscription dues was only $765 against a cost of $693.19 for printing and distributing the 4 numbers of the Fern Journal.

The expense of moving back numbers, herbarium and library, amounting to $123.99, was met by special gifts for the purpose. A gift of $50 as a nucleus for a fund to provide more illustrations for the Journal, has been increased to $112.94 by adding the profit from sale of back-numbers during the year. Three Life Memberships were received as against five in 1946. The dues from new members and suberibers fell off from $98.73 in 1946 to $86.90 in 1947, but the receipts from sale of back-numbers increased from $217.83 to $252.30.

The loyal support of our members in ratifying an increase in annual dues to $2.00 will enable us to meet increased printing costs, and it is hoped will permit printing a revised address list of members during 1948. We need more new members and subscribers; we also urge more of our members to avail themselves of the fund of valuable and interesting information in back-numbers of the Journal.

Receipts		*Amount*	*Sub-total*	*Total*
Cash on hand Jan. 1, 1947				$ 285.02
1942–1945	Membership Arrears	$ 7.95	$ 7.95	
1946	Membership Arrears	43.35	43.35	
1947	Membership Renewals	427.35		
1947	New Members	51.00	478.35	
1948	Membership Renewals	29.85		
1948	New Members	3.00	32.85	
1949	Membership Renewals	5.00	5.00	
1950	Membership Renewals	1.50	1.50	
1942–1945	Subscription Arrears	5.40	5.40	
1946	Subscription Arrears	3.85	3.85	
1947	Subscription Renewals	74.83		
1947	New Subscribers	30.40	105.23	
1948	Subscription Renewals	74.92		
1948	New Subscribers	2.50	77.42	
1949	Subscription Renewals	1.35	1.35	

1950 Subscription Renewals	1.35	1.35	
1951 Subscription Renewals	1.35	1.35	
Life Memberships	75.00	75.00	
Sale of back numbers A.F.J.	252.30	252.30	
Sale of A.F.J. Cumulative Index	1.00	1.00	
Sale of "Vars. and Forms of Ferns"	.50	.50	
Sale of Fern Bulletin	.50	.50	
Gifts—not restricted	140.00	140.00	
Gifts—for illustrations	50.00	50.00	
1947 Advertising	4.00	4.00	
Reprints	134.22	134.22	
Gifts for inserts and plates	20.32	20.32	
Gift of A.F.J. back numbers	2.40	2.40	$1,445.19
			$1,730.21
Deduction a/c Life Memberships[a]		75.00	
Deduction a/c Agency Commission (subscribers)[b]		10.79	
Deduction a/c Gift of A.F.J. back numbers[c]		2.40	88.19
			$1,642.02

[a] Transferred to Spec. Acct. No. 2.
[b] Deducted at source of subscription.
[c] Added to Inventory A.F.J.

Disbursements	*Amount*	*Sub-total*	*Total*
Science Press			
A.F.J. Vol. 36, no. 4	$180.72		
A.F.J. Vol. 37, no. 1	171.26		
A.F.J. Vol. 37, no. 2	168.11		
A.F.J. Vol. 37, no. 3	173.10	$693.19	
2000 printed envelopes	18.50	18.50	
Reprints	139.60	139.60	
Bank charges (service and activity)	12.38	12.38	
Moving back nos. A.F.J. to Smith. Inst.	51.84		
Moving herbarium to Univ. Minnesota	45.05		
Moving library to Univ. Minnesota	27.10	123.99	
Expense			
Treasurer	41.53	41.53	
Secretary	35.20	35.20	
Editor	11.22	11.22	
Membership Returned	1.50	1.50	
New Illustrations Fund:			
Gift	50.00		
Profit on sales A.F.J. back nos.	62.94	112.94	$1,190.05
Cash on hand Jan. 1, 1948			$ 451.97

STATEMENT, DECEMBER 31, 1947

Assets

Cash on hand	$ 451.97	
Illustrations Fund	112.94	
In Spec. Acct. #1	515.21	
In Spec. Acct. #2	339.83	
In Reserve fund	1,410.00	$2,829.95
Notes Receivable	1.00	1.00
Inventory A.F.J.	450.00	450.00
A.F.S. Library	340.00	340.00
Accts. Receivable	11.93	11.93
Suspense Dr.		
1948 Agency com.	6.77	6.77
		$3,639.65

Liabilities

Capital Acct.	$2,364.84
Suspense Cr.	
1948 Memb.	32.85
1949 Memb.	5.00
1950 Memb.	1.50
1948 Subscr.	77.42
1949 Subscr.	1.35
1950 Subscr.	1.35
1951 Subscr.	1.35
Gifts not restricted	16.01
Distrib. Vol. 37, No. 4	170.00
Illustrations Fund	112.94
Bissell Herb. Fund	515.21
Life Memb. Fund	339.83
	$3,639.65

Respectfully submitted,

WALTER S. ALLEN, *Treasurer*

Report of the Auditing Committee

We certify that the 1947 Financial Statement of the American Fern Society, Inc., prepared by the Treasurer, is true and correct.

The Auditing Committee compliments Mr. Allen for his careful and efficient work.

WILLIAM DURKIN
HESTER M. RUSK
Auditing Committee

Report of the Judge of Elections

As Judge of Elections for 1947 I report that 125 ballots were cast, of which 106 were completely filled out. The results are as follows:

For President	
Joseph Ewan	111
For Vice-President	
W. Herbert Dole	108
M. D. Mann	1
Mrs. Frank C. Smith	1
For Secretary	
Mrs. Elsie G. Whitney	110
R. M. Tryon, Jr.	1
For Treasurer	
Walter S. Allen	111
For Honorary Membership	
William Ralph Maxon	120

Amendments to Constitution (Article III, Membership):

Sec. 2. Change to read: ". . . by the required fee of *two dollars* . ."

Sec. 3. Change to read: "The admission fee shall be *two dollars* . ."

Sec. 4. Change to read: "The annual dues shall be *two dollars,* payable on January first of each year."

Yes—122
No 2

I therefore declare the following candidates elected to the several offices: President, Mr. Joseph Ewan; Vice-President, Mr. W. Herbert Dole; Secretary, Mrs. Elsie G. Whitney; Treasurer, Mr. Walter S. Allen.

This also confirms the election of Dr. William R. Maxon to Honorary Membership, and the changes in the Constitution raising annual dues to two dollars.

HENRY K. SVENSON, *Judge of Elections*

Report of the Curator

About the first of June, 1947, the Herbarium of the American Fern Society was transferred from the Brooklyn Botanic Garden to Dr. R. M. Tryon, Jr., at the University of Minnesota. When the Herbarium came to the Garden in 1941, it consisted of 5,615 sheets, and many unmounted specimens. During the time it was here numerous specimens were mounted, remounted or repaired.

Many new sheets were given to the Herbarium, mostly by Mr. Weatherby and Dr. Maxon, and a large number of sheets came from the estate of Amy A. Lillibridge. When the Herbarium was shipped from the Garden, it consisted of 7,143 specimens mounted and arranged, and numerous others, not counted, which had not been filed in their proper places because they needed mounting or remounting.

Respectfully submitted,
HESTER M. RUSK, *Curator*

Report of the Librarian

About the middle of July, 1947, the American Fern Society Library was transferred from the Brooklyn Botanic Garden to Dr. R. M. Tryon, Jr., at the University of Minnesota. When it was shipped to Minnesota it included about 100 books (not all of them on ferns alone) and about 50 duplicates (resulting mainly from the bequests); about 350 pamphlets; the American Fern Journal, volumes 1 to 37, bound; the Fern Bulletin, volumes 1 to 20 (all but the earliest bound); numerous odd duplicates; and odd numbers of various other publications, such as the British Fern Gazette, Sinensia, Philippine Journal of Science, and National Horticultural Magazine.

In December, 1941, a mimeographed list of the books and pamphlets in the Library was prepared, and given to any member or prospective member who requested it. Since that time the Library has been enlarged by a few purchases, a few gifts of books and reprints, and two bequests (Amy A. Lillibridge and Nellie Mirick).

Respectfully submitted,
HESTER M. RUSK, *Librarian*

The Chicago Meeting of the Society

The annual program meeting of the Society was held, as customary, as a part of the Convocation of the American Association for the Advancement of Science. Saturday morning, December 27th, was allotted to the Fern Society, for the presentation of papers and a general discussion of fern interests.

Dr. Rolla M. Tryon, Jr., of the University of Minnesota, Chairman of the Program committee, introduced the program with an interesting account of a botanizing expedition made last summer to Sleeping Giant, Thunder Bay, Ontario, with special reference to the ferns of that area. His description of the physiography and geology of this rocky landmark on the north shore of Lake Superior, together with a large series of fine kodachrome slides for illustration, left one with the feeling of having made an all-too-brief trip to Sleeping Giant, and a strong desire to visit it again. Mounted specimens of ferns collected there were on the tables for inspection and discussion after the papers.

Prof. Dwight M. Moore of the University of Arkansas also had kodachromes to illustrate a study of the development—or discovery?—of carpets of *Pilularia* along the margins of small ponds in Arkansas, especially those ponds artificially made during the days of WPA. His descriptions, and pictures of subsequent experiments in the laboratory on the development of maturing spores and the growth of sporelings, gave additional light on the habits and life history of the species.

Dr. William F. Rapp of Doane College initiated a discussion of *Equisetum* by describing some of the abnormal forms he had discovered around Crete, Nebraska.

Informal discussions over the mounted specimens were terminated by the need to vacate the room, and to get to other sessions of the Convocation, all of those present wishing that meetings for the exchange of experience might be held more often. The meeting was attended by about forty members and friends.

ELSIE G. WHITNEY, *Secretary*

NEW MEMBERS

Mrs. Martin B. Harrison, 306 University Ave., Ithaca, N. Y.
Miss Freda C. Howard, 7 St. Clair St., Ticonderoga, New York
Miss Alberta C. Jackson, 1135 Queen St. North, St. Petersburg, Florida
Mr. Edward P. Kearsley, 10 Merango Park, Springfield, Mass.
Mr. Eugene Kozloff, 01944 S. W. Palatine Hill Road, Portland 1, Oregon
Mr. James A. McCleary, Dept. of Botany, Arizona State College, Tempe, Arizona
Miss Jewel Moore, Dept. of Biology, Arkansas State Teachers College, Normal Station, Conway, Arkansas
Mrs. J. R. Rogers, 3107 Union St., Eureka, California
Miss Dagmar Schmidt, Box 794, Watsonville, California
Mr. Herbert S. Taylor, 1369 Fair Ave., Columbus, Ohio
Mr. Ralph M. Tiefel, 2240 Van Brunt Blvd., Kansas City 1, Mo.

CHANGES OF ADDRESS

Mr. William H. Baker, 434 North 29th St., Corvallis, Oregon
Dr. Fred A. Barkley, Facultad Nacional de Agronomia, Medellin, Colombia
Mrs. Elsie W. Cisler, 1050 E. Garvey St., Garvey, California
Mr. Joseph B. Comstock, 8406 Balford St., Los Angeles, Calif.
Mrs. Anita J. Cotner, 1019 Court St., Honesdale, Pennsylvania
Mrs. T. M. DePrang, Grover City, California
Mr. Charles E. DeVol, Luho, Kiangsu, China
Lt. Comdr. Richard C. Harlow, 50 Fallor St., Cambridge, Mass.
Mr. John P. Knable, II, 353 Yale Station, New Haven, Conn.
Mrs. M. L. Lord, 121 Clay St., Burlington, Iowa
Mr. Elmer J. Lorenz, 5227 El Rio Avenue, Los Angeles 41, Calif.
Mrs. W. L. Oldman, 1111 So. Weaver St., Springfield, Mass.
Mr. Charles C. Stockman, 2d, Friendship, Maine
Mr. Warren H. Wagner, Jr., Dept. of Botany, University of California, Berkeley, California

Vol. 38 April-June, 1948 No. 2

American Fern Journal

A QUARTERLY DEVOTED TO FERNS

Published by the

AMERICAN FERN SOCIETY

CONTENTS

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The American Fern Society

Council for 1947

OFFICERS FOR THE YEAR

JOSEPH EWAN, Department of Botany, Tulane University, New Orleans, La. *President*

HERBERT W. DOLE, 23 Overlook Ave., W. Orange, N. J. *Vice-President*

MRS. ELSIE GIBSON WHITNEY, 274 South Main Ave., Albany, N. Y. *Secretary*

WALTER S. ALLEN, 144–19 35th Ave., Flushing, N. Y. *Treasurer*

C. V. MORTON, Smithsonian Institution, Washington 25, D. C. *Editor-in-Chief*

OFFICIAL ORGAN

American Fern Journal

EDITORS

C. V. MORTON ....Smithsonian Institution, Washington 25, D. C.
R. C. BENEDICT..........................1819 Dorchester Road, Brooklyn 26, N. Y.
IRA L. WIGGINS..........Dudley Herbarium, Stanford University, Calif.

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The Ferns of Southern Chile

Gualterio Looser

Some years ago I published in this Journal an account of the ferns of central Chile, that is, of the region in which are situated the principal cities, Santiago, the capital, and the port of Valparaiso.[1] As some of my readers may remember, that is a steppe region of low rainfall, originally covered with a stunted and sparse xerophytic forest and now largely given over to the cultivation of wheat, barley, maize, and legumes, or in the drier parts, especially the hills, to pasture or the raising of wood for fuel. Rains are scanty, occurring only in winter (May to October), but are then often violent. Agriculture is carried on mostly by means of irrigation. The water comes from the great snow-fields of the Andes, which here reach a maximum altitude of 7,000 meters in Mt. Aconcagua, the highest peak in America, and various lesser summits. Ferns are rare, not only in number of species (only about 30), but also in number of individuals. No species is at all conspicuous in the landscape; one finds only some xerophytic forms under trees or between rocks, and a few mesophytic species in moist ravines, through which small streams run and in which forests of considerable height, requiring much more water than the vegetation of open lands, are able to maintain themselves. As one goes northward, environmental conditions become more and more un-

[1] The ferns of central Chile. Amer. Fern Journ. **20**: 52–60. 1 fig. 1930.

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favorable until, after leaving Copiapó (27° S. Lat.), one meets with a true desert, which in various phases extends along the coast from northern Chile through all of Peru to the vicinity of Guayaquil, almost under the Equator.

But south of Santiago (33.5° S. Lat.) conditions quickly change. It is true that if we take a train on the railway running from Santiago to the southern provinces, for the first 400 or 500 kilometers we notice no very appreciable difference. This is because we traverse the Valle Longitudinal of Chile between the Andes and the coastal mountains, a much lower and more broken range. This valley, which begins a little to the north of Santiago, has for some centuries been given over to an intensive agriculture, in consequence of which the native vegetation has almost wholly disappeared and, *a fortiori,* the ferns, which are especially sensitive. But if we leave the low country and penetrate the numerous transverse valleys which ascend into the Andes and cross the Coast Range, we find a native vegetation better preserved and always more vigorous and more mesophytic, with a notable development of forest. The xerophytic vegetation typical of central Chile disappears little by little. The great cactus (*Trichocereus chilensis*), like a gigantic candelabrum, 5 to 7 meters tall, is one of the most conspicuous features of the region of Valparaiso and Santiago, but does not pass beyond the River Maule (36° S.). The bromeliads of the genus *Puya,* so characteristic of the central region, reach no farther than the basin of the River Biobío (37–38° S.) and are rare in all the southern part of it. The leguminous tree *Acacia cavenia* Molino, the thorn of the Chileans, which is strongly xerophilous and a conspicuous feature of the landscape, also stops a little to the south of this river. Somewhat to the north of the Maule are the last rare and scattered specimens of the large palm, *Jubaea chilensis* (Mol.) Baill. (*J. spectabilis* H. B. K.). This species and *Juania aus-*

tralis (Mart.) Drude of Juan Fernandez are the sole representatives in Chile of their family, so mightily developed in the tropics. *Jubaea chilensis* marks the southernmost limit in America of these stately trees. It is interesting to note that on the Atlantic side of South America the southernmost palm (*Cocos Romanzoffiana* Cham.) ranges only to the suburbs of Buenos Aires (34° 30′ S.), although in Argentina tropical conditions are much more marked than in Chile and its shores are not bathed by a cold current like the Humboldt, which flows along the Chilean coast and makes it notably colder than the same latitude on the Atlantic side. No doubt it is to be attributed to the Pampas, immense grassy plains inhospitable to trees, that the palms get no farther south along the Atlantic slope.

The same thing happens to many xerophilous ferns of central Chile; toward the south they die out. Among those xerophytes that do go farther south the following may be mentioned. *Pellaea ternifolia* (Cav.) Link ranges from Arizona and Mexico along the Andes to Argentina and Chile and reaches Lake Ranco (40° S.) in the central part of the Valdivian Forest. At the same point terminates the range of *Notholaena tomentosa* Desv., the only member of its genus which penetrates the region of the great forests. Two other species range still farther south: *Cheilanthes glauca* (Cav.) Mett. reaches Lake San Martín (49° S.) and, according to the late Dr. Donat, Hicken found *Pleurosorus papaverifolius* at Ultima Esperanza (51° 30′ S.), not far from the Straits of Magellan.[2] I have seen specimens from as far south as Lake San Martín.

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[2] Since the foregoing was written, Señora Juana S. de Lichtenstein has informed me that at the Instituto Darwinión, where Hicken's herbarium is preserved, no specimen from Ultima Esperanza can be found. Consequently, this record is somewhat doubtful, though it is not at all improbable that the species may range so far south.

Pteris semiadnata. Corral, Valdivia.

Pleurosorus is a curious little genus, closely related to *Asplenium* and differing from it chiefly in the absence of an indusium. It consists of three species only, of restricted and very disjunct range—one in Spain, one in Australia and New Zealand, and our Chilean-Argentinian plant, which habitally is very like *Asplenium Ruta-muraria* of Europe.

Plants of southern range present the same phenomenon in reverse. The Fagaceae of the genus *Nothofagus*, strictly austral types which we find again in Australia and Tasmania, reach their northern limit opposite Valparaiso (33° S.) and increase gradually toward the south, becoming the predominant trees and an element of first importance in the great forests which cover all the south of Chile to the southermost point of the continent—or, rather, did cover that region before the axe of the lumberman and fires set purposely to clear land for tillage wrought great destruction in the northern half of these forests. The Chilean Proteaceae have almost the same northern limit as *Nothofagus*. The conifers extend north to Santiago (34° S.) and increase southward, but they never attain the physiognomic importance of the European conifers or those of the United States and Canada, though they have forms, such as *Araucaria, Fitzroya,* and *Pilgerodendron,* remarkable for their great size and local abundance. Almost always the Chilean conifers grow scattered among other trees. The Chilean forests, greatly developed from the River Biobío to Cape Horn, are heterogeneous; rarely does one find uniform associations of any extent where one element completely predominates.

I believe it necessary to emphasize this, since it has recently been stated in a periodical of wide circulation that the south-Chilean forests are coniferous.[3]

[3] F. Hardy, in Chronica Botanica 7(5): 212. fig. 2. 1942.

I consider that at the River Maule (35° 30′ S.) there is an important boundary line between the floras of central and southern Chile. Naturally it is in some respects conventional, and it must be regarded as approximate; nevertheless, so far as the pteridophytes are concerned, it is well justified. In all the north of Chile there is but one family, the leptosporangiate Polypodiaceae, representatives of which occur throughout; but south of the Maule we find no less than six families—Hymenophyllaceae, Gleicheniaceae, Cyatheaceae, Schizaeaceae, Lycopodiaceae, and Isoëtaceae. I may add, to complete the record, that a *Hymenophyllum* has been reported from the forest of Fray Jorge, at the mouth of the Río Limarí (30° 30′ S.), that is, about 600 kilometers north of the Maule; but this record needs confirmation and, if correct, would concern a glacial relict only. Beyond doubt, Fray Jorge is a living fossil, reminiscent of a time when the southern flora extended farther to the north.

In all the south of Chile, especially beyond Concepción (37° S.), ferns occur in enormous numbers and constitute an important element in the landscape, particularly in the provinces of Cautín, Valdivia, Osorno, Llanquihue, Chiloé, and Aysén. Beyond the peninsula of Taitao (46° S.), in western Patagonia, they decrease toward Cape Horn, and forms that are very conspicuous in the Valdivian Forest, which is rich in species, are lacking in the Magellanic Forest, which has no such abundance of species. For example, the great fern *Lophosoria quadripinnata* (Gmel.) C. Chr. disappears at 49° S.; *Hypolepis rugulosa* (Labill.) J. Smith var. *Poeppigii* (Kunze) C. Chr. at 48°; *Blechnum chilense* (Kaulf.) Mett. at 49°; *Dryopteris spectabilis* (Kaulf.) Macl. & Dusén at 45.5°; and the tall *Lycopodium paniculatum* Desv., so abundant in the provinces of Cautín, Valdivia, etc., that it is gathered in large quantities for florists, does not extend farther than 48°.

The only subarborescent fern which reaches Tierra del Fuego is *Blechnum magellanicum* (Desv.) Mett. and it is less well developed in the southern part of its range. This species is very close to *B. tabulare* (Thunb.) Kuhn of South Africa; related forms are found through South America to the West Indies.

Much the same is true of the phanerogams. The great bamboos of the genus *Chusquea* hardly enter the Magellanic Forest, nor do numerous Myrtaceae. Only one conifer reaches Tierra del Fuego and the genus *Nothofagus* loses half its species in "Magellania," though still of importance there. The more severe and colder climate of the southern end of the continent produces its effect. The storms of Cape Horn and the adjacent seas so lash the Magellanic regions that in many places the forests appear misshapen and disfigured by wind and snow.[4]

The cause of this marked change in the vegetation is climate or, more exactly, rainfall. In the region of Valparaiso and Santiago the amount of rain varies from 350 to 500 mm. a year and it falls exclusively in winter, so that there are five months or more of extreme drought. But in proportion as we go south, the climate becomes more rainy: Talca, 35° 26′, 686 mm.; Concepción, 36° 50′, 1296 mm.; Temuco, 38° 45′, 1250 mm.; Valdivia, 39° 48′, 2698 mm.; Puerto Montt, 41° 28′, 2160 mm.; Pillán de Renihue, 42° 34′, 5231 mm.; Cabo Raper, 46° 50′, 1933 mm.; Islas Evangelistas, in the mouth of the Straits of Magellan, 52° 24′, 3078 mm. And the precipitation is

[4] See, for example, the remarkable photographs of Fuegian trees deformed by the wind, published in Alberto M. de Agostini's work, "My Journeys in Tierra del Fuego," Milan, n.d., pp. 117–119. This work, which I have not seen in the original Italian, has been translated into German under the title "Zehn Jahre im Feuerland," Leipzig, 1924. I do not know if there is an English version.

DICRANOPTERIS SQUAMULOSA. CORRAL, VALDIVIA.

here much more evenly distributed through the year.[5]

Naturally, topographic factors, very important in a country of such broken relief as Chile, cause very considerable variation in the rainfall. On the coast and a little way inland, as at Valdivia, precipitation is usually great, since the water-vapor in the atmosphere is condensed on striking the coast range. In the Central Valley it is much reduced (Osorno, 40° 35′, 1328 mm.), but increases suddenly at the Andes (Casa Pangue, 41° 3′, 4110 mm.). Whatever moisture has not been precipitated in the coast range and the Central Valley falls in the Andes, the boundary between Chile and Argentina. Because of this, the forests of southern Chile form a narrow belt along the Pacific and barely penetrate Argentine territory, at certain places where the Andes are low, as often in western Patagonia. That part of Patagonia to the east, a much larger area, is a dry and barren desert where there are practically no pteridophytes.

Snow is of less importance. There is heavy snowfall in the high Andes, but there are few ferns there. In the Magellan region and Tierra del Fuego it often snows in the lowlands.

To sum up, the rains diminish rapidly from west to east, as can be seen on any map showing rainfall in Chile, e.g., those of Jefferson, or the more modern ones of Knoche[6] and the Meteorological Bureau of Chile.[7]

Especially striking is the diminution of rainfall in the Straits of Magellan; its decisive influence on the vegeta-

[5] Pluviometric data are from Mark Jefferson, "The Rainfall in Chile." Amer. Geogr. Soc. Research Ser. 7, New York, 1921, p. 21 and following.

[6] W. Knoche: Mapas del Agua Caída en Chile (Año, Enero y Julio). Zeitschrift der Gesellschaft für Erdkunde zu Berlin, Jahrgang 1929, no. 5–6.

[7] Oficina Meteorologica de Chile: Promedios annuales de Agua Caída. 1866–1935. Escala 1: 2,500,00. Dibujó C. Garcia E. Instituto Geográfico Militar. Santiago, 1936.

BLECHNUM CHILENSE. CONCON, VALPARAISO.

tion has attracted the attention of travellers since the earliest times. In the Evangelist Islands, at the western entrance of the Straits, the annual rainfall is 3078 mm. A little farther east, at Bahía Félix, it reaches the immense quantity of 5479 mm. It drops to less than a tenth of that (470 mm.) at Punta Arenas, halfway through the Straits, and only about 300 kilometers in a straight line from the Evangelistas. At Punta Dungeness, at the Atlantic end, it is hardly 219 mm. Here there is almost a desert; the effect on the vegetation could not be clearer. At the Pacific end we have great evergreen forests with an abundance of ferns, particularly *Hymenophyllum*. Toward the middle of the Straits, centering on the southernmost city in the world, Punta Arenas, there is a band, perhaps 50 kilometers wide, of deciduous forest, containing far fewer ferns, and, finally, the steppe-desert of southern Patagonia extending to the Atlantic Ocean. Conditions in Tierra del Fuego are similar.[8]

In the latitude of the Peninsula of Taitao there is an extraordinary geographic phenomenon. Here we find the first glacier which descends to sea level. It is a memorable thing to see the icebergs breaking off from the glacier with a roar as of heavy artillery and floating in Lake San Rafael. I believe this is the nearest glacier to the equator reaching the sea. Close by this purely Arctic scene we find Magnoliaceae (*Drimys Winteri* Forst.), numerous Myrtaceae, and tall, impenetrable thickets of the South American bamboo (*Chusquea*), recalling a tropical landscape. Back of Taitao is a huge ice-field, 700 kilometers long by 50 wide, where the polar regions are reproduced to perfection—a Greenland in miniature. Yet all this is at 46° S. Lat., which in the northern hemi-

[8] See the excellent map of the vegetation of western Patagonia and Tierra del Fuego published by Carl Skottsberg: Uebersicht über die wichtigsten Planzenformationen Südamerikas s. von 41°, ihre geographische Verbreitung und Beziehungen zum Klima. Svensk. Vetenskapsakad. Handl. **46**(3): 1–28. 1910.

sphere would correspond to the south of France or the northern United States. From Taitao southward glaciers which reach the sea become more and more frequent and may be counted by the dozen. Nevertheless, these glaciological conditions have much less effect on the vegetation than one would expect.

At this point I may refer briefly to the term "Antarctic America," which is often applied to the Magellanic region and even to areas farther north in many classical works in botany and zoology. Probably it originated with the earliest explorers in the South Seas. Magellan and his successors believed that Tierra del Fuego was the extreme northern part of the Antarctic Continent, whereas it is separated from the real Antarctic by Drake Sea, 1,000 kilometers of open ocean. Ercilla, in his "La Araucana," the most celebrated Spanish epic poem on the conquest of America, published in 1569, wrote: "Chile, a fertile province situated in the famous antarctic region"; and a century ago Joseph Dalton Hooker, in his Flora Antarctica, enshrined in science this unfortunate term for the southern tip of South America and New Zealand, though the flora he describes has little of the Antarctic element. There is nothing more persistent than error; we find the term Antarctic repeated in the phytogeographic treatises of Grisebach (1872), Drude (1897); Huguet de Villar (1929), de Martonne (1932), Gaussen (1933), and many others. Perhaps the worst of all was Warming, who, in one of his books, brings the "antarctic forest" to latitude 36° South, without taking into account that grapes, oranges, olives, and many other species of warm-temperate climates thrive there.

(*To be continued*)

Nomenclatural and Distributional Notes on Botrychium lanceolatum

ROBERT T. CLAUSEN

Most modern writers accredit Ångstroem with the original transference of Gmelin's *Osmunda lanceolata* to the genus *Botrychium*. Among botanists who have so given credit to Ångstroem may be mentioned Fernald (Rhodora **17**: 87–88. 1915), Maxon (Rhodora **20**: 19. 1918), Broun (Index North American Ferns, p. 35. 1938) and myself (Mem. Torr. Club **19**(2): 90. 1938). Subsequent to my publication, S. J. Smith mentioned to me that Ruprecht had listed the binomial *Botrychium lanceolatum* nine years before the date when it was published by Ångstroem. Ruprecht's ideas with respect to Gmelin's *Osmunda lanceolata* evidently underwent change in 1845. On page 33 of part 3 of Beiträge zur Pflanzenkunde des Russichen Reiches, he listed this as "48β. Botrychium (Lunaria) lanceolatum*" with the synonym *Osmunda lanceolata* Gmel. jun., 1768. This is the basis for the varietal combination under *B. Lunaria* cited by me on p. 90 of my Monograph. On p. 92 of part four of the Beiträge, Ruprecht listed "1. Botrychium lanceolatum.*" The 1. and * indicated that he regarded *B. lanceolatum* to be a species new to the flora of St. Petersburg. Ruprecht did not directly cite the basinym, but he cited his 48β mentioned above. Here Gmelin's binomial and the date of its publication were indicated, but no bibliographical citation. Ruprecht's intention appears clear. Since he did cite the date of Gmelin's publication, I am now inclined to accredit him with first valid publication of *Botrychium lanceolatum*. His binomial is neither a *nomen nudum* nor a *nomen dubium*. Its application seems reasonably definite. The citation thus should be: *Botrychium lan-*

ceolatum (Gmel.) Rupr. Beitr. Pflanzenkund. Russ. Reich. **4**: 92 (1845).

Little first reported *B. lanceolatum* from the San Francisco Mountains of Arizona (Amer. Fern Journ. **29**: 36–37. 1939). In 1940, H. Trapido and I visited these mountains and collected subsp. *typicum* on the steep east slope of Mt. Agassiz at an elevation of 3505 meters. On June 15, the leaves were still developing and the sporangia were quite green. Later that year, Trapido and I collected *B. l. typicum* in open woods along the east side of the Lostine River 27 km. south of Lostine, at an elevation of 1678 m., in the Wallowa Mountains of Oregon. This was my first record for *B. lanceolatum* in Oregon. Cottam, Garrett and Harrison (Bull. Univ. Utah **30**, no. 16: 1–11. 1940) reported *B. lanceolatum* from Big Cottonwood Canyon, Salt Lake Co., Utah. The specimen on which this report was based was kindly lent to me by A. O. Garrett. I identified it doubtfully as *B. matricariaefolium hesperium*. However, an authentic collection of *B. lanceolatum typicum* from Utah has now come to my attention. This is no. 21,900A of Maguire and Holmgren, preserved at the New York Botanical Garden. It is from timberline, on the west side of the basin, at the headwaters of Indian Farm Creek, Deep Creek Range, Juab County, and was collected in 1943, on July 16.

A specimen at the New York Botanical Garden from Helsingia, Sweden, somewhat resembles subsp. *angustisegmentum* in the narrow divisions of the blade, 1.5–3 mm. wide. The fuller data on variation and distribution available today confirm the idea that the two subspecies of *B. lanceolatum* intergrade and that occasional specimens of either are transitional towards the other.

To the records already cited by me for subsp. *angustisegmentum,* the following may be added as noteworthy:

moist base of wooded ravine, southwest bank of Mantua Creek opposite Hurffville, Gloucester County, New Jersey, 1941, July 16, *E. T. Wherry & Dorothy S. Ladow* (Univ. Pa.); Douglas Lake, Cheboygan County, Michigan, 1915, Aug. 10, *F. T. McFarland* 1115 (in herb. F. T. M.); and Rock Harbor, Isle Royal, Keweenaw County, Michigan, 1930, July 26, *C. A. Brown* 3449 (Univ. Mich.). Other records which fill in gaps in the known distribution of subsp. *angustisegmentum* are from New Haven County, Conn.; Albany, Columbia, Essex and Monroe Counties, N. Y.; Essex Co., N. J.; Elk, Lackawanna, Potter and Wyoming Counties, Pennsylvania; Ashtabula, Geauga and Trumbull Counties, Ohio; and Iron County, Wisconsin. Wright and Crandall (Torreya **41**: 75. 1941) reported *B. l. angustisegmentum* from Rhode Island and W. C. Legg (Amer. Fern Journ. **33**: 140–141. 1943) reported it from Preston County, West Virginia. The collection cited above from Hurffville, N. J., is my only record from the Coastal Plain. Another is indicated, however, from southwestern Monmouth County, N. J., by Chrysler and Edwards in "The Ferns of New Jersey," map 3. As collectors explore the eastern part of North America more thoroughly, we may expect further extensions of our knowledge of the ranges of this and other species of the subgenus *Eubotrychium*. Several of them may occur as far south as the high peaks of the southern Blue Ridge in western North Carolina and eastern Tennessee. Such a possibility may well whet our enthusiasm for exploration.

DEPARTMENT OF BOTANY, CORNELL UNIVERSITY.

The Hart's-Tongue in Tennessee in 1947

ELEANOR MCGILLIARD

The Tennessee station for the rare hart's-tongue is located in Marion County near the small city of South Pittsburg. For several years I had been hoping to revisit this station, not having been there since 1936 and I finally made the trip October 24, 1947. In my previous paper (1936), I said that the hart's-tongue had been known in Tennessee to scientists since about 1878. That is true of the South Pittsburg station, but at that time I failed to mention the Post Oak Springs station in Roane County mentioned by Augustin Gattinger in 1849 (Oakes 1932). There seems to be no other record for that station. When Pollard and Maxon visited there in 1900 (Maxon 1900) they found no plants. Tennessee botanists would like to learn that there is a specimen from Post Oak Springs in some herbarium. Through the Fern Journal and other publications we have a good record of the South Pittsburg station. The most recent paper is the fine one by Dr. Jesse M. Shaver (1945) with complete bibliography.

My recent trip, though tentatively planned in the summer as a joint trip with Dr. A. J. Sharp and others from University of Tennessee, rather suddenly took a different form. I knew that Mrs. Mary B. Henry, a well-known botanist of Pennsylvania, was planning to spend two days in Chattanooga, coming especially for the dedication of a tree to her in our new Elise Chapin Wild Life Sanctuary. On Wednesday, I learned that she would be available for a field trip on Friday. Hasty plans were made and she was invited to make the trip to visit the hart's-tongue; however, instead of saying that she made the trip with us, I might say more accurately that we made it with her, because she graciously agreed to take her car.

When we arose on Friday morning it was raining, and more rain was predicted. However, it brightened a little and we decided to make the trip as planned, although we knew that unless we could visit the locality about noon on a bright day we would be unable to see into the deep sink-hole. The party included Mrs. Henry, a young man who serves as her chauffeur and general helper in collecting plants, Dr. W. K. Butts, who is head of our Biology Department at University of Chattanooga, Bob Woodfin, a sophomore at the University and a resident of South Pittsburg, and me. When we reached South Pittsburg the sky had cleared and the sun shone beautifully during the most important part of our trip.

In South Pittsburg Mr. R. L. Lodge joined us. He and his father before him have done much to protect the hart's-tongue in Tennessee. In 1900, as a small boy he accompanied Dr. Maxon and Mr. Pollard, and with Mr. Pollard descended into the "sink." He seemed pleased to guide us on this trip though he told us he was no longer interested "in high places above deep holes." However, this time it was six-foot Bob who was elected to descend. He had heard of this famous sink-hole, but this was his first trip to it. His first view of a hart's-tongue was just before leaving Chattanooga, when he looked at some specimens in our herbarium. Not being particularly interested in plants, I'm sure he wasn't too impressed, but after a trip to the bottom of the sink, via a stout fifty-foot rope (a tow-rope from Mrs. Henry's car), I'm sure he will always have great respect for these ferns.

We parked our car near the cement plant at Richard City and began our three-quarter-mile climb. The first part is along the eastern hillside above Chitty's Creek, and, it being October, we were midst trees with colorful autumn foliage. Then we dropped into the creekbed, which was quite dry, and clambered among the boulders until we reached the beech trees which are the signal to climb the west bank. This brings us within a few feet of the sink. The place looked somewhat different than I remembered it, partly because two trees have fallen across the opening. A large one which was growing on one of the ledges, down which water cascades so beautifully in the spring, completely bridges the hole from its northwest corner to the middle of the eastern rim. This fell several years ago and more recently another, smaller one, had fallen from the northeast and lies approximately at right angles to the first. These definitely hinder one from gaining a clear view of the lower ledges.

Our stout rope was anchored to a tree at the northwest corner of the rim and Bob reached the first ledge easily. Here, we had found a large hart's-tongue in 1935, but now there was none. The soil being wet and slippery, and the next drop more difficult, Bob made it minus his shoes and socks. It is rather precarious, because if one were to drop from the point directly below the logical point for the first one, there is simply no place to land. A few feet toward the south there is a good landing place, however, but it cannot be seen from the first shelf. Following directions from above, this descent was made successfully and Bob began his inspection of the lower shelf but seemingly to no avail. His mental picture was of fronds 8–10 inches long, blunt-tipped and with the ventral surface full of sori.

Finally, at the north end of the shelf where it suddenly meets the east wall, we saw something with a broader leaf than those of the large walking ferns which are there in some abundance. We could see them vaguely with our field glasses. Bob told us that there was just one plant with four leaves which were rather pointed and had no sori. I told him to bring the smallest leaf but I didn't feel encouraged. He made his way across the floor of the sink and examined the ledge on the west side. He announced two plants there just like the one on the east. One of these was right at the north end of the ledge and at the end of a great north-south horizontal crack and almost under it, well protected and well sprayed with moisture from the falls. Each of these plants had four fronds, but now has three. Bob brought one from each plant in his shirt pocket. Had we been sure that these were hart's-tongues we would have taken no specimens.

The floor of the sink was examined toward the south. Here Mr. Graves had sown spores and here Dr. A. J. Sharp had counted twenty baby plants in 1935. These plants had been growing in the midst of a carpet of leafy liverworts which practically covered the floor. Liverworts still covers approximately one-third toward the east side. The rest of the floor is now a mass of small rocks suggesting a hard wash which precipitated all vegetation from that area into the pit at the north end of the sink.

When Bob was back on top and the specimens were in my hands, I was pleased. They were fronds of the hart's-tongue without doubt. The smallest from the smallest plant 2½ inches, the larger ones about 4 inches long. It is impossible to know whether these are the remains of larger plants which somehow suffered the loss of their older, larger fronds and are starting anew or whether they are new plants. The report for the hart's-tongue in Tennessee in 1947 is not encouraging—only three small plants—but we will hope that these will persist. At least, there are still a few hart's-tongues left in Tennessee.

BIBLIOGRAPHY

Maxon, Wm. R. 1900. On the Occurrence of the Hart's-tongue in America. Fernwort Papers pp. 36–40.

McGilliard, Eleanor. 1936. Amer. Fern Journ. **26**: 113–122.

Oakes, Henry N. 1932. A brief sketch of the life and works of Augustin Gattinger. Journ. Tenn. Acad. Sci. pp. 1–152.

Shaver, Jesse M. 1945. Some Notes on Tennessee Cliffbrakes, Chainferns, and the American Hartstongue. Journ. Tenn. Acad. Sci. pp. 195–202.

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Scott's Spleenwort in Connecticut

JESSE F. SMITH

According to the "Catalogue of the Flowering Plants and Ferns of Connecticut," published in 1910, two plants of this species had been found in the state prior to that date. Mr. J. S. Adams in 1876 found a plant in Canaan, which flourished until 1891; a second plant, at a different station in Canaan, was found by Mr. C. K. Averill in 1902.

Subsequently, as reported in the 1930 Supplement to this Catalogue, Scott's Spleenwort was found by Dr. Eames at a third station in Canaan and also in Kent, and in Brookfield by Dr. Eames and Mr. I. W. Starr. In this Supplement also, correction was made of the earlier reports of the finding of *Asplenium pinnatifidum* in Berlin, Southington, and Sharon; for preserved specimens of these plants, upon re-examination, were identified as unusual forms of *Asplenium ebenoides* R. R. Scott. On the basis of these findings it appears that in the last 70 years Scott's Spleenwort has appeared in six Connecticut towns—on limestone ledges in four towns in the northwestern part of the state, and on shale ledges in two towns in central Connecticut.

Early in November, 1945, Mrs. Harry L. Oppenheimer brought me a single frond of *Asplenium ebenoides* which she had picked from a plant on a shale ledge near her home in the western part of Suffield, Conn. A week later

Scott's Spleenwort, with Walking Fern at the Left she was unable to locate this plant for me on the ledge where she had found it, but on a ledge some 25 yards to the north we found another plant.

Mrs. Oppenheimer's specimen, which was sent to the Gray Herbarium for identification, is now in the Herbarium of the New England Botanical Club. The other plant, which survived the winter, flourished during the summer of 1946. In November, 1946, I was able, by using a flash bulb, to get a photograph of it. It is growing in close proximity to a few plants of Walking Fern (*Camptosorus rhizophyllus*), and only three or four yards distant on the same ledge are several plants of Ebony Spleenwort (*Asplenium platyneuron*). At the other end of the ledge is a large colony of *C. rhizophyllus*. Plants of *A. platyneuron* grow on and around this and other ledges in the immediate neighborhood. These ledges rise about four feet above the surface of a wooded swamp, well shaded by a few large swamp oaks (*Quercus bicolor*), smaller red maples (*Acer rubrum*), and scattering specimens of *Viburnum, Ilex, Hamamelis,* and similar shrubs. The general direction of the ledges is north and south; they are tilted to the east at an angle of 30 degrees and the ferns find lodgement in the exposed western and northwestern faces. Conditions now seem to be favorable not only for the persistence of this lone individual, but also for its duplication by reason of the number of plants of the supposed parents in the immediate vicinity. The swamp is not too accessible, is visited infrequently by any but the owners, and in spring and early summer the feet of the ledges are bathed in water. The property is owned by the Oppenheimer family.

The plant is still flourishing in November, 1947.

The illustration is from a photograph by Roger Cowles Loomis, of Suffield.

SUFFIELD, CONNECTICUT.

A Fern Reference in Seventeenth Century Literature

R. C. Benedict

The word fern does not seem to occur at all in the King James' version Bible and is found only once in Shakespeare—in the oft-quoted reference in "Henry I" to "fern seed" as a prescription for invisibility. Shakespeare does have a reference to "brakes" in "Venus and Adonis," by it seems likely that this does not mean a fern species but is a synonym for "thickets."

But if ferns are neglected in these two English classics of the seventeenth century, their mention in another type of literature of the period may be cited. An interest in log cabin life of early colonial times led me to a search for descriptions of various crafts of the period, including cooking equipment and recipes, and this, in turn, led to a cookbook by a most unexpected author. In a book auction list, a title by Sir Kenelm Digby, "The Closet of Sir Kenelm Digby Knight Opened" was intriguing in itself. Sir Kenelm is cited in most histories of science as the author of several essays. One, "The powder of sympathy" was given as an address before the Royal Philosophical Society about 1650. In this he ascribes to "blue vitriol" the virtue of healing wounds at a distance, and cites from his own experience the case of a stubborn duelling wound which was readily healed when a bloodied cloth was treated with the powder. In another essay on plant growth, he describes how the "calcined ash" of a plant can be caused to reconstruct the original plant. From this he reasons easily to conclusions regarding the resurrection of the bodies of departed saints, even those who may have been eaten by cannibals.

But the opened "closet" turned out to be, not another scientific disquisition, but a book of recipes, gathered from various sources, mostly from his highly placed friends in society. Sir Kenelm must have been a man of great social and political endowments. A friend of Francis Bacon and other luminaries, well placed at court and in society in the pre-Cromwellian period, he remained in favor during the Cromwell regime, and on the accession of Charles the Second, was again in royal and social favor.

Before giving specific references to the use of ferns in his cookbook, something of the flavor of the times may be given by quotations from the title page and preface. The text here referred to is a 1910 reprint with commentary, published by Philip Lee Warner, 361 Albemarle St., W. London. The title page of the original issue contains the following:

THE CLOSET OF SIR KENELM DIGBY OPENED

"Wherein is discovered several ways of making metheglin,, sider, cherry wine, ec. Together with excellent directions for Cookery, as also for Preserving, Conserving, Candying, etc.

"Published by his Son's Consent. London, Printed by E. C. for H. Brome, at the Star, in little Britain, 1669."

The preface gives clear evidence that the practice of issuing publishers' blurbs is not something invented during recent years. Addressed "To the Reader" and signed "Fare-Well," it runs in part:

"This collection of pleasing variety and of such usefulness in the Generality of it, to the Publique, coming to my hands, I should, had I forborn the Publication thereof, have trespassed in a very considerable concern upon my country-men, The like having not in any particular appeared in Print in the English Tongue. There is no need for Rhetoricating Floscules to set it off. The Authour, as is well known, having been a Person of Eminency for his Learning, and of Equisite Curiosity in his Researches, Even that Incomparable Sir Kenelme Digby Knight, Fellow of the Royal Society and Chancellour to the Queen Mother, (Et omen Nomine) His name does sufficiently Auspicate the Work. . . .''

A considerable part of this incomparable cookbook consists of recipes of various ladies of society for making "metheglin" and "meathe." Both are derivatives of fermented honey. Metheglin is defined today as "spiced mead," and "meathe" becomes "mead" in modern spelling. Ferns are specified in a number of recipes for metheglin, sometimes as one or two of a few herb ingredients, sometimes almost lost in the variety and number of flowering herbs. The most extensive of the latter, which also includes four kinds of ferns, begins as follows:

"Take bugloss, borage, hyssop, organ, sweet marjoram, rosemary, French-cowslip, coltsfoot, thyme, burnet, selfheal, sanicle, a little, betony, blew-buttons, hartstongue, meadowsweet, liverwort, coriander, two ounces, bistort, Saint Johnswort, liquorish, two ounces of caraway, two ounces of yellow saunders, balm, bugle, half a pound of ginger, and one ounce of cloves, agrimony, tormentil-roots, cumfrey, fennel's-root, clowns-all-heal, maidenhair, wall-rew, sweet-oak, Paul's-betony, mouse ear, spleenwort.

"For two hogsheads of metheglin, you take two handfuls apiece of each herb, excepting sanicle, of which you take a handful.

". . The handfuls of herbs, are natural handfuls (as much as you can take in your hand) not Apothecaries handfuls, which are much less.

". . When your water begins to boil, cast in your herbs, and let them boil a quarter of an hour. Then strain it from the herbs. When it is almost cold, put in as much of the best honey as will make it bear an egge, to the breadth of two pence. ."

Another recipe calls for the following:

"To eight gallons of the herb decoction, put in two gallons of pure honey, and boil them till the liquor beare an egge the breadth of three pence, or a groat."

With this recipe, a caution was added: "You must observe carefully. 1. Before you set the liquor to boil, to cause a lusty servant (his arms well washed), to mix the honey and water together, labouring it with his hands at least an hour without intermission."

Nothing was noted in any of the recipes which throws light on the particular contributions of the ferns to flavor or in other respects. They are not specified in all the metheglin recipes, so that we cannot conclude that they constituted the essential elements which led Digby to call metheglin "the liquor of life."

BROOKLYN COLLEGE.

Shorter Notes

A PROPOSED NEW GENUS AND FAMILY OF FERNS.—In 1909 the Italian botanist Negri collected in Abyssinia a fern with white ceraceous indument which Chiovenda (perhaps because of its marginal sori of only one or two sporangia) referred to *Mohria* of the *Schizaeaceae* and described as *M. scioana.* This fern has now been restudied by Dr. Pichi-Sermolli of the Colonial Herbarium at Florence. He places it, with obvious correctness, in the general vicinity of *Cheilanthes.* In all gross characters and in its spores, it agrees with that group. He finds, however, that the sporangia are large, very short-stalked and of peculiar structure. The annulus is vertical, as in all characteristically polypodiaceous ferns, but it is very broad, projects but slightly above the surface of the sporangium, and is formed throughout of narrow cells which are laterally much elongated and none of which are modified to form a stomium. The outer, as well as the inner and lateral, walls of these cells are indurated—a character which Pichi-Sermolli regards as of great importance. On the basis of these sporangium-characters, he erects for this fern a new genus, *Negripteris,* and a new family, *Negripteridaceae.*[1]

Dr. Pichi-Sermolli's work is admirably thorough and careful as far as it goes. If it does not carry full conviction, that is because, like Ching's restoration of the genus *Aleuritopteris,* like the proposal and discussion of *Sinopteris,* it does not go far enough. It does not take into account certain seemingly pertinent facts, particularly concerning American members of the *Cheilantheae.* In that group generally, oligosporangiate sori are not rare and short-stalked sporangia are the rule rather than the exception.[2] Pichi-Sermolli states that his fern resembles *Cheilanthes farinosa* in habit. It is much more like *Notholaena rigida* Davenp. of Mexico; indeed, except for the scaly rachis and the less dissected apex of the blade, Pichi-Sermolli's figure could easily be taken for that species. In America also there is in various white-ceraceous species conventionally referred to *Notholaena* a tendency, developed to different degrees in different species, toward sporangia with a broad, flat annulus composed of narrow, laterally elongated cells.

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[1] Pichi-Sermolli, Rodolfo. Negripteridaceae e Negripteris, nuova Famiglia e nuovo Genere delle Filicales. Nuov. Giorn. Bot. Ital. **53**: 129–169, *pl. 14–16.* 1946.

[2] It is not very surprising that these things should have been overlooked. No one except Gustav Kunze seems to have taken the trouble to look at or draw sporangia in this group, and he did not hit upon the extreme cases. See also Copeland, Gen. Fil. 67, 68. 1947.

Notholaena trichomanoides and *N. Greggii* are examples. Moreover, the annulus in these species passes into a large and broad stomium, the greatly elongated cells of which have dark, more or less indurated walls. It would be necessary only to lengthen somewhat the already elongate cells of the annulus and to thicken the walls of the stomium-cells to produce a structure like that in Pichi-Sermolli's figures. Judging from Christensen and Ching's illustrations, this has been very nearly accomplished in *Sinopteris.* The stomium is there reduced to two cells, thinner-walled than those of the annulus, but otherwise quite like them.[3]

We have, then, scattered cases of modification of sporangial structure which, taken together, form a broken, but recognizable, series leading in the direction of the extreme in *Negripteris.* They occur in species very different in habit, structure of scales, etc. Indeed these species have little in common, outside the general features of the *Cheilanthes*-group, except the waxy indument; and that occurs also in groups totally different in habit, sorus-structure and spores—that of *Notholaena nivea* for instance. It would seem, then, that sporangial structure is, in the *Cheilanthes* alliance, only one of a series of characters which vary widely and quite independently. Their pattern and interplay is highly complicated; I cannot see that our understanding of it is furthered by the setting up of genera and families based on the extreme development of a single feature. As I have had occasion to say before, it is far better to hold to conventional genera, however artificial, until, by

[3] Bull. Fan Mem. Inst. Biol. 4, no. 10, *pl. 1.* 1933. The above is not to be taken as implying that the development actually took place in this direction. More probably the condition in *Negripteris* is primitive, as Pichi-Sermolli supposes; and the very broad stomium might be regarded as a relict of the original structure, left behind, as it were, by the progressive specialization of the annulus proper.

cautious and thorough comparative study of all their details, we can arrive at a just sense of proportion.—C. A. WEATHERBY, *Gray Herbarium.*

POLYSTICHUM BRAUNII IN BUCKS COUNTY, PENNSYLVANIA.—The distribution of Braun's Holly-fern (*Polystichum Braunii*) in Pennsylvania was discussed some years ago by the writer in the Fern Journal.[1] Mention was made of its occurrence in southern Sullivan County, in northern Wayne County, and at a new locality (South Sterling) in the southern part of Wayne County.

The discovery by the writer of a single plant growing spontaneously near Morrisville, in Bucks County, Pennsylvania, about 100 miles south of its known limit at South Sterling, occasions considerable speculation about its origin. The plant is growing in a retaining wall about six inches from the ground. When found in May of this year, it had only one living frond (two had recently been trimmed off) and the bases of three or four of last year's fronds. By the middle of June two more fronds were uncurling. It is a plant of several years' growth.

There is a remote possibility that this plant had been growing among the rocks in the adjoining lot, whence the stones now in the wall had been removed in the process of digging a cellar. At this point there is an outcropping of quartz and schist in such a manner as to leave many deep pockets between the rocks. But it scarcely seems likely that a colony of the fern had existed there.

The consideration of wind-blown spores presents another possibility. The writer has had a few good plants of this species growing in his garden for about 12 years; they are about 200 feet from the wall. Also a dealer in

[1] 31: 27. 1941.

native plants about a mile away has had a few specimens for five or six years.

A check with the owners of this property brings no possibility that it may have been used in landscaping the place. Its location in the wall indicates that whether it came from spores or as a living plant only chance directed its coming. Whether one is to consider this single plant as an extension of range the writer willingly leaves to more energetic minds, but its occurrence here so far away from its previously known stations furnishes interesting material for the study of plant distribution.—W. L. DIX, *Morrisville, Pennsylvania.*

FERN PICKING IN NEW YORK.—It has been some time timé since the commercial gathering of ferns has been discussed in the pages of the Journal. This industry sprang into being shortly after the turn of the century, when it was found that fern fronds picked in late summer and early autumn could be kept over the winter in cold-storage. The early reports were: "$30,000 Paid Fern Pickers" (a reprint of a newspaper article), vol. 4, p. 28 (1914); "The Fern-picking Industry," by E. J. Winslow, vol. 6, p. 19 (1916); and "Commercial Fern Gathering," by S. H. Burnham, vol. 9, p. 88 (1919).

These early reports all discussed the industry as it existed in Vermont at the time. Fern picking is now common in Sullivan County, New York, beginning as early as June, when many people gather ferns directly for the florists. Beginning in August the ferns are gathered for cold-storage in Albany, New York, or Jersey City. As in Vermont, the fern chiefly used is the American wood-fern or "fancy-fern" (*Dryopteris intermedia*). The sterile fronds are the most acceptable, but some stages of the fertile fronds can be used also.

The ferns are gathered only in dry weather, for wet fronds are not satisfactory.

Up through 1919 the price paid was 40 cents for bunches of a thousand fronds, and it was stated that an expert picker could gather up to 20,000 fronds a day. At the present time the price is from $1 to $1.25 per thousand and a good "picker" gathers from 7,000 to 10,000 fronds a day. This seems to indicate that the pickers are not as energetic as formerly, or, more likely, that the ferns are not as abundant in Sullivan County as they were in Vermont.

It would be interesting to have a report on the present condition of the industry in Vermont. A good many fern-lovers felt that such extensive commercial exploitation might lead to the gradual extermination of the fern in the state.—EMMA DRESSEL.

Recent Fern Literature

The Gardener's Chronicle (n. ser. **120**: 301. 1946) reports that Mr. F. F. Nicol, of Furnace, Argyll, Scotland, believes he has found a new use for bracken. He has patented a process for making from it boards suitable for wall-linings. If the process proves successful, farmers whose land has been invaded by this enterprising fern can get some income from it.—C. A. WEATHERBY.

Dr. William A. Murrill has published privately[1] a little book entitled merely "Ferns." Part I consists of a story, concerned with the education of a boy. It has a biographical flavor, except presumably as to the hero's power of invisibility! Part II, entitled "Ferns," is a rambling account of some of the ferns of the eastern and southern United States. It contains abbreviated descriptions of 67 species, a few drawings and photographs, some simplified keys, and a number of local lists. Part III, entitled

[1] "Ferns," by W. A. Murrill, Gainesville, Florida, pp. 1–96, 1947.

"Primitive Green Plants" discusses the mosses, liverworts, and algae briefly and gives a list of some of the species collected by the author in Alachua Co., Florida.—C. V. M.

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"Guide to Eastern Ferns," by Dr. Edgar T. Wherry, has been reprinted by the University of Pennsylvania Press, Philadelphia 4, Pa., to which orders for copies should now be sent. It has been necessary to raise the price to $2.00 per copy, but discounts will be given for quantity orders, and to the trade.

AMERICAN FERN SOCIETY, INC.

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*Waters, Dr. Campbell E., 5812 Chevy Chase Parkway, Washington, D. C. 1893

Acker, Roy M., Dept. of Botany, University of Chicago, Chicago 37, Ill. 1947
Ade, Ralph D., 2324 23rd St. A, Moline, Ill. 1946
Allen, Dr. Fred H., 16 Fairfield Ave., Holyoke, Mass. 1921
Allen, Miss Mary N., 6 Academy St., Worcester, Mass. 1941
Allen, Walter S., 144-19 35th Ave., Flushing, N. Y. 1917
Ames, Prof. Oakes, Botanical Museum, Oxford St., Cambridge, Mass. 1917
Anderson, Dr. W. A., Dept. of Botany, University of Iowa, Iowa City, Iowa 1927
App, Miss Marjorie, Box 750, Route 3, Fresno, Calif. 1946

Bailey, Dr. Liberty Hyde, Ithaca, N. Y. 1921
Baker, Miss Harriet E., 1927 Buckingham Rd., Los Angeles, Calif. 1940
Baker, William H., 434 North 29th St., Corvallis, Ore. 1947
Ballard, Mr. F., Royal Botanic Gardens, Kew, Surrey, England 1944
Barkley, Dr. Fred A., Sección de Botánica, Facultad Nacional de Agronomía, Medellín, Colombia 1941
Barnes, Mrs. Albert C., Barnes Foundation, Latch's Lane, Merion, Pa. 1928
†Barnes, Mrs. William A., 2645 Edgewood Rd., Utica 3, N. Y. 1944
Barnhart, Dr. John Hendley, New York Botanical Garden, New York, N. Y. 1911
Bartlett, Dr. H. H., University of Michigan, Ann Arbor, Mich. 1945
Bartsch, Dr. Paul, Smithsonian Institution, Washington, D. C. 1911

Bauer, Mr. Bill, 133 N. Old Orchard, Webster Groves 19, Mo. 1943
Bean, Ralph C., 48 Emerson St., Wakefield, Mass. 1920
Beardslee, Mrs. John W., Jr., 25 Seminary Pl., New Brunswick, N. J. 1942
‡Bechtol, L. A., c/o Almont Savings Bank, Almont, Mich. 1946
Beck, Mrs. Walter, Innisfree, Millbrook, N. Y. 1928
Bedell, Dr. Sullivan, 1004 Lynch Bldg., Jacksonville, Fla. 1947
Benedict, J. E., Jr., 945 Pennsylvania Ave., N. W., Washington, D. C. 1923
Benedict, Dr. Ralph Curtiss, 1819 Dorchester Rd., Brooklyn 26, N. Y. 1905
Benson, Dr. Lyman, Pomona College, Claremont, Calif. 1945
Berko, Stephen Jay, 305 Camp Ave., Braddock, Pa. 1947
Betts, Edgar H., 1904 Fifth Ave., Troy, N. Y. 1941
Bill, Miss Bertha Earle, 12 Boynton St., Worcester 2, Mass. 1944
Billington, Cecil, 21060 Thirteen Mile Rd., Birmingham, Mich. 1945
Bissell, Mrs. A. Viola, Route 5, Box 39A, Watsonville, Calif. 1945
Blake, Mrs. Anson S., Rincon Rd. Nr. Arlington Ave., Berkeley 8, Calif. 1945
Blake, Dr. S. F., 2817 First Rd. N., Arlington, Va. 1945
Blomquist, Prof. H. L., Dept. of Botany, Duke University, Durham, N. C. 1934
Boyce, Mrs. David C., Rosalind Gardens, Dobbs Ferry, N. Y. 1930
Branum, Miss Florence, 117 N. Ewing St., Lancaster,Ohio 1947
Braun, Prof. E. Lucy, R. R. 13, Box 41C, Cincinnati 30, Ohio 1920
Brettle, Mrs. A. C., 159 Pleasant Ave., Hamburg, N. Y. 1935
Britton, Donald M., University of Virginia, Charlottesville, Va. 1946
Broadley, K. T., P. O. Box 1260, Honolulu, T. H. 1944
Brooks, Maurice G., West Virginia University, Morgantown, W. Va. 1926
Broun, Maurice, Hawk Mountain Sanctuary, R. D. 2, Kempton, Pa. 1934
Brown, Mrs. Haydn L., Main St., Atkinson, N. H. 1947
Brown, Hubert H., 9 Halford Ave., Toronto 9, Canada 1926
Brown, Dr. V. E.,Biology Dept. Marquette University, Milwaukee, Wisc. 1941
Brumbach, William C., Easterly P. O., Pa. 1936
Burns, Newell J., 2323 E. Falling Heath Pl., Milwaukee 7, Wisc. 1948

Cameron, Mrs. Lindsay, 5109 Plymouth St., Jacksonville, Fla. 1946
Campbell, Dr. Douglas Houghton, Leland Stanford University, Calif. 1915

Canan, Miss Elsie D., 1023 Millcreek Rd., Johnstown, Pa. 1935
+Capp, Seth Bunker, P. O. Box 2054, Philadelphia, Pa. 1915
Carlson, Mr. T. O., 16 Hillcrest Rd., Mountain Lakes, N. J. 1946
Carlson, Mrs. T. O., 16 Hillcrest Rd., Mountain Lakes, N. J. 1934
Carroll, Col. Robert P., Virginia Military Institute, Lexington, Va. 1938
Chamberlain, Glen D., 22 Academy St., Presque Isle, Me. 1939
Chandler, Albert, 221 W. Washington Ave., Kirkwood 22, Mo. 1941
Cheesborough, Mrs. F. E., 1611 Church St., Galveston, Texas 1945
Cheuvront, Elmer M., 314 Beaver Ave., West Aliquippa, Pa. 1948
Chillas, Richard B., Jr., 233 Winona Ave., Philadelphia, Pa. 1935
Chisholm, Mrs. Maude L., Proctor, Vt. 1923
Cisler, Mrs. Elsie W., 1050 E. Garvey St., Garvey, Calif. 1946
Clark, Mrs. B. Preston, 132 Marlboro St., Boston, Mass. 1928
Clarke, Miss Gladys, P. O. Box 29, Brookfield, Ill. 1946
Clausen, Dr. Robert T., Dept. of Botany, Cornell University, Ithaca, N. Y. 1933
Clokey, Ira W., 1635 Laurel St., South Pasadena, Calif. 1944
*Clute, Prof. Willard Nelson, 5257 Hinesley Ave., Indianapolis, Ind. 1893
Cobb, Boughton, 21 E. 26th St., New York 10, N. Y. 1946
Constantine, Thomas S., 72 Terrace, Katona, N. Y. 1936
Cook, John Hutchinson, 383 West State St., Trenton 8, N. J. 1948
Cooke, William B., 1718A Pullman St., Pullman, Wash. 1939
Correll, Donovan S., 9202 Old Bladensburg Rd., Silver Spring, Md. 1936
Coury, A. M., P. O. Box 703, Greenville, S. C. 1947
Cowan, Alexander, Valleyfield, Pencuik, Midlothian, Scotland 1914
Craine, Mrs. Z. W., 155 North Broad St., Norwich, N. Y. 1944

Dane, Mrs. Ernest B., Roughwood, Chestnut Hill, Mass. 1925
Darling, Cyrus, Box 193, Westboro, Mass. 1929
Deam, Charles Clemon, R. D. 3, Bluffton, Ind. 1905
Delafield, Mrs. John R., 17 E. 79th St., New York, N.Y. 1923
Demaree, Dr. Delzie, Arkansas State College, Jonesboro, Ark. 1938
DePrang, Mrs. T. M., Grover City, Calif. 1946
Derickson, Prof. Samuel H., Lebanon Valley College, Annville, Pa. 1935
Desmond, Hon. Thomas C., 94 Broadway, Newburgh, N. Y. 1942
DeVol, Charles E., Luho, Kiangsu, China 1938
+Diddell, Mrs. W. D., 8092 Hawthorne St., Jacksonville 6, Fla. 1935

Dix, W. L., 801 Crown St., Morrisville, Pa. 1933
Dole, W. Herbert, 23 Overlook Ave., West Orange, N. J. 1926
Doray, Robert A., 560 White St., Springfield, Mass. 1941
Doubleday, Mrs. Arthur W., Woodstock, Vt. 1928
Dressel, Mrs. Emma R., Star Route, Livingston Manor, N. Y. 1945
Dunbar, Henry F., Arrowhead Farm, R. D. 3, Kingston, N. Y. 1938
Duncan, Robert, 136 Woodland Rd., Chestnut Hill, Mass. 1927
Dunham, Mrs. F. G., 450 Beverly Rd., Ridgewood, N. J. 1941
Dunlop, Douglas W., University of Wisconsin, Milwaukee 3, Wisc. 1941
Durkin, William, Brooklyn Botanic Garden, Brooklyn 25, N. Y. 1944

Earle, R. S., 101A Charles St., Boston 14, Mass. 1927
Earle, Dr. T. T., Dinwiddie Hall, Tulane University, New Orleans 15, La. 1938
East, Miss Laura A., Plymouth, Conn. 1944
Eastwood, Sidney K., 5110 Friendship Ave., Pittsburg, Pa. 1946
Eckstein, Oscar O., 2646 No. Williams Ave., Portland 12, Ore. 1947
Edmondson, A. H., R. F. D. 1, Forestville, Upper Marlboro, Md. 1947
Edwards, James L., 17 Stanford Place, Montclair, N. J. 1932
Egan, Mrs. H. A., Cobb,Lake Co., Calif. 1945
Elliot, Rev. E. A., South Stoke Vicarage, Nr. Reading, Berkshire, England 1939
Emmons, Edwin Thayles, 177 Lewis St., Geneva, N. Y. 1915
Essene, Mrs. Edna, Route 1, Box 271A, Alexandria, Va. 1947
Evans, Miss Lucile, Apt. D, 2129 E. Kenwood Blvd., Milwaukee 11, Wisc. 1936
Eveleth, Dr. F. S., 12 Court St., Concord, N. H. 1938
Ewan, Joseph, Dept. of Botany, Tulane University, New Orleans 15, La. 1930

Fagley, Dr. Frederick L., 287 Fourth Ave., New York 10, N. Y. 1932
Featherly, H. I., Dept. of Botany, Oklahoma A. & M. College, Stillwater, Okla. 1928
Ferril, Mrs. W. C., 2123 Downing St., Denver 5, Colo. 1941
Fessenden, G. Russell, 5130 Connecticut Ave., Washington, D. C. 1937
Fisher, George L., 611 W. Pierce Ave., Houston 6, Tex. 1945
Fliflet, Thorleif, 128 Kenilworth Rd., Mountain Lakes, N. J. 1947
Flowers, Seville, University of Utah, Salt Lake City 1, Utah 1938
Foote, Mrs. Caroline C., 1105 Park Ave., New York 28, N. Y. 1925
Fosberg, Dr. F. R., 1631 Liholiho St., Honolulu, T. H. 1946

Freeland, Mrs. Montella, Rt. 1, Box 114, Central Point, Ore. 1947
Frick, Dr. T. A., Dept. of Biology, Lincoln Memorial University, Harrogate, Tenn. 1945
Furey, Bartley G., 278 Bayview Ave., Freeport, N. Y. 1947

Gannett, Lewis S., 120 E. 16th St., New York, N. Y. 1928
Garcia-Benitez, Dr. Carlos R., Dept. of Botany, University of Puerto Rico, Rio Piedras, Puerto Rico 1942
Gaston, Mrs. John Zell, 2210 Riverside Drive, Houston 4, Texas 1947
Gebert, James L., Box 424, New Iberia, La. 1948
Giauque, Mrs. M. F. Ashley, 2643 Benvenue Ave., Berkeley, Calif. 1942
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Gunnison, Mrs. R. M., Quaker Acres, Pawling, N. Y. 1941

Haas, Dr. Flora Anderson, Sorrento, Fla. 1917
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Harrison, Martin B., 306 University Ave., Ithaca, N. Y. 1947
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Jackson, Mrs. Alberta C., Millpond House, Readfield,Me. 1947
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Jennings, Otto Emery, Carnegie Museum, Pittsburg, Pa. 1911
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Jones, Prof. G. Neville, University of Illinois, Urbana, Ill. 1945
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Kearsley, Edward P., Box 205, Forest Park P. O., Springfield, Mass. 1947
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Weatherby, Mrs. Charles A., 27 Raymond St., Cambridge 40, Mass. 1914

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American Fern Journal

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The Discovery of Ceterach Dalhousiae in Mexico

JOSEPH EWAN

Few North American ferns carry such interest for the plant geographer as does *Ceterach Dalhousiae* of Abyssinia and southern Asia, and up to now reported on this continent only from Arizona. *Ceterach Dalhousiae* (Hook.) C. Chr.[1] has long commanded attention from North American students of ferns for its novel distribution, along with its distinctive frond shape.[2] Interest in this country began with its discovery in North America "under dryish shelving rocks between Brown and Tanner's Canyons," in the Huachuca Mountains of southeastern Arizona in October, 1907, by James H. Ferriss of Joliet, Illinois. At that station Ferris wrote, in the account of the discovery of the fern prepared for the Fern Bulletin (**19**: 36–38. 1911), that *Ceterach* "was growing in locations similar to those selected by *Aspidium juglandifolium* [*Phanerophlebia auriculata*] and *Polystichum aculeatum lobatum* [*P. scopulinum*]." This locality is about six miles from the Mexican border. Clute described this collection of Ferriss as *Asplenium*

[1] Specific name commemorates Christina Ramsey, Countess of Dalhousie (née Broun), wife of George Ramsey, 9th Earl of Dalhousie. Her plant collections, made in Nova Scotia, Canada, Simla, and Penang, are preserved at Kew. She lived in India from 1829–32, and died in 1839 (?). Her correspondence with William Jackson Hooker, who named the *Ceterach* for her in 1837, is at Kew.

[2] See line drawing as frontispiece to vol. 16, Fern Bull. (Jan.), 1908.

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Ferrissii (Fern Bull. **16**: 1) in 1908. It was not long, however, before W. A. Poyser of Hammond, Indiana, identified "*Asplenium Ferrissii*" as *Asplenium alternans* (Fern Bull. **19**: 33–36. 1911). This led to the fern's being properly placed by Maxon in 1913 under *Ceterach Dalhousiae.*

In the interim Leslie Newton Goodding, then twenty-nine, discovered this fern in "rocky protected canyons" of the Mule Mountains of Cochise County, Arizona, and three years later proposed the name *Asplenium rupium* for it (Muhlenbergia **8**: 92. 1912). Maxon subsequently showed this name to be a synonym of *Ceterach Dalhousiae* and at that time first reported the genus for North America (Am. Fern Journ. **3**: 110. 1913). Somewhat later the fern was detected in the adjoining Baboquivari Mountains of Pima County and quite recently W. S. Phillips cited three collections of it from that range (Am. Fern Journ. **36**: 105. 1946).

Now it may be reported for the first time from Mexico: *Howard S. Gentry* 6503, from Quebrada de Mansana, Sierra Suratato, Sinaloa, in oak forest on moist shady slope at 4,000–4,500 feet elevation, Sept. 10–14, 1941 (Univ. Mich. Herb., U. S. Nat. Herb.). It is of interest that Gentry has recently described as new *Mimulus calciphilus* (Scrophulariaceae) from the Sierra Suratato of Sinaloa (Madroño **9**: 21. 1947), with the comment that *Mimulus calciphilus* "appears to have no close relative in North America." This *Mimulus* occurs at somewhat higher elevations than the *Ceterach,* at about 6,500 feet, as a "small compact colony." Gentry's collection of *Ceterach Dalhousiae* agrees very closely with those studied[3] from China (e.g. Shweli River drainage, Yunnan, *J. F. Rock* 7595); northwestern India (Bhadwar, Kangra, Punjab, 2,000 ft., *W. Koelz* 4410, and Dharmkot, Dharmsala, Punjab, *R. R. & I. D.*

[3] All collections cited are in U. S. National Herbarium.

Stewart 2066a); and Arizona (*L. N. Goodding* 132). The Mexican and Arizona collections are certainly conspecific with the Asiatic material examined.

The discovery of *Ceterach* in Mexico reopens the consideration of the source of this fern in North America. I have recently reviewed (Am. Fern Journ. **35**: 120–128. 1945) three principal hypotheses advanced to explain the disjunct ranges of such species as this fern, *Asplenium adiantum-nigrum*, and *A. exiguum*. It seems clear that these species probably represent either (a) epibiotics, (b) polytopic endemics, or (c) stratospheric species. I have attributed the North American occurrence of these disjunct species to the action of stratospheric or upper air currents around the globe. May I reiterate: We need abundant data from gelatine plate collections made on transoceanic flights by aircraft. "It is essential to have precise information as to what types of fern spores are most widely distributed, and in what numbers and at what altitudes they occur."

No one hypothesis may be universally valid for all problems of discontinuous distribution among plants, and each problem must be examined on the basis of the ascertainable facts at hand. Thus, the validity of the epibiotic hypothesis must be granted close consideration in every case. The discovery of *Ceterach* in Mexico in the Sierra Madre Occidental, a southern extension of the important Rocky Mountain north-south avenue of migration, is consistent with the interpretation of its being a relict species. The fact strengthens the case for the epibiotic hypothesis.

The discovery of the Asiatic *Venturiella sinensis*, a moss (Erpodiaceae) ranging from Japan and Korea to eastern China, in McKittrick Canyon in the *arid* Guadalupe Mountains of western Texas is of interest in this connection, since it introduces another plant species with an anomalous distribution comparable to that of *Ceterach Dalhousiae*.[4] In these instances the establishment, however temporary, in our *arid* Southwest of species known from much more mesic habitats in Asia is the striking ecologic phenomenon for which there seems to be no logical explanation.

It may be proffered, of course, that the Mexican occurrence of *Ceterach Dalhousiae* demonstrates only another successful establishment of the species as a stratospheric visitor to North America. Indeed, there may have been and continue to be repeated "invasions" of *Ceterach* and *Asplenium* spores. We may well recall Setchell's oft-repeated point[5] in this connection: It is establishment or "ecesis" that counts, and the absence of positive results in the form of established individual plants is not to be taken as evidence *against* the possibility of there being continued dispersals of spores, the majority of which fail to meet the demands of climate, soils, and biotic factors and fail to establish themselves in new sites. Many plant geographers will urge, however, that it is more direct and altogether simpler to admit the epibiotic hypothesis than to lean uneasily upon the stratospheric vagaries! Yet the evidence is not all in. We still have almost no data on the transport of fern spores through the air for great distances —evidence that may yet come from aviation. Further botanical exploration in Mexico, meanwhile, and the possible discovery of more stations for this and other ferns with disjunct ranges will bring additional evidence toward a solution of this problem in the history of floras.

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[4] Cf. E. B. Bartram, Bryologist 37: 46. 1934. Dr. Maxon kindly directed the author's attention to this report.

[5] Cf. "Migration and endemism with reference to Pacific insular floras," Proc. 3d Pan-Pac. Sci. Congress, Tokyo, 1926, 1: 869–875, and other papers.

New Records of Two Ferns in Georgia

WILBUR H. DUNCAN

Since 1938, I have been attempting an extensive vegetation survey of the state of Georgia with a view to the ultimate preparation of a Flora of Georgia. Although I have been primarily concerned with certain other groups of vascular plants, I have made some observations and collections of pteridophytes with a view to contributing additional material to Rogers McVaugh and J. H. Pyron for their unpublished paper "Ferns of Georgia." Two collections, *Equisetum laevigatum* A. Br. and *Dryopteris Goldiana* (Hook.) A. Gray, are of particular interest because they represent range extensions into Georgia.

EQUISETUM LAEVIGATUM A. BR.

Collected on May 31, 1942 (*Duncan* 5282) in Banks County near the Habersham County line about 12 miles southwest of Toccoa, Georgia. This station is in the upper part of the Piedmont Province, at an elevation of about 750 feet above sea level. The plants were growing along and near the banks of the Middle Fork of Broad River in an open abandoned field a short distance below a waterfall. There were several small to large, rather dense colonies growing in sandy alluvium. The area apparently was occasionally inundated by flood waters. The outcropping rocks on the hillsides in the immediate vicinity consisted of granite gneiss with some occasional biotite gneiss and schist. The identification is by Rogers McVaugh of the University of Michigan.

Small (1938) gives the range for this species as extending south to North Carolina and Louisiana, no definite distribution in Georgia being indicated. On the distribution dot map for this species prepared by Schaffner (1939) one record for the extreme northwest corner of Georgia is shown. I have not seen the material upon which this record was based; if it is authentic, the Banks County specimens represent a southeastward extension of range in the United States. If it is not authentic, then the specimens probably represent a new state record.

DRYOPTERIS GOLDIANA (HOOK.) A. GRAY

Collected on August 10, 1947 (*Duncan* 7769) in the southern part of Union County, about one-fourth mile southeast of Wolfpen Gap in the Blue Ridge Province. This station is at an elevation of about 3,100 feet above sea level in a north-facing, rocky, boulder-strewn, broad ravine occupied by dense deciduous woods. The rocks are largely of biotite gneiss and schist. There were several colonies of the *D. Goldiana,* consisting of plants spaced a few feet apart among the boulders. Individual fronds were 125 cm. long or more.

Small (1938) gives the southern limit of this fern as North Carolina and Tennessee. The Georgia collection is sixteen miles south of the North Carolina line. Apparently then this is a new state record for Georgia and the southernmost station for this magnificent fern.

Specimens of these two fern collections are on file in the University of Georgia Herbarium, the *Equisetum* being No. 24,616, and the *Dryopteris* Nos. 26,529–26,532.

LITERATURE CITED

Schaffner, J. H. 1939. The Distribution of the Exclusively North American Species of *Equisetum*. Amer. Fern Journ. **29**: 45–47.

Small, J. K. 1938. Ferns of the Southeastern States. Science Press, Lancaster, Pa.

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The Ferns of Southern Chile

Gualterio Looser

(*Conclusion*)

Even at the extreme south of Tierra del Fuego well-developed forests of Fagaceae, Magnoliaceae, etc., are not lacking and certainly do not suggest polar conditions. And at present considerable wheat is grown along the Straits of Magellan. Nor is the situation much improved by the term subantarctic. The best proof that the southern regions are not Antarctic is the long list of pteridophytes from the Straits—all the more that, as is well known, few groups of plants avoid really cold climates as do the ferns.

The forests of southern Chile consist of tall, thick-trunked trees of *Nothofagus Dombeyi* (Mirb.) Blume, *N. obliqua* (Mirb.) Blume, and *N. betuloides* (Mirb.) Blume (Fagaceae), *Laurelia sempervirens* (R. & P.) Tul. and *L. Philippiana* Loos. (*L. serrata* Phil. non Bert.) (Monimiaceae), abundant Myrtaceae, *Lomatia hirsuta* (Lam.) Diels [L. *obliqua* (R. & P.) R. Br.], *L. ferruginea* (Cav.) R. Br., and *Embothrium coccineum* Forst. (Proteaceae), *Crinodendron Hookerianum* Gay (Elaeocarpaceae), and the beautiful tree *Eucryphia cordifolia* Cav., which in its season is covered with thousands of white flowers. It belongs to the small family Eucryphiaceae, related to Rosaceae; there are species in Australia as well. Other forest trees are the conifers *Saxegothea conspicua* Lindl., *Fitzroya patagonica* Hook., and *Pilgerodendron uvifera* (Don) Florin. For the most part these are more scattered.

The forest is moist and most of its trees are evergreen. Vines are not lacking and at least one of them, *Hydrangea integerrima* (Hook. & Arn.) Engl. (*H. scandens* Poepp. ex DC.), might well be called a liana. Its trunk is often as thick as a man's thigh. In all these characteristics these forests are very different from the usual types in temperate climates (which are deciduous or of evergreen conifers with needle-like leaves) and, of course with due allowances, recall tropical forests. To make this comparison more apt, epiphytes abound; the trunks and branches are covered, often to a great height, with a carpet of mosses, hepatics, and lichens. There are also phanerogamic epiphytes, such as *Mitraria coccinea* Cav. (Gesneriaceae), with thick orbicular leaves and red flowers, and the splendid bromeliad, *Fascicularia bicolor* (R. & P.) Mez. The latter grows astride the branches and often also on rocks. Its pale blue, crowded flowers are not very conspicuous, but by way of compensation the bases of the leaves which form the rosette are a brilliant scarlet-red, visible afar off. Another species of the same family is *Ochagavia Lindleyana* (Lem.) Mez. These bromeliads are found toward the north of the Valdivian forest; in all the south they are lacking.

The south of Chile, principally the provinces from Valdivia to the south of Aysén, has one of the notable fern-floras of the temperate zone. I believe that, in extra-tropical regions, New Zealand alone surpasses it, and that only because it possesses real tree-ferns, which southern Chile lacks, though *Lophosoria quadripinnata* often has fronds 6 or 7 meters long, borne on a short trunk. *Blechnum chilense* develops trunks 1 meter or a little more in height, and *B. magellanicum* often equals or even surpasses these dimensions and in general aspect and in its lustrous fronds greatly resembles cultivated cycads. These three species are very common and often cover clearings in the forest.

Lophosoria quadripinnata is a species of very wide range in America, from Mexico to southern Brazil, but its Chilean occurrence is completely isolated from the rest of its range by the deserts of northern Chile, the Andes, and the Argentine pampas. In Chile, because of the great size and beauty of its finely divided fronds and the bluish color of the lower surface, it is prominent in the landscape, much more so, doubtless, than in the tropics, where there are many large and handsome ferns to compete with it. The fronds of *Lophosoria* are sent to the cities, to be used for decorative purposes, and their collection is a local industry of some importance.

In the dense forest from Concepción southward, ferns abound. Besides the *Blechnums* already mentioned there grow, on the ground or on the banks of rivulets, *B. blechnoides* (Bory) Keys. (*B. valdiviense* C. Chr.), *B. penna-marina* (Poir.) Kuhn, *B. Leyboldtianum* (Phil.) C. Chr., and *B. asperum* (Klotzsch) Sturm, which are sometimes difficult to distinguish. They are herbaceous plants, small or middle-sized, not more than 50 to 70 cm. in height, and they all belong to the subgenus *Lomaria*, with dimorphic fronds. *Blechnum blechnoides* strongly resembles *B. Spicant* (L.) Roth, of Eurasia and the Pacific coast of the United States and Canada.

Of the subgenus *Eublechnum*, with isomorphic fronds, there are *B. auriculatum* Cav., of wide range in temperate South America, and *B. arcuatum* Rémy & Fée, which has handsome narrow fronds up to 1.5 meters long, very like those of cultivated *Nephrolepis*. It often grows beside small waterfalls, with its fronds pendent. *Blechnum Gayanum* (Rémy & Fée) Sturm [*B. Germainii* (Hook.) Christ] is very like *B. penna-marina* and is often difficult to distinguish from it. It grows in drier soil in the mountains at a certain altitude, and ranges from the province of Valparaiso to that of Llanquihue and perhaps farther south.

Other terrestrial ferns are the various *Polystichums* of the complex group of *P. aculeatum* (L.) Schott. They are very difficult to separate, but there are, no doubt,

LYCOPODIUM PANICULATUM. VOLCÁN ASORNO, PROVINCE OF LLANQUIHUE, 600 METERS.

some good species, such as *P. chilense* (Christ) Diels, *P. Brongniartianum* Rémy & Fée, and perhaps others. *P. multifidum* (Mett.) Moore, belonging to the same group, has much more conspicuous characters; it may be recognized by its finely divided fronds (up to quadripinnate) reaching 1 meter in length. In mountainous regions, principally among rocks at an altitude of 1,000 meters or more, one frequently meets with *P. mohrioides* (Bory) Presl. It is a very variable plant of somewhat fleshy consistency, a feature in which it differs from all the other *Polysticha,* which are rather strongly coriaceous. Its extreme forms, *P. mohrioides* var. *elegans* (Rémy & Fée) C. Chr. and var. *plicatum* (Kze.) C. Chr., differ so much that good botanists have considered them separate species. Some taxonomists treat *P. Lemmonii* Underw. and *P. scopulinum* (D. C. Eaton) Maxon of the western United States and Canada as additional varieties of *P. mohrioides.*

One of our handsomest ferns, frequent enough in the Valdivian forest, is the tall *Hypolepis rugulosa* (Labill.) J. Smith var. *Poeppigii* (Kunze) C. Chr. It has a creeping rootstock, from which the stipes come up rather far apart; it sometimes forms large colonies of attractive appearance, because of its finely divided fronds of a somewhat reddish tint. This fern ranges only to the northern limit of the Magellanic forest. There are scarcely distinguishable forms in New Zealand and Australia, far across the ocean, and closely related species in the tropics.

The great genus *Pteris,* principally tropical, has only two representatives in southern Chile. Apparently they do not extend beyond 44° S. and are rare. *Pteris semiadnata* Phil. has only slightly divided fronds, recalling a *Marattia*—a feature which suggested one of its synonyms, *P. marattiaefolia* Hook. *Pteris chilensis* Desv. resembles *P. tremula* R. Br., often cultivated in hothouses and in the open air. When well developed, these two pterids of southern Chile reach a height of 1 meter.

Other notable terrestrial ferns are: *Adiantum chilense* Kaulf., *Dryopteris spectabilis* (Kaulf.) Macl. & Dusén, and the species of Gleicheniaceae, especially *Dicranopteris squamulosa* (Desv.) Looser [*Gleichenia pedalis* (Kaulf.) Spreng.], which abounds as far as the Chonos Islands. Often it covers large areas or hangs like garlands on the sides of ravines. There is no lack of specimens, often large ones, of the most cosmopolitan of ferns, *Cystopteris fragilis* (L.) Bernh. I have seen material from the islands near Cape Horn, the "Land's End" of America. In marshy places, of which there are many, a tall form [var. *uliginosum* (Phil.) C. Chr.] of *Blechnum penna-marina*, *Dicranopteris cryptocarpa* (Hook.) Loos., and *D. quadripartita* (Poir.) Loos, which reaches the extreme south, are frequent. Much rarer, though covering nevertheless a wide range, is the little *Schizaea fistulosa* Labill., very like *S. pusilla* Pursh of eastern North America, known to many readers of the JOURNAL. It grows in marshes, forming scattered little colonies, and it is the only representative of its family in Chile.

Adiantum chilense, mentioned above, is known as far south as Río Aysén (45° 30′ S.) and, in addition, at an isolated station at Skyring (53°), a little north of the Straits of Magellan. Recently, Ilse von Rentzell found it east of the continental ice on the River León, a tributary of the large lake Buenos Aires, at about 47° S.,[9] so one may suppose that this distributional gap, which so impressed Skottsberg, will gradually be filled. *Adiantum excisum* Kunze, very abundant in the region of Santiago and Valparaiso, reaches only to the basin of the Río Biobío (37–38° S.), that is, it hardly penetrates into the area here covered.

[9] Federico Reichert e Ilse von Rentzell. Breve resumen de los resultados geográficos, geológicos y botánicos de la octava expedición patagónica. Darwiniana 7(1): 138–170. 2 maps, 4 pl. 1945.

Epiphytic ferns are abundant on the tree-trunks, principally *Polypodium Feuillei* Bert. [*P. Synammia* (Fée) C. Chr., *P. trilobum* Cav.], *P. Billardieri* (Willd.) C. Chr. var. *magellanicum* (Desv.) C. Chr., *Asplenium dareoides* Desv. (*A. magellanicum* Kaulf.), and *A. trilobum* Cav. Rarer in Chile is *Polypodium lanceolatum* L., with a wide range in both hemispheres. I have seen it in Concepción and the islands of Juan Fernandez and have specimens from the interior of the province of Valdivia (Puñire). Apparently it is not found in the southern part of our region.

I have referred to some species of *Asplenium;* it remains to mention others which live under very different conditions. *Asplenium obliquum* Forst. grows on rocks at the very margin of the ocean and is often lashed by the waves. It is definitely halophilous. It is also remarkable for its range; we find it again in Australia, New Zealand, and some of the Polynesian islands. It has apparently crossed the Pacific at its widest point. In Chile it is known from the province of Valparaiso to the northern half of western Patagonia (Isla Garza, 45° 55′ S.). *Asplenium monanthes* L., with a vast range in Africa, America, and the Hawaiian Islands, is known from a few stations in rocky and sunny places in the provinces of Cautín and Osorno, completely isolated from its principal area. *Asplenium triphyllum* Presl has been collected once at Lago San Martin, in Argentine territory but near the Chilean boundary. Its presence there is the more remarkable in that its nearest known station is 2,400 kilometers to the north.

The glory of the Chilean epiphytic ferns is its Hymenophyllaceae, a family represented chiefly by the genus *Hymenophyllum* with some 15 or 20 species, for the most part endemic in the southern forests. These delicate little plants, mingled with bryophytes and lichens, cover

LYCOPODIUM MAGELLANICUM. LAGUNA SAN RAFAEL, PROVINCE OF AYSÉN the trunks and branches of trees. Their fronds, which rarely are more than 20 cm. long and often no more than 4 to 8 cm., are usually several times divided. The blade consists of a single layer of cells, rather large and easily seen by transmitted light with a lens of moderate power. In some species the fronds are erect, in others pendent like bits of delicate lace in the dampness and shade of the forest; but let the humidity diminish or a ray of direct sunlight strike them and they dry up, blacken, and lose all their attractiveness. Some, like *H. falklandicum* Baker and *H. tunbridgense* (L.) J. E. Smith, grow on the ground as well as epiphytically. Compared with these, *H. caudiculatum* Mart. and *H. fuciforme* Swartz are veritable giants,[10] attaining 40 cm. in height. These large species have fronds much alike, but they are readily distinguished, since in the latter the fronds are clustered, whereas in *H. caudiculatum* they are scattered on a long, creeping rhizome.

Polymorphism in the Chilean Hymenophyllums is considerable. I have said that most of them have finely divided fronds, but there are exceptions. In *H. dicranotrichum* (Presl) Sadeb. the triangular blades, about 5 cm. long, are barely pinnatifid. In *H. cruentum* Cav. they are quite entire, a character which, with others, in my opinion justifies the placing of this fern in a genus of its own—*Hymenoglossum* Presl [*H. cruentum* (Cav.) Presl]. Another species has blades pinnate on one side only—very regularly, like a comb—hence its name *H. pectinatum* Cav. Similar, but less symmetrical, is *H. secundum* Hook. & Grev. Most of the species are glabrous, but in *H. ferrugineum* Colla, which occurs also on the islands of Juan Fernandez and in New Zealand, the blade is covered with silky hairs of a rusty color.

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[10] Christ writes of the latter species, "wohl die grösste Art des Genus." Geogr. Farne 326. 1910.

Nowhere else in temperate South America does *Hymenophyllum* reach so high a development as in the southern part of Chile.[11] On the other hand, *Trichomanes,* the other great genus of the family, is represented in our region by only a single species, *T. exsectum* Kunze, known from Valdivia to Chiloé and also on Juan Fernandez. Very common also in southern Chile down to Tierra del Fuego is *Serpyllopsis caespitosa* (Gaudich.) C. Chr., a little plant with pinnate blades, which one would hardly take for a fern at all but rather for an hepatic such as *Plagiochila.* Its peculiar characters are reflected in its nomenclature; it was placed variously under either *Hymenophyllum* and *Trichomanes* until van den Bosch, the distinguished Dutch pteridologist of the middle of the last century, set up for it the genus *Serpyllopsis,* monotypic, and endemic in southern Chile, adjacent Argentina, and Juan Fernandez.

Other pteridophyta in southern Chile are as follows. The genus *Elaphoglossum* is represented by three species, which I know only from the provinces of Valdivia, Osorno, and Llanquihue, that is, from the northern part of our area. They are: *E. Gayanum* (Fée) Moore, *E. Mathewsii* (Fée) Moore, and *E. Porteri* Hicken. The first two are found also outside of Chile.

The Lycopodiums are all terrestrial. In some parts of the provinces of Cautín and Valdivia the tall *L. paniculatum* Desv., which attains a height of 1 meter, is common. In the more southern part of our region *L. magellanicum* Sw. is found, in many forms, but more

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[11] Winkler's statement (in Verdoorn, Man. Pterid. 472. 1936), referring to southern Chile that "nirgends in Südamerika ist die Gattung *Hymenophyllum* so vielfältig" seems unjustifiable. It was perhaps taken from a passage in Christ (1. c. 326). But in a restricted area about Cuzco in southern Peru (13° S.), Herrera (Syn. Fl. Cuzco 1: 93–96. 1941) could record 21 species of *Hymenophyllum* and it seems likely that there are a considerably larger number in Peru. Many years ago Sodiro (Crypt. Vasc. Quit. 16–21. 1893) could cite for Ecuador the same number of species as did Herrera for the Cuzco region.

rare. It may be considered a species corresponding to *L. clavatum* L., of circumboreal regions. I have specimens which show an extraordinary resemblance to that species, but in the South American plant the leaves are never bristle-tipped. *Lycopodium magellanicum* not only extends to Cape Horn but, according to Skottsberg,[12] is found also on some islands along the margin of the Antarctic, such as South Georgia, Falkland Islands, Kerguelen, and Tristan d'Acunha. Other Chilean ferns which are found on South Georgia are, according to the same author,[13] *Hymenophyllum falklandicum, Cystopteris fragilis,* and *Polystichum mohrioides* (as *P. andinum*). Almost all the pteridophytes of the Falkland Islands (Malvinas) occur in southern Chile; at least from a pteridological point of view, these islands—and South Georgia also—may be considered as extensions, much impoverished, of the south-Chilean flora.

After this digression, we return to *Lycopodium*. Other Chilean representatives are: *L. confertum* Willd., of which a few collections are known; *L. Gayanum* Rémy (*L. Jussieui* auctt.), more frequent and relatively common in the Valdivian forest; and, in Tierra del Fuego, a form (*L. fuegianum* Roiv.) difficult to separate from *L. Selago* L. of northern Eurasia and North America. *Lycopodium chonoticum* Phil. is a doubtful species, near *L. confertum*.

In all Chile there is not a single species of the great subcosmopolitan genus *Selaginella*. Neither has *Anogramma*, widely distributed in America and even in Asia, nor the cosmopolitan *Pteridium* been found there. The strange thing is that all three genera just mentioned occur in Argentina; they have not been able to cross the

[12] Carl Skottsberg, Die Gefässpflanzen Südgeorgiens. Stockholm. 1905.

[13] Carl Skottsberg, A botanical survey of the Falkland Islands. Svensk Vet. Akad. Handl. 50 (3): 1–129. 1913.

Andes. This great mountain-chain, the deserts, and the Pacific Ocean give Chile an almost insular character and account for the pecularities of its flora and fauna.

In certain lakes in southern Chile and Argentina *Isoëtes Savatieri* Franch. has been observed. It is the only *Isoëtes* in the region. *Azolla filiculoides* Lam. (Salviniaceae) is known from the extreme north of Chile to the Straits of Magellan. *Pilularia americana* A. Br. (Marsileaceae) occurs at Valdivia.

Some species of *Ophioglossum* and *Botrychium* have been collected in our area.[14] *Equisetum bogotense* H. B. K., a small plant of wide range in South America and frequent in Chile, is known as far south as the region of Aysén. *Equisetum giganteum* L., which often attains a height of 4 meters, according to data at hand scarcely reaches the Río Biobío (Renaico, 37° 30′ S.).[15] Apparently the greater part of the region here treated lacks Equisetaceae. Further exploration may show, as in other cases, that this supposition is incorrect.

Even more unexpected than the presence of *Lycopodium Selago* in Tierra del Fuego, above referred to, since that species has been collected at intervening stations in Ecuador[16] and Peru,[17] are various collections in the Andes of Chile of the European *Cryptogramma crispa* (L.) R. Br., from the province of Colchagua (Tinguiririca, 34° 30′ S.) to that of Biobío (Nitrito, 38° S.). Recently I have recorded its presence still farther south.

[14] For these very difficult genera, still little collected in Chile and Argentina, see the excellent work of Juana S. de Lichtenstein, Las Ofioglosáceas de la Argentina, Chile y Uruguay. Darwiniana **6**: 380–441. 14 fig. 1944.

[15] According to Ada L. Pastore, Physis **15**: 248, 1939, *E. giganteum* in Argentina reaches 40° S.

[16] Sodiro, l. c. 561. Nessel (Die Bärlappgewächse [Lycopodiaceae], p. 34, 1939) doubts this, saying that he has seen no material from Ecuador.

[17] Marie-Victorin, Les Lycopodinées du Québec, p. 94, 1925: "et peut-être dans les Andes péruviennes."

in Nahuel-Huapi (41° S.), in Argentina,[18] and I have little doubt that some day it will be found in the adjacent part of Chile. The typical phase of the species inhabits Europe and western Asia. We have here one of the most disjunct ranges imaginable, since this species has never been found elsewhere in tropical America. The plant of the southern Andes differs slightly from the European and may be given varietal designation (var. *chilensis* (Christ) Loos.). It differs much more markedly from *C. acrostichoides* R. Br. of temperate, boreal, and subarctic America. The distribution of *C. crispa* can be compared only with that of *Pleurosorus.*

Finally, I must not fail to record an important recent discovery. In November, 1944, Augusto Grosse found *Histiopteris incisa* (Thunb.) J. Smith on the island of Garza (45° 55′ S.), in the Estero de los Elefantes, a little north of the Peninsula of Taitao. A year later he found it again in the same place; it may be expected at other localities in western Patagonia. This fern has an immense range, from southeastern Asia to New Zealand and South Africa, and over most of tropical America. In Chile it had previously been known only from Juan Fernandez, where it is frequent. There have been vague references in literature to its occurrence in southern Chile; but Skottsberg, who has made the most thorough studies of this region, does not mention it.

Santiago, Chile.

APPENDIX I

Pteridophytes of the Region of Corral, Niebla, and the City of Valdivia

This region, bordering on the Pacific Ocean, lies at about 39° 30′ S. Lat. and has an elevation up to 400 meters.

Meteorological data from Punta Galera, a few kilometers south of Corral (according to Skottsberg): Average temperature, 11.4°

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[18] Looser, Las Pteridofitas del Parque Nacional de Nahuel-Huapi. Physis 15: 231. 1939.

C.; average maximum, 13.7°; average minimum, 8.7°; absolute maximum, 23.8°; absolute minimum, 0.8°. Average humidity, 82.2%. Annual rainfall, 2460.7 mm. Rainfall in the spring months, 8.8%.

Adiantum chilense Kaulf. Very common.
    sulphureum Kaulf. Less common than the preceding.
Asplenium dareoides Desv. (*A. magellanicum* Kaulf.) Very common, almost always epiphytic.
    obliquum Forst. Only on rocks on the seashore.
    trilobum Cav. Common epiphyte.
Azolla filiculoides Lam. Floating in slow-flowing streams.
Blechnum arcuatum Rémy & Fée. In shaded and humid places.
    asperum (Klotzsch) Sturm. Beneath trees and shrubs.
    auriculatum Cav. Common.
    blechnoides (Bory) Keys. (*B. valdiviense* C. Chr.). Very common.
    corralense Espinosa. One of the smaller species of the genus, known only from the port of Corral; prefers small holes in the rocks.
    chilense (Kaulf.) Mett. Very common and of physiognomic importance because of its large size.
    Leyboldtianum (Phil.) C. Chr. Very like *B. blechnoides.*
    magellanicum (Desv.) Mett. Frequent and very large. Sometimes with a trunk 1 m. or more tall.
    penna-marina (Poir.) Kuhn. Abundant in wet, marshy places,
Cystopteris fragilis (L.) Bernh. Common.
Dicranopteris cryptocarpa (Hook.) Loos. Common.
    litoralis (Phil.) Loos. Scarce.
    quadripartita (Poir.) Loos. Scarce.
    squamulosa (Desv.) Loos. [*Gleichenia pedalis* (Kaulf.) Spreng.] Very common.
Elaphoglossum Gayanum (Fée) Moore. Scarce.
Equisetum bogotense H.B.K. Common throughout.
Hymenoglossum cruentum (Cav.) Presl
Hymenophyllum caudiculatum Mart.
    cuneatum Kunze (*H. terminale* Phil.).
    dentatum Cav. Very common.
    dicranotrichum (Presl) Sadeb. (*Trichomanes spinulosum* Phil.)
    fuciforme Swartz. Apparently scarce in this region; plant 0.4 m. tall.
    Krauseanum Phil.
    magellanicum Willd.
    pectinatum Cav. Very common.
    plicatum Kaulf. (*H. dichotomum* auctt.). Very common.
    tortuosum Hook. & Grev.
    tunbridgense (L.) J. E. Smith. The same as the European type?
Hypolepis rugulosa (Labill.) J. Smith var. *Poeppigii* (Kunze) C. Chr. The typical form is Australian.
Lophosoria quadripinnata (Gmel.) C. Chr. [*Alsophila pruinata* (Swartz) Kaulf.]. Very abundant and of great physiognomic importance because of its large size and beauty.

Lycopodium Gayanum Rémy (*L. Jussieui* auctt.)
magellanicum Swartz. (including *L. erectum* Phil.)
paniculatum Desv. Very common in some places and decorative; up to one meter tall.
Ophioglossum crotalophoroides Walt. Cited for Corral by Mettenius (Fil. Lechl. 27. 1856) as *O. bulbosum* Michx.
Pilularia americana A. Br.
Polypodium Billardieri (Willd.) C. Chr. var. *magellanicum* (Desv.) C. Chr. Frequent epiphyte: the type is from Australia.
Feuillei Bert. [*P. Synammia* (Fée) C. Chr.]. Very common epiphyte; also on walls.
lanceolatum L. Rare epiphyte; widespread tropical species.
Polystichum adiantiforme (Forst.) J. Smith. Rather common, its range very wide and not confined to America.
Brongniartianum Rémy & Fée [*P. aculeatum* (L.) Schott, pro parte].
chilense (Christ) Diels [*P. aculeatum* (L.) Schott, pro parte; *P. vestitum* auctt.]
Pteris semiadnata Phil. Handsome fern up to 1 meter; rare.
Schizaea fistulosa Labill. Rare, though of wide range. In Chile known from Corral (39° 30′ S.) to the peninsula of Taitao (46°) and besides in Malvinas (Falkland Islands), Australia, New Zealand, New Caledonia and Auckland Islands.
Serpyllopsis caespitosa (Gaud.) C. Chr.
Trichomanes exsectum Kunze. Rare.

APPENDIX II

LIST OF THE PTERIDOPHYTES OF THE REGION OF THE PENINSULA OF TAITAO AND THE ISTHMUS OF OFQUI (46–47° S.)

(Compiled from publications of Espinosa, Franchet, Roivainen, Skottsberg, and the collections of the author.)

Pluviometric data from Cabo Raper, 40° 50′ S., on the west coast of the peninsula of Taitao, according to Jefferson: Annual rainfall, 1933 mm.; in the winter months (April–Sept.), 49%; in the three spring months (Dec.–Feb.), 26%.

Asplenium dareoides Desv.
obliquum Forst.
Blechnum arcuatum Rémy & Fée
magellanicum (Desv.) Mett.
penna-marina (Poir.) Kuhn
Dicranopteris quadripartita (Poir.) Loos.
Histiopteris incisa (Thunb.) J. Smith
Hymenoglossum cruentum (Cav.) Presl
Hymenophyllum caudiculatum Mart.
Darwinii Hook. f.
dentatum Cav.
dicranotrichum (Presl) Sadeb.
ferrugineum Colla
Krauseanum Phil.

magellanicum Willd.
pectinatum Cav.
plicatum Kaulf.
secundum Hook. & Grev.
tortuosum Hook. & Grev.
Hypolepis rugulosa (Labill.) J. Smith var. *Poeppigii* (Kunze) C. Chr.
Lophosoria quadripinnata (Gmel.) C. Chr.
Lycopodium magellanicum Swartz
paniculatum Desv.
Ophioglossum crotalophoroides Walt.
Polypodium Billardieri (Willd.) C. Chr. var. *magellanicum* (Desv.) C. Chr.
Polystichum multifidum (Mett.) Moore
Schizaea fistulosa Labill.
Serpyllopsis caespitosa (Gaud.) C. Chr.

APPENDIX III

List of the Pteridophyta of the Chilean Part of Tierra del Fuego, the Shores of the Straits of Magellan, and Adjacent Regions [19]

Pluviometric data for the Straits of Magellan, according to Jefferson:

Islas Evangelistas, 52° 24′ S., at the Pacific entrance to the Straits: Annual rainfall, 3078 mm.; in the six winter months, 49%; in the three spring months, 27%.

Punta Arenas, 53° 10′ S., more or less at the center of the Straits: Annual rainfall, 470 mm.; in the six winter months, 61%; in the three spring months, 19%.

Punta Dungeness, 52° 24′ S., at the outlet into the Atlantic: Annual rainfall, 219 mm.; in the six winter months, 58%; in the three spring months, 28%.

Asplenium dareoides Desv.
Azolla filiculoides Lam.
Blechnum magellanicum (Desv.) Mett.
penna-marina (Poir.) Kuhn
Botrychium Lunaria (L.) Swartz var. *Dusenii* Christ
matricariaefolium A. Br. ssp. *patagonicum* (Christ) Clausen. Cited by Sra. de Lichtenstein from Ultima Esperanza and Punta Arenas.
Cystopteris fragilis (L.) Bernh.
Dicranopteris cryptocarpa (Hook.) Loos.
quadripartita (Poir.) Loos.
Hymenophyllum Darwinii Hook. f. (*H. Skottsbergii* C. Chr.)
dentatum Cav.
falklandicum Baker
ferrugineum Colla

[19] This list makes no claim to completeness, many parts of the territory being still unexplored.

magellanicum Willd.
pectinatum Cav.
peltatum (Poir.) Desv.
plicatum Kaulf.
secundum Hook. & Grev.
tortuosum Hook. & Grev.
Isoëtes Savatieri Franchet
Lycopodium confertum Willd.
magellanicum Swartz
Selago L. (*L. fuegianum* Roiv.)
Polypodium Billardieri (Willd.) C. Chr. var. *magellanicum* (Desv.) C. Chr.
Polystichum adiantiforme (Forst.) J. Smith
mohrioides (Bory) Presl
multifidum (Mett.) Moore
Serpyllopsis caespitosa (Gaud.) C. Chr.

Two New Generic Names of Ferns

CLYDE F. REED

Among the new genera proposed by Copeland in his recent Genera Filicum is one which caught my attention, the genus *Polypodiopsis.* This generic name has already been used for a genus of plants in the family Taxaceae from New Caledonia. For the species segregated as the genus *Polypodiopsis* of Copeland, the following generic name may be used.

Polypodiopteris Reed, *nom. nov.*
Polypodiopsis Copeland, Gen. Fil. 210. 1947. *non* Carr. Conif., *ed. 2,* 710. 1867.

The type is *Polypodium proavitum* Copel. The three species are all Bornean:

Polypodiopteris **proavita** (Copel.) Reed, *comb. nov.*
Polypodium proavitum Copel., Philip. Journ. Sci. **3C**: 347. 1909.

Polypodiopteris **colorata** (Copel.) Reed, *comb. nov.*
Polypodium coloratum Copel., Philip. Journ. Sci. **3C**: 347, *pl. 6.* 1909.

Polypodiopteris **brachypoda** (Copel.) Reed, *comb. nov.*
Polypodium brachypodium Copel., Philip. Journ. Sci. **12C**: 62. 1917.

Another generic name proposed by Copeland (1938) is *Crepidopteris*, a name used again in the Genera Filicum (39. 1947) for several species of ferns found from Sumatra and Luzon to Tahiti, and south to New Zealand. The type of the genus is *Crepidopteris humilis* (Forster) Copeland, based on *Trichomanes humilis* Forster. Copeland states that this species is widespread, and has more synonyms than its limited variability justifies. It seems as if another name must be found, inasmuch as *Crepidopteris* Presl (in Sternb., Flora der Vorwelt, **2**: 119. 1838), a group of species of fossil ferns (now referred to *Danaeopsis*), and *Crepidopteris* Benth. (Fl. Brasil XV. **1**: 166. 1859), a group of flowering plants of the family Leguminosae (= *Dioclea* H.B.K.), both antedate the publication of Copeland's generic name. Neither of the generic names listed as synonymous with *Crepidopteris* by Copeland are available. *Crepidium* Presl (Hymen., 23, as section of *Didymoglossum*. 1843; Epim. Bot., 258, as genus, 1849) is antedated by *Crepidium* Blume (Bijdr., 387. 1825) of the Orchidaceae (= *Microstylis* Nutt.). Also *Crepidomanes* v.d. Bosch (Hymen. Javan. 16. 1861) is antedated by *Crepidomanes* Presl (Epim. Bot. 258. 1849) of the Hymenophyllaceae.

On the basis that either of the previous uses of the generic name *Crepidopteris* might be reestablished, it would be better to employ a new generic name for Copeland's genus, than to suggest that his generic name be conserved. Therefore, the following generic name is proposed:

Crepidophyllum Reed, *nom. nov.*

Crepidopteris Copel. Philip. Journ. Sci. **67**: 57. 1938; Genera Filicum, 39. 1947, *non* Presl, in Sternb. (1838), nec Benth. (1859).

The type is *Crepidophyllum humile* (Forst.) Reed. (*Trichomanes humilis* Forst.).

12468

Crepidophyllum **humile** (Forst.) Reed, *comb. nov.*
Trichomanes humilis Forst. Prod. 84. 1786. Sumatra to Tahiti.

Crepidophyllum **Endlicherianum** (Presl) Reed, *comb. nov.*
Trichomanes Endlicherianum Presl, Abh. Böhm. Ges. V. **5**: 33. 1848; Epim. 10, *pl. 5A.* 1849. New Zealand to Norfolk Isl., Fiji, Tahiti.

Crepidophyllum **gracillimum** (Copel.) Reed, *comb. nov.*
Crepidopteris gracillima Copel., Philip. Journ. Sci. **67**: 57–58. 1938. Luzon.

Crepidophyllum **Vieillardii** (v.d.Bosch), Reed, *comb. nov.*
Trichomanes Vieillardii v.d.Bosch, Ann. Sci. Nat. IV **15**: 90. 1861. New Caledonia.

Crepidophyllum **Werneri** (Rosenst.) Reed, *comb. nov.*
Trichomanes Werneri Rosenst., Fedde Repert. **5**: 35. 1908. New Guinea.

MOREHEAD STATE TEACHERS COLLEGE, MOREHEAD, KENTUCKY.

Ferns of Fairview Mountain, Calapooya Range, Oregon

WILLIAM H. BAKER

Fairview Mountain is located in the Bohemia District, southeastern Lane County, Oregon. The mountain is part of the Calapooya Range, a subsidiary connecting range between the Cascade and Coast ranges at the head of the Willamette Valley. It is 32 air miles west of the main crest of the Cascade Divide and is one of the highest peaks in this region, reaching an elevation of 5,933 feet.

According to Smith (4), the lower part of the Calapooya formation is dominantly sedimentary, while the upper part is mostly igneous. The lower or sedimentary phase of the Calapooya is made up for the most part of pyroclastics or coarse breccias and agglomerates, all of these being different facies of volcanic materials of more or less explosive origin. Mud flows are also present in this region. The upper igneous phase consists largely of different types of andesitic, dacitic and basaltic flows. The mountains in this area are made up predominantly of tertiary sediments and related intrusive igneous rocks, basalts and andesites, which are the result of folding and faulting, peneplanation and later dissection by rejuvenated streams. They do not seem to present any regular pattern. The topography is in that stage usually designated as mature.

Collections of ferns were made through the seasons of 1937, 1938 and 1940 with additional trips in 1946 and 1947, all the specimens being deposited in the Oregon State College Herbarium or held in the private herbarium of the author.

The area covered was limited as follows: the northwest slope to the middle of Fairview-Elephant saddle at 5,300 feet; the southwest slope to the middle of Fairview-Bohemia saddle at 5,300 feet; on the southeast slope to the Musick Guard Station, and on the south slope to the headwaters of City Creek. In general this corresponds to the 4,500 foot contour line on the mountain given by the U.S.G.S. topographic map of the Lowell Quadrangle.

Catalogue of Ferns

Polypodiaceae

CYSTOPTERIS FRAGILIS (L.) Bernh. Bladder-fern. Growing on a cliff near the Bohemia saddle; occasional.

POLYPODIUM VULGARE L. var. OCCIDENTALE Hook. Licorice-fern. Along a stream on the north slope; common.

POLYPODIUM VULGARE L. var. COLUMBIANUM Gilbert. Mountain licorice-fern. Growing at the top of the northwest slope among the rocks; not common.

POLYSTICHUM LONCHITIS (L.) Roth. Holly-fern. On the north slope near the top, growing among the boulders and rocks; occasional.

POLYSTICHUM MUNITUM (Kaulf.) Presl. Common sword-fern. In woods of the north slope and at lower elevations along the Utopian Way; fairly common.

ATHYRIUM AMERICANUM (Butters) Maxon. Alpine lady-fern. On the north slope near the summit of the mountain; occasional.

ATHYRIUM FILIX-FEMINA (L.) Roth. Lady-fern. About springs and watercourses; common.

STRUTHIOPTERIS SPICANT (L.) Weis. Deer-fern. Common along watercourses and in dense forests on the north slope.

ADIANTUM PEDATUM L. var. ALEUTICUM Rupr. Western maidenhair. West slope along the Utopian Way; common.

PTERIDIUM AQUILINUM (L.) Kuhn var. PUBESCENS Underwood. Western bracken. Common around the Musick Guard Station.

CHEILANTHES GRACILLIMA D. C. Eaton. Lace-fern. Common on the summit, growing on rock slopes and outcroppings.

CRYPTOGRAMMA ACROSTICHOIDES R. Br. American parsley-fern. Fairly common at high elevations among the rocks.

BIBLIOGRAPHY

1. Abrams, LeRoy. An Illustrated Flora of the Pacific States. Stanford Univ. Press, vol. 1, 1923.
2. Peck, Morton E. A Manual of the Higher Plants of Oregon. Binfords and Mort, Portland, 1941.
3. Piper, C. V. and R. K. Beattie, Flora of the Northwest Coast. New Era Printing Co., Lancaster, 1915.
4. Smith, Warren D. The Geology and Mineral Resources of Lane County, Oregon. Oregon Dep. Geol. and Mineral Resources Bull. 11, 1938.

OREGON STATE COLLEGE, CORVALLIS, OREGON.

Shorter Notes

SOME NEW HAMPSHIRE FERNS.—Botanists everywhere have welcomed Edith Scamman's valuable monograph "Ferns and Fern Allies of New Hampshire." While this monograph was in press one new fern was added to the New Hampshire flora. Neal Gilbert, a student of Dartmouth College and an enthusiastic fern hunter, found a single small plant of ×*Asplenosorus ebenoides*. This plant was found on a large boulder, on which *Camptosorus rhizophyllus* was growing, in Lyme, New Hampshire. A photograph of it has been deposited in the Gray Herbarium. The writer and Mr. Gilbert visited the station in October. Due to the severe drought the hybrid and most of the walking fern plants were badly dried.

Miss Scamman credits New Hampshire with two localities for *Athyrium pycnocarpon*—Alstead and Hanover. The Hanover station reported by Jesup apparently disappeared some time ago. From Jesup's botanical notes, discovered many years ago, it was found that the station for this fern was in the southwestern part of town. The writer and others tried to relocate the station 20 or more years ago. The approximate site was found, but no plants. In 1943 a group of amateur Hanover botanists was exploring the Connecticut Valley region in the northern part of town and Mr. N. L. Goodrich, Librarian of Dartmouth College, found in a shaded ravine a fine stand of this *Athyrium* with nearby a few plants of *Dryopteris Goldiana*. Although fronds were collected and pressed for the Jesup Herbarium at Dartmouth, they somehow disappeared and not until last year (1947) were fronds deposited in the College herbarium. These were collected by Professor Poole of the Botany Department. Specimens were also sent to the Gray Herbarium. It is difficult to account for the scarcity of this fern in New Hampshire. Just across the river in Vermont it is fairly common, and several stations within a few miles of Hanover are known.—HAROLD G. RUGG, *Dartmouth College.*

BOTRYCHIUM RANGE EXTENSIONS IN WEST VIRGINIA.—The discovery of *Botrychium simplex* in Upshur County, West Virginia, represents a considerable range extension. The nearest, and only other known West Virginia station, is near Terra Alta, Preston County, some sixty miles to the northeast.[1] Only four plants of *B. simplex* were found, but search in the vicinity revealed seventy-five plants or more of *B. lanceolatum* var. *angustisegmentum.* This grapefern, having been previously discovered in only three counties in the State, is considered quite rare. However, more extensive searches in suitable localities may reveal other stations for both species. The find was made July 30, 1947, by the author, near the Upshur County Youth Camp at Selbyville, West Virginia. The plants were growing on a steep, wooded talus slope at an elevation of about 2,000 feet above sea-level. As is the case at the Terra Alta station, plants of every *Botrychium* known in West Virginia are to be found nearby.—R. M. Tetrick II, *Buckhannon, West Virginia.*

Recent Fern Literature

Readers of the Fern Journal may recall that Prof. Martens of the University of Louvain recently recorded the discovery of curious glandular organs among the sporangia in the sori of *Polypodium virginianum.*[2] This discovery has led him to investigate, with the aid of a

[1] This JOURNAL 33: 140–41, 1943.
[2] This JOURNAL, 37: 124. 1947.

pupil, Mlle. Nelly Pirard, the nature of similar structures in other species, commonly interpreted as abortive or modified sporangia. Tracing the development of these structures from their early stages, he finds that in most of the 50 species studied they are not modified sporangia at all, but often glandular and in the nature of hairs.

In two cases only, *Polypodium virginianum*, already described, and *Vittaria scolopendrina* were real modified sporangia found. In the *Vittaria*, these begin growth in the normal manner, but the cells of the pedicel soon become enlarged and secrete tannin. The development of the spore-bearing capsule is retarded and sometimes prevented altogether. When it does develop to maturity it is perched at the top of a swollen, glandular organ. Under these circumstances, the annulus does not function in the usual way, but remains inactive; the whole capsule falls off, leaving a hole at the base through which the spores escape.[1]—C. A. WEATHERBY.

A comprehensive treatment[2] of the ferns of Guam has been published by Warren H. Wagner, Jr., and David F. Grether. The two authors visited the island of Guam 25 times between December 1944 and June 1946, while serving in the Naval Air Transport, and made numerous collections of the pteridophytes. They were assisted in the work by a number of other servicemen who had organized the Guam Society of Natural Sciences, which met weekly at the town of Agaña. These collections have been worked up carefully at the University of California. Fifty-seven species are definitely reported from Guam. This is about one-fifth of the total number of indigenous vascular plants known from the island. Ten of the species are here reported from Guam for the first

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[1] Martens, P. Formations sporangiales et "parasporangiales" chez quelques fougères. Bull. Soc. Roy. Bot. Belgique, **79**: 45–47 (1947).

[2] Pteridophytes of Guam. Bernice P. Bishop Mus. Occas. Papers **19**: 25–99. 1948.

time. *Cyclosorus maemonensis* is described as new. All species are keyed and described, and a number are illustrated by photographs also.—C. V. M.

M. A. Chrysler and J. L. Edwards have published[1] a book on the ferns of New Jersey that ought to be in every fern student's library. It represents the results of years of careful study and checking of records. A total of 77 species are fully treated, each with a description, illustration, and distributional map. The treatment is conservative and the nomenclature up to date. Chapters are included on the general structure and life history of ferns, on factors determining distribution, classification, nomenclature, and hybrids. There is a glossary of technical terms.—C. V. M.

"Flora of Delaware and the Eastern Shore"[2] includes an annotated list of the ferns and fern allies of the peninsula of Delaware, Maryland, and Virginia. There are only 56 species listed, which indicates that the fern flora is not especially rich. Among the rarities are *Lygodium*, *Asplenium pinnatifidum*, *Dryopteris celsa*, *D. atropalustris*, and *Isoëtes riparia*, each known from a single station, in some cases no longer in existence. There are no keys or descriptions.—C. V. M.

American Fern Society

On Monday, September 13, the American Fern Society held a field trip to the Shenandoah National Park in company with the American Society of Plant Taxonomists and the Mycological Society of America. Among our members present were J. E. Benedict, Jr., S. F. Blake, Donovan S. Correll, Mrs. W. D. Diddell, Joseph Ewan, Mildred Faust, F. R. Fosberg, Mary E. Humphreys, Elva

[1] The Ferns of New Jersey. Rutgers University Press, New Brunswick, New Jersey. 1947 ($4.00).

[2] By Robert R. Tatnall, pp. 1–313. 1946. Published by the Society of Natural History of Delaware, Wilmington Institute Free Library, Wilmington 28, Delaware.

Lawton, Elbert L. Little, Jr., C. V. Morton, H. W. Truesdell, and Edgar T. Wherry. We left Washington in private cars about 8:00 A.M. and arrived at Panorama, on the Skyline Drive, about 10:00 o'clock, where we were met by a park naturalist, who gave a general permit for collecting. The admission fee to the park was kindly waived. We first visited Little Stony Man Mountain in search of forms of *Lycopodium Selago*, but these were not found, unfortunately. Lunch was taken at Skyland and then we proceeded to Big Meadows, where we were successful in locating specimens of *Botrychium multifidum* at its recently discovered southernmost station. The plants were fairly abundant in a limited area. Among the other pteridophytes noticed by the writer were *Botrychium dissectum* and its variety *obliquum*, *Athyrium asplenioides*, *Cystopteris fragilis*, *Woodsia ilvensis*, *Polypodium virginianum*, *Onoclea sensibilis*, *Asplenium platyneuron*, *Thelypteris palustris*, *Polystichum acrostichoides*, *Dryopteris marginalis*, and *Selaginella rupestris*.—C. V. M.

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American Fern Journal

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Contents

[It was our original plan to issue a special enlarged number of the Journal in honor of Dr. Maxon on the occasion of his retirement as Editor-in-chief of the Journal, as a testimonial of the esteem in which he was held by the members of the American Fern Society. A number of his colleagues in fern study were invited to write papers especially for the occasion. Unfortunately, Dr. Maxon's death has made it necessary to change this testimonial number into a memorial number. Ed.]

[Volume 38, No. 3, of the JOURNAL, pp. 65–96, was issued October 11, 1948.]

William R. Maxon

C. A. Weatherby

William Ralph Maxon was born at Oneida, New York, February 27, 1877, the eldest child of Samuel Albert and Sylvia Louisa (Stringer) Maxon. His father was for many years editor of a local newspaper, the Oneida Democratic Union. He was a man careful and precise in his editorial work and, beyond it, of wide interests and culture, of taste, discernment and high standards. Happily, the boy, as he grew up, found his father especially congenial and in Sunday walks about the countryside acquired the love of natural history and the habit of careful observation which were to determine his career. He was also much influenced (as many of us are; therein lie the responsibility and the opportunity of the teaching profession) by one of his teachers, Miss Susan Chase, whose subjects were English and Latin. He graduated from the local high school in 1894 with honors in those subjects. How sound and thorough Miss Chase's instruction was may be gathered from the fact that when, after thirty years of disuse, he began to write Latin in technical diagnoses, their relative elegance and idiomatic quality were at once apparent. The combined and lasting influence of both father and teacher may be traced in the always well rounded and careful, slightly formal style of his published papers[1] and in the endless care and effort he bestowed both on his own writings and those he was called upon to edit; and that of his father, at least, in greater things. Indeed, the haltingly expressed, but obviously sincere, encomiums in the obituary of the father could be applied,

[1] Any formality disappeared in his personal letters; the care, never. I well remember his exasperation at a series of misplaced semicolons in a Fern Society document.

WILLIAM R. MAXON

verbatim, to the son.[2]

William entered Syracuse University in 1894. He had an active, pleasant, and profitable college career. Naturally, he took part in editorial work on college publications. An excellent singing voice and a sense of absolute pitch were utilized on the Glee Club. Throughout, his interest in natural history, fostered by the sympathy of both parents, not only increased, but became focused on ferns, beginning, appropriately, with the hart's-tongue, one of the chief floristic features of the Syracuse region. In his senior year he read a paper on the distribution of this species before the local Academy of Sciences; and his graduating thesis was entitled "A Contribution to the Biology of the Hart's-tongue Fern." By that time he had decided to devote himself to the study of ferns and in the summer of 1898 went to New York for post-graduate work with Prof. L. M. Underwood. His immediate association with Underwood was brief, though continued at longer range in subsequent years; but I think the influence of the older man's keen and incisive mind might be traced, at least in the younger's earlier work.[3]

Late in 1898 Maxon was offered a temporary position in the United States National Museum and, after due consideration, accepted it and reported for work at Washington on January 9, 1899. "I think I shall like it," he wrote at the time; he liked it well enough to hold the appointment, soon made permanent, for the rest of his active life, passing through the various grades to the post of Curator of Plants and retiring, with that title, in 1946. In 1922, Syracuse University conferred on him the honorary degree of Doctor of Science.

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[2] "Exactness was one of his hobbies . . . with him a thing worth doing was worth doing well. . . . He considered the finer things of life and good books, ennobling thoughts and right friends were his constant companions. He was a most enjoyable companion." Oneida Democratic Union, May 26, 1927.

[3] There is no trace, however, of Underwood's combativeness nor of his occasional tendency to cocksureness.

In spite of a great amount of routine, the life of a curator in a first-rate museum is neither monotonous nor devoid of varied interest. Bits of new and significant knowledge pass constantly through his hands; and the frequent contacts with scientists in all branches are both pleasant and stimulating. Nevertheless, the mere keeping in order of a large collection, so that it can be effectively used, takes a heavy toll of time and energy. Dr. Maxon was an excellent curator, with a marked instinct for order and administrative precision. In his forty-odd years of service, by a vast amount of determinative work, by correspondence, exchange and purchase, he built up the fern collection at the National Museum from negligible proportions to the finest, both in quantity and quality, on this side of the Atlantic.[4] As with other good curators, the price of this was a considerable curtailment of investigation. The treatment of the ferns in the North American Flora, barely begun, and that in the British Museum's Flora of Jamaica, projected and worked upon largely, but never got on paper, are examples of the sacrifices required. He once remarked that his curatorial records, complete for forty years, were as much the history of what he had not done as of what he had.[5]

Government service offers its men periodic opportunities for field work. During the years 1903 to 1926, Dr.

[4] Dr. Maxon calculated it at approximately 150,000 specimens, exceptionally well determined and arranged. Though devoted to the interests of his own institution and keen in furthering them, he was by no means unmindful of others. Most American herbaria have profited from his generous policy in exchange.

[5] He could be philosophical about this. "As to the routine interruptions," he wrote in reply to some complaint of mine, "they cannot be helped; they are part of the game (and especially so in a government institution); and the only thing to do is not to let them get under your skin. I found, abroad, pretty much the same condition—a mournful satisfaction, if one may call it that. —I ought not to complain and shall try not to."

One expenditure of time, often considerable, he never grudged—that used, gladly and generously, in helping young men beginning their professional careers.

Maxon made nine considerable excursions to the American tropics, visiting Jamaica (repeatedly), Cuba, and various places in Central America, and making extensive collections of both ferns and flowering plants. He meditated other trips to the South American Andes, but a heart-attack in 1931—the beginning of a long period of slowly declining health—put a conclusive stop to exploration.

In 1928 and 1930 he worked in European herbaria, especially at London, Copenhagen and Berlin. On the second visit, he attended the International Botanical Congress at Cambridge, England—a pleasant and stimulating experience. He was appointed to the Committee on Nomenclature of the Congress, but declined to serve, having no interest in the technicalities of that subject. The photographs and other data in regard to type specimens which he brought back add much to the usefulness of the National Herbarium and of other institutions with which he shared them.

There seems no doubt that in the history of science, Dr. Maxon will stand in the first rank of the systematic pteridologists of his time. Much more careful, critical and orderly-minded than Christ or Rosenstock, less interested than Christensen or Copeland in phylogenetic theory and general problems of classification, his published work consists of descriptions of individual new species noted in the course of determinative tasks; of revisions of critical groups, often undertaken as corollaries of regional treatments such as that of the ferns in Abrams' Flora of the Pacific States; and of the regional treatments themselves. Since his enterprises of widest scope were never finished, his achievement is rather a series of shafts of light thrown into dark places in the taxonomy of ferns than a general illumination of the whole subject. But where the light strikes, it is penetrating and revealing. He drew lines between species closely, but accurately. His revisions rarely failed to smooth away persistent difficulties in the path of taxonomy; some of them, where data were adequate, seem finally conclusive. He himself, who judged his own work severely, perhaps took most satisfaction in the account of the ferns in the Scientific Survey of Porto Rico and the Virgin Islands. This was done under pressure and against an all too definite time-limit; but there is no sign of that in the finished product, which, in its clarity, thoroughness and taxonomic understanding, is likely to remain for many years the chief dependence of anyone working in its territory.

He found time, occasionally, for writing of a less technical sort. His historical and critical essay on taxonomic botany in the Smithsonian series on Plant Lore, his sketches of Pursh and Walter in the Dictionary of American Biography, and his illustrated paper, "Ferns as a Hobby," in the National Geographic Magazine, are examples of his accomplishment in this direction.

He was a fellow of the American Academy of Arts and Sciences and of the American Association for the Advancement of Science, and a member of many other scientific societies. Particular mention may be made of that nearly unique organization the Biologists' Field Club of Washington which developed and maintains a nature preserve and biologists' retreat at Plummer's Island, Maryland. Of this, Dr. Maxon was an original member and past president. He served as president and on the council of the American Society of Plant Taxonomists.

Almost from the beginning, he was a pillar of the American Fern Society. He joined it (then the Linnaean Fern Chapter) in the year 1895. In 1898 he was its secretary and next year was elected president (probably the youngest of its presidents), serving for two years. His second published article (on the development of sporelings in the hart's-tongue, and notable for maturity of style and skill in description) appeared in the Fern Bulletin, and he remained, to the end, a frequent contributor to it and its successor, the American Fern Journal. His occasional "Notes on North American Ferns," begun in 1900, ran to 23 installments in 39 years, and another series, "New Tropical American Ferns," begun in 1924, to fifteen. It is hardly necessary to add that these and other contributions by him added much to the scientific value of the Journal.

In 1919 he was again elected president and, as the natural and inevitable leader of students of ferns in America, was kept in office continuously until 1933. Nor was he then permitted to retire from the service of the Society; he was at once appointed one of the editors of the Journal, and became editor-in-chief in 1940, serving to within two months of his death. His work here, in which he had the able assistance of Mr. Morton, was of the usual high quality. He did not, as his predecessor here confesses to have done, leave the content of the Journal more or less to the chance receipt of manuscript; by solicitation and arrangement of material he kept each number on an even and high level of variety and quality. At the election of 1947 he was chosen for honorary membership—something which would have been done long before except for his active service on the Journal. Happily it came just in time for him to know of it—the expression of the Society's appreciation of him and of his work.

He married, June 2, 1908, Edith Hinckley Merrill, whom he met, appropriately, at a reception in honor of John Burroughs, and whose fine qualities he seems to have recognized with immediate and accurate judgment. She, with one daughter, Mary, survives him.

He died February 25, 1948, at Terra Ceia, Florida, where he and his wife had spent a quiet and happy early winter.

A scientist may become so absorbed in his subject that all others lose their interest—witness Darwin's complaint that music and literature no longer appealed to him. Or, the alert and lively curiosity which underlies all scientific investigation may reach out in many directions and engender secondary, but lively, interests. It was so, in high degree, with Dr. Maxon—he extracted keen extra-professional enjoyment from matters as diverse as birds (his major interest outside of ferns), music, archery, postage-stamps, history (current and past), bridge, billiards and poetry. The last was more than a passive and critical interest; from time to time he tried his hand at that most difficult of verse-forms, the sonnet. The results, never published and shown to very few, were, judging from what is apparently the sole surviving example, fine both in content and workmanship.

Words can give but a faint shadow of the alert, vital and vivid personality which was Maxon the man. Only those can really know it who have sat by the table in his office in the Smithsonian overlooking the Mall, or have partaken of his and Mrs. Maxon's hospitality in their pleasant Washington home or in the gracious old Merrill house in Maine which served as their summer residence in late years—who have watched the gleams of earnestness, humor or mischief in his fine brown eyes and have followed the flow of his talk, always animated and original, frank, direct and emphatic without indiscretion, picturesque without bad taste. And only those who knew him well can fully realize how high and sensitive were the standards of conduct by which he steered his way through life.

GRAY HERBARIUM.

Bibliography of William R. Maxon

C. V. MORTON

The writer does not deserve credit for the preparation of this bibliography, for Dr. Maxon himself, with his characteristic thoroughness, kept his own bibliography, complete up to the next to last entry, in such neat form that it could almost be sent to the printer without editing. The writer has found it necessary to add only five papers (nos. 103, 136, 171, 186, and 201) that Dr. Maxon inadvertently omitted.

It is believed that the present list is complete. A partial bibliography appears in the "Catalogus Literaturae" of Christensen's Index Filicum and Supplements, but that lists only strictly taxonomic papers and is not complete for those. Christensen lists 84 papers up to October, 1933, where the present bibliography lists 157. However, some of the earlier papers here listed do not pertain to ferns but to birds.

It is perhaps appropriate to mention at this place some of the plants named in honor of Dr. Maxon. The ferns include *Maxonia* C. Chr., a distinctive genus of the Polypodiaceae, *Alsophila Maxonii* Rosenst., *Atalopteris Maxonii* (Christ) C. Chr., *Blechnum Maxonii* (Broadh.) C. Chr., *Cyathea Maxonii* Underw., *Dryopteris Maxonii* Underw. & C. Chr., *Elaphoglossum Maxonii* Underw., *Hemitelia Maxonii* Rosenst., *Plagiogyria Maxonii* Copel., *Polypodium Maxonii* C. Chr., *Stenochlaena Maxonii* Underw., and *Urostachys Maxonii* Herter. A much larger number of flowering plants were named for him, a natural consequence of the fact that Dr. Maxon identified his own fern collections whereas his collections of flowering plants were named by others. Perhaps the best known is *Dahlia Maxonii* Safford, a magnificent plant well known in cultivation.

1. An interesting fern. (Syracuse University Forum, 2: 76. 1896.)
2. Young hart's-tongues at Green Lake. (Fern Bull. 7: 1. 1899.)
3. [Autumnal blooming of *Pieris mariana.*] (Plant World 2: 71. 1899.
4. [Origin of the name "Christmas fern."] (Fern Bull. 7: 15. 1899.)
5. A variety of *Dicksonia.* (Fern Bull. 7: 63. 1899.)
6. Some variations in the Adder's-tongue. (Fern Bull. 7: 90. *figs.* 1899.)
7. The boulder fern or fine-haired mountain fern. (Fern Bull. 7: 94. 1899.)
8. [Habitat of *Lygodium palmatum.*] (Fern Bull. 8: 8. 1900.)
9. Notes on American ferns: I. (Fern Bull. 8: 29–31. 1900.)
10. A new Asplenium hitherto referred to *A. trichomanes* var. *incisum* Moore. (Bull. Torrey Club **27**: 197–199. 1900.)
11. A second fern meeting. (Fern Bull. 8: 48. 1900.)
12. Notes on American ferns: II. (Fern Bull. 8: 58, 59. 1900.)
13. The hart's-tongue in New York and Tennessee. (Plant World 3: 129–132. *pl. 4.* 1900.)
14. Notes on American ferns: III. (Fern Bull. 8: 84, 85. 1900.)
15. *Polypodium vulgare oreophilum* Maxon, subsp. nov. (Proc. Biol. Soc. Washington **13**: 174. 1900.)
16. *Polypodium hesperium,* a new fern from western North America. (Proc. Biol. Soc. Washington **13**: 199–200. 1900.)
17. On the occurrence of the hart's-tongue in America. (Fernwort Papers, 30–46. Dec. 1900.)
18. Notes on the validity of *Asplenium ebenoides* as a species. (Bot. Gaz. **30**: 410–415. 1900.)
19. A list of the Pteridophyta collected in Alaska in 1900 by Mr. J. B. Flett, with description of a new *Dryopteris.* (Bull. Torrey Club **27**: 637–641. 1900.)
20. [A new common name for *Lygodium palmatum.*] (Fern Bull. 9: 19. 1901.)
21. A list of the ferns and fern allies of North America north of Mexico, with principal synonyms and distribution. (Proc. U. S. Nat. Mus. **23**: 619–651. May 4, 1901.)
22. Notes on American ferns: IV. (Fern Bull. 9: 59–61. 1901.)
23. Some new and additional records on the flora of West Vir-

ginia. (Proc. Biol. Soc. Washington **14**: 161–163. 1901.) (With C. L. Pollard.)

24. A singular form of the Christmas fern. (Plant World 5: 73. *pl. 11.* 1902.)
25. An interesting Japanese polypody. (Fern Bull. **10**: 42. 1902.)
26. Notes on American ferns: V. (Fern Bull. **10**: 46. 1902.)
27. The hooded warbler breeding near Washington, D. C. (Proc. Biol. Soc. Washington **15**: 156. June 20, 1902.)
28. Notes on some yellow-throated vireo's nests. (Osprey, II. **1**: 37–39. *pl.* March 1902.)
29. A Japanese polypody. (Pop. Sci. News **36**: 221. illustr. 1902.)
30. The cerulean warbler a summer resident near Washington, D. C. (Osprey, II, **1**: 106, 107. 1902.)
31. Notes on a collection of Cuban Pteridophyta, with descriptions of four new species. (Bull. Torrey Club **29**: 577–584. *pl.* Oct. 1902.) (With L. M. Underwood.)
32. A botanists' Mecca. (Plant World **6**: 38. 1903.)
33. Notes on American ferns: VI. (Fern Bull. **11**: 38–40. 1903.)
34. A study of certain Mexican and Guatemalan species of *Polypodium*. (Contr. U. S. Nat. Herb. **8**: 271–276. *pl. 61, 62.* June 27, 1903.)
35. Notes on the birds of Madison County, New York, with especial reference to Embody's recent list. (Auk **20**: 262–266. July, 1903.)
36. An odd nest-site of the chimney swift. (Bird Lore **5**: 133. Aug. 1903.)
37. A fern new to the United States. (Torreya **3**: 184, 185. Dec. 22, 1903.)
38. Two new ferns of the genus *Polypodium*, from Jamaica. (Proc. U. S. Nat. Mus. **27**: 741–744. May 21, 1904.)
39. A new fern, *Goniophlebium Pringlei*, from Mexico. (Proc. U. S. Nat. Mus. **27**: 953, 954. *pl. 48; text fig.* June 27. 1904.)
40. Notes on American ferns: VII. (Fern Bull. **12**: 101–103. Oct. 1904.)
41. A new *Asplenium* from Mexico. (Bull. Torrey Club **31**: 657, 658. *text fig.* Dec. 1904.)
42. On the names of three Jamaican species of *Polypodium*. (Bull. Torrey Club **32**: 73–75. Feb. 1905.)

43. A new *Botrychium* from Jamaica. (Bull. Torrey Club 32: 219–222. *pl. 6*. Apr. 1905.)
44. A new species of fern of genus *Polypodium* from Jamaica. (Smiths. Misc. Coll. **47**: 410, 411. *pl. 57*. Apr. 5, 1905.)
45. *Adenoderris*, a valid genus of ferns. (Bot. Gaz. **39**: 366–369. *text figs. 1, 2*. May, 1905.)
46. A new cloak-fern from Mexico. (Proc. Biol. Soc. Washington **18**: 205, 206. Sept. 2, 1905.)
47. [Review of Index Filicum . . . by Carl Christensen.] (Science, II. **22**: 267–269. Sept. 1, 1905.)
48. A new name for a Middle-American fern. (Proc. Biol. Soc. Washington **18**: 224. Oct. 17, 1905.)
49. A new fern from Porto Rico. (Proc. Biol. Soc. Washington **18**: 215, 216. Oct. 17, 1905.)
50. A new *Lycopodium* from Guatemala. (Proc. Biol. Soc. Washington **18**: 231, 232. Dec. 9, 1905.)
51. A new name for *Kaulfussia* Blume, a genus of marattiaceous ferns. (Proc. Biol. Soc. Washington **18**: 239, 240. Dec. 9, 1905.)
52. A new *Botrychium* from Alabama. (Proc. Biol. Soc. Washington **19**: 23, 24. Feb. 26, 1906.)
53. Report on a collecting trip in Costa Rica. (Journ. N. Y. Bot. Gard. **7**: 187–193. *fig. 23, 24*. Aug. 1906.)
54. Two new ferns of the genus *Lindsaea*. (Smiths. Misc. Coll. **50**^{3}: 335, 336. Oct. 28, 1907.) (With L. M. Underwood.)
55. Studies of tropical American ferns,—No. 1. (Contr. U. S. Nat. Herb. **10**: 473–508. *pl. 55, 56*. Mch. 30, 1908.)
56. A new spleenwort from China. (Contr. U. S. Nat. Herb. **12**: 411. *pl. 60*. May 10, 1909.)
57. Studies of tropical American ferns,—No. 2. (Contr. U. S. Nat. Herb. **13**: 1–43. *pl. 1–9*. June 30, 1909.)
58. Schizaeaceae [of North America]. N. Amer. Fl. **16**: 31–53. Nov. 6, 1909.)
59. Gleicheniaceae [of North America]. N. Amer. Fl. **16**: 55–63. Nov. 6, 1909.)
60. Cyatheaceae [of North America]. N. Amer. Fl. **16**: 65–88. Nov. 6, 1909.)
61. A remarkable new fern from Panama. (Smiths. Misc. Coll. **56**^{24}: 1–5, *pl. 1–3*. Nov. 22, 1911.)
62. On the identity of *Cyathea multiflora*, type of the genus *Hemitelia*. (Bull. Torrey Club **38**: 545–550. *pl. 35*. Jan.

6, 1912.)

63. Three new club-mosses from Panama. (Smiths. Misc. Coll. 56[29]: 1–4. *pl. 1–3.* Jan. 6, 1912.)
64. Notes on the North American species of *Phanerophlebia.* (Bull. Torrey Club **39**: 23–28. Feb. 10, 1912.)
65. The relationship of *Asplenium andrewsii.* (Contr. U. S. Nat. Herb. **16**: 1–3. *pl. 1, 2.* Feb. 13, 1912.)
66. Notes on American ferns: VIII. (Fern Bull. **19**: 67–70. July, 1911; issued Jan. 1912.)
67. A new name for a Hawaiian fern. (Amer. Fern Journ. **2**: 19, 20. *text figs.* Feb. 29, 1912.)
68. A new fern from Panama. (Amer. Fern Journ. **2**: 21, 22. Feb. 29, 1912.)
69. Studies of tropical American ferns,—No. 3. (Contr. U. S. Nat. Herb. **16**: 25–62. *pl. 18–34.* June 19, 1912.)
70. The tree-ferns of North America. (Report Smiths. Inst. **1911**: 463–491. *pl. 1–15.* Dec. 12, 1912.)
71. A new genus of davallioid ferns. (Journ. Washington Acad. Sci. **3**: 143, 144. March 4, 1913.)
72. Pteridophyta [of the Southeastern United States]. (In Small, J. K., Fl. S. E. U. S., ed. 2, 1–31. Apr. 23, 1913.)
73. *Saffordia,* a new genus of ferns. (Smiths. Misc. Coll. **61**[4]: 1–5. *pl. 1, 2; text fig. 1.* May 26, 1913.)
74. Pteridophyta [of the northern United States, Canada, and the British Possessions]. (In Britton & Brown, Ill. Fl. etc., ed. 2, 1–54. June 7, 1913.)
75. Studies of tropical American ferns,—No. 4. (Contr. U. S. Nat. Herb. **17**: 133–179. *pl. 1–10; text fig. 1–7.* June 20, 1913.)
76. Some recently described ferns from the Southwest. (Amer. Fern Journ. **3**: 119–126. Dec. 1913.)
77. Studies of tropical American ferns,—No. 5. (Contr. U. S. Nat. Herb. **17**: 391–425. *pl. 11–23; text fig. 8–10.* Jan. 21, 1914.)
78. A family of ferns new to the United States. (Amer. Fern Journ. **4**: 15–17. March, 1914.)
79. The North American species of *Psilogramme.* (Bull Torrey Club **42**: 79–86. Feb. 27, 1915.)
80. Notes on American ferns: IX. (Amer. Fern Journ. **5**: 1–4. March 1915.)
81. *Notholaena aschenborniana* and a related new species. (Amer. Fern Journ. **5**: 4–7. March 1915.)

82. *Polypodium marginellum* and its immediate allies. (Bull. Torrey Club **42**: 219–225. Apr. 24, 1915.)
83. Report upon a collection of ferns from western South America. (Smiths. Misc. Coll. **65**[3]: 1–12. May 3, 1915.)
84. Note upon *Polypodium subtile* and a related species. (Amer. Fern Journ. **5**: 50–52. May, 1915.)
85. Studies of tropical American ferns,—No. 6. (Contr. U. S. Nat. Herb. **17**: 541–608. *pl. 32–43*. May 23, 1916.)
86. Notes on American ferns,—X. (Amer. Fern Journ. **6**: 65–68. Sept., 1916.)
87. Notes on western species of *Pellaea*. (Proc. Biol. Soc. Washington **30**: 179–184. Dec. 1, 1917.)
88. Notes on American ferns,—XI. (Amer. Fern Journ. **7**: 104–106. 1917.)
89. A new *Notholaena* from the Southwest. (Amer. Fern. Journ. **7**: 106–109. 1917.) (Issued Feb. 23, 1918)
90. The American range of *Botrychium lanceolatum*. (Rhodora **20**: 19. Jan. 1918.)
91. A new hybrid *Asplenium*. (Amer. Fern Journ. **8**: 1–3. 1918.)
92. A new *Anemia* from Mexico. (Journ. Washington Acad. Sci. **8**: 199, 200. Apr. 4, 1918.)
93. *Polystichum andersoni* and related species. (Amer. Fern Journ. **8**: 33–37. 1918.)
94. Further notes on *Pellaea*. (Amer. Fern Journ. **8**: 89–94. 1918.)
95. A new *Polystichum* from California. (Journ. Washington Acad. Sci. **8**: 620–622. Nov. 19, 1918.)
96. Notes on American ferns,—XII. (Amer. Fern Journ. **8**: 114–121. 1918.) (Issued Jan. 20, 1919)
97. The lip-ferns of the Southwestern United States related to *Cheilanthes myriophylla*. (Proc. Biol. Soc. Washington **31**: 139–151. Nov. 29, 1918.)
98. A new *Selaginella* from Oklahoma and Texas. (Proc. Biol. Soc. Washington **31**: 171, 172. Dec. 30, 1918.)
99. Notes on American ferns,—XIII. (Amer. Fern Journ. **9**: 1–5. 1919.)
100. A new *Cheilanthes* from Mexico. (Proc. Biol. Soc. Washington **32**: 111, 112. May 20, 1919.)
101. A new *Alsophila* from Guatemala and Veracruz. (Proc. Biol. Soc. Washington **32**: 125, 126. June 27, 1919.)
102. Ferns of the District of Columbia. (Amer. Fern Journ. **9**:

38–48. July, 1919.)

103. Pteridophyta, Polygonaceae, Primulaceae, Orobanchaceae, Phrymaceae, Valerianaceae, Dipsacaceae, Campanulaceae, Lobeliaceae, *Antennaria* [of District of Columbia]. (In Hitchcock & Standley, Flora of the District of Columbia, Contr. U. S. Nat. Herb. **21**. Sept. 23, 1919.)
104. Notes on American ferns,—XIV. (Amer. Fern Journ. **9**: 67–73. Oct. 1919.)
105. Notes on American ferns,—XV. (Amer. Fern Journ. **10**: 1–4. Apr. 1920.)
106. Cyatheaceae [of Mexico]. (In Standley, P. C., Trees and Shrubs of Mexico, Contr. U. S. Nat. Herb. **23**: 38–47. Oct. 11, 1920.)
107. New selaginellas from the western United States. (Smiths. Misc. Coll. **72**^{5}: 1–10. *pl. 1–6*. Dec. 22, 1920.)
108. Notes on American ferns,—XVI. (Amer. Fern Journ. **11**: 1–4. March, 1921.)
109. A neglected fern paper. (Proc. Biol. Soc. Washington **34**: 111–114. June 30, 1921.)
110. Notes on American ferns,—XVII. (Amer. Fern Journ. **11**: 33–39. Oct. 12, 1921.)
111. Notes on American ferns,—XVIII. (Amer. Fern Journ. **11**: 105–107. 1921.) (Issued March 31, 1922)
112. Notes on a collection of ferns from the Dominican Republic. (Proc. Biol. Soc. Washington **35**: 47–52. March 20, 1922.)
113. The botanical gardens of Jamaica. (Report Smiths. Inst. **1920**: 523–535. *pl. 1–20*. 1922.)
114. Studies of tropical American ferns,—No. 7. (Contr. U. S. Nat. Herb. **24**: 33–63. *pl. 11–20*. Aug. 15, 1922.)
115. A new *Salvinia* from Trinidad. (Journ. Washington Acad. Sci. **12**: 400, 401. Oct. 18, 1922.)
116. Ferns new to the Cuban flora. (Journ. Washington Acad. Sci. **12**: 437–443. Nov. 19, 1922.)
117. The genus *Culcita*. (Journ. Washington Acad. Sci. **12**: 454–460. Dec. 4, 1922.)
118. The genus *Microstaphyla*. (Journ. Washington Acad. Sci. **13**: 28–31. Jan. 19, 1923.)
119. The type-species of *Pteris*. (Journ. Bot. Brit. & For. **61**: 7–10. Jan. 1923.)
120. A new *Dryopteris* from Dominica. (Proc. Biol. Soc. Washington **36**: 49, 50. March 28, 1923.)
121. Occasional notes on Old World ferns: I. (Proc. Biol. Soc.

Washington **36**: 169–178. May 1, 1923.)
122. Pteridophyta [of the Pacific States]. (In Abrams, Ill. Fl. Pacif. States **1**: 1–50. *fig. 1–109.* May, 1923.)
123. Notes on American ferns,—XIX. (Amer. Fern Journ. **13**: 73–75. Oct., 1923.)
124. Two new species of *Jamesonia.* (Journ. Washington Acad. Sci. **14**: 72–74. Feb. 4, 1924.)
125. New or critical ferns from Haiti. (Journ. Washington Acad. Sci. **14**: 86–92. Feb. 19, 1924.)
126. A third species of *Atalopteris.* (Proc. Biol. Soc. Washington **37**: 63, 64. Feb. 21, 1924.)
127. New or noteworthy ferns from the Dominican Republic. (Proc. Biol. Soc. Washington **37**: 97–104. Feb. 21, 1924.)
128. New West Indian ferns. (Journ. Washington Acad. Sci. **14**: 139–145. March 19, 1924.)
129. Further notes on Hispaniola ferns. (Journ. Washington Acad. Sci. **14**: 195–199. May 4, 1924.)
130. Report upon a collection of ferns from Tahiti. (Univ. Calif. Publ. Bot. **12**: 17–44. *pl. 1–6.* May 27, 1924.)
131. Two new ferns from the Dominican Republic. (Amer. Fern Journ. **14**: 74–76. Sept., 1924.)
132. New tropical American ferns,—I. (Amer. Fern Journ. **14**: 99–102. 1924.) (Issued Jan. 6, 1925)
133. Notes on American ferns,—XX. (Amer. Fern Journ. **15**: 16–19. May 26, 1925.)
134. Ferns as a hobby. (Nat. Geogr. Mag. **47**: 541–586. *illustr.* May, 1925.)
135. New tropical American ferns—II. (Amer. Fern Journ. **15**: 54–57. June, 1925.)
136. Pteridophyta [of Utah and Nevada]. (In Tidestrom, Flora of Utah and Nevada, Contr. U. S. Nat. Herb. **25**: 43–52. Oct. 31, 1925.)
137. New tropical American ferns—III. (Amer. Fern Journ. **16**: 7–9. March, 1926.)
138. Pteridophyta [of Porto Rico and the Virgin Islands]. (In N. L. Britton, Botany of Porto Rico and the Virgin Islands. N. Y. Acad. Sci., Sci. Surv. Porto Rico **6**: 373–521. June 15, 1926.)
139. New tropical American ferns—IV. (Amer. Fern Journ. **18**: 1–6. 1928.
140. A new tree-fern from Haiti. (Journ. Washington Acad. Sci. **18**: 316, 317. June 4, 1928.)

141. New tropical American ferns—V. (Amer. Fern Journ. **18**: 46–51. 1928.)
142. The identification of *Polypodium triangulum* L. (Journ. Washington Acad. Sci. **18**: 582–586. *fig. 1.* Dec. 19, 1928.)
143. Studying ferns in European herbaria. (Expl. & Field-work Smiths. Inst. Publ. **3011**: 109–114. *f. 94–99.* March, 1929.)
144. A diminutive new holly-fern from Ecuador. (Journ. Washington Acad. Sci. **19**: 197–199. *fig. 1.* May 19, 1929.)
145. New tropical American ferns—VI. (Amer. Fern Journ. **19**: 44–48. 1929.)
146. A singular new *Dryopteris* from Colombia. (Journ. Washington Acad. Sci. **19**: 245–247. *fig. 1.* June 19, 1929.)
147. New tropical American ferns—VII. (Amer. Fern Journ. **20**: 1–4. 1930.)
148. Fern miscellany. (Proc. Biol. Soc. Washington **43**: 81–88. June 5, 1930.)
149. Ferns of the Republic of Salvador. (Proc. Biol. Soc. Washington **43**: 167–178. Sept. 26, 1930.) (With Paul C. Standley.)
150. New tropical American ferns—VIII. (Amer. Fern Journ. **21**: 136–139. Dec., 1931.)
151. Systematic botany: Its development and contacts. (Smiths. Sci. Ser. **11**: 131–164. *pl. 19–25.* 1931.)
152. New tropical American ferns—IX. (Amer. Fern Journ. **22**: 11–15. Apr. 1932.)
153. Two new ferns from Colombia. (Kew Bull. Misc. Inf. **1932**: 134–136. 1932.)
154. Two new tropical American species of *Adiantum*. (Amer. Journ. Bot. **19**: 165–167. Feb. 25, 1932.) (With C. A. Weatherby.)
155. Fern miscellany—II. (Proc. Biol. Soc. Washington **46**: 105–108. Apr. 27, 1933.)
156. Fern miscellany—III. (Proc. Biol. Soc. Washington **46**: 139–146. June 30, 1933.)
157. A second species of *Ormoloma*. (Proc. Biol. Soc. Washington **46**: 157–158. Oct. 26, 1933.)
158. A new *Lycopodium* from western Guatemala. (Proc. Biol. Soc. Washington **46**: 159–160. Oct. 26, 1933.)
159. New tropical American ferns—X. (Amer. Fern Journ. **23**: 73–76. Nov. 30, 1933.)
160. New tropical American ferns—XI. (Amer. Fern Journ. **23**:

105–108. Mar. 8, 1934.)
161. *Polystichum acrostichoides* in Mexico. (Amer. Fern Journ. **24**: 23–24. Mar. 20, 1934.)
162. A new maidenhair from Peru. (Amer. Fern Journ. **24**: 15–17. Mar. 20, 1934.) (With C. V. Morton.)
163. New tropical American ferns—XII. (Amer. Fern Journ. **24**: 72–74. Sept. 19, 1934.)
164. *Pleuroderris*, a new genus of Middle American ferns. (Journ. Washington Acad. Sci. **24**: 549–557. *figs. 1, 2.* Dec. 15, 1934.)
165. Natural history of Plummers Island, Maryland: Introduction. (Proc. Biol. Soc. Washington **48**: 115–117. Aug. 22, 1935.)
166. A new tree-fern from Trinidad. (Journ. Washington Acad. Sci. **25**: 528–530. *1 fig.* Dec. 15, 1935.)
167. *Ceratopteris thalictroides* in Jamaica. (Amer. Fern Journ. **25**: 136–137. Dec. 29, 1935.)
168. Thomas Walter, botanist. (Smithson. Misc. Coll. **95**[8]: 1–6. Apr. 22, 1936.)
169. Frederick Vernon Coville. (Science **85**: 280–281. Mar. 19, 1937.)
170. *Trichomanes petersii* in Louisiana. (Amer. Fern Journ. **27**: 67–68. June 4, 1937.)
171. [Biographies of] Daniel Cady Eaton, Charles Horton Peck, Henry Perrine, Fredrick Pursh, Joseph Nelson Rose, William Edwin Safford, Volney Morgan Spalding, William Starling Sullivant, Edward Tuckermann, Lucien Marcus Underwood, George Vasey, and Thomas Walter. (In Dictionary of American Biography, 1935–1937.)
172. A new species of *Dryopteris*, subgenus *Eudryopteris*, from Guatemala. (Proc. Biol. Soc. Washington **50**: 179, 180. Oct. 28, 1937.) (With C. V. Morton.)
173. Notes on American ferns—XXI. (Amer. Fern Journ. **27**: 109–111. Jan. 3, 1938.)
174. Pteridophyta. (In T. G. Yuncker, A contribution to the flora of Honduras. Field Mus. Nat. Hist. Bot. Ser. **17**: 299–311. Jan. 13, 1938.)
175. Fern miscellany—IV. (Proc. Biol. Soc. Washington **51**: 33–40. Mar. 18, 1938.)
176. The American species of *Dryopteris*, subgenus *Meniscium* (Bull. Torrey Club **65**: 347–376, *pl. 11–14.* June 1938.) (With C. V. Morton.)

177. Notes on American ferns—XXII. Amer. Fern Journ. 28: 140–144. Dec. 15, 1938.)
178. New ferns from Bolivia and Peru. (Bull. Torrey Club 66: 39–45. *fig. 1.* Jan. 30, 1939.) (With C. V. Morton.)
179. Notes on American ferns—XXIII. (Amer. Fern Journ. 29: 70–73. May 1939.)
180. Fern miscellany—V. (Proc. Biol. Soc. Washington 52: 113–120. July 22, 1939.)
181. *Pteris multifida* in Washington, D. C. (Amer. Fern Journ. 29: 122–123. Aug. 12, 1939.)
182. [Review of F. Verdoorn. Manual of Pteridology] (Nat. Hort. Mag. 18: 288–289. Oct. 1939.)
183. Some species of *Notholaena*, new and old. (Contr. Gray Herb. 127: 3–17. *1 fig.* Oct. 25, 1939.) (With C. A. Weatherby.)
184. Hymenophyllaceae; Polypodiaceae. (In R. E. Woodson and R. J. Seibert, Contributions toward a flora of Panama—III, Ann. Mo. Bot. Gard. 26: 273–274. Nov. 1939.)
185. Isoetaceae. (In R. E. Woodson and R. J. Seibert, Contributions toward a flora of Panama—III, Ann. Mo. Bot. Gard. 26: 272–273. Nov. 1939.) (With C. V. Morton.)
186. Pteridophyta [of Arizona]. (In Kearney & Peebles, Flowering Plants and Ferns of Arizona, U. S. Dept. Agr. Misc. Publ. 423: 24–45. 1941.)
187. New tropical American ferns—XIII. (Amer. Fern Journ. 32: 58–61. June 29, 1942.)
188. New tropical American ferns—XIV. (Amer. Fern Journ. 33: 133–136. Dec. 15, 1943.)
189. Five new species of *Dryopteris* from Peru. (Journ. Washington Acad. Sci. 34: 24–27. Jan. 15, 1944.)
190. Three new species of *Alsophila* from Colombia and British Honduras. (Journ. Washington Acad. Sci. 34: 46–48. *fig. 1.* Feb. 15, 1944.)
191. *Diplazium lonchophyllum* in Louisiana. (Amer. Fern Journ. 34: 21–24. Mar. 22, 1944.)
192. *Nephrolepis tuberosa* (Willd.) Presl. (Amer. Fern Journ. 34: 25. Nov. 22, 1944.)
193. The name of the deer-fern. (Amer. Fern Journ. 34: 50–51. June 19, 1944.)
194. Fern miscellany—VI. (Proc. Biol. Soc. Washington 57: 17–21. June 28, 1944.)
195. A new species of *Hemitelia* from Peru. (Journ. Washington

Acad. Sci. 34: 309–310. *pl.* Sept. 15, 1944.)
196. New tropical American ferns—XV. (Amer. Fern Journ. **35**: 21–23. April 11, 1945.)
197. Two new ferns from Colombia. (Amer. Fern Journ. **36**: 91–94. Sept. 16, 1946.) (With C. V. Morton.)
198. New Cyatheaceae from Colombia. (Journ. Arnold Arboretum **27**: 438–441, *pl. 1.* Oct. 15, 1946.)
199. New ferns from the northern Andes. (Contr. Gray Herb. **165**: 69–75, *pls. 4–6.* Oct. 6, 1947.)
200. Puerto Rican fern notes. (Proc. Biol. Soc. Washington **60**:123–130. Oct. 9, 1947.)
201. Pteridophyta. (In Maguire, Plant explorations in Guiana in 1944, chiefly to the Tafelberg and the Kaieteur Plateau—I, Bull. Torrey Club **75**: 66–80. Jan. 1948.) (With C. V. Morton.)

SMITHSONIAN INSTITUTION.

Early Years of Maxon in Washington

C. E. WATERS

In 1893, W. N. Clute organized the Linnaean Fern Chapter of the Agassiz Association, and this chapter later became the American Fern Society. Two years later, my friend Maxon joined the Fern Chapter, while he was a student in Syracuse University, where he received the degree of Ph.B. in 1898. For some reason, now forgotten, we became acquainted by the exchange of letters. I was then living in Baltimore, and once or twice a year spent a day of sightseeing in Washington. Maxon was appointed Aid in Cryptogamic Botany, in the National Museum, in 1899, and in that year or soon afterward, I took occasion to visit him at the National Herbarium. This was then in the Old National Museum. His office was on the top floor of one of the square towers that failed to adorn the ugly brick building. There he had the full benefit of Washington's midsummer tropical climate. Much of the time he must have had to keep the windows closed, so his specimens would not be blown away. As a genial host he invited me to dine with him in a lunchroom tucked away somewhere in the building. Only one thing is remembered about that lunch: on the bill of fare was "collyrobbers", a mystery until the waiter said that was the best he could do for "kohl-rabi."

When a young man, Maxon's chief interest was in birds and not in ferns. He never told me why he made the study of ferns, and not of birds, his life work. Perhaps like many another young man just out of college, he accepted the first promising job that offered. This is only a surmise. To young graduates the world seems formidable when they have their living to earn and don't quite know how to get started. In my hearing Maxon never said he regretted having given up the study of birds, and perhaps in his more mature years he was glad of having made the change. At any rate he went along steadily, growing in his knowledge of ferns, and establishing a reputation as one of the world's leading authorities on them. No doubt he would have done as intrinsically good work if he had become a professional ornithologist, but it seems to me that he was especially fortunate in having been put to work on the tropical American pteridophyta.

A year or two after his coming to Washington, Maxon spent a day with me visiting two especially interesting localities near Baltimore. At one he saw *Asplenium Bradleyi*, at a station discovered not long before by J. H. Brummell, a florist and botanist living near Baltimore. With it was *A. montanum,* which Brummell had overlooked. Here Maxon gave me my first and only lesson in collector's courtesy, by asking my permission to collect some specimens for the National Herbarium. He did not take it for granted that because the ferns were growing wild he had a right to take what he wanted.

We took a train back to Baltimore and caught another on the Annapolis Short Line, which took us to a spot on the Coastal Plain, where *Dryopteris simulata* grew in great beds in the woods. With it were even larger beds of *Lorinseria areolata.* These ferns grew in a level stretch of the woods not far from a small stream. They were not the only species to be found there. Perhaps fifty yards from the stream there was a slight rise, and the woods were somewhat more dry and open. Here grew the type plants of *Osmunda cinnamomea glandulosa,* that were yet to be named. Altogether we had a busy and interesting day, and saw ferns that are not to be found every day in this part of the country.

We kept up a desultory correspondence until well along in September 1904, when notification came of my appointment as a chemist in the almost brand-new National Bureau of Standards, and some place in which to live had to be found before October 1. A letter to Maxon asked him whether he could recommend a good boarding house. His reply invited me to join a group of young men, of whom he was one, who rented an apartment and made it as much like a home as possible. They had a housekeeper who came in the morning in time to prepare breakfast, and left in the evening after the dinner dishes had been washed. During the day she did most of our laundry work, darning and mending, and the various chores familiar to housekeepers. Lunch was obtained in one of the numerous lunchrooms downtown. There were normally five men in the group, and one of them was about to go abroad for the Department of Agriculture for several months, which would leave a vacancy that Maxon invited me to fill. Needless to say, the invitation was gladly accepted, and I went to live with the group of men. The apartment was a comfortable one, not at all crowded by the five of us, and the housekeeper was a good cook, as well as otherwise efficient. The five men shared the general expenses equally, of course, and each took his turn for a month at a time in doing the marketing. This consisted chiefly in deciding what we would have to eat, and ordering it, when on his way to work, at a nearby store.

By common consent, Maxon sat at the head of the table and did the carving. He did this well, and in his more facetious moments with much mock ceremony. Two of the self-imposed rules, and practically the only ones by which the group was governed, related to the the meals. Nobody was permitted to read a newspaper at the table, and, except by unanimous consent, nobody could read excerpts from letters, no matter how interesting.

The men held scientific positions in the Government service, and were as serious-minded as could be expected of them, yet there was plenty of light conversation, and a minimum of "talking shop." It is true that there was a legend of their having once thrown hot pennies from their window on the fourth floor to an organ-grinder on the sidewalk. This sport was not repeated in my day, and the account of it may be only a legend.

To repeat, the men were serious-minded, and some of them held positions of increasing responsibility in the scientific work of the Government. We know about Maxon and his work. Some others who were in the group at one time or another were: T. H. Kearney, who brought to this country many valuable plants for the Department of Agriculture; L. A. Rogers, at the time of his retirement in charge of the bacteriological laboratories of the Bureau of Dairy Industry, and for whom is named a building of the University of Maine; J. M. Bell, chemist in what was then the Bureau of Soils, who later became Professor of Chemistry in the University of North Carolina; L. Abrams, later Professor of Botany in Stanford University; Ralph Robinson, who assisted G. T. Moore in experiments on the use of copper sulphate for killing detrimental algae in water reservoirs, and now manager of a citrus grove in Florida. J. I. Schulte was not a regular member of the group, but for years he took his meals with us. He held a responsible position in the Editorial Division of the Department of Agriculture. Between them, the men of the group were on friendly terms with many of Washington's leading scientists.

It may be added that two men of the group were elected to Honorary Membership in this Society. Although Maxon was taken from us before the results of the election could be announced, he knew of his nomination and it gave him great pleasure; and he could have had no doubt that he would be elected, probably unanimously.

Thus our affairs went on, until the inevitable break-up, when the men began to marry. The first man ventured in 1906, and two others followed in 1907, The survivors moved to another apartment house, but this did not break the spell. In 1908 Maxon married a charming young woman who, with an attractive daughter, survives him. Their home was in a pleasant part of Washington, near Rock Creek Park. Around the sides of the back yard flourished quite a collection of hardy ferns. Maxon was successful with most of the species he planted.

Maxon had many friends, for he was an approachable man, not given to advertising his own merits. He had positive ideas about the way things should be done, but was not obstinately set on having his own way. He was a good President of the Society, but in my opinion he was even better as Editor-in-Chief of the Journal. In this task he was sometimes under fire from those who thought that too many "popular" articles were published; others criticized him for having too many purely scientific articles that were above the heads of most of the readers. Maxon knew that the life of the Society depended upon members of both types, and he did his best to have both kinds of articles in every issue of the Journal.

The Society has lost its leading member, who was greatly liked by those who were fortunate enough to know him, and was respected by all members.

WASHINGTON, D. C.

Notes on the Geographical Distribution of Ferns

DOUGLAS H. CAMPBELL

The geographical distribution of the existing ferns affords some interesting problems concerning the origin and relationship of the various families and genera. Whereas some families and genera are cosmopolitan, and some species like the common bracken (*Pteridium aquilinum*) are spread over much of the world and are adapted to a great range of soil and climate, others are of restricted range, such as the small family Matoniaceae, confined to a few localities in Malaya, Borneo and Sumatra, one species *Phanerosorus sarmentosus* being known only from a single locality in West Borneo.

One of my most vivid recollections is a trip to Sarawak in West Borneo where I collected this rare fern. My main objective was another fern, *Macroglossum*, a new genus of Marattiaceae described by E. B. Copeland. This fern grew in the same region as *Phanerosorus* and I shall never forget my first sight of this superb plant, whose massive upright simply pinnate leaves were six feet tall and suggested a Cycad. My success in getting material of two such rarities made my Borneo visit a memorable one.

In a recent, very important summary of the ferns (Filicineae) Copeland[1] recognizes three orders—Ophio-

[1] Copeland, E. B. Index Filicum. Chronica Botanica Co. Waltham, Mass. 1947.

glossales, Marattiales and Filicales. The first two orders have each a single family and relatively few species, while the vast majority of the living ferns belong to the Filicales. While evidently not closely related, the Ophioglossaceae and Marattiaceae are alike in having massive sporangia which do not originate from a single epidermal cell, while in the Filicales the sporangium always develops from a single cell; they are sometimes known as the Leptosporangiatae, while the other two orders are called Eusporangiatae. However, it is not probable that the Ophioglossales and Marattiales are really closely related.

While the Eusporangiatae are recognized as the oldest and most primitive of existing ferns the Ophioglossaceae differ so much from all the other ferns that they probably may represent an independent phylum. The Marattiaceae, however, have so much in common with the Filicales as to indicate a real relationship with them.

The Ophioglossales include a single family Ophioglossaceae, with four genera, of which two—*Ophioglossum* and *Botrychium*—are widely distributed, the other two genera being much more restricted in their range. *Ophioglossum* is cosmopolitan, but most abundant in the tropics, whereas *Botrychium* is mainly restricted to the North Temperate Zone. Although the Ophioglossaceae are typically terrestrial, two very characteristic species are epiphytes—*Ophioglossum pendulum* of the East Indies and Polynesia and *O. palmatum* of the American tropics and also the old world.

The Marattiales, also a single family—Marattiaceae—are mostly inhabitants of the humid tropics. Copeland recognizes six genera, the two most important being *Marattia* and *Angiopteris*, both large ferns widely distributed. *Danaea* is exclusively American and *Kaulfussia* is Indo-Malayan.

The Filicales have 19 families, many genera, and hundreds of species, and include the vast majority of the living ferns. Many genera are cosmopolitan, but some are more restricted in their range.

The wide distribution of many ferns is due, no doubt, to the readiness with which their innumerable light spores may be transported by air currents. Thus ferns are especially characteristic of remote oceanic islands, and are the first immigrants on areas that have been devastated by volcanic eruptions. A notable case was the reestablishment of the vegetation on Krakátau, a volcanic island near Java, which in 1882 was almost destroyed by a violent explosion which completely destroyed the vegetation on what was left of the island. When first visited three years later several species of ferns were well established but no flowering plants. In 1906 I had an opportunity to visit the island. By this time, due to the equatorial climate and the proximity of Java and Sumatra, there had developed a luxuriant vegetation, especially in the formation of a young forest along the shore, which included fruiting coconuts, *Pandanus*, *Casuarina* and other characteristic strand plants.

While most of the families of the Filicales are widespread, and many cosmopolitan, several families are mainly confined to the Southern Hemisphere. Among these are the Hymenophyllaceae, Schizaeaceae, Gleicheniaceae, and Cyatheaceae. The occurrence of a very few species of *Hymenophyllum* in Europe, and *Schizaea* and *Lygodium* in the eastern United States might be explained as migration from the south. The general occurrence of these families in such widely separated areas as South America, Australia and New Zealand indicates that they originated in the Southern Hemisphere. The great land masses of the Northern and Southern Hemispheres were separated by a wide ocean belt until the end of the Mesozoic, by which time the families had presumably become differentiated. It has been suggested that the several southern continents had originally been united into one which broke up and drifted apart, while in the Northern Hemisphere the continents remained connected. This theory of Continental Drift should be considered in studying the present distribution of ferns.

STANFORD UNIVERSITY.

Further Notes on Onocleopsis

F. BALLARD

The present article is intended to supplement the somewhat meager information supplied with the original description which was published in this Journal in 1945 (page 1). It is not often that one is privileged to describe a really new fern genus and since *Onocleopsis* belongs to the small and interesting group which includes *Matteuccia* and *Onoclea,* some additional information may prove of interest.

Mr. Weatherby[1] has already drawn attention to the fact that Hinton was not the first to discover the plant. We now know that Conzatti and Gonzalez found it in Oaxaca in 1897. The specific epithet "*Hintonii*", therefore, might be said to be misleading and is an argument for the view, held by some taxonomists, that epithets should always be based on some attribute of the plant rather than on personal names or geographical locations.

The species is now known to have been found at two localities in Mexico and one in Guatemala, all of them at altitudes of 2000 meters or more. According to Hinton's notes, it is rooted in sand under running water and at certain seasons may suffer considerably from flooding. It apparently has the habit of *Matteuccia Struthiopteris* with a tall shuttlecock of sterile fronds up to

[1] THIS JOURNAL 35: 52–53. 1945.

FIG. 1. AN UPPER PINNA OF STERILE FROND, NAT. SIZE (HINTON 7228); FIG. 2. STERILE PINNULE, SOMEWHAT DIAGRAMMATIC, WITH SPORANGIA REMOVED TO SHOW VENATION, ×4 (HINTON 3297); FIG. 3. SCALES FROM BASE OF STIPE, ×4 (HINTON 7228); FIG. 4a, b, c, d. SPORES COMPLETE WITH EXINE; FIG. 4e. SPORES MINUS EXINE, ALL ×625 (HINTON 3297); FIG. 5. CROSS SECTION STERILE STIPE, ×4 (HINTON 11211); FIG. 6. CROSS SECTION FERTILE STIPE, ×4 (HINTON 3297); FIG. 7. CROSS SECTION OF RHIZOME SHOWING MERISTELES (DOTTED) AND LEAF-TRACES (SOLID BLACK), ×2 (LIVING MATERIAL).

eight feet high accompanied on occasions by a number of shorter fertile fronds. Evidently the latter are produced infrequently judging from Hinton's statement that "my best collector has not been able to find any fertile fronds for the last three years." Possibly they are produced only as a result of the stimulation of drought, a feature not unknown among certain aquatic or semi-aquatic plants.

ANATOMY

Since the rhizome is an erect one with leaves radially arranged, the stele is also radially symmetrical. It is a dictyostele of conventional type with a double leaf-trace as in *Matteuccia* and *Onoclea*. There are no "epidermal pockets" nor do the meristeles curve outwards into the leaf-base ridges as has been described for *Onoclea* by D. T. Gwynne-Vaughan.[2] The figure (7) of Plate 8 is based on sections cut from a rhizome that was sent to Kew by Hinton in a fresh condition though it failed to grow on arrival. The cross sections of the sterile (fig. 5) and fertile (fig. 6) stipes were made from dried material and show an astonishing resemblance to those of *Matteuccia Struthiopteris.*

SCALES

The scales on the base of the stipe are pale brown; they vary widely in size (up to 15 mm. long by 4 mm. broad) and are lanceolate and long-attenuate. The cells are long, narrow, and thin-walled. The fronds are otherwise devoid of scales apart from small tufts of hair-like ones on the rachis at the bases of the pinnae.

SPORANGIA AND SPORES

The sporangia are practically orbicular in outline; the number of the cells in the longitudinal annulus var-

[2] New Phyt. 4: 214. 1905.

Onocleopsis Hintonii, type (sterile)

ies from 30 to 35 or even more. Apparently, in the specimen examined by Dr. Copeland,[3] presumably Steyermark's Guatemalan collection, only 24 annular cells were present. The stalk of the sporangium is of the usual slender type. The morphology of the spores has proved somewhat difficult of interpretation. I originally described them as ellipsoid though Copeland has since stated that they are globose-tetrahedral. After another thorough examination of the few spores that remain on the type specimen, I have come to the following conclusions. The spores are certainly not tetrahedral as I understand the term. In general outline they are more or less ellipsoid, as will be seen from fig. 4, though there is some variation. The spore is encased in a loose and easily detachable exine which is finely granular and curiously adorned with linear tucks or folds. There seems, however, to be present on many of them a triradiate tetrad scar and they can therefore be described as trilete. In many of the spores the aforementioned linear folds confuse the picture and the scar ridges become broken up. An investigation of better and preferably fresh material is much to be desired.

The overall length of the spore varies between 52 μ and 63 μ due to the readily distorted exine, but the size of the spore divested of the exine measures from 36 μ to 41 μ The color of the spores is another point of difference between Dr. Copeland and myself. I described them as green though Copeland states they are black. Viewing them by transmitted light under the microscope the spores of the type specimen appear brownish green. Divested of the exine they are clear green in color. By reflected light, they would, of course, appear darker, though not, I think, sufficiently so as to be described as black.

The spores of *Matteuccia Struthiopteris* and *Onoclea*

[3] Gen. Fil. 104. 1947.

ONOCLEOPSIS HINTONII, TYPE (FERTILE)

sensibilis were also examined for comparison. Herbarium specimens were again used and the spores of both plants were found to be identical in construction with those of *Onocleopsis*. Indeed, apart from slight differences in size, it is doubtful whether they could be distinguished. The measurements of the spores were as follows:

ONOCLEA:—Length of complete spore 52 μ to 58 μ; of spore minus exine 39 μ to 46 μ.

MATTEUCCIA—Length of complete spore 45 μ to 49 μ; of spore minus exine 32 μ to 40 μ.

The spores of these two genera have been described both by Christensen and Copeland as "bilateral" though this character cannot be very pronounced. The profile view of a spore as seen in fig. 4 gives very little idea of its three-dimensional shape. I was quite unable to make up my mind as to the exact shape of the spores of *Onocleopsis* or of its congeners though I suggest they conform to what Erdtman[4] calls "suboblate."

As stated above, the exine of *Onocleopsis* is finely granular and there seems to be no trace of epispore. Although *Matteuccia* is usually stated to possess an epispore, I could find only slight traces of extraneous tissue adhering to the exine.

In the original generic description the nervation of *Onocleopsis* was stated to be similar to that of *Onoclea*. The long narrow costal areoles are present in both, while the only free veins are those along the margins of the pinnae. To avoid ambiguity, if any should exist, it is suggested that the phrase in the specific description, "venulis apice liberis nullis" should read "venulis apice liberis exceptis marginalibus nullis."

The genera *Matteuccia, Onoclea* and *Onocleopsis* form a compact group of obvious affinity. They have prob-

[4] Introd. to Pollen Analysis 45. 1943.

ably no close living relatives and are certainly of ancient lineage. The two first named were treated by Christensen (1938) as a subfamily of his Polypodiaceae. In Copeland's latest arrangement (1947), however, they are rejected from a more circumscribed Polypodiaceae and appear under his Aspidiaceae, though without the status of subfamily. Indeed, the category of subfamily seems not to be accepted by Copeland. This seems a pity, more especially in a large family such as the Aspidiaceae (66 genera) in which the *Onoclea* group rubs shoulders with such morphologically diverse elements as *Elaphoglossum, Dryopteris* and *Quercifilix.*

ROYAL BOTANIC GARDENS, KEW.

A New Athyrium with Reticulate Venation

E. B. COPELAND

ATHYRIUM **praestans** Copeland, n. sp.

Diplazium (?) *praestans* Maxon, in herb.

A. rhizomate breve adscendente, stipitibusque paleis fuscis angustis 2–3 mm. longis integris vestitis; stipitibus paucis fasciculatis, 4–7 cm. longis, 2 mm. crassis, obscuris; lamina 20–30 cm. longa, 7–9 cm. lata, oblanceolata, subcuspidata, basi attenuata, integra vel undulata, herbacea, glabra; costa conspicua, venis angulo acuto excurrentibus deinde versus marginem curvatis, ubique furcatis et anastomosantibus; soris irregularibus, usque ad 5 cm. longis, fere omnibus unilateralibus (asplenioideis), indusiis angustis integris.

Peru: Chazuta, Río Huallaga, Department of San Martín, alt. 260 meters, in forest, *G. Klug* No. 4002 (type, in U. S. National Herbarium). Also, Department Junín: *Killip & Smith* 23621, alt. 700–900 m.; 26798, alt. 340 m.; 27800, alt. 135 m.; Department of San Martín: *F. Woytkowski* 35237, alt. 890 m.

When I chose this subject for a publication in honor of Doctor Maxon, I intended to treat the species as representing a new genus. Considering only it and the types and body of *Athyrium* and *Diplazium,* its generic

Athyrium praestans, type, with detail of cell structure of palea of stipe (×90) separation would be justified, and would have ample precedent. I have decided not to do this because it has too much precedent, and would in turn be a precedent for the recognition of several more potential genera.

In my Genera Filicum, I have admitted as genera *Hemidictyum*, *Callipteris* and *Diplaziopsis* (besides *Anisocampium*, which is no near relative of the ferns considered here), all most conspicuously characterized by the patterns of the anastomosing veins. I have not given generic status to *Athyrium esculentum*, which may be the type of Presl's genus *Digrammaria*, nor to the group of *A. cordifolium*, which includes the types of *Anisogonium* Presl, *Ochlogramma* Presl, *Pteriglyphis* Fée, and perhaps of *Oxygonium* Presl. These seem to constitute a natural group of species, which might be one genus, and include *A. fraxinifolium*, the veins of which are usually free.

Generic status would be given to *A. praestans* as reasonably as to any of the preceding species or groups. But, with the same propriety, it could be given to its Peruvian neighbor, *A. pinnatifidum*, to *Diplazium aberrans* of Colombia, and to *A. ceratolepis* of Costa Rica. The immediate affinities of these species are not clear to me, but their differences are such that I would not combine them in a genus distinct from *Athyrium*.

Anastomosis of the veins is obviously correlated with the integrity (absence of dissection) of considerable areas of lamina, whether of simple fronds or of very ample pinnae. As a casual, more or less rare, phenomenon, it occurs in similarly undissected fronds of some species, such as *A. plantaginifolium*, the type species of *Diplazium*, in which it has not become established. Free veins are surely to be regarded as primitive in the genus.

UNIVERSITY OF CALIFORNIA.

Origin of the West Indian Fern Flora

M. A. Chrysler

The richness of the West Indies fern flora in respect to both individuals and species is sure to impress the visiting botanist. With a vast reservoir of species in South America and with ocean currents, trade winds, hurricanes, and birds provided, it might appear easy to account for the origin of the flora. But as soon as one looks into the matter he begins to find serious obstacles. A review of the problem, to which Dr. Maxon made so many contributions, is attempted in this article.

Let it at once be admitted that the origin of the fern flora, depending on distribution by spores, cannot be settled apart from the general problem of introduction of higher plants. A very small proportion of the fern flora exists apart from forests, even though the pioneer flora of Krakatau may have consisted of blue-green algae and mycorrhizal ferns (van Leeuwen, 1936). The problem is thus enlarged by our having to consider modes of dispersal which are effective only over short distances. The ease with which hypothetical land-bridges can be furnished has led many biologists to discard such proposals unless supported by strong geological evidence. Moreover, theories of dispersal of higher animals and plants by winds, ocean currents, floating logs, and the like are definitely rejected by some biologists.

Topography, Present and Past: The Greater Antilles

Ninety miles south of Key West, across the Straits of Florida, lies the western end of the large island of Cuba, which in the Sierra Maestra of the eastern end reaches an altitude of 6500 feet.

Due south of eastern Cuba, across 120 miles of deep water (to 23,000 feet) lies the much smaller but higher Jamaica. Eastward from Jamaica lies Hispaniola, also a mountainous island. Eighty miles to the east of the latter is the small but mountainous island Puerto Rico, with the Virgin Islands rising from a submerged shelf on the eastern side. Geologically the islands are similar, and show no evidences of volcanic activity.

If ordinary maps showed the depth of water as well as height of land, a conspicuous feature would appear; extending west-southwest from Jamaica to Honduras and Nicaragua is a great submarine plateau at depths of less than 6000 feet; above this rise a number of banks and "keys." To the west lie the cavernous depths of the Bartlett Deep. The submarine plateau, islands of Jamaica, Hispaniola and Puerto Rico, with a branch represented by Cuba, are regarded by Schuchert (1935) and other geologists as part of an Antillean geanticline. During the Eocene and again during the Miocene and early Pliocene the now submerged portions appear to have been above water, forming a continuous land-bridge making possible the dispersal of plants and animals from Central America. For more or less prolonged periods the four islands were connected, such periods being followed by sinkings bringing about isolation of one or another of the islands from the chain, and the partial submergence of the islands, e.g., the central part of Cuba.

To complicate the situation, it should be recalled that the Panama land-bridge was completed only in late Mesozoic Time, and was broken during parts of the Cenozoic. Spread of plants from South America was manifestly delayed by these earth movements.

TOPOGRAPHY: THE LESSER ANTILLES OR CARIBEES

To the east of the Virgin Islands, and separated from them by the Anegada Passage, which reaches a depth of 6400 feet, extends an arc-shaped group of islands beginning with tiny Sombrero and terminating in Grenada, which lies 90 miles north of Trinidad. This group embraces many small islands, also the larger Guadeloupe, Dominica, and Martinique. Many signs of volcanic activity are evident (witness Mont Pelée), and for many years geologists regarded the islands as the product of submarine volcanoes arising from the Atlantic bottom, probably never forming a continuous ridge. These islands vary in age, but all are considered recent compared with the Greater Antilles.

More recent methods of submarine study by means of gravity measurements have established the existence of an arc of negative "gravity anomalies" lying slightly to the east of most of the Caribees, indicating the reality of a geanticline connecting the east end of the east-west Antillean geanticline with the east-west axis extending through northern Venezuela and Colombia. Hess (1938) has furnished a useful account of the geological aspects of the problem. Although geologists are cautious in concluding that this connecting geanticline arose above water as a more or less continuous ridge, it is at least possible that a land-bridge was present in the Tertiary, even though interrupted locally by subsidence and erosion.

We may now examine the various possible sources of the Antillean flora.

(1) Florida, representing southeastern North America.

The distance from Florida to Cuba, say 90 miles, represents as short a gap as any now existing between the islands and mainland. Small (1938) recognizes over 60 species of ferns which occur in Florida as well as the Antilles, but agrees with other observers in the opinion that most if not all of these are West Indies ferns which have spread across to the mainland; several of the spleenworts have even given rise to endemics, e.g., *Asplenium biscaynianum.* Moreover, the direction of prevailing winds and ocean currents indicates that spores from Venezuela or the West Indies would be deposited on the eastern side of Florida. Incidentally, there are several of the seed plants which may have been carried from the southeastern states to Cuba (*Myrica cerifera,* by birds (?), *Pinus caribaea* or other species, *Quercus virginiana*).

(2) Continental Tropical America across the conjectured land-bridge between Honduras and Nicaragua and Jamaica.

Derivation of at least part of the Antillean flora from Central America is strongly indicated by the following ranges. Of the 284 Puerto Rican pteridophytes recognized by Maxon (1926):

108 range from Mexico to South America
68 are reported only from Central and South America
11 are reported only from Central America[1]
187

Of the remaining 97 species:

10 are endemic in Puerto Rico
55 others are found only in the West Indies
65

This leaves only 32 species to account for. It may be remarked that these 10 + 55 species represent part of a real "West Indian flora"—if there is one.

(3) Continental Tropical America by way of the conjectured land-bridge between Yucatan and Cuba.

[1] It is realized that the reported presence of a species in a given locality is of greater significance than the reported absence. Quoting Cain (1944): "Perhaps the most that plant geography can accomplish is the accumulation of coincidences between the occurrence of areas and the possible causes of areas."

Yucatan lies only 130 miles from the west end of Cuba. Little evidence however has been adduced for the functioning of a late and evanescent bridge across this gap. But a study of the flora of Pinar del Rio, western Cuba, might reveal the presence of plants occurring here as well as Mexico or Central America, but not in eastern Cuba and Hispaniola.

(4) Venezuela and adjoining parts of South America.

Between Trinidad (structurally, geologically and floristically a part of Venezuela) and Grenada extends a passage 90 miles wide and with depths to 2400 feet. This has usually been considered an effective barrier, but as we have seen, recent geological research has at least supported the idea of an axis connecting the east end of the Antillean geanticline with the Venezuelan east-west axis.

Compilation of the work of Maxon (1926), Domin (1929), and Hodge (1941) shows that 42 species of pteridophytes, reported from various West Indian islands, occur also in Venezuela or adjoining countries, but are not reported from Central America. Stehlé (1935–37) lists ferns only incidentally; from his work has been compiled a list of 75 West Indian angiosperms occurring in Venezuela and/or adjoining countries but not in Central America. A contribution to the Antillean flora directly from Venezuela is thus plainly indicated.

According to Maxon (1926) 36 out of the 42 pteridophytes just mentioned occur in Puerto Rico as well as Lesser Antilles. This is in line with the count made from Maxon's work, that of the 284 pteridophytes found in Puerto Rico 184 occur also in the Caribees; many of these of course may have come from Central America over the land-bridge. It looks as though there has been extensive migration between the Greater and Lesser Antilles. With the exception of endemics, there appears to be but little evidence for a distinct flora in the latter group. It is obvious that if a direct land connection formerly existed between the Lesser Antilles and Venezuela, the effect on the West Indian flora of the prolonged separation of North America from South America in the Panama region is greatly lessened.

If recent geological work should fail to be substantiated, biologists are hard pressed to account for the fauna and flora of the Caribees. If wind and water, birds and floating logs must be depended on as carriers of propagules, it is important to bear in mind that the prevailing direction of both air and water currents in this region is in a general way from the east. The trade winds blow from the northeast, and hurricanes mostly move from south to north; the equatorial current flows strongly from the east along the north shore of South America.

As to angiosperms, the minute seeds of orchids are carried by winds, and the agency of birds must not be overlooked. For an extended treatment of this topic the reader is referred to Ridley (1930).

(5) By mutation.

One other source of the West Indian flora deserves brief consideration—the origin of new species by mutation in plants already introduced. No doubt this process is constantly in operation, but perhaps most actively when a recently introduced plant finds conditions somewhat different from the former ones; some of the conditions may be favorable for preservation of the novelty. One of the changes associated with the origin of new forms is doubling (or otherwise altering) the normal chromosome number; this phase of the matter is at present receiving much attention at the hands of cytologists, plant geographers and breeders.

The new form may sooner or later be recognized in the field and regarded as a variety, and later be raised to the status of a species. Good examples are to be found among the ferns. *Cyathea arborea* (L.) Smith, widely distributed in South America and the West Indies, is a hardy species, enduring considerable sunlight and only moderate humidity, as is shown by its occurrence as a roadside plant in the eastern mountain region of Puerto Rico. In 1881 Baker recognized *C. arborea* var. *concinna* at altitudes of 1500–2100 meters in the Blue Mountains of Jamaica. In 1891 Jenman raised the status of the plant to *C. concinna.* Thus far it has not been observed outside of Jamaica, and so is regarded as an endemic.

Polypodium squamatum L. may possibly have arisen as a mutant from the widespread *P. polypodioides* (L.) Watt on one of the greater Antilles; it is now found in Cuba, Hispaniola, Puerto Rico and the Bahamas.

Only 10 endemic species of pteridophytes are listed from Puerto Rico out of the total of 284 species, i.e., 3.5%. That the angiosperms endemic in Puerto Rico form a larger proportion is indicated by such counts as the four endemics out of thirteen species of *Croton*, nine out of 25 in *Eugenia*, and many others.

Speaking generally, it is agreed among plant geographers that the West Indian flora is distinctly a tropical one, showing close affinities with the South American flora. Two chief routes of migration are most probable: directly from Venezuela, and via Central America. As climatic changes are met along the way, some species drop out while others arise by mutation. The need for further field work is clear to every botanist who collects on the islands.

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LITERATURE CITED

Cain, S. A. 1944. Foundations of plant geography, 556 pp.
Domin, K. 1929. Pteridophyta of the island of Dominica.
Hess, H. H. 1938. Gravity anomalies and island arc structure

with particular reference to the West Indies. Proc. Amer. Phil. Soc. **79**: 71–96.

Hodge, W. H. 1941. Notes on Dominica ferns. Amer. Fern Journ. **31**: 103–111; 121–127.

Van Leeuwen, W. M. 1936. Krakatau, 1883–1933. Leiden.

Maxon, W. R. 1926. Pteridophytes, *in* Sci. Survey of Porto Rico and the Virgin Islands, vol. 6, part 3. New York Academy of Sciences.

Ridley, H. N. 1930. The dispersal of plants throughout the world.

Schuchert, C. C. 1935. Historical geology of the Antillean-Caribbean region. 811 pp. New York.

Small, J. K. 1938. Ferns of the southeastern states. Lancaster, Pa.

Stehlé, H. 1935–37. Flore de la Guadeloupe et dépendances.

Unlisted Fern Names of Alphonso Wood[1]

E. D. MERRILL

An examination of the various botanical works published by Alphonso Wood beginning with his first Class-Book (1845) indicates that there are a considerable number of unlisted binomials which have escaped the attention of those bibliographers interested in recording new names. A check of Wood's new names for ferns in Christensen's Index Filicum and its three supplements shows that the names listed below (marked with an asterisk *) have been overlooked, or in one case (marked with a dagger †) the entry is erroneous. The one entry due to an error in transcription is possibly not worthy of being recorded. The only works involved are the original edition of Wood's Class-Book (1845), its second and revised edition (1847), the first issue of his new Class-Book (1861), which is *not* a third edition of the original one, but an entirely new work, and the American Botanist and Florist (1870).

* ADIANTUM CURTISII Wood, Class-Book, ed. 1861, 820. 1861 = *A. Capillus-Veneris* Linn.

[1] See also, Merrill, E. D. Unlisted new names in Alphonso Wood's botanical publications. Rhodora **50**: 101–130. 1948.

This is a rather strange case, considering the circumstances. Wood visited Curtis on his trip to the south in 1857. All he says regarding this new species is: "We saw specimens of a new Adiantum in the herbarium of M. A. Curtis from the Mts. of N. Car. But our notes are insufficient at present for its proper diagnosis." The same statement appears in all printings of this work up to 1880, but in the 1881 issue, which was very slightly revised, its place is taken by *Adiantum Capillus-Veneris* Linn., but *A. Curtisii* Wood is not there mentioned as a synonym. Curtis in a letter written in 1857 to Asa Gray states: "Wood is taking in the southern field too. He spent a couple of days with me a fortnight since & has milked me to some extent . . . I have been sorry, since he left, that I showed him as much as I did." One result was the rather irresponsible publication, on the part of Wood, of *Adiantum Curtisii* Wood, a *nomen nudum*.

* ANTIGRAMMA PINNATIFIDA Wood, Class-Book, ed. 1861, 822. 1861 = *Asplenium pinnatifidum* Nutt. (1818).

At the end of the description Wood cites "*Asplenium*, Nutt.," which explains the disposition of this new binomial.

* ANTIGRAMMA RHYZOPHYLLA Wood, l.c., *sphalm.* = *A. rhizophylla* J. Smith = *Camptosorus rhizophyllus* (Linn.) Link.

† BOTRYCHIUM NEGLECTUM Wood, Class-Book, ed. 2, 635. 1847; Class-Book, ed. 1861, 816. 1861 = *B. ramosum* (Roth) Aschers.

The entry in Index Filicum is to the 1861 Class-Book, the entry being "ed. 2, 816. 1860." Underwood[2] cited it as "[ed. 3]," his date, 1860, being erroneous. However, it was first described in 1847, Wood's type being from Meriden, New Hampshire. Some authors recognize the species as a valid one; others reduce it to the

[2] Bull. Torrey Cl. 30: 47. 1903.

European *B. ramosum* (Roth) Aschers. (*B. matricariaefolium* A. Br.).

* CAMPTOSORUS EBENOIDES Wood, Amer. Bot. Flor. 425. 1870 = *Asplenium ebenoides* R. R. Scott (1866).

The entry is merely "*C. ebenoides* (R. R. Scott)," but this is sufficient to place the new binomial.

* CAMPTOSORUS PINNATIFIDUS Wood, l.c. = *Asplenium pinnatifidum* Nutt. (1818).

The entry here is merely "*C. pinnatifidus* (Nutt.)," a case similar to the preceding.

CISTOPTERIS, as entered by Wood, Class-Book 460. 1845, *nom.* in syn. and Class-Book ed. 1861, 882. 1861, with *C. bulbifera* and *C. fragilis* described in the work of 1861, is not listed as an overlooked name as *Cistopteris* may be considered merely a variant spelling of *Cystopteris* Bernh. This form of the generic name may have been used by other authors than Wood, even if not recorded. See my paper "Cystopteris fragilis or C. Filix-fragilis?"[3] The argument in favor of the binomial *Cystopteris fragilis* was that the original publication of the name *Polypodium F*[*ilix*] *fragile* was an error on the part of Linnaeus in 1753, and that what he intended was *Polypodium fragile*, the form used in his Flora Svecica, ed. 2, 374. 1755. Mr. Weatherby informs me that Linnaeus, in his personal copy of the Species Plantarum, had corrected the entry under *Polypodium* from "*F. fragile*" to "*fragile*," which further supports my argument.

COMMENT ON WOOD'S TEXTS

There has been much confusion in the actual citation of references to various issues of Wood's Class-Book. Apparently it has not been generally realized that two entirely different works under the same leading title "Class-Book of Botany" were being issued concurrently and sold in great numbers year after year following

[3] Amer. Fern Journ. 25: 127–131. 1935.

1861. The subtitle of the original Class-Book is "A Flora of the Northern United States, Particularly New England and New York." In 1847 it was rewritten, amplified and issued as a second edition. Its subtitle reads "A flora of the Northern, Middle, and Western States, Particularly of the United States North of the Capitol, Lat. $38\frac{3}{4}$°." This work was an immediate success, and from 1848 on it was reprinted year after year from the original stereotype plates of the 1847 issue up to 1869, with undated issues after this period; each year it was reprinted the date on the title page was changed, but otherwise there were no changes except that in the unimportant addenda of 1847 the four entries were increased to six by 1869. The most extraordinary thing is the number of so-called "revised and enlarged editions." By 1849 the so-called tenth edition had appeared, and by 1855 the so-called forty-first edition, all of them, according to the imprint "revised and enlarged" . . . forty-one revised and enlarged editions in eight years! These are, of course, not new editions, but merely new issues, for all were printed from the unchanged stereotype plates of 1847. One suspects publisher's propaganda here!

Clarity in citation is further complicated by the fact that in 1861 Wood issued an entirely new work, still called "Class-Book of Botany." Its subtitle is "A Flora of the United States and Canada." The area covered was extended west to the Mississippi River and south to northern Florida and Louisiana. The history of this work is similar to that of the earlier one. From 1862 to 1868 it was reprinted from the stereotype plates of 1861, the only changes being the date on the title pages. In 1869 a very slightly changed issue appeared, not indicated as a new edition, although it did contain a modicum of new material; for the most part the original stereotype plates of 1861 were used without changes. This was reissued year after year with changed dates on the title page. In 1881 it was again very slightly amplified, the chief changes being made in the addenda, and this 1881 issue continued to be reprinted year after year until the work was withdrawn from circulation late in the last century or early in the present one. The latest dated copy that I have seen is that of 1891.

Here the publishers might legitimately have indicated the editions of 1869 and of 1881 as new ones, but they did not do so. The new issues are indicated by the copyright dates only. I repeat that the chief cause of confusion is that two entirely different works under the same leading title "Class-Book of Botany" were concurrently being issued from 1861 on. Some authors have tried to clarify the situation by characterizing the 1861 issue as "[ed. 3]" which it is not; others have called it ed. 2 which is manifestly wrong; it is actually the first edition of an entirely new book. I cite the original work of 1845 merely as "Wood, Class-Book," and the 1847 issue as "ed. 2." For the issue of 1861, the new work, the best that I can do is to cite it as "Wood, Class-Book, ed. 1861, . . . 1861," and so for the issues of 1869 and of 1881. This is a bit cumbersome, but it is at least clear.

It is fortunate that there is little need to consult this obsolete work very frequently. Most of Wood's nomenclatural innovations have not stood the test of time, and if his names are cited at all, with very few exceptions they appear as synonyms. The only dates that one should keep in mind are 1845, 1847, 1861, 1869, and 1881, for in most or all of these issues there are a very few nomenclatural innovations. The issues bearing intermediate dates, no matter what edition they may be called, were all printed without changes from the plates of 1847 for one run of the Class-Book, and from the second run the plates of the 1861 edition with only a very few minor changes in 1869 and in 1881, and no changes later than 1881.

To a degree there are similar difficulties in Wood's American Botanist and Florist, first published in 1870. This was issued year after year, the only changes made being in the date on the title pages, and very minor additions in the addenda beginning with the 1875 issue.

Wood's botanical publications were very popular as texts in secondary schools. It is reported that between 800,000 and 1,000,000 copies were sold. This must have been a bonanza for the publishers, and it is hoped that the author profited accordingly. One suspects that the publishers permitted the author to make only very minor changes in the years when additional data were included, so as to avoid the cost of making new stereotype plates. The only time when there was a rather thorough-going revision was for the second edition of 1847. The author was apparently in the publisher's hands. He had produced a series of "best sellers" and there was no apparent reason why any thorough-going revisions should be undertaken as long as the original works sold well, and sell well they did. The stereotyped plates of 1847 and 1861, used over and over again until the works were finally withdrawn by the publishers in 1915, resulted in stereotyped texts in the secondary senses of that word "repeated mechanically or without variation; mechanical; lacking originality or individuality."

ARNOLD ARBORETUM.

Fern Miscellany: Brooklyn

R. C. Benedict

Brooklyn, of all five boroughs of Greater New York, is probably least blessed in sites suitable for the persistence of native species of ferns. While there are many hundreds of acres which have not been built upon, most of such acreage comprises either salt-marshland or regions of grading and fill. It is not impossible that there may exist some small areas of natural marshland where the Osmundas may be found. I have found *O. spectabilis* on one of the narrow sand strips which border the ocean side of Great South Bay (Oak Island Beach). Even Manhattan, despite is great encrustations of asphalt, brick, and cement has at least some areas of rocky outcrops, including the park section at its northern end. The Bronx has the hundreds of acres along the Bronx River included within the Botanical Garden and Zoological Park area, where woods of native hemlock and other trees offer sites for ferns. Similarly, Queens Borough, although I cannot vouch for any specific ferns, offers park reservations which carry westward the conditions under which a number of species flourish on Long Island in general. Richmond—Staten Island—is the least citified of all five boroughs from its former state. While I have made no recent visit there, its central areas must still offer sites for the persistence of *Dryopteris Goldiana* and other related wood ferns, and its marshy woods presumably still provide sites for the Massachusetts fern, the narrow chain fern, and others.

In earlier days, the area now lying within the boundaries of Kings County (Brooklyn) must have had approximately the same fern flora as adjacent Long Island regions still offer. When road traffic permits, it is still possible to start from almost any part of Brooklyn and to reach in less than half an hour some water-reservation woodland just outside New York limits where the Osmundas, the narrow chain fern, the Massachusetts fern and some other dryopterids flourish. Presumably a search at the right times of the year would turn up a few of the Botrychiums.

But this paper is not intended to deal with native ferns as one might find them in some area more fortunate than Brooklyn. (Parenthetically, the Brooklyn Botanic Garden still maintains the largest assortment of greenhouse species to be found in Greater New York and probably over a much wider range of the country.) The following paragraphs are designed to place on record notes regarding a few widely separate fern observations. Their only unity arises from the fact that Brooklyn is the place in which most of the observations have been made.

THREE PTERIDOPHYTES NATURALIZED IN BROOKLYN

SELAGINELLA: Across the street from where this is being written stands a large, New England meeting-house type of church building, the Flatbush-Tompkins Congregational Church. The building is flanked on either side by fairly large lawns. Matted in with the grass over a few square yards of area is a thrifty growth of *Selaginella apoda*, first noted last fall. Whether it has been there longer I am unable to say, but it has come through the past two very dry summers in excellent condition and seems to be spreading. Herbarium specimens are being collected for deposit in various herbaria. This species is probably like some of the small Botrychiums and Adder's-tongues in being of more common occurrence than has been recognized.

EQUISETUM: The Borough of Brooklyn is cut through by a freight spur of the Long Island Railroad, which, in much of its course, runs through an open cut. The banks of this cut offer excellent ground for a considerable variety of tolerant, more or less weedlike species, such as wild cherry, mountain sumac, with special emphasis on ragweed and poison ivy. As the southern border of the Brooklyn College campus, this rather neglected right of way has furnished excellent supplementary collecting grounds for college botany classes. Flourishing on one portion of its southern bank, where Ocean Avenue bridges the cut, is a colony of the "gold rush," *Equisetum arvense.* This horsetail seems to have almost unequalled capacity to pioneer poor soil, including cinder embankments.

PTERIDIUM: The Brooklyn College landscaping developments of some ten years ago included a considerable variety of shrub plantings, with various members of the heath family. In two of the heath plantings, stowaway bracken plants must have been included. These have flourished in these two spots until the intended shrub plantings are almost overgrown and crowded out. So far the fern intruders have been permitted to hold on, as adding a distinctive touch to an otherwise formal planting. One slight possible curb was applied to one of the plots a couple of years ago in the form of a spraying with the hormone herbicide, 2,4-D. This proved almost completely ineffective, as had been shown by comprehensive tests elsewhere. Here it may be added that a similar test on the horsetail mentioned above, made elsewhere, indicated that this pteridophyte is extremely susceptible to 2, 4-D. After a single spraying with a sodium salt solution, the herbage turned black and the plants were apparently killed.

CERATOPTERIS, A MUCH MIS-IDENTIFIED AQUARIUM FERN

During the past score or so of years, interest in tropical fish has greatly increased the demand for aquatic plants as adjuncts of fish culture. At least three true ferns have been utilized, *Azolla, Salvinia* and *Ceratopteris.* Regarding the first two, there is no real confusion as to identification, but for examples of the "horn fern" (*Ceratopteris*), there is and has been a great deal of misidentification, both in fern literature and in popular accounts.

At one time in the last century, the English fern students Hooker and Baker were so impressed with the diversity of leaf forms and other features in this genus that they identified some of the specimens under several species and even established a new genus and family, *Parkeria* and Parkeriaceae, to distinguish these ferns. Later fern students went to the reverse extreme and put all the diverse plants from all over the world in a single species, *Ceratopteris thalictroides,* and this treatment persisted for some time. Some years ago, it was my task to examine world-wide material of these ferns as a basis for their consideration in the first fern part of North American Flora. Consultation with men who had collected them in the American and Old World tropics, together with microscopic examination of their spores and sporangia, showed that certain constant vegetative differences could be correlated with important differences in these other features. For example, in one species, the spore-case has an annulus or ring consisting of only a few cells, and contains only sixteen spores; in another species, the annulus has many cells and the spore-case contains thirty-two spores. One species, true *thalictroides,* has slender, tall fertile leaves and mostly small sterile leaves. At least two other species, both American, seem to occur almost entirely as floating plants with large, wide-spread fertile leaves and with broad, partly erect sterile ones. One of the latter species has been found abundantly in Lake Pontchartrain, Louisiana, and in situations in Florida and

ORNAMENTAL ARRANGEMENT OF FRUITING LEAVES OF ONOCLEA, MATTEUCCIA, AND LORINSERIA elsewhere in the American tropics. This, the most common Florida species, was found to be *C. pteridoides.*

What is identified now as *C. thalictroides* has been seen growing very successfully in dimly lighted fish tanks in two places in Brooklyn. It appears to be of easy culture in a foot or so of water, if the temperature does not rise too high. All these species reproduce abundantly by budding from the older leaves as well as from spores.

SPORE PRODUCTION AMONG NATIVE FERNS

Like flowering plants, our native ferns show a wide range of fruiting periods from spring to fall. There are no ferns which match the skunk cabbage in precocity of reproduction, and, in the New York City area, May seems to see the first spore production, with a succession lasting among various species until frost. The following notes center about observations made mostly in a backyard garden in Brooklyn, but with other data gained from field work.

The earliest noted are the Osmundas, with the interrupted the first to start the procession, about May 15th, followed by the royal and cinnamon at intervals of a week apart. In these, the spores are short-lived. The fertile parts wither very quickly, and the spores cannot be kept without planting for more than a few days.

June sees a wider variety of spore development with the early Botrychiums and one or two *Dryopteris* species maturing their spores in ordinary years before the end of the month. In July, most of the remaining species of *Dryopteris* ripen their spores and discharge them. The early Botrychiums finish their reproduction and are often withered by early August. During August, *Athyrium* and *Asplenium* join the procession. The lady fern group comes into its fullest maturity during this period. The *Dryopteris* species have discharged most of their spores, but usually one or more leaves on a plant are behind the general schedule. Maidenhair and bracken belong in the August group.

In September, the spore cases of the "fall" Botrychiums shed their copious yellow spores. Belated leaves of *Dryopteris* and *Athyrium* complete their development. The ostrich fern matures its moulded-brown fruiting leaves and begins to slit them open. Apparently at least three species wait until October before spore distribution begins in abundance, the sensitive, climbing, and narrow chain ferns. Indeed, while the spores of some sensitive-fern plants may be discharged in October, the plants in my backyard garden do not open their bead-like cases until the following spring. Likewise for the narrow chain fern; in my observation, although the fertile leaves may turn brown and partly wither fairly early in the fall, the leaf flaps and spore cases do not open until later.

Apparently these three ferns—ostrich, sensitive, and narrow chain—are adapted to distribute their spores over a long period of time. Like the salt-shaker type of seed pod, which remains brown but erect above winter snows, so with these fern fruiting leaves which may stand erect above ice and snow for more than one winter. In passing I may record my opinion as to the appropriateness of the common name proposed for *Onoclea* by Dr. Wherry. "Bead fern" is much more descriptive than the old term "sensitive fern."

BROOKLYN COLLEGE AND BROOKLYN BOTANIC GARDEN.

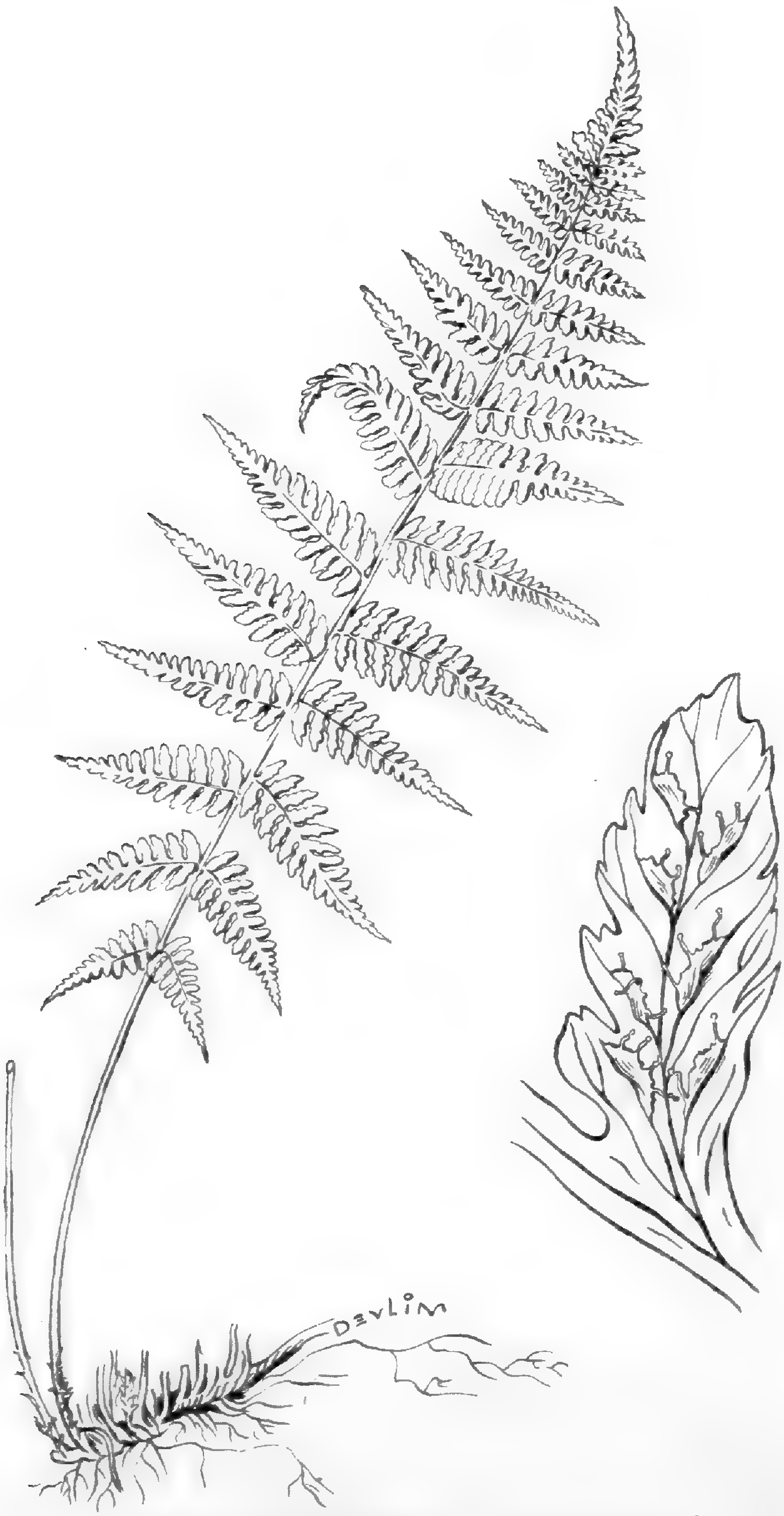
Remarks on the American Lady Ferns

EDGAR T. WHERRY

That the Lady Ferns, placed by Linnaeus under *Polypodium*, deserve assignment to another genus was recognized by Roth in 1799, and the name *Athyrium* was proposed. The lumping of this genus with *Asplenium* was perpetrated by Bernhardi in 1806, and accepted by the conservatives of the succeeding hundred years. Today, however, Roth's view is favored; and in Copeland's recent Genera Filicum *Athyrium* and *Asplenium* are even placed in separate families—Aspidiaceae and Aspleniaceae respectively.

Differences between east-American and Eurasian-west-American Lady Ferns were early noted. First, a southern entity found "from New England to Carolina" was named *Nephrodium asplenioides* by Michaux in 1803, and transferred to *Athyrium* by Eaton in 1817. Then a more northern one, received from "Canada," was designated *Aspidium angustum* by Willdenow in 1810, and assigned to *Athyrium* by Presl in 1825. Numerous other epithets were proposed for members of this assemblage in subsequent years, but in 1917 Butters brought order out of chaos by recognizing three species, each with multiple varieties and forms: respectively Eurasian-west-American, northeast-American, and southeast-American.

During the succeeding 30 years this taxonomic system has been widely accepted by American fern students, amateur and professional alike, and one might have hoped that the situation was stabilized. However, we learn now (Fernald, 1946) that in the forthcoming edition of Gray's Manual, the nomenclature is to be rearranged, and the east-American entities made varieties of the circumboreal *Athyrium filix-femina*. This is to



ATHYRIUM ASPLENIOIDES F. ELLIPTICUM

be done because certain of the entities treated by Butters are more or less intermediate between the entities he recognized as species. Actually there are plenty of cases, in ferns and flowering plants as well, where the existence of minor intermediates has not been allowed to disturb the convenience of recognizing species as independent.

My first acquaintance with *Athyrium Filix-femina* in the field was made in Idaho in 1931. From a moving automobile it could be readily recognized as quite unlike the eastern Lady Ferns. The large, firm-textured fronds, strongly tapered toward the base, were growing in funnel-like groups, corresponding to their arising from an erect rhizome. Repetition of such observations on many subsequent occasions has only served to strengthen the view that this western entity is abundantly distinct from the eastern ones.

In the writer's experience, the differentiating characters listed by the late Professor Butters (except that of degree of persistence of old stipe-bases) correlate reasonably well. The Northeastern Lady Fern, *Athyrium angustum* (Willd.) Presl, usually has copious persistent dark stipe-scales, elliptic blade-outline, glandless indusial cilia, and yellow, papillose spores. The Southeastern Lady Fern, *Athyrium asplenioides* (Michx.) Eat., usually has sparse caducous pale stipe-scales, ovate blade-outline, gland-tipped indusial cilia, and dark brown wrinkled spores. Confusion between them may be partly due to their inapt characterization by Tilton in 1922 as respectively "Upland" and "Lowland" Lady Ferns; actually the line of demarkation of their ranges shows no relation to altitude, and the "Lowland" one reaches in the Appalachians far greater altitudes than the "Upland" one.

One deviation from consistency, which unfortunately makes field identification difficult, concerns the blade-outline of the southeastern entity: at scattered localities from Pennsylvania to Georgia, this may be just about as elliptic as in the northeastern one. This would seem to deserve a technical designation in the status of form:

ATHYRIUM ASPLENIOIDES (Michx.) Eat., f. **ellipticum**, forma nova. Blade narrowed below so as to approach an elliptic outline; otherwise as in the typical form. (Lamina plus minusve elliptica; cetera ut in forma typica.)

Type in the herbarium of the Academy of Natural Sciences, Philadelphia, collected by Edgar T. Wherry, June 29, 1947, in moist woods 2 miles south of Wye Mills, Talbot County, Maryland. A drawing of the sparsely fertile frond, by Joseph M. Devlin, is here reproduced.

REFERENCES

1753. Linnaeus, Sp. Pl. (2): 1090.

1799. Roth ex Mertens, Röm. Arch. Bot. 2^1: 105; also Roth, Tent. Flor. Germ. 3^1: 58 (later in 1799). Validity of genus established by Milde, Bot. Zeit. **24**: 373 (1866). (These references, like numerous others, are inaccurately stated in Copeland's Genera Filicum.)

1803. Michaux, Flora Bor-Amer. 2: 268.

1806. Bernhardi, Schrader's Neues Journ. Bot. 1^2: 26.

1810. Willdenow, Sp. Pl. (ed. 4) **5**: 277.

1817. Eaton, Man. Bot. (ed. 1), 122.

1825. Presl, Rel. Haenk. (Pt. 1), 39.

1917. Butters, Rhodora **19**: 181.

1922. Tilton, Fern Lover's Comp., 91.

1946. Fernald, Rhodora **48**: 389.

1947. Copeland, Genera Filicum.

Some Woodsias from the North Shore of Lake Superior

ROLLA M. TRYON, JR.

Dr. F. K. Butters described in 1941[1] two *Woodsia* hybrids from Cook County and adjacent St. Louis County, Minnesota and Ontario, Canada. He mentioned the occurrence of five species in Cook County, in some places all "within a radius of a few hundred yards." Surely this makes the area one of the best *Woodsia* haunts in the country. The five species and two hybrids all grow on calcareous rocks and the rare ones are confined to them.

Knowing from a geological report[2] of the existence of similar calcareous rocks on Thunder Cape near the town of Silver Islet (about 15 miles east of Port Arthur, Ontario, Canada) we planned to visit the area at our first opportunity and in 1947 a week was spent camping and collecting at Silver Islet.

In the 1880's this historic town was the site of one of the richest silver mines in Canada. All told, about three and a half million dollars in silver was mined. The mine is located, and can be seen today, on a very small island just off the mainland. We were told that the ore-bearing vein was discovered accidentally while prospectors were using the islet as a triangulation station in their survey of the Sleeping Giant. Many of the old mining town buildings still remain in good condition, much to our advantage since we spent the first rainy night in the old jail and used it later as a press room.

The southern tip of Thunder Cape, on the western side, is composed of several large rock formations that

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[1] Amer. Fern Journ. 31: 15–21. 1941.

[2] Tanton, T. L. Fort William, Port Arthur and Thunder Cape Map Areas, Thunder Bay District, Ontario. Canada Geological Survey, Memoir 167. 1931.

rise to 1200 feet above Lake Superior. Viewed from Port Arthur on the west or from several miles away on the eastern side the formations have the aspect, to a remarkable degree, of a reclining man and the name Sleeping Giant is very aptly applied.

The rock formations are broadly rounded to nearly flat on top, each with nearly vertical cliffs and an open talus slope below. In one place there is a sheer 800 foot cliff. The cliffs are composed of slate below, limestone or conglomerate above, and massive diabase on the top. We chose the northeastern part of the Sleeping Giant as most accessible on foot though there was only a rough blaze to follow until we came to a surveyors line going out to the cliffs. The sheer cliffs were generally massive, dry and unproductive. The best fern habitats were above the talus at the base of small serried cliffs or in notches in the main cliff. Here the slate was weathered very suitably for ferns, affording numerous horizontal or vertical crevices and flat ledges. We worked this area for about a quarter of a mile. Thunder Cape proved to be a choice place for Woodsias for we collected five species and three hybrids in the limited area we were able to cover.

This series of collections raised several problems in identification and a study was undertaken to elucidate some of the identities in the genus. In the following treatment the key and the habitat statements pertain to the area under special consideration, that is, southeastern Thunder Bay District, Ontario and adjacent northeastern Minnesota. Taxonomic discussion is also centered on this area although extraneous material is cited when it pertains to specific problems. This study is primarily based on the collections of the author on Thunder Cape and in northeastern Minnesota, the collections of F. K. Butters and E. C. Abbe *et al.* in Cook County, Minnesota and the collections from Thunder

Bay District, Ontario in the Herbarium of David A. Watt now incorporated in the Herbarium of the Missouri Botanical Garden.

HYBRIDIZATION IN WOODSIA

As previously mentioned, F. K. Butters described, in 1941, two hybrids in *Woodsia*, one described originally from Sweden and one new. Two others are described in this paper. Since this "rash" of hybrids may seem more the product of overzealous pteridologists than of nature a general discussion of the evidences of hybridity is presented.

All of the putative hybrids have two characteristics in common. They have all or some of the sporangia abortive, and they are either intermediate between two known species or combine characters of two species. *W. Cathcartiana* × *scopulina* has the hairs of the latter species, although these are reduced in number, and the glandularity of both species but in greater amount than in either parent. The sporangia are entirely abortive. *W. ilvensis* × *scopulina* combines the scales of the former species with the characteristic hairs of the latter. The sporangia are abortive. *W. alpina* × *ilvensis* is quite intermediate between the two species and were it completely fertile would bridge the gap between them. Plump, mature spores are sometimes produced. *W. glabella* × *ilvensis* has the scales of *W. ilvensis*, although these are few, and is intermediate in shape of blade and stipe color. Mature spores are sometimes produced.

Another point to consider is that the hybrids between the most closely related species *W. alpina, glabella* and *ilvensis* are partially fertile while those between less closely related species *W. Cathcartiana, ilvensis* and *scopulina* are perfectly sterile. A single frond of *W. ilvensis* × *scopulina* has been found partially fertile but this has been interpreted[3] as a segmental chimera, the basal portion being sterile and diploid and the apical portion being fertile and tetraploid.

In my own collecting experience hybrids have been found in places where Woodsias were generally abundant and luxuriant. There are 15 stations known for the four hybrids and at ten of the stations both putative parent species are known to occur. At five stations only one parent species is known to occur, but considering limitations of time, difficulties of making complete surveys of numerous small cliffs, and the fact that very few collectors in the area have made special efforts to collect *Woodsia*, this cannot now be considered as significant.

Immature fronds cannot be used for characters of the stipe color or of abortive sporangia. The color of the stipe progressively darkens with the maturation of the frond and young fertile fronds will present "abortive sporangia" which are merely immature. In all of the four hybrids material collected late in the summer has been available and comparison has been made with the development of the sporangia in the parent species collected in the same place at the same time.

FERTILE HYBRIDS

As previously mentioned, the hybrids *W. alpina* × *ilvensis* and *W. glabella* × *ilvensis* are partially fertile; at least they often produce some mature sporangia that shed their spores in a normal manner and the spores are plump and appear normal. I have seen specimens of 40 rootstocks of *W. alpina* × *ilvensis*, probably representing at least 15–20 individual plants and have seen an estimated 50 plants of *W. glabella* × *ilvensis*. The number of individuals of these hybrids seems ample

[3] Butters, F. K. and R. M. Tryon, Jr. A fertile mutant of a *Woodsia* hybrid. Amer. Journ. Bot. **35**: 132. 1948.

proof of their fertility. The possibility is thus raised that these fertile hybrids may backcross to one of the parent species. Such plants would probably be more fertile than the hybrids and would in their characters be closer to one of the parents. On the Sleeping Giant in the particular notch where we collected *W. glabella* and *W. glabella × ilvensis* (*W. ilvensis* was, as always, ubiquitous) there were nearly equal numbers of *W. glabella* and the hybrid; thus future hybridization of *W. ilvensis* might occur as readily with the hybrid, or perhaps more so on genetical grounds, than with *W. glabella*. The same would be true for a backcross with *W. glabella* except that the chances would be considerably less because of the fewer individuals of that species. The specimens of the hybrid are variable—some are moderately close to *W. ilvensis,* most are intermediate and a few seem closer to *W. glabella.* Perhaps some backcrossing has occurred but, of course, the natural variability of the hybrid is not known.

A similar situation apparently also obtains in *W. alpina × ilvensis.* It has not been collected at a single locality where it was at all abundant, but it is known from 13 collections representing at least 10 stations. Specimens of the hybrid show a complete transition between the parent species. Considering the long period of time that has been available for these species to cross and backcross in their present habitats, or in similar ones in earlier post-glacial times, it seems quite likely that there are plants of *W. alpina* and of *W. ilvensis* that are perfectly fertile and are of hybrid origin. These plants would be referred to one of the species but would approach the other in one character or another. Plants of *W. alpina* that are slightly scaly on the pinnae and have a broader blade than normally and plants of *W. ilvensis* that are almost glabrous beneath (see discussion of *W. ilvensis*) may be of such hybrid origin.

KEY TO SPECIES AND HYBRIDS

1. Stipe jointed near the base; blade not glandular; indusium of several filiform segments. 2.
   2. Stipe light brown to dark reddish brown above the joint, and rachis smooth or scaly; or stipe straw-colored and the rachis scaly; blade usually scaly. 3.
      3. Sporangia all maturing. 4.
         4. Rachis and blade hairy and scaly, usually copiously so, or if sparsely scaly the scales at least on some distal nerves and leaf tissue on the lower surface of the pinnae; pinnae oblong-tapering, the basal nearly or more than twice as long as broad. .... *W. ilvensis.*
         4. Rachis smooth or only sparingly hairy or scaly; blade smooth or only sparingly hairy or scaly; scales on the blade only on the midnerve and at the base of the main veins on the lower surface of the pinnae; pinnae usually round-ovate to triangular-ovate, the basal usually broader than long to only slightly longer than broad. *W. alpina.*
      3. All or many sporangia abortive; abundance of indument on rachis and blade variable, usually moderately scaly and hairy. .... ×*W. gracilis.* *W. glabella* × *ilvensis.*
   2. Stipe greenish to straw-colored above the joint; rachis and blade smooth. .... *W. glabella.*
1. Stipe not jointed; blade glandular; indusium of several squamiform segments, these sometimes with a filiform tip. 5.
   5. Rachis and blade without hairs. .... *W. Cathcartiana.*
   5. Rachis and blade hairy with articulate hairs. 6.
      6. Rachis and blade sparingly scaly; sporangia abortive. ×*W. Abbeae.*
      6. Rachis and blade not scaly. 7.
         7. Sporangia abortive. .... ×*W. Maxoni.*
         7. Sporangia maturing. .... *W. scopulina.*

1. WOODSIA ILVENSIS (L.) R. BR.

Common on sedimentary or igneous rocks in either damp or dry situations. THUNDER BAY DISTRICT, ONTARIO: Damp, shady, slate cliffs, ne. side of Sleeping Giant, 2 miles w. of Silver Islet, Sept. 5, 1947, *Tryon, Tryon & Faber* 4965 (MBG).

The abundant scales are distinctive in this species and mark its presence in hybrid combinations. Shade forms are found in extremely damp and shady habitats and they are considerably less scaly than the normal sun form. The most extreme that I have seen (Pattison State Park, Douglas Co., Wisconsin, *Tryon & Tryon*

4887, MBG) has as few as 15 scales per pinna. A collection from Idington, St. Louis Co. Minnesota (*Lakela* 3851, Herb. Univ. Minn.) is not an extreme shade form, but one plant in this collection is essentially lacking in scales. Some pinnae are completely glabrous, and others have a few scales. As previously suggested, this may be of hybrid origin.

2. × WOODSIA GRACILIS (LAWSON) BUTTERS, Amer. Fern Journ. **31**: 15. 1941. (*W. alpina* × *ilvensis*.)

On basic rocks in damp or moderate exposed places. In leaf cutting and in degree of scaliness and hairiness some of the specimens approach *W. alpina*, some approach *W. ilvensis* and some are quite intermediate. In addition to the five collections cited by Butters I have seen the following:

MINNESOTA: Gooseberry Falls State Park, 15 miles ne. of Two Harbors, Lake Co., Aug. 28, 1947, *Tryon, Tryon & Faber* 4890 (Herb. Univ. Minn., MBG); Grand Portage, Cook Co., June 28, 1936, *Butters & Abbe* 153 (Herb. Univ. Minn.); Pigeon Point, Cook Co., Aug. 21, 1937, *Abbe & Abbe* 591 (Herb. Univ. Minn.), Aug. 11, 1944, *Butters & Abbe* 999 (Herb. Univ. of Minn., MBG). VERMONT: Westmore, July 25, 1910, *Winslow* 10113 (Herb. Amer. Fern Soc.). QUEBEC: Saguenay [river], Aug. 1865, *Watt* (MBG); Riviere du Loup, Sept. 1, 1865, *Watt* (MBG), Sept. 1867, *Watt* (MBG).

3. WOODSIA ALPINA (BOLTON) S. F. GRAY.
W. Belli (Lawson) Porsild, Rhodora **47**: 147. 1945.

Damp, shady, basic, igneous and sedimentary rocks; rare. THUNDER BAY DISTRICT, ONTARIO: Slate cliff, ne. side of Sleeping Giant, 2 miles w. of Silver Islet, Sept. 5, 1947, *Tryon, Tryon & Faber* 4962½ (MBG).

The blade is often lacking in scales, but sometimes has a few—the most I have found on a specimen is two to a pinna. It is suggested in the introduction that this is, at least in part, a *W. ilvensis* character that has entered the species through hybridization. This species grades into *W. ilvensis* through $\times$ *W. gracilis.* Plants of that hybrid that are close to *W. alpina* may be separated by their greater scaliness and their abortive sporangia.

Porsild has recently separated the plants of eastern temperate North America as a species distinct from typical *W. alpina* of arctic North America and Europe. A suite of specimens, it is true, is generally different from the more northern material, but none of the differential characters are sufficiently constant to afford more than varietal distinction at best. Except for the luster and color of the stipe, the characters of *W. Belli* seem reasonably correlated with the more temperate climate. The less chaffy, thinner stipe, the more delicate, larger fronds (somewhat different in shape) and the discrete sori are all "shade form" characters and are variable as one would expect. One plant of a collection from Gooseberry Falls State Park, Lake Co., Minnesota, (*Tryon* 4106, MBG) is definitely a sun-form of our plant and has heavily fertile blades up to 6.5 cm. long, contiguous sori and the larger stipes up to 1 mm. in diameter. The blades are coriaceous and broadest above the middle. This plant is similar to European specimens except that it has a dark, shiny, smooth stipe. Four other plants in the same collection have the characters of *W. Belli.*

This example has a parallel in *Dryopteris fragrans* (L.) Schott which has a similar range in North America. Arctic plants have a small coriaceous blade with crowded segments which are quite chaffy, as is the stipe. Var. *remotiuscula* Komarov, about the upper Great Lakes and Gulf of St. Lawrence, is less chaffy with a larger and more expanded and membranaceous blade.

The reddish brown and shiny stipe is a stronger character, but some specimens of *W. Belli* have a light brown stipe. A collection from the Falls of the Aroostook river, New Brunswick, Canada, *J. R. Churchill,* (in part, MGB) has such a specimen. A specimen of N. J. Andersson (MBG 873,080) from Lapponia has a shiny stipe, and one of Reuter (July 1860, MBG) from Alpes de Savoy has a reddish brown and shiny stipe.

4. WOODSIA **glabella** R. Br. × **ilvensis** (L.) R. Br., hybr. nov.

W. ilvensi similis; laminis laxis angustis membranaceis, paleaceis et pubescentibus; stipitibus et rachibus pallidioribus; sporangiis plerumque abortivis. TYPE: Damp, shady, slate cliffs, northeast side of Sleeping Giant, 2 miles west of Silver Islet, Thunder Cape, Thunder Bay District, Ontario, Canada, September 5, 1947, *R. M. & A. F. Tryon & A. C. Faber* 4962 (Herb. Missouri Botanical Garden.)

Frond 7–21 cm. long; stipe maturing to light brown at the base and straw-colored above or to brown; blade 5.5–17 cm. long, 1.2–2.1 cm. broad, the ratio of length to breadth 4.3:1–8.3:1, averaging 6.2:1 for the longest blades, relatively thin and lax, the apex acuminate or long-tapering; pinnae pinnatifid, the pinnule-segments mostly 4 (3–5) on each side; rachis light brown to straw-colored or greenish straw-colored at the base, the upper half greenish to green; rachis and blade scaly and hairy in variable but moderate degree; sporangia mostly abortive, but some spores maturing.

One of the parent species cannot be stated with the same degree of certainty as in the case of the other hybrids. One is, of course, *W. ilvensis,* as indicated by the characteristic scales in the hybrid. The other parent could be *W. alpina* rather than *W. glabella;* however, *W. glabella* was locally abundant near the hybrid locality and only a single plant of *W. alpina* was seen there. Also, the hybrid differs generally from × *W. gracilis* and in characters that are suggestive of *W. glabella.* These are the generally light stipe and rachis and the long narrow blade. The longest blades per plant averaged a length to breadth ratio of 6.2:1 for this hybrid and a 4.8:1 ratio for × *W. gracilis.* Some, but not all, plants show blades with a long-tapering apex, a character often seen in *W. glabella.* The hybrid may be separated from × *W. gracilis* only poorly at best by the characters mentioned above.

5. WOODSIA GLABELLA R. BR.

On basic rocks in shaded localities, particularily those that are locally cool; very rare. THUNDER BAY DISTRICT, ONTARIO: Cool, damp, slate cliff, ne. side of Sleeping Giant, 2 miles w. of Silver Islet, Sept. 3, 1947, *Tryon, Tryon & Faber* 4950 (MBG).

This species may always be distinguished by the smooth rachis and blade and the light colored stipe and rachis. In the collection cited the smallest fertile frond was 1.6 cm. long and the largest 14.5 cm. long.

6. WOODSIA CATHCARTIANA B. L. ROBINSON.

On various types of basic or acidic rocks in shady or sunny situations; infrequent. THUNDER BAY DISTRICT, ONTARIO: Damp, shady, slate cliffs, ne. side of Sleeping Giant, 2 miles w. of Silver Islet, Sept. 3, 1947, *Tryon, Tryon & Faber* 4949 (MBG).

This may be distinguished from the other species by the glandular, but not hairy, rachis and blade; rarely the rachis is slightly scaly. All material that I have seen from Iowa, Minnesota, Wisconsin, Michigan and adjacent Ontario is rather homogeneous and certainly conspecific. The indusial segments are relatively long and mostly with a broad squamiform base and a filiform tip. The blade is always glandular, although sometimes only slightly so, for the glands tend to be deciduous with age. Actually, *W. Cathcartiana* should probably stand as a variety, at best, of *Woodsia oregana;* however, for convenience it is treated here as a species until its relations with related material of the western and southwestern United States are clear.

Leaf-cutting offers no basis for separation of *W. oregana* and *W. Cathcartiana* and there is quite a complete transition from the short, small, narrow indusial segments of extreme *W. oregana* and the larger, broad, filiform-tipped indusial segments of extreme *W. Cathcartiana.* Sometimes the indusia are variable in a single collection. *Fassett* 19254 and 19252 from Big Limestone Mountain, nw. of L'Anse, Baraga Co., Michigan (MBG), are examples of this; some indusia are definitely of the *W. Cathcartiana* type, but others have the segments almost entirely filiform, although longer than in the extreme of *W. oregana.*

7. × WOODSIA **Maxoni** (*W. Cathcartiana* × *scopulina*), hybr. nov.

W. Cathcartianae similis; laminis et rachibus magis glandulosis, pubescentibus pilis articulatis *W. scopulinae;* sporangiis abortivis. TYPE: Damp, shady, slate ledges, northeast side of Sleeping Giant, 2 miles west of Silver Islet, Thunder Bay District, Ontario, Canada, Sept. 5, 1947, *R. M. & A. F. Tryon & A. C. Faber* 4968 (Herb. Missouri Botanical Garden).

Similar to *W. Cathcartiana* in general aspect; the rachis and blade are hairy and glandular, and the sporangia abortive. The hairs are of the *W. scopulina* type but are not as abundant as in the species. The glands are of the type that occur in both parent species but are more abundant than in either parent. The hybrid differs from × *W. Abbeae* in being more glandular and in lacking scales. It is named for Dr. W. R. Maxon in recognition of his early and discriminating work on the genus.

8. × WOODSIA ABBEAE Butters, Amer. Fern Journ. **31**: 18. 1941, emend. = *W. ilvensis* × *scopulina,* non *Cathcartiana* × *ilvensis.*

W. confusa T. M. C. Taylor, Amer. Fern Journ. **37**: 87. 1947.

Damp to moderately dry, basic rocks; rare. THUNDER BAY DISTRICT, ONTARIO: Damp, shady, slate ledges, ne.

side of Sleeping Giant, 2 miles w. of Silver Islet, Sept. 3, 1947, *Tryon, Tryon & Faber* 4949½ (MBG).

Although Butters clearly states that the hairs of × *W. Abbeae* are not like those of *W. scopulina*, a close study under high magnification indicates that the hairs are actually of that type, so it is evident that *W. scopulina* not *W. Cathcartiana* is one of the parent species along with *W. ilvensis*. The type of *W. confusa* (*Taylor, Losee & Bannan* 2159, Herb. Univ. Toronto) has been examined through the courtesy of Dr. J. H. Soper and is identical with the type (*Abbe & Abbe* 596, Herb. Univ. Minn.) of × *W. Abbeae*. Specimens I have seen that have not been previously cited are:

COOK CO., MINNESOTA: Slate talus, Grand Portage, July 5, 1940, *Butters & Burns* 713½ (Herb. Univ. Minn.); Dry, slate cliff, Grand Portage, Sept. 8, 1947, *Tryon, Tryon & Faber* 4986 (MBG).

9. WOODSIA SCOPULINA D. C. EATON.

Shaded or somewhat exposed basic rocks; local. THUNDER BAY DISTRICT, ONTARIO: Damp, shady, slate cliffs and ledges, ne. side of Sleeping Giant, 2 miles w. of Silver Islet, Sept. 5, 1947, *Tryon, Tryon & Faber* 4966 (MBG).

This species is quite characteristic by reason of the articulate, whitish hairs on the rachis and blade. All of the material from Minnesota and adjacent Ontario examined was also glandular. The indusial segments are squamiform with a tip that varies from acuminate to filiform. This variation is perhaps significant in evaluating similar variations in the *W. Cathcartiana-oregana* complex. The blade often fragments in late summer and frequently a rhizome will bear only a few fronds so that nice-looking specimens are hard to find at that time.

MISSOURI BOTANICAL GARDEN.

Asplenium monanthes in South Carolina

H. L. BLOMQUIST

In May 1946, I received a letter from Rev. A. Rufus Morgan, of Franklin, North Carolina, enclosing a frond of an *Asplenium* about which he wrote: "Please identify this fern for us. You will see that at first glance it appears to be ebony spleenwort [*Asplenium platyneuron* (L.) Oakes], but the form is not quite the same and the sporangia [i.e. sori] are quite different." The plant was collected below the falls of Whitewater River in Oconee County, South Carolina, close to the boundary between that state and North Carolina. In another letter, Mr. Morgan stated further that, as he recalled, "There were two plants close together which grew in rich leaf mold in the forest."

After examining the frond, I was convinced that Mr. Morgan's observations were correct, that, while it superficially resembled the common ebony spleenwort, upon closer inspection was quite different. Furthermore, it differed markedly from any other *Asplenium* in the Southeast with which I was familar, except *A. heterochroum* Kunze of Florida, which it resembled in form of frond and pinnae but differed in the shape of the sori and their location.

Knowing that Dr. Maxon would be much interested in this unique find and could identify it with less effort than I could, I sent it to him with the request that he give us his opinion regarding its identity. In reply, I received an interesting letter in which he said in part: "I wish your friend had sent you a plant of it rather than just a frond, for it is a puzzling thing. The frond itself is not so puzzling after all for, as nearly as I can see, it is matched by any number of fronds of *Asplenium monanthes* L. from Mexico, this being, as you doubtless know a plant of wide distribution which gets into the

ASPLENIUM MONANTHES. FROND × 1, PINNAE × 4.6

United States only in southeastern Arizona [Huachuca Mountains].'' Obviously doubting the occurrence of this fern so remote from its previously known range limit, Dr. Maxon wrote further in his characteristic fashion: ''Are you sure that your friend actually collected the plant in South Carolina? If so, please ask him to collect more of it. I should very much like to see a good specimen.''

I wrote Dr. Maxon that I was fully convinced that Mr. Morgan collected the fern where he said he did, that I would attempt to secure a better specimen for him and would ask Mr. Morgan to accompany me to the locality where he found it. Unfortunately, owing to a delay because of other activities and finally a period of illness, I was unable to carry out this plan myself. However, on June 2, 1947, Lewis E. Anderson together with H. J. Oosting and Robert Wilbur were guided by Mr. Morgan to the locality where he had found this fern. They succeeded not only in relocating the original colony of the fern but discovered another station about three-fourths of a mile below the original one. Specimens of the latter plants bear the following habitat and locality data: ''In moss-liverwort mat, on moist vertical rock in small cool shaded ravine in hemlock-hardwood cove on steep bluff along river. Whitewater River, 1 mile above its confluence with Thompson River, reached by dirt road $2\frac{1}{2}$ miles above Camp Jocassee, Oconee County, South Carolina.''

A plant of this collection sent to Dr. Maxon confirmed his opinion that it was *Asplenium monanthes* and convinced him that this species actually occurs in northwestern South Carolina.

As noted by Maxon,[1] *Asplenium monanthes* is, according to his interpretation, a fern of wide distribution and extreme variability. The type came from

[1] Contr. U. S. Nat. Herb. **17**: 150–152. 1913.

Asplenium monanthes in its native habitat in South Carolina. Photo by Lewis E. Anderson

South Africa (Cape of Good Hope). Besides being widely distributed in Africa, it occurs in some of the islands of the Atlantic, in Jamaica and the Hawaiian Islands and on the American continent from South Carolina and Arizona through Mexico to Chile. It belongs to the *Asplenium Trichomanes* group and is distinguished from other species of this group mainly by its erect fronds, closely set pinnae, sterile and fertile fronds similar, sori borne mostly upon the inferior (lower) side of the pinnae instead of on both sides of the midrib as in the majority of species of this group, and by the brownish to blackish rhizome scales. Another unique feature found in many forms of this species, including the one from South Carolina, is the parallel position of most of the sori to the lower margin of the pinnae.

The discovery of *Asplenium monanthes* in South Carolina, approximately 1500 miles from its nearest previously known locality, should be of great interest not only to those interested in ferns per se but to plant geographers as well. It attracts renewed interest in an area which has already been found to be floristically unique. Only a short distance from the locality of *Asplenium monanthes* Mary S. Taylor[2] discovered, for the first time in temperate North America, *Hymenophyllum tunbridgense* (L.) J. E. Smith and the liverwort, *Lophocolea muricata* (Lehm.) Nees. *Trichomanes Petersii* A. Gray is also found in this locality, and, nearby in North Carolina, *T. Boschianum* Sturm.[3] It also contributes support to the evidence already established by Sharp[4] and others of a definite floristic relationship between the southern Appalachian region and parts of Mexico A thorough plant survey of this area is highly desirable.

I wish to express my appreciation for the coopera-

[2] Journ. Elisha Mitchell Soc. **54**: 345–348. 1938.
[3] *Ibid.* 349–350.
[4] Amer. Midl. Nat. **21**: 267–354. 1939.

tion of Dr. Anderson and those with him in going to the locality of this fern and securing additional material when it was not possible for me to do so. To Mr. Morgan, who in modest pursuit of his interest in local ferns as a hobby and through his keen observation has made a notable contribution to our knowledge of plant distribution in North America, we owe praise and encouragement.

DUKE UNIVERSITY.

The Ophioglossum of the Falkland Islands and the Relationships and Distribution of Ophioglossum crotalophoroides

ROBERT T. CLAUSEN

George Hiram Snyder of Lansingburg, Rensselaer County, New York, collected four plants of *Ophioglossum* on West Falkland Island in 1853. These were included in his herbarium which was donated to Cornell University in 1946 by Dr. Rousseau Flower. According to Dr. Flower, Mr. Snyder was able to visit the Falklands and other localities in the southern hemisphere by obtaining passage on a cattle-boat. The specimens of *Ophioglossum* appear most similar to *O. crotalophoroides*, but are much more robust. The note on the original label indicates that these plants were abundant on West Falkland Island. This locality, at about lat. 52° S., is more than seventeen degrees south of the southernmost locality cited under *O. crotalophoroides* in my "Monograph of the Ophioglossaceae."[1] Also it is the southernmost locality known for any species of *Ophioglossum*.

The Swedish geologist, T. Halle, while a member of the Swedish Magellanic Expedition, 1907–1909, collected *O. crotalophoroides* on Speedwell Island and at Cerritos on East Falkland Island. Christensen[2] reported these

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[1] Mem. Torr. Club 19, no. 2. 1938.
[2] Arkiv för Bot. 10[2]: 3, 33. 1910.

collections and cited them as new proof of the relationship between the floras of the Falkland Islands and Chile. Subsequently, Skottsberg[3] in discussing these same collections, designated *O. crotalophoroides* as very rare in the *Cortaderia* meadow of East Falklands. Also, he remarked that the Falkland specimens are more robust than others that he had seen. Donat[4] reported *O. crotalophoroides* from as far south as the vicinity of lat. 49° S. and about long. 73° W. in the Central Cordillera of Patagonia. Unfortunately, I had not seen any of these reports when I was preparing the manuscript of my monograph of the Ophioglossaceae. Since the publication of that paper, Juana S. de Lichtenstein[5] has reviewed the status of *O. crotalophoroides* in southern South America and cited specimens from many localities in Argentina as well as Halle's collection from Cerritos, East Falkland Island. The southernmost collections which she cited from the mainland were Hicken's nos. 23, 24 and 25 from San Rafael, Isthmus of Ofqui, Chile, at about lat. 47° S. Neither Donat nor Lichtenstein suggested that the plants of *O. crotalophoroides* from the far southern latitudes were different from those from elsewhere, but Lichtenstein's drawings, 1 and 2 of Fig. II, depicting plants from East Falkland and San Rafael, Isthmus of Ofqui, respectively, show specimens which are much larger and more robust than those in any of her other illustrations of *O. crotalophoroides*.

In view of the robustness of Snyder's specimens and the remoteness of their place of collection from localities from which I had previously examined *O. crotalophoroides,* I noticed their special features and contrasted them with three collections of my own from the southeastern United States. The results of this comparison are shown in table 1.

[3] Kungl. Svensk. Vet. Akad. Handl. **50**³: 11. 1913.
[4] Ber. Deut. Bot. Gesell. **54**: 42. 1936.
[5] Darwiniana **6**³: 390–398. 1944.

TABLE 1

COMPARISON OF SPECIMENS FROM WEST FALKLAND ISLAND AND THE SOUTHEASTERN UNITED STATES

	West Falkland Island[6]	Georgia[7]	Florida[8]	Alabama[9]
Length of lamina	2.5–4 cm.	0.9–1.9 cm.	0.9–1.6 cm.	1.7–2.6 cm.
Width of lamina	2.1–3.45 cm.	0.46–1.2 cm.	0.75–1.6 cm.	1–1.9 cm.
Diameter of fertile stalk[10]	3.5–5.5 mm.	0.6 mm.	0.2–0.3 mm.	0.5–1.4 mm.
Length of spike	1.7–2.5 cm.	0.46 cm.	0.4 cm.	0.5–1 cm.
Length of sporangia	2–4 mm.	0.6–1 mm.	0.7–0.8 mm.	0.8–2 mm.
Diameter of spores	64–73 μ	43.9–58.4 μ	....	48–54.4 μ

[6] Collected by G. H. Snyder.
[7] Southeast of Gay, Meriwether Co., *R. T. Clausen, L. J. Kezer & D. G. Huttleston* 6957.
[8] 5 km. south of Crystal River, Citrus Co., *E. P. & R. P. St. John, R. T. Clausen & H. Trapido* 3307.
[9] Tuscaloosa, Tuscaloosa Co., *R. T. & E. R. Clausen* 5758.
[10] Measured 1 cm. below the lowest sporangium.

A comparison of the descriptions of *O. crotalophoroïdes* by Lichtenstein and myself reveals some interesting differences. Below are contrasted the same features which were just used in comparing the specimens from West Falkland Island with those from the three localities in the southeastern United States.

COMPARISON OF DESCRIPTIONS

	LICHTENSTEIN	CLAUSEN
Length of lamina	1–4 cm.	1–1.5 cm.
Width of lamina	0.8–2.8 cm.	0.8–1.2 cm.
Diameter of fertile stalk	....	. . ..
Length of spike	0.5–2.5 cm.	0.3–1.1 cm.
Length of sporangia	0.8–3 mm.	0.6–1.2 mm.
Diameter of spores	29–59 μ	....

Lichtenstein's measurements, in each case, are greater at the upper limits than mine. Since she cited and figured specimens from the Falkland Islands and southern Chile, she probably included the dimensions of those (except their spores) in her composite description of *O. crotalophoroides*. My own description did not encompass the large specimens which grow in southern South America and adjacent islands, for I had seen nothing from south of Tapiales, Province of Buenos Aires. Subsequent studies have shown, however, that by measuring more specimens from the area from which I had material, I could have increased the upper limits of my measurements, but never to the sizes attained in the far southern latitudes.

Through the kindness of Mr. Morton, I have had the opportunity to restudy the series of forty collections of *O. crotalophoroides* in the United States National Herbarium. From these, I have selected the three collections comprising the largest plants and have contrasted them with the specimens from West Falkland Island. The results are shown in table 2, from which measurements of spores are omitted since these were not available for all the specimens.

TABLE 2

COMPARISON OF SPECIMENS FROM WEST FALKLAND ISLAND WITH LARGEST FROM ELSEWHERE

	WEST FALKLAND ISLAND[11]	ALABAMA[12]	GUATEMALA[13]	COLOMBIA[14]
Length of lamina	2.5–4 cm.	1.3–3.6 cm.	2.3–2.7 cm.	1.7–3.5 cm.
Width of lamina	2.1–3.45 cm.	0.8–2.7 cm.	1.9–2.4 cm.	1.4–2.75 cm.
Diameter of fertile stalk[15]	3.5–5.5 mm.	0.7–1.5 mm.	1.8–2 mm.	1–1.8 mm.
Length of spike	1.7–2.5 cm.	0.5–0.8 cm.	1.2–1.3 cm.	0.9–1.5 cm.
Length of sporangia	2–4 mm.	1–1.5 mm.	1.5–2 mm.	1.5–2 mm.

11 Collected by G. H. Snyder.
12 Spring Hill, near Mobile, *W. C. Dukes*.
13 Chichavac, *A. F. Skutch* 604.
14 Edge of Páramo de las Vegas, *Killip & Smith* 15611.
15 Measured 1 cm. below the lowest sporangium.

These measurements indicate that *O. crotalophoroides* from the Falkland Islands has longer fertile spikes with larger sporangia and thicker peduncles. Also they show that the blades of the leaves tend to be larger, but that the dimensions of the laminas are less satisfactory than the other features for distinguishing them.

In eastern North America, *O. crotalophoroides* is unknown north of South Carolina. The northernmost point in that state is about lat. 35° 12′ N. Places in the north equivalent in latitude to the southernmost known localities for *O. crotalophoroides* in the southern hemisphere, are Quebec, not quite at lat. 47° N., and southern Labrador at lat. 52° N. Realizing the discrepancy between the northward and southward distribution of this species, I have investigated the climate in the Falkland Islands in comparison with that towards the northern limits of its range in North America. The following table contrasts some of the climatic features.

COMPARISONS OF CLIMATE

	FALKLAND ISLANDS[16]	GEORGIA[17]	ALABAMA[18]
Mean annual temperature C.	6.2°	about 14.6°	about 15.8°
Absolute maximum temperature C.	20.6°	35.5°	38°
Absolute minimum temperature C.	–11.2°	–13.5°	–19.5°
Mean annual precipitation	731 mm.	1237 mm.	1388 mm.

[16] Port Stanley. Data from Skottsberg, *ibid.* p. 81.
[17] Meriwether Co. Data from U. S. Dep. Agr. Yearbook 1941.
[18] Tuscaloosa, Tuscaloosa Co. Data from U. S. Dep. Agr. Yearbook 1941.

OPHIOGLOSSUM CROTALOPHOROIDES. TWO LARGE SPECIMENS TO LEFT ARE SUBSP. ROBUSTUM FROM WEST FALKLAND ISLAND; THE LARGER, THAT TO RIGHT, IS THE TYPE. TWO SMALL SPECIMENS TO RIGHT ARE SUBSP. TYPICUM, THAT TO LEFT FROM TUSCALOOSA, ALA., THAT TO RIGHT FROM NEAR GAY, GA. PHOTOGRAPH BY W. R. FISHER.

From these data, we may conclude that the climate in the Falklands is drier than at the two localities in the United States, and also that the summers are much cooler. In addition, the photoperiod is different. What this means in terms of physiological adjustments and genetical differences, I do not know. My expectation is that significant physiological differences exist and that these are determined by genetical factors. For this reason, in view of the differences in size of spores and sporangia and in length of fertile spikes, I am inclined to designate as a subspecies the large plants of *O. crotalophoroides* from the Falkland Islands and southern South America, employing an epithet which calls attention to their large size.

OPHIOGLOSSUM CROTALOPHOROIDES subsp. **robustum,** subsp. nov., laminis magnis, orbicularibus vel suborbicularibus, 2.4–4 cm. longis, 2.1–3.45 cm. latis; pedunculo crasso, 3.5–5.5 mm. diam. ad 1 cm. sub sporangium infimum; spicis 1.7–2.5 cm. longis; sporangiis 2–4 mm. longis, sporis 64–73 μ diam. Typus est collectio George Hiram Snyder in Wiegand Herbarium of Cornell University ex West Falkland Island, 1853.

Typical *O. crotalophoroides* should now be designated as subsp. **typicum** subsp. nov. fundatum super *O. crotalophoroides* Walter.[19] All specimens of the species cited in my monograph belong to this subspecies. Also, the the var. *nanum* Osten in Lichtenstein[20] should be included in subsp. *typicum*.

The range of subsp. *robustum*, as understood at present, includes the Falkland Islands and southern Chile south of 45° S. Since Donat's specimens have not been available to me, I do not know whether his material from the Central Cordillera of Patagonia belongs to this subspecies, but I suspect that it does. From study of Lichtenstein's illustration of a specimen of Hicken's collec-

[19] Fl. Carol. 256. 1788.
[20] Darwiniana 6: 397. 1944.

tion no. 24, I believe that the plants of the Falklands and the region of the Isthmus of Ofqui should be regarded as belonging to the same subspecies. This further confirms Christensen's contention, already cited, of the relationship between the floras of the Falkland Islands and southern Chile.

Before selecting a name for subsp. *robustum,* I have considered the possibility that some of the various names in the synonymy of *O. crotalophoroides* might apply. Two of these are based on South American specimens. *O. stipatum* Colla clearly belongs to subsp. *typicum.* *O. tuberosum* Hook. & Arn.[21] likewise applies to subsp. *typicum.* It is based on a collection of Capt. Beechey from Conception in Chile. A few years ago, I had on loan from the Royal Botanic Gardens at Kew the specimens of *Ophioglossum,* including Capt. Beechey's collection from Conception. At the time, I did not consider it different from *O. crotalophoroides* from farther north. The available evidence suggests that the robust *O. crotalophoroides* with large spores has not previously been named.

Since Miss Lichtenstein reduced *O. opacum* to varietal status under *O. crotalophoroides,* an expression of my opinion of this change of status is perhaps in order here. At the time that I was writing my monograph, I had no specimens of *O. opacum* for study. After the manuscript had been submitted for publication, I examined a collection of Robertson from St. Helena and a note was inserted to that effect. Since then, I have had on loan from Kew a collection made in 1822 on Tristan da Cunha by Carmichael himself and also Houghton's collection from St. Helena. After study of these specimens, I am convinced that *O. opacum* should continue to be considered a valid species. Its most significant feature is not the shorter length of the fertile segment as I had wrongly

[21] Bot. Beechey Voy. 53. 1832.

assumed in any earlier writing, but instead the venation, which is very different from that in *O. crotalophoroides.* The principal veins form large primary areoles in which the lesser veinlets form a closed network of secondary areoles after the fashion in *O. Engelmanni* and *O. ellipticum.* This difference seems to be the decisive one. The secondary veinlets in *O. crotalophoroides* do not form a closed secondary reticulum, but for the most part have free ends as shown in Fig. III, 1, of Miss Lichtenstein's paper.

Since 1938, I have seen several collections which supplement the known information about the distribution of *O. crotalophoroides.* The following records all are for subsp. *typicum:* 4°–7° N., 70°–73° W., Hacia La Cueva, Dept. Boyacá, Colombia, 3700 m., *J. Cuatrecasas* 1620 (US); 9°–10° N., 62°–64° W., headwaters of the Guanipa, Venezuela, *H. Pittier* 14867 (US); 14° 59′ N., 89° 33′ W., desert near Estanzuela, Dept. of Zacapa, Guatemala, 200 m., *J. A. Steyermark* 29103 (US); 23° 10′ N., 109° 55′ W., El Taste, Lower California, *T. S. Brandegee* (Pomona Coll.); 31° 55′ N., 90° 28′ W., Brookhaven, Lincoln Co., Miss., *Miss Flint* (Elmira Coll.); 33° 5′ N., 84° 32′ W., southeast of Gay, Meriwether Co., Ga., *R. T. Clausen et al.* 6957 (Corn. Univ.); about 17° S., 66° W., Colomi, Dept. Cochabamba, Bolivia, 3810 m., *E. K. Balls* 6260 (US); about 22° S., 64° W., San Luis, Bolivia, ex herb. Pearce (Kew); and 29° 45′ S., 51° 7′ W., São Leopoldo, Rio Grande do Sul, Brazil, *José Eugenio Leite* 71 (N. Y. Bot. Gard.). In addition, readers interested in distributional records should consult V. Matthews[22] for South Carolina, C. A. Brown and D. S. Correll[23] for Louisiana, and J. S. de Lichtenstein[24] for temperate South America. Finally,

[22] Amer. Fern Journ. **30**: 78. 1940.
[23] Ferns of Louisiana 132–133. 1942.
[24] Darwiniana **6**^{3}: 390–398. 1944.

the collection of Skutch (US) from Chichavac, Guatemala, erroneously printed in my monograph as 418, is his no. 618.

SUMMARY

George H. Snyder first collected *Ophioglossum crotalophoroides* in the Falkland Islands in 1853. Plants of that species from there and from southern Chile south of lat. 45° S. differ from *O. crotalophoroides* from farther north in having longer spikes, larger sporangia, larger spores, and relatively larger laminas. These southern plants constitute a geographical subspecies, *O. crotalophoroides robustum*. *O. opacum* of Tristan da Cunha and St. Helena islands differs from *O. crotalophoroides* in the pattern of venation and is a valid species. The known range of *O. crotalophoroides* extends from lat. 33° 15′ N. to lat. 52° S.

CORNELL UNIVERSITY.

Notes on a Collection of Ferns from the Vicinity of Cayambe Peak, Ecuador

IRA L. WIGGINS

While preparing to do field work in Ecuador for the Foreign Economic Administration in connection with the search for new sources of quinine, I wrote to Dr. Maxon asking if there were any particular groups of ferns in the Ecuadorean Andes that should be collected when time could be spared from the search for *Cinchona* bark. He replied immediately that I should attempt to collect "every fern in sight!" It was impossible to carry out such a broad commission, but fortunately the officers in charge of the field work for the Misión de Cinchona in Ecuador encouraged the field botanists to collect representatives of one or two groups in which each was particularly interested whenever such collecting could be done without impairing the primary program. Owing to this farsighted policy, which did much to keep the morale of the field men at a high level, I was able to make about 300 separate collections of ferns and other pteridophytes between my arrival in Quito on May 18, 1944, and my return to the United States eight months later.

Most of these collections consisted of two or three herbarium sheets, but a few were represented by a single specimen only. It was impossible to collect numerous duplicates because most of the time every ounce of camping equipment, supplies, personal gear, presses, and specimens had to be carried on the backs of our Indian porters over boggy, wind-swept, rain-drenched páramos or through jungles where trails were poor or totally absent. Under these conditions we had to hold down the number of specimens collected, even when we ardently wished that we might fill huge presses with rare and intriguing plants! The rainy weather, even during the so-called "dry" season, often forced the field men to dry their specimens over smoking campfires, so the number of herbarium sheets that could be dried with our small supply of metal ventilators was discouragingly limited. Even today, four years after completion of the field work, the specimens from the eastern slopes of Cayambe are redolent with the odor of the jungle campfire smoke! Attempts to crowd more material into the small presses would have resulted in poorer or ruined specimens, so one made the best use possible of what could be obtained and hoped for another chance to enter the country when time would press less harshly.

Immediately after my return to the United States I began to send fern specimens to Dr. Maxon and Mr. Morton for determination. Together they identified the majority of the specimens and a duplicate of each specimen so determined is deposited in the National Herbarium at Washington, D. C. I gratefully acknowledge my indebtedness to both gentlemen for the hours they devoted to the study of my Ecuadorean ferns. The first set is in the Dudley Herbarium at Stanford University.

Among the specimens collected in Ecuador were a number set aside as probable new species, a few others were referred questionably to known species, and the collections represented by a single herbarium sheet still await critical examination. It may take many more months to complete the identification of some of these specimens, particularly of the few that are nearly or quite sterile.

The limitations of space preclude a full report on all the pteridophytes I collected in Ecuador, but an account of those obtained on one of my most interesting field trips into the areas east of Cayambe Peak may add somewhat to our knowledge of the ferns of Ecuador. This field trip was made under the leadership of Dr. William B. Drew, now Head of the Department of Botany and Plant Pathology of Michigan State College. We set out from Olmedo on July 10th, skirted the northern shoulder of Cayambe Peak at 14,300 feet above sea level and advanced approximately 35 kilometers eastward before our way was blocked by the Río San Pedro at flood stage. Since we had found no trees of exploitable *Cinchona* in the whole area explored up to the time of our arrival at Río San Pedro and were threatened with dwindling supplies, we started back toward Olmedo on July 27th and reached that village late in the afternoon on August 1, 1944.

During the twenty-three days in the field I collected ferns whenever the exploration for *Cinchona* permitted and secured sixty-five ferns and related pteridophytes. These collections were made chiefly at elevations of 9000 feet or above, but a few were obtained as low as 6800 feet along the banks of the Río San Pedro. The highest altitude at which I collected a fern was on the northern shoulder of Cayambe, at 14,200 feet, where *Elaphoglossum Mathewsii* (Fée) Moore grew in glacial sand in the protective lea of outcropping rocks. This fern was not seen above that level although struggling tufts of such flowering plants as *Draba, Luzula, Astragalus, Eryngium, Valeriana,* and several small composites were collected at least 200 feet higher.

Only two pteridophytes were seen at the lowest elevation reached on the trip, *Selaginella Poeppigiana* (H. & G.) Spring and *Asplenium hastatum* Klotzsch being collected on the steep wall of the canyon through which the Río San Pedro flows, at an elevation of 6800 feet above sea level.

We left Olmedo at about 10 a.m., our supplies on six pack mules, Dr. Drew, our head guide and myself riding wiry ponies, and the eighteen porters who were to take over the pack animals' burdens at the end of the first three days' march, strung out along the faint trail leading eastward past the northern flank of Cayambe Peak. This mountain is one of the major peaks in Ecuador, reaching an altitude of 19,015 feet. The perpetual snow line occurs at about 15,000 to 16,000 feet on the northern and southern slopes, respectively. Hence there is a band of virtually bare rock and gravel of varying width separating the snow fields from the arctic-alpine vegetation marking the upper limits of plant growth. The first plant I collected on the field trip was a fern, *Polystichum polyphyllum* Presl, growing at the foot of a rocky outcrop at an altitude of 13,450 feet. Several sedges, species of *Halenia, Luzula, Erigeron, Lupinus,* and an attractive bright blue gentian grew on the adjacent slopes.

By nightfall the first day we had pitched camp at 12,800 feet on a boggy bench slightly shielded by adjacent ridges from the full force of the bitter wind. Three more ferns had been added to my press—*Elaphoglossum Mathewsii* (Fée) Moore, *Dryopteris supina* (Sodiro) C. Chr., and an undescribed *Hypolepis,* recently published as *H. crassa* Maxon[1]—having been taken during the afternoon.

Our route from the first camp led northeasterly to the Río Arturo, then meandered across boggy páramos covered with dense stands of *Blechnum Buchtienii* Rosenst. and *B. loxense* (H.B.K.) Hieron. These two ferns have woody trunks 1–1.5 dm. in diameter and 1–4 m. tall which are profusely overgrown with lichens, mosses and epiphytic ferns, orchids and other small flowering plants. The fertile fronds are situated in the center of the crown of deep green, stiffly ascending leaves. The bases of old petioles and a dense mat of coarse hairs intermingled with slender scales persist on the upper 1–2 meters of the trunks. The whole area was dripping, oozing and running with water. Sphagnum bogs were common. Pack animals could be taken through such areas only on "corduroy" roads made of the trunks of the two ferns.

At Las Toldadas, a boggy meadow slightly less fluid than most of the area, we had to send the pack and saddle animals back to Olmedo and make the rest of the trip on foot. From that point onward the footing became less and less reliable, the porters often breaking through the thin layer of sod into the cold, slimy mud underneath. We continued southward about 10 kilometers from Las Toldadas, then again turned eastward and alternately climbed the steep sides of the ridges running at right angles to our line of march, and slithered down the opposite side into the next canyon—then repeated the process. Two days' march to the east we descended a ridge lying parallel to the Río

[1] Contr. Gray Herb. **165**: 69, *pl. 4.* 1947.

Clavadero that ran northeasterly into the Río San Pedro. Growing on the ground under the huge trees foresting this ridge were comparatively few ferns—I collected *Jamesonia Mayoris* (Ros.) Chr., *Lycopodium bolivianum* Rosenst. and *Dryopteris brachypus* (Sodiro) C. Chr. from terrestrial sites. The rich harvest, pteridologically speaking, was to be had in the trees, on their trunks and ascending high into the crowns on branches no thicker than one's finger. Among such epiphytes were *Polypodium strictissimum* (Hook.) Hieron., *Elaphoglossum deltoideum* (Sodiro) C. Chr., *Vittaria Gardneriana* Fée, *Blechnum angustifolium* (H.B.K.) Hieron., *Trichomanes lucens* Swartz, and several species of *Hymenophyllum.*

Sharing the tree trunks with the ferns were a number of orchids, some small and delicate, others quite large and robust, from which assemblage I collected such things as *Epidendrum amplexicaule* Lindl., *Pleurothallis saltatoria* Lindl. (which was a new record for Ecuador), *Masdevalia rosea* Lindl., *Lepanthes Vespertilio* Rchb. f., *Stelis purpurea* (R. & P.) Willd., and *Pleurothallis incurva* Lindl.

Voluminous notes on the vegetational assemblages on the easterly flanks of Cayambe could be presented, but in order to give more precise data on the total fern flora of the region, together with geographical localities as accurately placed as the methods of our field survey permit, the following lists of pteridophytes collected there in 1944 are presented. The summit of Cayambe Peak lies in the northeasterly corner of Pichincha Province, but the major portion of the territory we explored was east of that province in the area rather indefinitely called the "Oriente," in the Napo-Pastaza Province. The summit of the lofty mountain is a fraction of a degree north of the equator.

SPECIMENS OF PTERIDOPHYTES COLLECTED ON THE FLANKS OF CAYAMBE PEAK, MAINLY IN NAPO-PASTAZA PROVINCE, ECUADOR, JULY 10 THROUGH AUGUST 1, 1944.

PÁRAMO ON NORTHWEST SLOPE OF CAYAMBE PEAK, PICHINCHA PROVINCE, ALT. 13,450 FEET, JULY 10, 1944.

10,366 *Polystichum polyphyllum* Presl.
10,373 *Elaphoglossum Mathewsii* (Fée) Moore

BENCH ON HEADWATERS OF RÍO DESAGUADERO, NORTHWEST SLOPES OF CAYAMBE PEAK, PICHINCHA PROVINCE, ALT. 12,800 FEET, JULY 10, 1944.

10,383 Unidentified epiphytic fern
10,384 *Elaphoglossum ovatum* (H. & G.) Moore
10,386 *Hypolepis crassa* Maxon
10,387 *Dryopteris supina* (Sodiro) C. Chr.

ALONG RÍO ARTURO, NORTH SLOPES OF CAYAMBE PEAK, PICHINCHA PROVINCE, ALT. 10,850 FEET, JULY 11, 1944.

10,389 *Elaphoglossum dendricola* (Baker) C. Chr.

BOGGY SLOPE 2–3 KM. EAST OF RÍO ARTURO ON TRAIL TO LAS TOLDADAS, PROBABLY IN NAPO-PASTAZA PROVINCE, ALT. 11,000 FEET, JULY 11, 1944.

10,391 *Lycopodium clavatum* L.
10,392 *Blechnum Buchtienii* Rosenst.
10,393 *Blechnum loxense* (H.B.K.) Hieron.

LAS TOLDADAS, NORTHEAST OF CAYAMBE PEAK, ALT. 10,150 FEET, NAPO-PASTAZA PROVINCE, JULY 12, 1944. (ALL LOCALITIES CITED BELOW, UNLESS INDICATED OTHERWISE, OCCUR IN NAPO-PASTAZA PROVINCE.)

10,397 *Lycopodium tetragonum* H. & G.

RIDGE 10 KM. SOUTH OF LAS TOLDADAS, EAST OF CAYAMBE PEAK, ALT. 10,650 FEET, JULY 15, 1944.

10,400 and 10,406 *Hymenophyllum myriocarpum* Hook.
10,401 *Hymenophyllum endiviifolium* Desv.
10,402 *Polypodium* sp.
10,403 *Vittaria Gardneriana* Fée

NEAR LOWER MARGINS OF PÁRAMO, EAST SLOPES OF CAYAMBE PEAK, ALT. 10,900–11,450 FEET, JULY 16–17, 1944.

10,407 *Polypodium pseudonutans* Chr. & Rosenst.
10,410 *Polypodium* sp. Epiphytic
10,412 *Polypodium* sp. Epiphytic

10,413 *Hymenophyllum trichophyllum* H.B.K.
10,415 *Hymenophyllum Sodiroi* C. Chr.
10,416 *Elaphoglossum Rimbachii* (Sodiro) Chr.
10,417 *Polystichum* sp.
10,418 *Lycopodium bolivianum* Rosenst.
10,419 *Polypodium farinosum* Hook.

BOGGY PÁRAMO EAST OF CAYAMBE PEAK, ALT. 10,400–11,500 FEET, JULY 18, 1944.

10,420 *Jamesonia Mayoris* (Rosenst.) Chr.
10,422 *Polypodium strictissimum* (Hook.) Hieron.
10,423 *Elaphoglossum deltoideum* (Sodiro) Chr.

RIDGE SOUTHEAST OF RÍO CLAVADERO, ALONG TRAIL TO RÍO SAN PEDRO, EAST OF CAYAMBE PEAK, ALT. 8500–10,300 FEET, JULY 21 AND 25, 1944.

10,425 *Elaphoglossum deltoideum* (Sodiro) Chr.
10,427 *Hymenophyllum calodictyon* v. d. Bosch.
10,430 *Elaphoglossum* sp., probably aff. *E. deltoideum*
10,431 *Hymenophyllum endiviifolium* Desv.
10,432 *Trichomanes lucens* Swartz
10,433 *Polypodium semihirsutum* Klotzsch
10,434 *Vittaria Gardneriana* Fée
10,435 *Selaginella Lindigii* A. Br.
10,436 *Blechnum angustifolium* (H.B.K.) Hieron.
10,443 *Asplenium radicans* L. var.

CANYON OF RÍO SAN PEDRO, JUST BELOW MOUTH OF RÍO CLAVADERO, ALT. 6800 FEET, JULY 26, 1944.

10,456 *Selaginella Poeppigiana* (H. & G.) Spring
10,457 *Asplenium hastatum* Klotzsch

VICINITY OF LAGUNA DE LA VIRGEN, JUST SOUTH OF RÍO CLAVADERO, ALT. 8750 FEET, JULY 26, 1944.

10,459 *Polypodium sphenodes* Kunze
10,466 *Polypodium subflabelliforme* Rosenst.
10,469 *Elaphoglossum* sp.
10,473 *Selaginella Lindigii* A. Br.
10,474 *Hymenophyllum Plumieri* H. & G.
10,475 *Elaphoglossum* sp.
10,476 *Dryopteris brachypus* (Sodiro) C. Chr.

RIDGE SOUTHEAST OF RÍO CLAVADERO, ALT. 9100–10,400 FEET, JULY 27, 1944.

10,478 *Elaphoglossum* sp.

10,479 *Elaphoglossum antisanae* (Sodiro) C. Chr.
10,480 *Hymenophyllum myriocarpum* Hook.
10,489 *Dryopteris rudis* (Kunze) Kuntze
10,490 *Hymenophyllum endiviifolium* Desv.

ALONG TRAIL BETWEEN RÍO CLAVADERO AND RIDGE 14 KM. SOUTH OF LAS TOLDADAS, ALT. 10,100–10,400 FEET, JULY 28, 1944.

10,491 *Pteris coriacea* Desv.
10,492 Unidentified tree fern
10,494 Unidentified fern
10,495 *Polypodium pichinchae* Sodiro
10,498 *Polypodium* sp., near *P. myriophyllum* Mett.
10,499 *Polypodium strictissimum* (Hook.) Hieron.
10,500 *Polypodium moniliforme* Lag.
10,501 *Polypodium* sp.

BOGGY MEADOW 2 KM. SOUTH OF LAS TOLDADAS, ALT. 10,300 FEET, JULY 29, 1944.

10,511 *Polypodium* sp.

ALONG TRAIL BETWEEN LAS TOLDADAS AND RÍO ARTURO, ALT. 10,900 FEET, JULY 30, 1944.

10,513 *Elaphoglossum leptophyllum* (Fée) Moore

VICINITY OF LAGUNA SAN MARCOS, NORTH OF CAYAMBE PEAK, PROBABLY IN PICHINCHA PROVINCE, ALT. 11,250 FEET, JULY 30–31, 1944.

10,521 *Equisetum* sp.
10,526 *Dryopteris Macbridei* C. Chr. & Maxon
10,529 *Elaphoglossum petiolosum* (Desv.) Moore
10,548 *Dryopteris* sp., near *D. rudis* (Kunze) Kuntze

NORTH SLOPES OF CAYAMBE PEAK, ALT. 14,200 FEET, PICHINCHA PROVINCE, AUGUST 1, 1944.

10,561 *Elaphoglossum Mathewsii* (Fée) Moore

Other collections of modest size were made along the Colombian border in Carchi Province, in western Imbabura Province, on the Páramo Tinajillas, south of Cuenca in Azuay Province, in the lowlands of El Oro Province, at moderate elevations in Loja Province, and in the vicinities of Joyagshi and Sacramento in Chimborazo Province.

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Dryopteris simulata

HENRY K. SVENSON

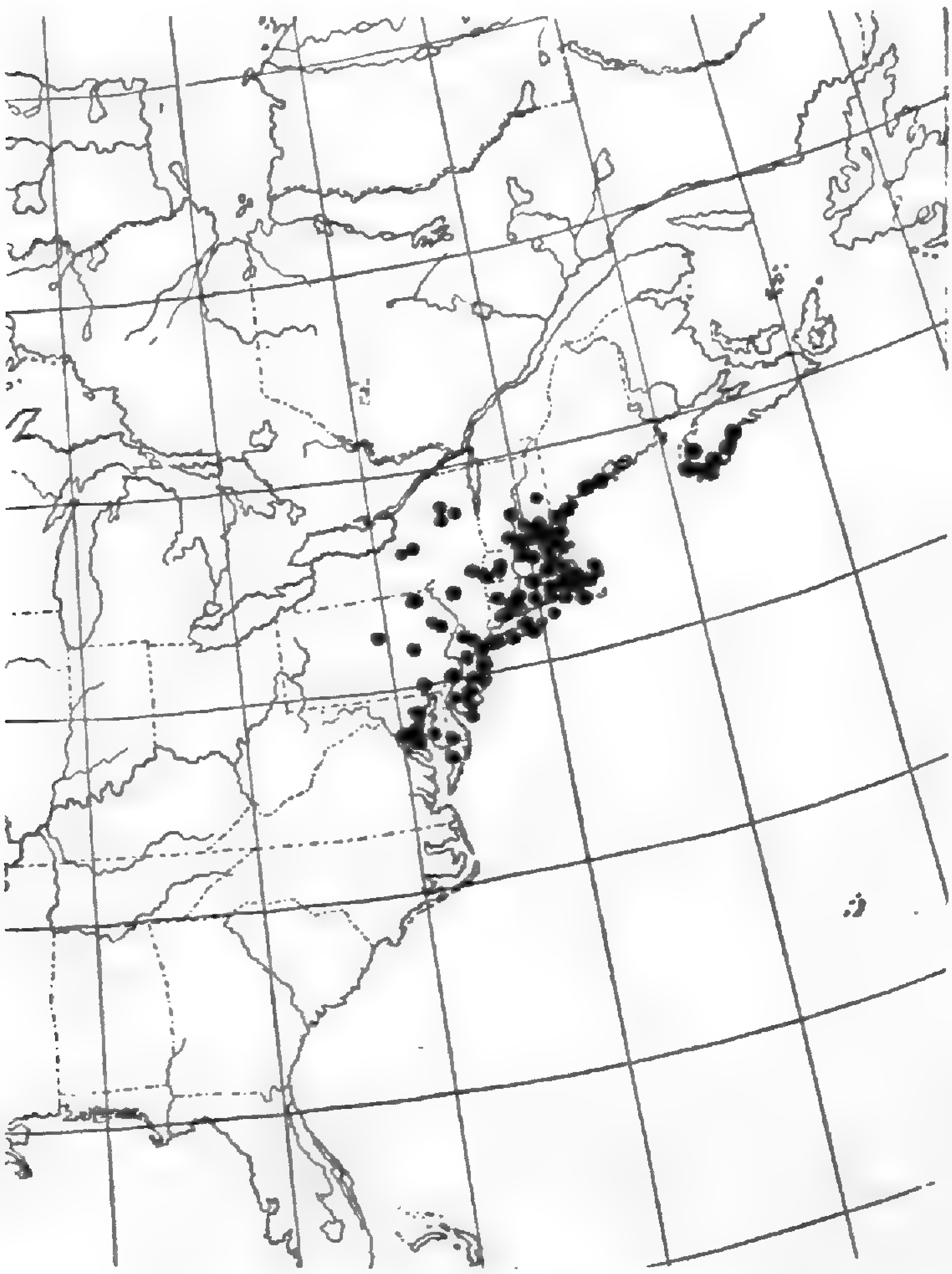
Perhaps the latest of the ferns to be described as a "new species" from the northeastern United States, is the Massachusetts or Bog Fern, *Dryopteris simulata* Davenp.[1] This fern, according to current literature, was so called because it simulated two closely related species, the marsh fern (*Dryopteris Thelypteris*) and the New York fern (*Dryopteris noveboracensis*). It is therefore of interest to read in Clute's "Our Ferns in their Haunts" (1901) the statement, "Many suppose that this species was named *simulatum* because of its resemblance to *Noveboracense* and *Thelypteris*. While this thought may have occurred to its describer, he writes [Garden and Forest **9**: 484. *fig. 69.* 1896] that it was so named because it simulates a narrow woodland form of the lady fern (*Athyrium Filix-foemina*)." Davenport said (l.c.), "exactly simulates the narrow form of *Asplenium Filix-foemina*, which suggested its name. Plants of these forms growing side by side in my garden so closely resemble each other in every way that, although belonging to two entirely distinct genera, they cannot readily be distinguished from each other by any merely superficial examination."

It should be remembered that the northernmost known station for *D. simulata* in Maine is also the type locality (Indian Point, Georgetown). As to the habitat of the "bog fern," there seems to be a good deal of variation. In Nova Scotia Fernald[2] found it to be "quite general on bog-barrens, in spruce swamps or in alder thickets . . . growing with its regular southern associates, *Carex atlantica* and *C. Howei*." Davenport himself says,[3]

[1] Bot. Gaz. **19**: 497. 1894.
[2] Rhodora **23**: 104. 1921.
[3] Garden and Forest **9**: 484. 1896.

"The finest clumps of *Aspidium simulatum* that I have anywhere seen were growing on large hummocks in a submerged swampy woodland on Indian Point, Maine."

Davenport was not the actual discoverer of *Dryopteris simulata*. That was accomplished by Raynal



DISTRIBUTION OF DRYOPTERIS SIMULATA

Dodge[4] who was "a machinist in a comb factory at Newburyport [Massachusetts], and had shown no little

[4] Cf. the brief biography, Amer. Fern. Journ. 9: 28–29. 1919.

ability in designing and constructing mechanical devices. Most of his spare time was spent in the fields." Dodge first collected the fern at Seabrook, New Hampshire, about 1880. One member of our Society, C. E. Waters, had also found the fern at a very early date, and wrote,[5] "Enormous patches of this were found in October, 1894, at Glen Burnie, Anne Arundel Co. [Maryland], two months before it was described by Davenport."

Very soon *Dryopteris simulata* was found to be not uncommon in coastal swamps, and from its frequency in eastern Massachusetts, the name "Massachusetts Fern" was acquired. Since the distribution is more widespread (cf. accompanying map) this name is not too appropriate; neither is its appellation of "bog fern." Davenport describes the habitat as "woodland swamps thriving best in deep shade near cool moist hummocks, in beds of sphagnum." It does not seem to move out into open meadows and bogs, as does the marsh fern, and it does not inhabit the drier woodlands characteristic of the New York fern. In southern New England and on Long Island, *Dryopteris simulata* delights in red maple swamps. Where plants are only occasional, they will most frequently be found at the trunk bases; where frequent, they form extensive stands in peaty swampland between the trees. The most luxuriant stands that I have seen are at Valley Stream and Woodmere in western Long Island, where *D. simulata* is accompanied by *Woodwardia areolata*. In New Jersey it frequents the borders of cedar swamps.

As in the closely related New York fern and marsh fern, heavily fruiting fronds of *Dryopteris simulata* are much narrowed, producing a decided contrast with the sterile fronds. The New York fern is easily distinguished by the shortened lower pinnae; the marsh fern by its bluish green color. *Dryopteris simulata* has

[5] Amer. Fern Journ. 11: 22. 1921.

DRYOPTERIS SIMULATA. FIG. 1. HABIT × ¼, SHOWING NARROW FERTILE AND BROAD STERILE FROND; 2. FERTILE PINNA × 1; 3. FERTILE PINNULE × 5; 4. INDUSIUM × 30; 5. STERILE PINNULE × 5; 6. SPORANGIUM, GREATLY ENLARGED. DRAWN FROM LIVING PLANTS FROM VALLEY STREAM, LONG ISLAND, N. Y.

abundant small glandular structures on the frond and indusium and also simple hairs; also, the veins of the sterile segments are not forked. The marsh fern (*Dryopteris Thelypteris* var. *pubescens*) is usually pubescent, at least in the juvenile stages, but the specimen here illustrated in *pl. 18* was entirely glabrous. Some botanists believe that *D. simulata* is a hybrid between the New York fern and marsh fern, but to me it seems to be an entirely distinct species. There has been some shifting about of the generic names, but the only varietal designation seems to be *Filix-Mas Thelypteris* (L.) Farw. var. *simulata* (Davenp.) Farw.[6]

It was not long before the fern began to be recorded at inland stations. Thomas Porter found it in 1899[7] on the Pocono Plateau at elevations of 2000–2300 feet, associated with a characteristic northern flora, but it may be noted also that many "coastal-plain" species also grow in that area. In the same year F. G. Floyd found it far inland at Contoocook, New Hampshire.[8] Eggleston[9] mentions a collection at Brattleboro by Mrs. F. B. Horton. Rugg[10] states, "To my knowledge there are only two Vermont stations, Brattleboro and Hartland, and unfortunately the exact location of either station is unknown today. This fern is abundant at Hinsdale, N. H., a town separated from Brattleboro, Vermont, only by the Connecticut River." By 1904, Ralph Hoffman knew the plant from "swampy woods bordering ponds in Becket and Otis" in western Massachusetts. And Emma J. Thompson[11] described a delightful "Rhodora Swamp" just north of Middletown in central Con-

[6] Amer. Midl. Nat. 12: 258. 1931.
[7] Rhodora 1: 183. 1899.
[8] Rhodora 2: 156. 1900.
[9] Rhodora 3: 138. 1904.
[10] Amer. Fern Journ. 2: 87. 1912.
[11] Rhodora 13: 78. 1911.

DRYOPTERIS THELYPTERIS VAR. PUBESCENS. 1. FROND × ¼; 2. FERTILE PINNA × 1; 3, 4, FERTILE AND STERILE PINNULES × 5; 5. INDUSIUM × 30. DRAWN FROM LIVING PLANTS FROM SPRING VALLEY, N. Y.

necticut, in which the fern grew with *Carex Collinsii*, *Lygodium*, and *Linnaea*. The northernmost station in New Hampshire appears to be at Lake Wentworth in southern Carroll Co. (*T. O. Fuller* in 1903). Inland in New York, *Dryopteris simulata* is found at Taborton, Rensselaer Co. (*House* 29,339); Minnewaska, Ulster Co. (*Svenson* 10,698); various collections by House and Killip in the vicinity of Oneida Lake; in the Adirondack Mts., collections by R. C. Benedict at Fourth Lake, Herkimer So., and at Horseshoe, St. Lawrence Co.; and in Essex County at Newcomb, 1600 ft. alt. (*House*). I had the great privilege of going with W. L. Dix to the fine locality at Poyntelle in Wayne Co., Pa.,[12] and Farida Wiley tells me that the fern grows abundantly at Bear Meadows on the border of Center and Huntington Counties in central Pennsylvania. Davenport, in his original treatment, said that the fern was first collected in Missouri, but that report was based on an incorrect determination[13] and the plant seems to be unknown west of Pennsylvania. Chrysler and Edwards, in the Ferns of New Jersey (1947), state that *Thelypteris simulata* ranges from Prince Edward Island and Nova Scotia to Alabama. I have not located the record from Prince Edward Island, but that from Alabama I believe is based on misidentified sterile plants of *Athyrium thelypteroides* collected by St. John at Buck's Pocket, Sand Mt., Alabama, May 4, 1936. (hb. New York Bot. Garden).

The map has been constructed mainly from specimens at the Gray Herbarium, Herbarium of the New England Botanical Club, New York Botanical Garden, and Brooklyn Botanic Garden, and citations from Tatnall's Flora of Delaware and the Eastern Shore (1946).

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[12] Cf. Amer. Fern Journ. **29**: 21. 1939.
[13] Cf. Rhodora **11**: 36. 1909.

Notes on Elaphoglossum—II. The Species of the French West Indies[1]

C. V. MORTON

The present paper,[2] giving a synoptic treatment of the genus *Elaphoglossum* as it is represented in Martinique and Guadeloupe, was inspired by the opportunity of studying a fine series of specimens collected in Guadeloupe by Mr. A. Questel, who kindly forwarded them to the National Herbarium for identification. The treatment includes only those species of which I have seen specimens from these islands. A number of others, which have been reported to occur there by Christ or Krug, are merely listed at the end, for published identifications are not to be trusted in this difficult genus. The number of species here treated is 17, but the actual number occurring in the islands is probably somewhat larger.

Key to species

Vein-ends clavate, not reaching the margin; veins distant, 3–6 per cm.; leaf tissue herbaceous to thin-chartaceous; sterile fronds with paleaceous margins (except in *E. Feei*), the scales subulate to setiform; fertile blades shorter than the sterile (Subg. *Condyloneuron*).

Fronds distant, the rhizome very slender, widely repent. Blades crenulate, scaleless .... *1. E. Feei.*

Fronds caespitose or subcaespitose, the rhizome erect to short-creeping.

Stipes wanting or very short, not more than one-fourth as long as the blade; blades long-decurrent at base; rhizome scales 5–12 mm. long, crispate, strongly toothed. *2. E. apodum.*

Stipes half as long as the blade or more; blades only slightly decurrent; rhizomes scales 2–7 mm. long, not crispate, entire to denticulate.

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1 Published by permission of the Secretary of the Smithsonian Institution.

2 The first paper in this series appeared in this JOURNAL 29: 10–14. 1939.

Fertile blade oval to orbicular, without scales among the sporangia .... 3. *E. pusillum.*
Fertile blade oblong, with setiform scales among the sporangia .... 4. *E. Plumieri.*
Vein-ends not or only slightly clavate, reaching the margin or nearly so; veins mostly closer, 5–17 per cm.; leaf tissue chartaceous to coriaceous; sterile fronds with naked or paleaceous margins, if paleaceous the scales not subulate, except in *E. erinaceum* (Subg. *Stenoneuron*).
Stipes bearing large spreading scales 6–12 mm. long; margins of sterile fronds with two regularly imbricate rows of conspicuous, rounded, cordate-based, appressed scales. 5. *E. decoratum.*
Stipes naked or with smaller scales; margins naked or the scales spreading, not regularly imbricate.
Sterile blades with spreading, marginal and costal, subulate scales, the leaf surface only microscopically paleaceous. 6. *E. erinaceum.*
Sterile blades with naked margins or, if paleaceous, the leaf surface also conspicuously paleaceous.
Sterile blades emarginate and proliferous at apex. 7. *E. undulatum.*
Sterile blades not emarginate or proliferous.
Lower surface of the sterile blades conspicuously paleaceous.
Scales of the lower surface reddish, very numerous and conspicuously imbricate .... 8. *E. vestitum.*
Scales of the lower surface whitish, fewer, not imbricate, leaving much of the leaf surface exposed. 9. *E. Boryanum.*
Lower surface of the sterile blades apparently naked or sometimes with inconspicuous, dissected, hairlike scales.
Rhizome wide-creeping, the fronds distant. 10. *E. scandens.*
Rhizome erect to short-creeping.
Rhizomes 1.5–2 mm. thick, the scales minute (about 2 mm. long), blackish .... 11. *E. glabellum.*
Rhizomes thicker, the scales larger and paler.
Sterile fronds nearly exstipitate.
Rhizome scales orange-brown, 2 cm. long or more; sterile blades coriaceous, the fertile very much shorter .... 12. *E. Herminieri.*
Rhizome scales fuscous, 2–4 mm. long; sterile blades thinner, the fertile subequal to the sterile .... 13. *E. rigidum.*
Sterile fronds obviously stipitate.
Sterile fronds paleaceous beneath when young, the scales dissected, hairlike; blades resinous-dotted beneath .... 14. *E. Dussii.*
Sterile fronds only microscopically paleaceous beneath; blades not resinous-dotted.

Margins of sterile blades repand, subscarious; vein-tips transversely-arcuate at apex sometimes joined .... *15. E. longifolium.*
Margins of sterile blades plane, cartilaginous; vein-ends free.
Rhizome scales 2 cm. long or more, conspicuous; fronds subcaespitose. *16. E. alismifolium.*
Rhizome scales shorter and darker; fronds subdistant .... *17. E. martinicense.*

1. ELAPHOGLOSSUM FEEI (Bory) Moore, Ind. Fil. XVI. 1857.

Acrostichum Feei Bory ex Fée, Mém. Foug. **2**: 48. *pl. 18 f. 2.* 1845.

This species has the smallest fronds of any West Indian *Elaphoglossum* and is further characterized by its slender, elongate rhizome and crenulate blades. The type is from Guadeloupe (*de Thiouville* in 1844). Although apparently common in Guadeloupe, *E. Feei* has not been found elsewhere except in Dominica.

GUADELOUPE: Matouba, *Duss* 4135. Lac Flammarion, *Stehlé* 652. Bains-Jaunes, *Questel* 2717, 3267; *Stehlé* 1120, 1420, 1791, 2406. Echelle à la Citerne; *Stehlé* 1211. *L'Herminier.* Also *Mazé* 178 (fide Krug).

2. ELAPHOGLOSSUM APODUM (Kaulf.) Schott, Gen. Fil. *ad tab. 14.* 1934.

Acrostichum apodum Kaulf. Enum. Fil. 59. 1824.

This species occurs throughout the West Indies and has also been assigned a wide continental range. The type is from Montserrat (*Ryan*).

MARTINIQUE: Bois de la Calebasse, *Duss* 1621, 4577.

GUADELOUPE: Reported by Maxon (Pterid. Porto Rico 395. 1926).

3. ELAPHOGLOSSUM PUSILLUM (Mett.) C. Chr. Ind. Fil. 314. 1905.

Acrostichum pusillum Mett. ex Kuhn, Linnaea **36**: 43. 1869.

The present plant, described originally from Cuba, is probably only a West Indian subspecies of the wide-spread *Elaphoglossum spathulatum* (Bory) Moore. It is evidently rare in the French West Indies, not being represented in the abundant collections of Stehlé and Questel.

MARTINIQUE: Deux-Choux, *Duss* 1615, 4576.

GUADELOUPE: Matouba, *Duss* 4137.

4. ELAPHOGLOSSUM PLUMIERI (Fée) Moore, Ind. Fil. 13. 1857.

Acrostichum Plumieri Fée, Mém. Foug. **2**: 50. 1845, not Desv. (1827).

Although Fée names his species after Plumier and cites his plate *Lingua cervina villosa minor* (*pl. 127*) as representing it, the species must be typified on the basis of the specimens seen by Fée, which were from Guadeloupe. Guadeloupe plants agree very well with Plumier's figure, but his plant came from Hispaniola, where the present species has not since been found.

MARTINIQUE: Mont Pelée, *Duss* 1614.

GUADELOUPE: Bains-Jaunes; *Stehlé* 2405; *Questel* 2731. Massif Central, *Questel* 1036. *L'Herminier* (Yale).

5. ELAPHOGLOSSUM DECORATUM (Kunze) Moore, Ind. Fil. 8. 1857.

Acrostichum decoratum Kunze, Linnaea **9**: 25. 1835; Anal. Pter. 9. *pl. 6*. 1837.

A rare species, widely distributed in tropical America.

GUADELOUPE: *L'Herminier; Mazé* 779 (both fide Krug).

6. ELAPHOGLOSSUM ERINACEUM (Fée) Moore, Ind. Fil. 9. 1857.

Acrostichum hybridum sensu Hook. & Grev. Ic. Fil. **1**: *pl. 21*. 1829, not Bory.

Acrostichum erinaceum Fée, Mém. Foug. **2**: 41. 1845.

This species has been assigned a broad range in the West Indies and continental tropical America. Its relationship to *E. scolopendrifolium* (Raddi) J. Smith is not clear. The type is from Guadeloupe (*de Thiouville*).

GUADELOUPE: Sainte-Rose, *Duss* 4149. Bains-Jaunes, *Questel* 1785. Palomiste, *Stehlé* 694. Matouba, *Questel* 3255. Ravine Roche, *Questel* 2901, 2901 bis. Hacienda Bernard, *Questel* 3054. Gombeyre, *Questel* 3910.

7. ELAPHOGLOSSUM UNDULATUM (Willd.) Moore, Ind. Fil. 16. 1857.

Acrostichum undulatum Willd. Sp. Pl. **5**: 105. 1810.

Acrostichum podotrichum Desv. Ges. Naturf. Freund. Berlin Mag. **5**: 309. 1811. Type from the Caribaean Islands (photograph, U. S.).

Olfersia undulata Presl, Tent. Pterid. 234. 1836.

Willdenow's *Acrostichum undulatum* was based wholly on Plumier's *Lingua cervina villosa major et rufescens.* (Trait. Foug. 110, *pl. 126.*), representing a plant from the Morne de la Calebasse, Martinique. The figure, although termed "bona" by Fée, is poor and does not accurately represent any species known to me from Martinique. The fronds are shown as densely villous and strongly undulate. However, it seems best to retain the current interpretation of this species, which is due to Kaulfuss, who gave an excellent description based on a plant collected by Sieber (no. 346) in Martinique.

Thus defined, *E. undulatum* is distinguished from all others in the West Indies by the proliferous apices of the sterile blades. It is definitely known to me from

Martinique, Grenada, Montserrat, and Trinidad. Fée adds Mauritius to the range, and Christ Santo Domingo, Mexico, Colombia, and Ecuador, but these records need verification. If it really occurs in Guadeloupe it must be very rare there.

MARTINIQUE: Deux-Choux, alt. 500–1,000 meters, *Duss* 4122, 4718. Also *Hahn* 3 (fide Christ) and *Sieber* 348 (fide Kaulfuss and Fée).

GUADELOUPE: *Duss* 177 (fide Christ). The identification perhaps needs verification.

8. ELAPHOGLOSSUM VESTITUM (Schlecht. & Cham.) Schott, Gen. Fil. *ad tab. 14.* 1834.

Acrostichum vestitum Schlecht. & Cham. Linnaea **5**: 605. 1830.

Olfersia vestita Presl, Tent. Pterid. 234. 1836.

Acrostichum fulvum Mart. & Gal. Mém. Acad. Brux. **15**: 24. *pl. 3, f. 2.* 1842.

Elaphoglossum laminarioides sensu Christ, Monogr. Elaph. 72. 1899, not *Acrostichum laminarioides* Bory?

The group of species related to *Elaphoglossum hirtum* (Swartz) C. Chr. is exceptionally complex. The name *E. vestitum*, based on a Mexican collection of Schiede, is adopted for our plant with some reservations. As I understand it at present, the species is confined to Guadeloupe and Mexico, but it probably occurs elsewhere.

GUADELOUPE: *Duss* 4132. Matouba, *Duss* 4133, 4337, 4338. Saut de Bouillante, *Questel* 3933. Christ cites (as *E. laminarioides*) also *Mazé* 176, *Duss* 173, and *L'Herminier* 12 and 14.

9. ELAPHOGLOSSUM BORYANUM (Fée) Moore, Ind. Fil. 7. 1857.

Acrostichum Boryanum Fée, Mém. Foug. **2**: 40. *pl. 1.* 1845.

Fée's description of this little-known species is based on material from Guadeloupe (*L'Herminier* 2). In the D. C. Eaton Herbarium at Yale University there is a L'Herminier specimen received from Fée, which agrees well with the description and illustration and is doubtless an isotype. The species, which is probably related to *E. undulatum,* is known from Guadeloupe, Martinique, Dominica, and St. Kitts. Christ reports it also from Costa Rica, probably in error. Mr. Questel has collected a fine series of specimens in Guadeloupe.

Martinique: *Guiraud* (fide Fée); *Duss* (fide Christ).

Guadeloupe: St. Claude, *Questel* 1142. Matouba, *Questel* 3256, 3256b. Bains-Jaunes, *Questel* 2712, 3268, 3287, 3288. Hacienda Bernard, *Questel* 3036, 3042.

10. Elaphoglossum scandens (Bory) Moore, Ind. Fil. 14. 1857.

Acrostichum scandens Bory ex Fée, Mém. Foug. **2**: 33. 1845, not Raddi (1819).

Acrostichum lingua var. *scandens* Krug; Bot. Jahrb. Engler **24**: 138. 1897.

This species, the type of which is from Matouba, Guadeloupe (*de Thiouville* 1844), has currently been united with *Elaphoglossum lingua* (Raddi) Brack. but may tentatively be regarded as distinct. The typical Brazilian *E. lingua* differs in its rhizome scales, and in the shape of the frond, which is broadest near the middle rather than near the base. The species of this group need to be revised. The present plant is distinct from all those of the Lesser Antilles other than *E. Feei* in its elongate, creeping rhizome, with widely spaced fronds. *Elaphoglossum Feei* is widely different and may be distinguished at a glance by its very small, crenulate fronds, 10 cm. long or less. The range of *E. scandens* is uncertain. In the West Indies it is known from Martinique, Guadeloupe, and Dominica, and it probably occurs also in Venezuela and elsewhere in South America.

MARTINIQUE: Morne Rouge, *Duss* 1629. Also *Duss* 1627 (fide Krug).

GUADELOUPE: Bains-Jaunes, *Questel* 2717; *Stehlé* 7063. Echelles, *Stehlé* 1199. *L'Herminier* 11 (fide Moore). Also *Mazé* 314 (fide Krug).

11. ELAPHOGLOSSUM GLABELLUM J. Smith, Lond. Journ. Bot. **1**: 197. 1842.

Acrostichum martinicense sensu Fée, Mém. Foug. **2**: 45. *pl. 16, f. 3.* 1845, not Desv. (1811).

Acrostichum glabellum Klotzsch, Linnaea **20**: 421. 1847.

Elaphoglossum simplex of authors, not *Acrostichum simplex* Swartz.

A widespread species occurring throughout the West Indies and in various parts of South America.

MARTINIQUE: Pitou Gelé, *Duss* (under nos. 1624, 1628, and 4687 in part).

GUADELOUPE: *L'Herminier.* Bains-Jaunes, *Stehlé* 342. Also *Mazé* 172 (fide Krug).

12. ELAPHOGLOSSUM HERMINIERI (Bory & Fée) Moore, Ind. Fil. XVI. 1857.

Acrostichum Herminieri Bory & Fée, in Fée Mém. Foug. **2**: 43. *pl. 11.* 1845.

A characteristic species because of its elongate linear, coriaceous sterile fronds and very short broad fertile ones. The rhizome scales are borne in a huge tuft and are bright cinnamon-brown in color. Fertile plants are rare or, at least, seldom collected. It is possible that the small fertile fronds are sometimes overlooked. This species has a wide range, occurring throughout the West Indies, and from Panama to Brazil and Bolivia. The type is from Guadeloupe (*L'Herminier*).

MARTINIQUE: Morne Rouge, Duss 1629.

GUADELOUPE: Sofaia, *Questel* 1852. Matouba, *Questel* 3139. Rivière Noir, *Duss* 4137. Also *L'Herminier* and *Mazé* 364 (fide Krug).

13. ELAPHOGLOSSUM RIGIDUM (Aubl.) Urban, Symb. Antill. **9**: 374. 1925 (as to name).

Polypodium rigidum Aubl. Pl. Guian. **2**: 963. 1775.

Acrostichum flaccidum Fée, Mém. Foug. **2**: 35. *pl. 7, f. 2.* 1845. Type from Guadeloupe, *L'Herminier.*

Elaphoglossum flaccidum Moore, Ind. Fil. 356. 1862.

Alston[3] has shown that this species, long known as *E. flaccidum,* must be known as *E. rigidum.* Neither epithet seems especially appropriate. It occurs throughout most of the West Indies and also on the continent, the exact range being uncertain.

GUADELOUPE: Sofaia, *Questel,* 2567.

14. ELAPHOGLOSSUM DUSSII Underw. ex Maxon, Pterid. Porto Rico. 398. 1926.

This species, which is perhaps too close to *E. petiolatum* (Swartz) Urban, is evidently the commonest member of the genus in Guadeloupe. It is known from Hispaniola, Puerto Rico, and the Lesser Antilles (the type from Martinique, *Duss* 4688), and probably occurs also in northern South America.

MARTINIQUE: Morne-Rouge, *Duss* 1622.

GUADELOUPE: Bois de Pigeon, *Duss* 4131. Bois du Gommier; *Duss* 4150b. Bains-Jaunes, *Duss* 4130b; *Questel* 3203, 3283, 3284; *Stehlé* 1061, 2418. St. Claude, *Questel* 3129. Parnasse, *Questel* 1056, 3122. Matouba,

[3] Kew Bull. **1932**: 316. 1932.

Questel 1805, 3138, 3152, 3153, 3160, 3161, 3254. Palmiste, *Questel* 2811. Chemin de la Prise d'Eau. *Stehlé* 1808.

15. ELAPHOGLOSSUM LONGIFOLIUM (Jacq.) J. Smith, Bot. Mag. Curtis **72,** Comp. 17. 1846.

Acrostichum longifolium Jacq. Coll. Bot. **2**: 105. 1788, not Burm. (1768).

Olfersia longifolia Presl, Tent. Pterid. 234. 1836.

Aconiopteris longifolia Fée, Mém. Foug. **2**: 80. *pl. 41.* 1845.

The present species, which is the one called *E. rigidum* in Maxon's Pteridophyta of Porto Rico, often has the veins more or less united at the margin, but this does not seem to be a constant character. It has been ascribed a wide range in the West Indies and continental tropical America. The type is from Martinique.

MARTINIQUE: Morne de la Calebasse: *Duss* 4121.

GUADELOUPE: Bains-Jaunes, *Questel* 1090, 3202, 3282, 3286.

16. ELAPHOGLOSSUM ALISMIFOLIUM (Fée) Moore, Ind. Fil. 5. 1857.

Acrostichum alismifolium Fée, Mém. Foug. **2**: 28. *pl. 3.* 1845.

Acrostichum impressum Fée, op. cit. 33. *pl. 5, f. 3.* Type from Martinique.

Elaphoglossum impressum Moore, Ind. Fil. 10. 1857.

Acrostichum latifolium var. *alismifolium* Sod. Crypt. Vasc. Quit. 431. 1893.

Elaphoglossum latifolium var. *alismifolium* Bonap. Not. Pterid. **7**: 361. 1918.

The species allied to *Elaphoglossum latifolium* have been much confused, due primarily to the lack of strong morphological characters. The range of the present species is yet to be determined. The type is from Guadeloupe (*L'Herminier*).

MARTINIQUE: Bois de la Calebasse, *Duss* 1629b, 1630.
GUADELOUPE: *Duss* 4123. Bains-Jaunes, *Duss* 4126, 4319; *Questel* 2014, 3189, 3205, 3281 bis. St. Claude, *Questel* 3128. Hacienda Bernard, *Questel* 3040. Matouba, *Questel* 3137, 3179, 3180, 3180 bis.

17. ELAPHOGLOSSUM MARTINICENSE (Desv.) Moore, Ind. Fil. 11. 1857.
Acrostichum martinicense Desv. Ges. Naturf. Freund. Berl. Mag. **5**: 309. 1811.
Elaphoglossum Underwoodianum Maxon, Pterid. Porto Rico 397. 1926. Type from Puerto Rico, *Hess* 352.

Elaphoglossum martinicense has been confused by authors with *E. glabellum* and *E. simplex*. Maxon indicated in his original description of *E. Underwoodianum* that it might be the same as *E. martinicense*, and a photograph of the Desvaux type from Martinique, without indicated collector, shows this to be true. The species is apparently confined to Hispaniola, Puerto Rico, and the Lesser Antilles.

GUADELOUPE: St. Claude, *Questel* 3126, 3126 bis, 3126 ter. Grande Rivière, *Questel* 3088.

ADDITIONAL SPECIES REPORTED FROM GUADELOUPE OR MARTINIQUE

ELAPHOGLOSSUM BRACHYNEURON (Fée) J. Smith, Cat. Cult. Ferns 26. 1857.
Acrostichum brachyneuron Fée, Mém. Foug. **2**: 49. *pl. 22, f. 1.* 1845.

A South American species reported from Guadeloupe by Christ on the basis of *L'Herminier* 12 and 14.

ELAPHOGLOSSUM BREVIPES (Kunze) Moore, Ind. Fil. 7. 1857.

Acrostichum brevipes Kunze, Ind. Fil. Hort. Lips. 1845; Fée, Mém. Foug. **2**: 29. 1845.

Reported from Guadeloupe by Christ (Monogr. Elaph. 46. 1899) on the basis of *Herminier* 5. A dubious species, described originally from cultivated material.

ELAPHOGLOSSUM CUSPIDATUM (Willd.) Moore, Ind. Fil. XVI. 1857.

Acrostichum cuspidatum Willd. Sp. Pl. **5**: 106. 1810.

Reported from Guadeloupe (*Mazé* 994) by Krug. The specimen (not seen) probably represents the species here called *E. vestitum.* True *E. cuspidatum* is South American.

ELAPHOGLOSSUM FUNCKII (Fée) Moore, Ind. Fil. 9. 1857.

Acrostichum Funckii Fée, Mém. Foug. **2**: 36. *pl. 6, f. 1.* 1845.

A South American species reported from Guadeloupe (as *Acrostichum latifolium* var. *Funckii*) by Krug on the basis of a L'Herminier specimen. It is near *E. scandens.*

ACROSTICHUM LATIFOLIUM var. MEMBRANACEUM Krug, Bot. Jahrb. Engler. **24**: 139. 1897.

This is a *nomen nudum,* based on *Duss* 1620 and 1625 from Martinique.

ELAPHOGLOSSUM LEPIDOTUM (Willd.) J. Smith, Cat. Kew Ferns 1856; Cat. Cult. Ferns 26. 1857.

Acrostichum lepidotum Willd. Sp. Pl. **5**: 102. 1810.

Reported from Guadeloupe by Krug on the basis of a L'Herminier collection, which I have not seen. It is a South American species.

ELAPHOGLOSSUM LONCHOPHYLLUM (Fée) Moore, Ind. Fil. 11. 1857.

Acrostichum lonchophyllum Fée, Mém. Foug. **8**: 68. 1857.

This Mexican species is reported from Guadeloupe by Krug on the basis of a Mazé collection.

ELAPHOGLOSSUM PTEROPUS C. Chr. Ind. Fil. 314. 1905.

Acrostichum alatum Fée, Mém. Foug. **2**: 35. *pl. 5, f. 2.* 1845, not Roxb. (1844).

Elaphoglossum alatum Moore, Ind. Fil. XVI. 1857, not Gaud. (1846).

This species is reported from Guadeloupe by Christ (Monogr. Elaph. 46. 1899) on the basis of *Bory* 17.

ELAPHOGLOSSUM VILLOSUM (Swartz) J. Smith, Journ. Bot. **4**: 148. 1841.

Acrostichum villosum Swartz, Prodr. Veg. Ind. Occ. 128. 1788.

Reported from Guadeloupe by Krug. The identification is almost certainly erroneous, for this species (*sens. strict.*) is known only from Jamaica and Hispaniola.

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Index to Volume 38

ERRATA

Page 6, line 29: For "*Odontosaria*," read "Odontosoria."

Page 24, line 29: For "Lester," read "Leston."

Page 47, line 11: For "Monroe," read "Madison."

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CONTENTS

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CONTENTS

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American Fern Journal

Vol. 39 JANUARY–MARCH, 1949 No. 1

Ferns and Fern Allies of the Central Yukon Valley

EDITH SCAMMAN

The following list of ferns and fern allies has been compiled from my own collections of various summers in the vast, mostly unglaciated region of mountains, valleys, rivers, and creeks that form a part of the Yukon River drainage system, and from specimens of other collectors preserved in the Gray Herbarium. These I have supplemented by all published lists of collections known to the writer. The most complete is the catalogue of specimens in Hultén's monumental "Flora of Alaska and Yukon."[1] To this work I am much in debt, and also to Anderson's "Flora of Alaska and Adjacent Parts of Canada,"[2] especially for being enabled thereby to include two species in our district which I could not have done otherwise.

For convenience I have followed Hultén's divisions and boundaries, according to which the Central Yukon River District "is taken to include the basin of the Yukon River from the mouth of Stewart R. to the mouth of Koyukuk R., as well as the basins of the large tributaries of the Tanana R. and Porcupine R. The upper parts of the tributaries of the Tanana R. from the south are regarded as belonging to the Alaska Range District

[1] Lunds Univ. Arsskr. N.F. Avd. 2. **37**[1]: 1–77. 1941.
[2] Iowa State Coll. Journ. Sci. **18**: 137–175. 1943.

and not to this district.''[3] Hence numerous specimens from Dawson, and the Klondike region in Yukon Territory are mentioned here.

During my plant collecting in Alaska—a delightful task and pleasure at intervals for the past twelve years —I have been greatly disappointed at the paucity of true ferns, which is due in part to the extreme cold and length of the winters, and the dry conditions in the interior.

I have always been especially interested in ferns. My first venture into print, in the line of nature study, was a list entitled: "Ferns in my Pine Lot," in the "Maine Naturalist," published in Thomaston, Maine. The number of ferns found within the confines of this twenty-acre patch of woodland, strange as it may seem, is as large as the number I myself have obtained in this vast district, extending for hundreds of miles, in Alaska. One can hike for miles in sections of our district without meeting a single true fern, although a few species are fairly frequent in some localities. On the other hand the clubmosses and horsetails, especially the latter, are a very common and conspicuous feature of the vegetation.

Much of my time these past summers has been spent in the mountains and valleys near Miller House and Eagle Summit, a mining region, reached by the Steese Highway, which extends from Fairbanks to Circle City on the Yukon River. The mountains are usually dome-shaped, and have many gold-bearing creeks flowing down their slopes. Eagle Summit, 108 miles northeast of Fairbanks, so-called because the top resembles the outspread wings of a great bird, has an altitude of 3880 feet; Porcupine Dome, 4810 feet, and Mastodon Dome, 4400 feet.

[3] Loc. cit. p. 6.

The basic rocks of the Eagle Summit-Mastodon Dome district have been described as granite, quartz, mica schist (Birch Creek schist), and quartzite, with decomposed limestone. A granite dyke cuts through this region.

Livengood, which I have found to be richer in ferns than any other place in this district where I have collected, except the hot springs, is an old mining town 81 miles northwest of Fairbanks. There is a good deal of lime in the formations around Livengood and a serpentine dyke.

Twice I have visited Wiseman, a small mining camp reached only by plane, about 200 miles from Fairbanks and 80 miles north of the Arctic Circle. Wiseman is situated on the Koyukuk River, which flows into the Yukon from the north, and is the northernmost station where I have collected in Alaska.

The hot springs, always a source of great interest to botanists wherever they occur in various parts of the world, are, in Alaska, a veritable treasure house of species whose habitats are much farther south, and which are more or less isolated in the neighborhood of the springs, where milder conditions exist during the winter. Circle Hot Springs, 137 miles northeast of Fairbanks, near the Steese Highway, is the leading resort in interior Alaska. Manley Hot Springs, a small community delightfully situated near the Tanana River, is west and slightly north of Fairbanks.

In several cases I have mentioned my collections from Ophir, Yankee Creek, and Takotna, in the Upper Kuskokwim Valley. These stations are in central Alaska, in the interior, but are included by Hultén in his Lower Yukon District. However, as there have been only a few botanical collections made in this district, I think it worth while to cite these here.

My own specimens are preserved in the Gray Herbarium (G). Specimens cited from Hultén's Flora or mentioned in lists are found in the following herbaria: United States National Herbarium (US), National Herbarium of Canada, Ottawa (Can), New York Botanical Garden (NY), University of California (UC), Botanical Museum, Stockholm (S), and Hultén's private herbarium (H).

Published lists of collections from which specimens are cited include:

Coville & Wight, U.S. Geol. Surv. Prof. Paper **10**: 58. 1902.
Harshberger, Proc. Amer. Phil. Soc. **67**[3]: 227, 232. 1928.
Macoun, Ottawa Nat. **13**: 217. 1899 (Tyrrell's collection); Geogr. Surv. Can. Sum. Rep. **1911**: 22. 1912; Geol. Surv. Can. Mem. **67**: 13. 1914 (Cairnes' collection).
Mertie, U.S. Dep. Int. Bull. **836E**: 363. 1932.
Porsild, Rhodora **41**: 171–174. 1939.
Scamman, Rhodora **42**: 315–316. 1940.
Trelease, Harriman Alaska Exp. **5**: 375–395. 1904.
Underwood, Bull. N. Y. Bot. Gard. **2**: 148–149. 1901.

I am very grateful to Mr. Weatherby for his encouragement and helpful suggestions during the preparation of this paper.

OPHIOGLOSSACEAE

BOTRYCHIUM LUNARIA (L.) Swartz. The moonworts are easily overlooked and are doubtless more common in the Central Yukon than would appear from the collections seen: Franklin, Forty Mile district, *Anderson & Gasser* 7147 (G); Kokrines Mts., *Porsild* 687 (G) [belonging to var. *minganense* (Victorin) Dole, with more rounded, less fan-shaped segments of the sterile blade]. I found a large colony in a wooded hollow near the Chena River at Fairbanks (no. 1619), and a few plants on a mossy slope near Miller House (no. 1973), and also at Livengood (no. 4876).

Other collections mentioned by Hultén are: Dawson, *Williams* (acc. to Underwood), *Malte* 70 (H); Black Hill Creek, July 15–20, 1898, *Andersson* (S); Fairbanks, *Anderson;* College, *Anderson* 1269b (H). Hultén remarks, "It seems probable that the area of this species in Central Alaska and Yukon is isolated from the coastal area of the species." Most of the collections from the Alaska Range District have been made on the western slope of the range.

BOTRYCHIUM BOREALE (Swartz) Milde. The northern grape-fern is rarer throughout Alaska than the moonwort and nearly all collections reported are from the Pacific Coast districts and the Aleutian Islands. I am including it in the Central Yukon River District because of the statement of Anderson,[4] "circumboreal, in Alaska from Wiseman southward." The Nelsons obtained it at Camp Eielson, Mile 66, Mt. McKinley National Park (no. 4107, G).

POLYPODIACEAE

WOODSIA ILVENSIS (L.) R. Br. The rusty Woodsia grows abundantly among the rocks on a dry, exposed cliff along the river at Manley Hot Springs (no. 3641), and other specimens were obtained at Rhode Island Creek, 26 miles north of the hot springs beyond Eureka Camp (no. 3642). Anderson also collected it at Manley Hot Springs (no. 7107, G).

Hultén lists collections from: Fairbanks, *Palmer* 227; Coldfoot, *Heideman* 297 (US); Koyukuk River, Aug. 21, 1902, *Collier* (US); Allen River, 35 miles above the mouth (acc. to Coville & Wight); Totanilla Mts. (at Melozi River), *Collier* 128 (US); Kokrines Mts., divide towards Melozina River, *Porsild* 685 (Can). He lists also *Scamman* 871 (G, H), from Wiseman, but the only

[4] Loc. cit. 144.

HAUNTS OF ALPINE WOODSIA NEAR RAPIDS LODGE

OSTRICH FERNS ALONG THE SUSITNA RIVER AT CURRY specimen of 871 that I find in the Gray Herbarium is *W. glabella.*

The rusty Woodsia is probably frequent and widely distributed in our area.

WOODSIA ALPINA (Bolton) S. F. Gray. I was thrilled to find the alpine Woodsia near Rapids Hunting Lodge in 1936 (no. 1), and I collected it again at the same station on a succeeding visit (no. 4588). Clumps grew in narrow crevices on the face of a cliff opposite a beautiful little waterfall in the woods. Rapids Hunting Lodge is south of our area, on the Richardson Highway 138 miles south of Fairbanks. I have never seen it elsewhere in Alaska, but Hultén cites three collections from the Central Yukon River District: Forty Mile Creek, *Tyrrell* (acc. to Macoun); Coldfoot, *Heideman* 263; 35 miles from the mouth of the Alatna River, July 23, 1901, *Mendenhall.*

Our plants correspond to the true *W. alpina* of Europe and not to the form of eastern North America that Porsild[5] has recently named *W. Belli.* It is a very rare fern in Alaska, and of scattered distribution.

WOODSIA GLABELLA R. Br. One of our most delicate and fragile little ferns in appearance, but one of our hardiest, surviving the severe cold of the far north, the smooth Woodsia is frequent in shaded, moist crevices in cliffs or hidden away in rock slides. It has a preference for calcareous soils. I have found it in most of the localities in the Central Yukon River District where I have botanized: Miller House (no. 4638); Eagle Summit (no. 1969); Livengood (nos. 1675, 4877); Wiseman (nos. 871, 2178). To these records may be added: Forty Mile, *Anderson & Gasser* 7174 (G); Dawson, Bonanza Creek, *Eastwood* 308 (G), and the citations of Hultén: Bettles, *Heideman* 315; Coldfoot, *Heideman* 263; Forty Mile Creek, *Tyrrell* (acc. to Macoun).

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[5] Rhodora **47**: 147. 1945.

CYSTOPTERIS FRAGILIS (L.) Bernh. One of the most widely distributed ferns known, the fragile bladder-fern is found generally in interior Alaska. The plants raise their yellowish-green, delicately-cut fronds from small openings in rock slides or at the base of boulders, or project from the knifelike edges of cliffs. Sometimes *C. fragilis* and *Dryopteris fragrans* are the only ferns one comes across during a day's jaunt in the interior.

There are forty collections of *C. fragilis* from Alaska in the Gray Herbarium, more than of any other fern. Specimens vary considerably in aspect in different habitats and localities. Near the hot springs at Circle City (nos. 3, 3442) it grows luxuriantly, with tall, deeply-cut fronds. My other collections from the Central Yukon Valley include: Livengood (nos. 1676, 4878); Wiseman (no. 2179); Miller House (nos. 1970A, 3443); Eagle Summit (no. 1970B); Harrison Dome (no. 4682). Other collections studied include: Goldstream Creek and Pedro Dome, *Porsild* 106 (G); Rampart, *Kusche* in 1916 (G); Coal Creek, *Funston* 71, 146 (G); Dawson, *Eastwood* 252 (G), and *Malte* 73 (G).

Hultén mentions also the following specimens and reports in his Flora: Klondike, July 9, 1899, *Williams* (NY), July 11, 1902, *Macoun* (Can); Dawson, July 13, 1899, *Williams*, Aug. 6, 1902, *Macoun* (Can); Black Hill Creek, July 5–10, 1898, *Andersson* (S); Forty Mile Creek, *Collier* 23 (US), *Tyrrell* (acc. to Macoun); Tatunduk-Nation River distr. (acc. to Mertie); Chandinau River, *Tyrrell* (acc. to Macoun); Porcupine River, 1891, *Turner* (UC); Woodchopper Creek, *Collier* 102 (US); Fort Gibbon, *Heideman* 77 (US); Fort Yukon, Aug. 8–12, 1889, *Russell* (US); Old Rampart House, *Murie* 2186 (H).

Despite the variance in appearance all the material seen seems to belong to the typical circumboreal variety.

CYSTOPTERIS MONTANA (Lam.) Bernh. The mountain bladder-fern is one of the loveliest of our northern ferns and sufficiently rare so that the sight of the many low fronds carpeting the mossy ground under the shade of alders or willows affords a real joy to the fern enthusiast. It has been my privilege to find it at only three stations: Livengood (nos. 1677, 4879); Wiseman (no. 2180); and Anvil Hill, Nome (no. 3783) (the last in the Bering Strait District). Miss Eastwood found it growing among rocks at Dawson Slide (no. 453, G).

Hultén refers to the following specimens in the U. S. National Herbarium from the central part of the Yukon River Valley: Klondike River-Indian River divide, Aug. 10, 1899, *Tarleton;* Rampart-Tanana, *Palmer* 38, 70; Fort Gibbon, *Heideman* 68, 79; Melozi, *Collier* 135, and mentions reports from Forty Mile Creek, *Tyrrell* (acc. to Macoun) and Tatunduk-Nation River district (acc. to Mertie).

PTERETIS PENNSYLVANICA (Willd.) Fernald.[6] The name used by Hultén and Anderson is *Struthiopteris Filicastrum* All. They do not consider the American fern to be separable from the European. Apparently the ostrich fern has been collected in only a very few localities in Alaska, these chiefly in the interior, so it must be considered rare. But wherever it is found, it grows in luxuriant profusion. Many tourists to the interior have noticed it on the banks of the Susitna River at Curry, with fronds five or six feet high. According to Anderson it occurs "along the Alaska R. R. from Talkeetna to Curry." Curry is situated south of the Alaska Range and is not in our district. In the Central Yukon Valley the only definitely known station seems to be Manley Hot Springs, where I collected it in 1945 (no. 3640). It grew there abundantly in wet, wooded hollows near the hot springs. Gus Benson,

[6] Rhodora 47: 123–124. 1945.

the postmaster at Manley, a plant-lover, had transplanted some of the ferns to his attractive log cabin and post office, where the fronds nearly touched the roof. I observed it also in a garden plot in Fairbanks (no. 7), and I was told vaguely that the plants came from creeks in the woods in the vicinity.

DRYOPTERIS FRAGRANS (L.) Schott. The fragrant shield-fern, which is so rare in New England that some collectors have never seen it in its native haunts, is probably the best known and most familiar fern in the interior of Alaska. Hundreds of clumps of tall, evergreen, swordlike fronds, with clusters of brown curls at the base, grow amid the rocks under scattered spruce trees on the hills near Miller House (nos. 15, 700, 1971, 3445). I have collected it also at Wiseman (nos. 872, 2181); Livengood (nos. 1678, 4880); Circle Hot springs (no. 14), all of these being in the Central Yukon River District, and at Yankee creek (no. 1769) and Ophir (no. 1768A) in the Kuskokwim Valley of the Lower Yukon River District, and back of the hotel in Mt. McKinley National Park (no. 4946), where it is abundant.

Elsewhere in our district, as evidenced by specimens in the Gray Herbarium, it has been obtained at Coldfoot, *Heideman* 302; Rampart, *Kusche* in 1916; Dawson, *Kusche* in 1916; Klondike, *MacLean* in 1898–1901; Dawson Slide, *Eastwood* 63; and Red Mt., near Fort Selkirk, *Gorman*, July 17, 1899. Hultén cites numerous other collections from Hunker Creek, Forty Mile Creek, Tatunduk-Nation River district (acc. to Mertie), Eagle, Fort Egbert, Black River, *Cairnes* (acc. to Macoun), Tanana River, 51 miles north of Fairbanks, Cleary Summit, Lower Rapids of the Yukon, Fort Hamlin, Porcupine River, 35 miles above mouth of the Alatna River, Old Man Creek, 20 miles below Walker Lake, and Kokrines Mountains.

DRYOPTERIS SPINULOSA (O. F. Müll.) Watt, var. AMERICANA (Fisch.) Fernald. *D. austriaca* (Jacq.) Woynar, according to Hultén and Anderson. Common and widely distributed in most sections of Alaska, especially along the Pacific coast and the Bering Sea, the spreading shield-fern is very rare in the Yukon Valley. Hultén comments on its total absence in the Upper Yukon District. In our area north of the Alaska Range I have seen it only in the neighborhood of the hot springs, where it reaches its northern limit in the interior—Circle (nos. 16, 17, 3448); Manley (no. 3637). Anderson also obtained it at Circle (no. 7552, G); and Hitchcock at Tanana Hot Springs (doubtless Manley), July 20–29, 1909 (US), according to Hultén. The only other station reported seems to be Melozi River, *Collier* (no. 134, US), considerably west of the above-mentioned localities.

In the Upper Valley of the Kuskokwim River, where I botanized in 1940, this fern was growing abundantly at Yankee Creek (no. 1770A), and Takotna (no. 1770 B). Patches of vivid green could be seen at a considerable distance, extending up and down the hillsides and marking the course of the creeks.

Most of the specimens seen in the interior have monochrome scales and seem to agree with the fern of northeastern America. My specimen (no. 17) from Circle Springs approaches var. *dilatata* (Hoffm.) Watt.

DRYOPTERIS PHEGOPTERIS (L.) C. Chr. The long beech fern, while found frequently beside brooks and waterfalls in the coastal areas of Alaska as far north as Nome on Bering Straits, is very rare in the interior, north of the Alaska Range. Here again Manley Hot Springs is the northern limit in interior Alaska, and the only station known in the Central Yukon River District. In fact it appears to be the only known locality in the entire Yukon Valley. Specimens from there include my no. 3639, and *Porsild* 632 (G.) In the Upper Kuskokwim I obtained it at Takotna (no. 1771).

DRYOPTERIS DISJUNCTA (Ledeb.) Morton. *D. Linnaeana* C. Chr. Anderson refers to the delicate oak fern "as common in most parts of Alaska." But judging from the collections it seems to be found less frequently in the central and northern interior than in the coastal regions. I have obtained it in the Central Yukon only at both hot springs—those fascinating localities for the rare Alaskan plants—Circle (nos. 10, 3446) and Manley (no. 3638); and also at Wiseman (no. 913). Porsild collected it at Tanana Hot Springs (Manley) (no. 631, G). Mertie mentions it in his list from the Tatunduk—Nation River district. In the Kuskokwim Valley of the Lower Yukon district I found it at Takotna (no. 1772), and Yankee Creek (no. 1773).

My specimens from Wiseman have a few glands on the rachis, and were labelled by Tyron *D. Linnaeana* forma *glandulosa* Tryon[7]. Hultén however, lists the Wiseman specimen under *D. Robertiana*.

DRYOPTERIS ROBERTIANA (Hoffm.) C. Chr. This circumboreal fern, a dweller on moist, calcareous ledges, is always of scattered distribution and may be considered very rare in Alaska, as it has been found only in the Central Yukon River district, and in no other part of the territory. According to Hultén "the difference between *D. Robertiana* and *D. Linnaeana* seems to be less distinct in Alaska than in Scandinavia." But typical *D. Robertiana* when seen in the field is characteristic in its general appearance. The way the fern carries itself, the difference in shape and color of the frond, as well as the glands on the stipe and pinnae clearly distinguish the plants I have seen in the field from the oak fern, however variable the latter may be.

[7] Amer. Fern Journ. 29: 4. 1939.

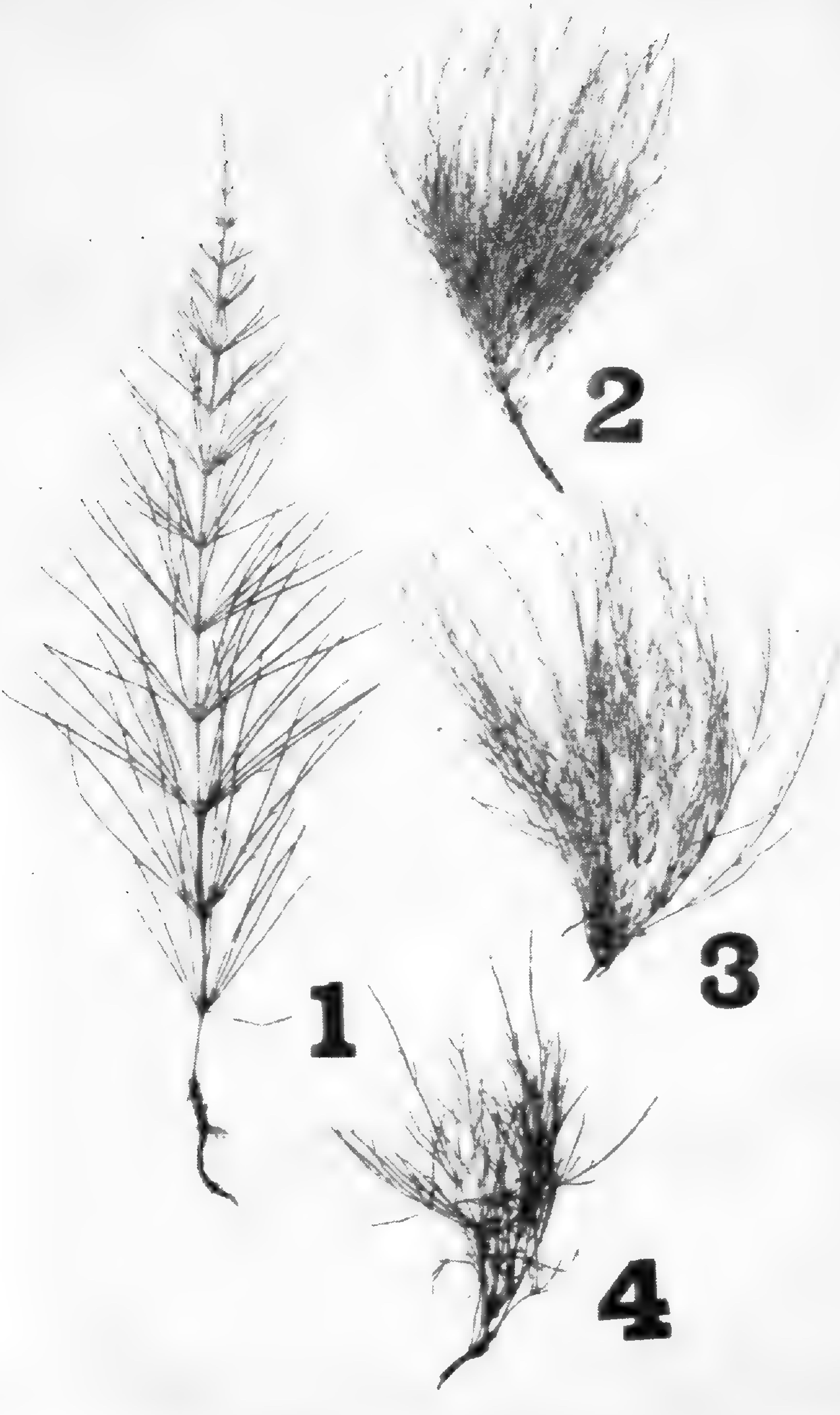
(*To be continued*)

The Effect of Mechanical Injury on Equisetum arvense

WILLIAM F. RAPP, JR.

Botanists have speculated on the theory that many of the forms and varieties of *Equisetum* are the results of mechanical injury and therefore should not be named. In North America we have only thirteen species of *Equisetum,* but Broun (1938) recognizes 17 forms and varieties of *Equisetum arvense!* For the most part these are names found only in our check-lists. A few are valid and should be considered subspecies rather than varieties or forms.

This past spring the author was engaged in some field work in the Indiana Dunes State Park, Porter County, Indiana. During the course of his work he came across a small stand of *Equisetum arvense* L. This stand of *arvense* covered about 24 square feet and was growing on the leeward side of a large sand dune which was slowly moving south or away from Lake Michigan. Plate I illustrates the types of *arvense* which were found in this colony. Number one is typical *arvense,* but while most workers would agree that numbers 2, 3, and 4 are *arvense* they would be at a loss to know what form name to apply to these specimens. In order to be sure that I was not dealing with different plants, I dug carefully in the sand to uncover the rhizomes and was able to trace the same rhizome to both normal and injured plants. The sand sliding down the face of the dune was the cause of the deforming of the plants. An individual plant tended to hold a little pile of sand along the main stem. Finally the weight of the sand pushed the plant over, covering up the lower whorls of branches. The pushing over of the plant and the covering of these branches apparently released some plant hormone which



Equisetum arvense

caused the plant to send off a large number of closely spaced branches, giving the plant a low compact shape rather than the normal form.

The late Alvah A. Eaton was the last student of *Equisetum* to make use of the form and variety names. In the herbarium at the University of Illinois there is a large series of *Equisetum arvense* named to form and variety by Eaton. I compared the specimens illustrated by figures 2, 3, and 4 with Eaton's specimens and found that the following names were applicable:

2. *Equisetum arvense* forma *alpestre* (Wahl.) Luerss.
3. *Equisetum arvense* forma *diffusum* (A. A. Eaton) Clute
4. *Equisetum arvense* forma *decumbens* (Meyer) Klinge.

Therefore, I would like to recommend that in the future we drop these forms from our check-lists unless they breed true and offer better morphological characters.

APPENDIX

Check-list of forms and subspecies of *Equisetum arvense*.

Equisetum arvense L. Sp. Pl. 1061. 1753.

E. arvense var. *alpestre* Wahl. Fl. Lappon. 398. 1812.

E. arvense decumbens Meyer, Chlor. Hanov. 667. 1836.

E. arvense var. diffusum A. A. Eaton ex Gilbert, List N. Am. Pterid. 8, 25. 1901.

E. arvense granulatum Lawson, Trans. Bot. Soc. Edinb. 7: 561. 1863.

E. arvense var. *irriguum* Milde, Monogr. Equis. 223. 1865.

E. saxicola Suksdorf, Deutsche Bot. Monatss. 19: 93. 1901.

Forma *arcticum* (Rupr.) Broun, Index N. A. Ferns, 84. 1938.

Forma *campestre* (C. F. Schultz) Klinge, Archiv. Naturk. Kurl. II. 8: 380. 1882.

Forma *nanum* (A. Br.) Broun, Index N. A. Ferns, 85. 1938.

Forma *nemorosum* A. Br. ex Döll, Rhein. Fl. 27. 1843.

Forma *polystachyon* (A. A. Eaton) Broun, Index N. A. Ferns, 85. 1938.

Forma *proliferum* (Luerss.) Broun, Index N. A. Ferns, 85. 1938.

Forma *varium* Milde, Nov. Act. Acad. Caes. Leop. Halle II. 90c. **26**: 423. 1858.

Subsp. *ramulosum* (Rupr.) Rapp, Amer. Fern Journ. **37**: 21. 1947.

E. arvense var. *pseudo-silvaticum* Milde, Monogr. Equis. 220. 1865.

Var. *boreale* (Bong.) Rupr. Symbolae, 87. 1846.

Var. *boreale* forma *caespitosum* J. Rousseau, Bull. Mus. Nat. Hist. Canada, no. **66**: 5. 1931.

Var. *boreale* forma *pseudo-alpestre* Victorin, Equis. du Quebec, 36, *f. 5.*, 116. 1927.

Var. *boreale* forma *pseudo-varium* Victorin, l. c. 37, 116. 1927.

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Selaginella rupestris in Kansas

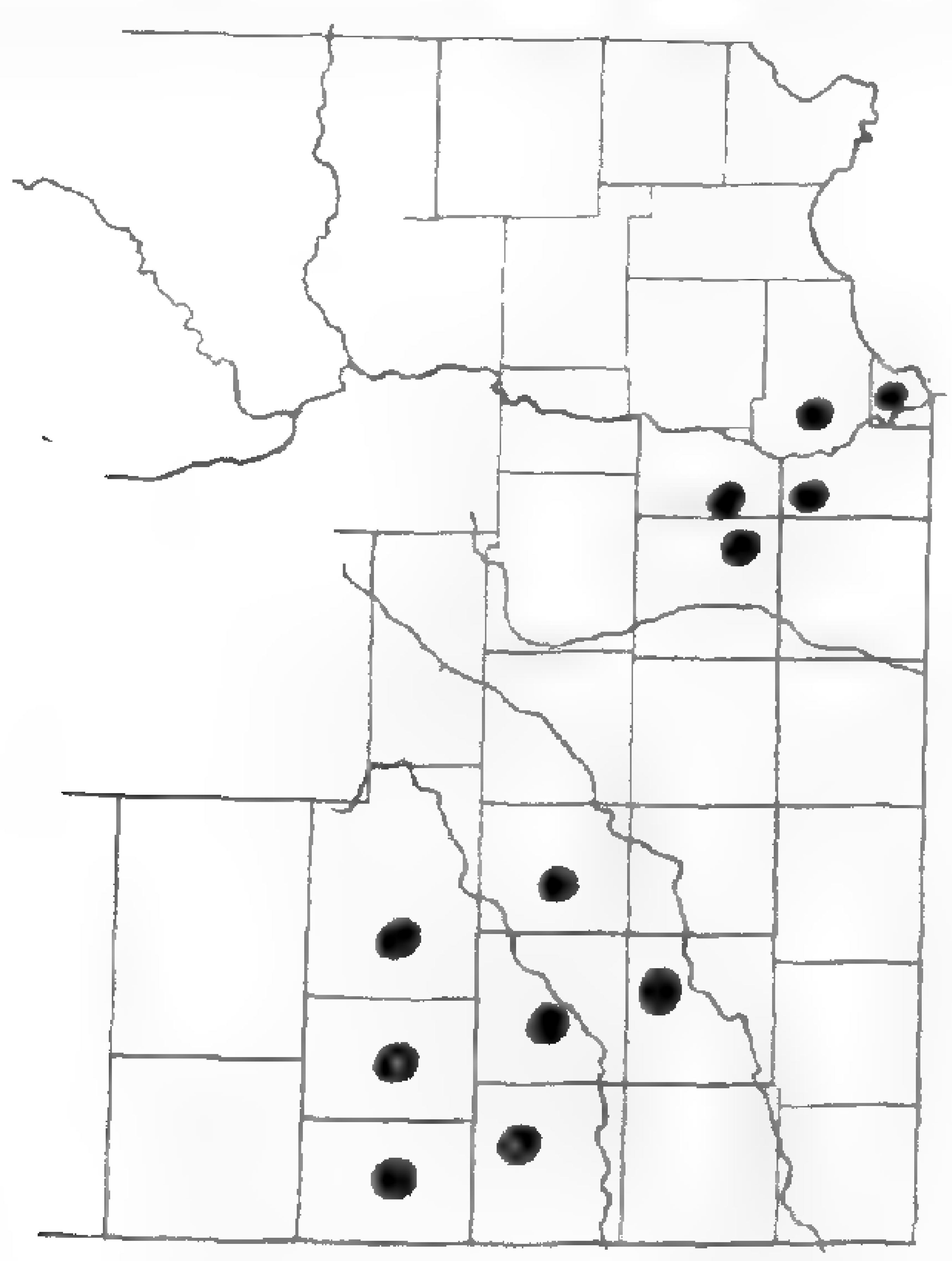
R. L. MCGREGOR AND W. H. HCRR

In 1940 Dr. Frank C. Gates[1] did not list *Selaginella rupestris* (L.) Spring in the list of plants known for the state of Kansas. In this Journal[2] there was published a map showing the range of *Selaginella rupestris* in the eastern half of the United States and again Kansas was not credited with any known records of this plant.

The present writers have made several collections of this plant in the state during the past seasons. A map of eastern Kansas, here reproduced, shows the known distribution of *Selaginella rupestris* in this state. In this Journal[3] this plant was said to occur only rarely in sand. In Kansas, however, it has been found only on sandstone rocks and on sandy soil. It is found most abundantly in sandy soil bordering exposed sandstone rocks or in

[1] Flora of Kansas, Contr. Dept. Bot. 391, Kansas State College.
[2] **36**: 68. 1946.
[3] *l. c.* 69.

regions where the soil covering the sandstone is only an inch or two thick. In eastern Kansas there is sandstone outcropping only in those areas in which *Selaginella rupestris* has been found. There are other regions in the central and western part of the state where sandstone comes to the surface, but as yet *Selaginella rupestris* has not been found in those areas. Specimens collected are on file in the Herbarium at the University of Kansas as follows: Chautauqua Co., 2 mi. NE. of Sedan,



July 16, 1936; Douglas Co., 5 mi. W. of Baldwin City, Oct. 18, 1947; Elk Co., 10 mi. S. of Fall River, July 10, 1946; Franklin Co., 9 mi. NE. of Ottawa, Nov. 2, 1947; Greenwood Co., 5 mi. N. of Fall River, July 17, 1947; Johnson Co., 3 mi. W. of Olathe, Nov. 2, 1947; Leavenworth Co., 4 mi. NW. of Linwood, July 27, 1947; Montgomery Co., 3 mi. SW. of Elk City, July 1, 1947; Neosho Co., 3 mi. N. of Morehead, July 10, 1946; Wilson Co., 1 mi. NE. of Neodesha, July 1, 1947; Woodson Co., 3 mi. NW. of Yates Center, Oct. 26, 1947; Wyandotte Co., 5 mi. NW. of Bonner Springs, July 27, 1947.

DEPT. OF BOTANY, UNIV. OF KANSAS.

Geographic Notes on the Bog Fern

EDGAR T. WHERRY

A few additional records supplementary to Dr. Svenson's article[1] on *Dryopteris simulata* in the Maxon memorial number of the Journal may be worth publication. The bog fern is known to range farther south than shown by records in the herbaria from which Svenson's map was drawn, that is, to Lanexa in the southeastern corner of Virginia.[2] A specimen collected there is in the herbarium of the University of Virginia, Charlottesville.

The westernmost known station is in the mountains of Maryland 3 miles east of Grantsville;[3] a specimen from there is in the herbarium of the Academy of Natural Sciences, Philadelphia. There have, to be sure, been reports from West Virginia,[4] Michigan,[5] and Indiana,[6] and specimens labeled as this fern were distributed by the Arnold Arboretum (*E. J. Palmer* 39521) to various herbaria from the last named state. Careful checking of these reports indicated them to be based on a source of misunderstanding mentioned by Dr. Svenson—immature *Athyrium thelypterioides.* In this connection there is a useful diagnostic character not usually mentioned in books but well shown in Dr. Svenson's illustrations—in the bog fern the innermost lobes of the lower pinnae are equal in length to, or shorter than, the lobes further out; in the marsh fern and silvery glade-fern the innermost lobes tend to be elongated.

An interesting prediction in regard to the northern limit of the range is also worth relating: In his famous

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[1] This JOURNAL **38**: 195. 1949.
[2] This JOURNAL **15**: 5. 1925.
[3] This JOURNAL **23**: 111, 1933.
[4] Millspaugh, Liv. Pl. W. Va. 195. 1913.
[5] Pepoon, Fl. Chicago Reg. 146. 1927.
[6] Peattie, Fl. Ind. Dunes 31. 1930.

thesis on the Ferns of Quebec,[7] Brother Marie-Victorin included this fern, remarking that since it occurs in Vermont almost up to the Canadian boundary, it is surely present in Quebec also. Although this was doubted by others, the fern was later discovered near Bedford, in Quebec a few miles north of the Vermont border, as reported by Mousley.[8]

In lectures on the plant geography of the eastern United States, the writer likes to show distribution maps representing species which because of their general distribution may be classed as northern, western, southern, and finally eastern. It was not easy to find a good illustration of the last category, but the bog fern proved to be an excellent one. Its range is most reasonably interpreted as corresponding to its former occurrence, and presumably evolution, on the land which extended from the North Carolina cape region to Nova Scotia and Newfoundland during fairly recent geological times. By the time that land mass had sunk beneath the sea this fern had migrated far enough west to escape annihilation, but its ancestors or connecting links with related entities failed to do so.

UNIVERSITY OF PENNSYLVANIA.

A Study of Apospory in Pteridium aquilinum

W. N. STEIL.

Although, Farlow (1889) described over a half century ago, the marginal growths produced by the fronds of *Pteris aquilina* as aposporous, no further study has been made of the nature of these apparently gametophytic structures. Several years ago, the writer began a study of the prothalloid growths of the fern to determine whether they possess the characters generally accepted

[7] Rev. Trim. Can. 9: 46. 1923.
[8] Can Field Nat. 46: 1. 1932; This JOURNAL 22: 53. 1932.

as those which belong exclusively to the gametophyte. Such structures, if they originated from the leaves, could then be regarded as aposporous.

A number of *Pteridium aquilinum* plants[1] bearing the anomalous leaves were found in nature and transplanted to a greenhouse. When they became well established, a glass chamber was placed over each one to maintain an atmospheric moisture content thought to be favorable for the development of aposporous growths. Small portions of the leaves of these ferns were cut off and planted on moistened sterilized sand and on peat which had been saturated with either Knop's solution, or Beyerinck's solution as modified by Moore (1903). During the course of the investigation, many of the growths were also removed and planted on sterilized filter paper moistened with the nutrient solutions.

When the prothalloid growths were removed from the fronds of plants growing in nature and examined with the microscope, it could be observed that they always originated from sporangia in early stages of development and not from ordinary epidermal cells. They were generally elongated, branched, and of irregular form. Among these growths were normal sporangia which produced viable spores.

When the outgrowths produced on the fronds of the plants in the moist chambers were removed from time to time and examined, it could be seen that they had increased considerably in size. Those on the portions of fronds which had been planted had undergone a similar change, but the outgrowths which had been removed and planted on moistened filter paper remained the same size.

A careful study was made of the prothalloid structures to determine if they were composed of cells gametophytic in nature, or if they produced rhizoids or sex-organs.

[1] The Wisconsin form on which the investigation was made is *Pteridium aquilinum* var. *latiusculum*.

As is known these factors serve as criteria to determine whether certain structures are gametophytic. To aid further in the study, portions of the anomalous fronds were fixed, sectioned and stained. As a result of a study of the slides, no evidence could be obtained that the structures were gametophytic.

Heart-shaped structures resembling the prothallia of the *Polypodiaceae* were never produced from the frond of the fern, neither rhizoids, nor sex-organs were formed. Hence, it is evident that the outgrowths possess no gametophytic characters. Frequently, vascular strands from the frond were observed to extend for a considerable distance into the outgrowths. Therefore, these structures possess one distinctly sporophytic character—vascular tissue.

As a result of the studies which have been made by the writer, he has been led to the conclusion that the peculiar prothalloid growths produced not infrequently by the sporangia of *Pteridium aquilinum* possess no gametophytic characters, and are not of an aposporous nature like those described by Druery (1884a, 1884b, 1893), Bower (1884), Goebel (1905, 1907), Georgevitch (1910), Lawton (1932), Manton (1932), Sarbadhikari (1926, 1929), Stansfield (1899), Steil (1919, 1921), and Woronin (1907, 1908). No studies have been made to determine the cause of the anomaly in *Pteridium aquilinum*. It is suggested that the outgrowths are abnormal and may be due to pathological or physiological conditions.

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BIBLIOGRAPHY

Bower, F. O. 1884. On Apospory in Ferns. Journ. Linn. Soc. London 21: 360–368. *pl. 10, 11, 5 figs.*

———. 1888. On Some Normal and Abnormal Developments of the Oophyte of *Trichomanes alatum*. Ann. Bot. 1: 269–305. *pl. 14–16.*

Druery C. T. 1884a. Observations on a Singular Development in the Lady-fern. Journ. Linn. Soc. 21: 354–360.

———. 1884b. Further Notes on a Singular Mode of Reproduction in *Athyrium Filix-foemina* var. *clarissima.* Journ. Linn. Soc. 21: 358–360. *2 figs.*

———. 1886. On a New Instance of Apospory in *Polystichum angulare* var. *pulcherrimum* Wills. Journ. Linn. Soc. 22: 437–441. *1 fig.*

———. 1892. Notes on an Aposporous *Lastrea* (*Nephrodium*). Journ. Linn. Soc. **29**: 479–483. *pl. 34.*

———. 1893. Notes upon Apospory in a Form of *Scolopendrium vulgare* var. *clarissima* and a New Aposporous *Athyrium;* Also an Additional Development in *Lastrea pseudomas* var. *cristata.* Journ. Linn. Soc. **30**: 281–284. *pl. 17.*

Farlow, W. G. 1889. Apospory in *Pteris aquilina.* Ann. Bot. 2: 383–386.

Georgevitch, F. 1910. Aposporie und Apogamie bei *Trichomanes Kaulfussii.* Jahrb. Wiss. Bot. **48**: 155–170.

Goebel, K. 1905. Kleiner Mitteilungen—3. Aposporie bei *Asplenium dimorphum.* Flora **95**: 239–244.

———. 1907. Experimentell—morphologische Mitteilungen künstlich hervorgerufene Aposporie bei Farnen. Sitz Königl. Bayer. Akad. Wiss. **37**: 119–137.

Lawton, Elva. 1932. Regeneration and Induced Polyploidy in Ferns. Amer. Journ. Bot. **19**: 303–333.

Manton, Irene. 1932. Contributions to the Cytology of Apospory in Ferns—I. A Case of Induced Apospory in *Osmunda regalis.* Journ. Genet. **25**: 423–430.

Moore, G. T. 1903. Methods for Growing Pure Cultures of Algae. Journ. Appl. Microscopy **6**: 2309–2314.

Sarbadhikari, P. C. 1926. Apospory in *Osmunda javanica.* Ceylon Journ. Sci. **12**: 137–143.

———. 1929. Cytology of Apogamy and Apospory in *Osmunda javanica.* Bl. Ann. Bot. **53**: 137–145.

Stansfield, F. W. 1899. On the Production of Apospory by Environment in *Athyrium filix-foemina* var. *unco-glomeratum.* Journ. Linn. Soc. **34**: 262–268.

Steil, W. N. 1919. Apospory in *Pteris sulcata.* L. Bot. Gaz. **57**: 469–482.

———. 1921. Vegetative Reproduction and Aposporous Growths from the Young Sporophyte of *Polypodium irioides.* Bull. Torr. Club **48**: 203–205.

Woronin, H. 1907. Apogamie und Aposporie bei einigen Farnen. Ber. Deutsch. Bot. Gesells. **25**: 85–86.

———. 1908. Apogamie und Aposporie bei einigen Farnen. Flora **98**: 101–162.

Recent Fern Literature

Dr. Clyde F. Reed has published[1] a study of certain species hitherto commonly referred to *Woodsia* and *Pteretis*—a study concerned primarily with the characters of the spores and the number of annulus-cells. On the basis of low cell-count and differences in spores and indusium, he accepts Ching's proposed segregate genus *Protowoodsia*, based on *Woodsia manchuriensis* Hook., correcting the original description of the spores. Similarly, on characters of spores and sori he maintains the genus *Pentarhizidium* Hayata for the three Asiatic ostrich ferns—*P. intermedium, P. japonicum* and *P. orientale*.

The paper raises a question of terminology which ought to be settled in the interest of clarity. Dr. Reed defines perispore as the spore-wall; exospore as the "loose outer covering" found in some groups of ferns and not in others. Bower uses the two terms in exactly the reverse sense; so, apparently, do other authors. If the morphologists can give us an authoritative decision as to their proper use and meaning, we shall be grateful.—C. A. WEATHERBY.

Although it is not customary to review in the pages of the Journal books other than on ferns, many members who have gardens may be glad to know of "The Cultivated Species of Primula."[2] Primroses are delightful plants and are among the best subjects for borders and rock gardens. The author of this book on their classification and cultivation, which is beautifully printed and illustrated, has made an exhaustive study of the group for more than 20 years. The results seem to have amply justified the effort.—C. V. M.

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[1] Reed, C. F. Notes on the taxonomy of some Eastern Asiatic ferns of the genera Protowoodsia and Pteretis. Madroño 9: 189–193 (1948).

[2] By Walter C. Blasdale. University of California Press, Berkeley, California. pp. 1–284. 1948 ($7.50).

American Fern Society

Report of the President for 1948

The year 1948 brought death to a distinguished botanist, an internationally known student of ferns, a devoted supporter of this Society and its activities, and a valued friend of its members. As D. C. Eaton distinguished the late Nineteenth Century, so William R. Maxon distinguished the present period of American Pteridology. The Society owes Mr. Morton a genuine vote of thanks for his fine editorial work on the memorial number of the Journal dedicated to Dr. Maxon. Mr. Weatherby's biographical sketch, sensitive as it was to all the strong personal qualities of the man as well as to his scientific merits, will introduce Maxon so well to those who will be using his foundational work in years to come.

Dr. R. M. Tryon joined the staff of the Missouri Botanical Garden during the year and moved the Society's Library and Herbarium from Minneapolis to St. Louis with but small incidental expense to the Society. We are indeed grateful to Dr. Tryon for his generosity in defraying the transportation costs.

From Mr. Morton's imagination in figuring out ways of contacting libraries which might be buyers of back files of the Journal, the Society has thrown up a levee of income against rising operation costs. Nevertheless, let every member serve on a committee of the whole Society and let each one try to introduce a new member to the Society. Perhaps in this way the dues will not have to be increased again. Have members considered a gift subscription to a local secondary school or college library? For the modest price of a year's subscription one may interest a student in ferns as a hobby today toward lifetime studies tomorrow.

The annual program meeting held customarily in conjunction with the A.A.A.S. convention took the form this past year of a field trip to the Blue Ridge Mountains of Virginia—a memorable occasion for those members who found it possible to visit Washington for the Centennial meetings of the Association. Fern students from points as distant as Quebec, Florida, and India joined with mycologists and bryologists in a foray through Shenandoah National Park.

And this leads me quite naturally to remind you that the Society will meet this Christmas in New York City, along with the A.A.A.S., and we hope that you will plan to be there.

JOSEPH EWAN, *President*

Report of the Secretary for 1948

This year your Society has held two meetings for as many members as were able to reach them. The wide distribution of our membership precludes the getting together of more than a small fraction of members at any one time and place. Our annual meeting, as an associate of Section G of the American Association for the Advancement of Science, was a participation in the celebration of the Centennial of the A.A.A.S. held in Washington, D. C. This year the time was set for September, the date of the original A.A.A.S. meeting, rather than during the December Holiday season as has become the custom of recent years. In this instance the time of year was propitious for a day's field trip, which has been duly reported in the Journal.

The last of July, Society members living in New Jersey and in the vicinity of New York City joined with the Torrey Botanical Club for a field day at Roselle, N. J. One of our members, M. D. Mann, Jr. was host and leader to about twenty members who enjoyed studying his extensive fern garden of more than one hundred and twenty hardy native and hybrid ferns, and foreign and crested specimens. Plant specimens of some of the more unusual ones were available to those who have gardens in which to plant them.

This is a fine example of a sectional group of members getting together for exchange of information and acquaintanceship. We would welcome the reports of many more such meetings.

The large vote for the election to Honorary Membership of Mr. Weatherby and Dr. Copeland fills the two vacancies in that class of membership, and reflects in some measure a consciousness of our great indebtedness to their long-continued contributions to our knowledge of ferns.[1]

The Society suffered a severe loss early in the year in the death of Dr. William R. Maxon, who had almost from the start of the Fern Chapter of the Agassiz Association—which later became the American Fern Society—been one of the "pillars" who not only prompted activities and interests of others, and himself contributed a steady flow of information about ferns, but also helped to steer the Society on a balanced and progressing course. Another loss was occasioned by the death

[1] Letters acknowledging the election have been received as follows:

December 30, 1948

Dear Mrs. Whitney:

I could not have had a pleasanter Christmas surprise than your letter telling of my election to honorary membership in the Fern Society. That is a very real honor—so much so that it starts some soul-searching as to whether I can possibly have deserved it. But that the officers and members of the Society thought I did is a lasting satisfaction.

Of course I shall be available for any service I can render the Society.

Sincerely yours,
C. A. WEATHERBY

December 31, 1948

Dear Mrs. Whitney:

Of course I accept the honor of election as an Honorary Member of the American Fern Society.

I accept with pride, because I appreciate the honor of the election, and because it is an appreciation by my colleagues in pteridology of my long half-century of fern study.

I accept with especial pleasure because it places me in the company of my old professor, Dr. D. H. Campbell. One of my purposes in going to Stanford in 1894 was to study under him.

And I accept with more humility than pride, because I know that from its start I should more worthily have been a supporting member of the Society.

Very sincerely indeed,
E. B. COPELAND

of Dr. F. O. Bower, who was elected to honorary membership in 1926. Dr. Linda Lange, whose fern studies and general interest in natural history had for some years been carried on from a precarious sick-bed, was a third member claimed by death.

Other losses of membership through resignations and non-payment of dues totaled 48. This considerable number included a group who had been carried from one to several years with the expectation that dues would eventually be paid up. But the financial condition of the Society necessitated the elimination of further expense of this sort.

New memberships during the year added 38, showing a continuing and healthy interest in ferns, and bringing our list at the year's end to about 400 members.

Respectfully submitted,
ELSIE GIBSON WHITNEY, *Secretary.*

Report of the Treasurer for 1948

The Society has held its own financially in spite of increased printing costs, and ends the year with a balance of $773.22 in addition to a fund for illustrations amounting to $117.94. Special gifts amounting to $196.00 toward defraying the cost for the Maxon Memorial number are heartily appreciated. The sale of back numbers and pamphlets amounted to $224.60. This income plus that from new members and subscribers is very necessary in keeping the budget balanced.

A revised membership address list was issued to all members in June. No withdrawals have been made from the two Special accounts or the Reserve fund in the Savings Bank.

The "Note receivable", formerly carried in the Assets at $1.00, has been cancelled as uncollectable.

The loyal support of our members in backing up the increase in annual dues is most gratifying.

Receipts		*Amount*	*Sub-total*	*Total*
Cash on hand Jan. 1, 1948				$ 451.97
1946	Membership arrears	$ 1.50	$ 1.50	
1947	Membership arrears	10.50	10.50	
1948	Membership renewals	546.10		
1948	New Members	56.75	602.85	
1949	Membership renewals	74.35	74.35	
1950	Membership renewals	3.60	3.60	
1945–1947	Subscription arrears	5.60	5.60	
1948	Subscription renewals	102.66		
1948	New subscribers	18.70	121.36	
1949	Subscription renewals	112.05	112.05	
Sale of back numbers A.F.J.		186.96	186.96	
Sale of Index No. American Ferns		2.00	2.00	
Sale of A.F.J. Cumulative Index		1.75	1.75	
Sale of Back nos. Phil. J. of S.		33.14	33.14	
Sale of Fern Bulletin		1.75	1.75	
Gifts for Maxon Memorial No.		196.00	196.00	
1948 Advertising		4.00	4.00	
Reprints		77.09	77.09	
Repayment of bank charges		.41	.41	$1,434.91
				$1,886.88
Deduction a/c Agency Commission (subscribers)[a]				19.49
				$1,867.39

[a] Deducted at source of subscription.

Disbursements	*Amount*	*Sub-total*	*Total*
Business Press, Inc.			
A.F.J. Vol. 37, no. 4	$218.65		
A.F.J. Vol. 38, no. 1	197.45		
A.F.J. Vol. 38, no. 2	183.14		
A.F.J. Vol. 38, no. 3	204.07	$803.31	
4000 printed envelopes	44.73	44.73	
Reprints	63.30	63.30	
Reprints, repayment to member	5.41	5.41	
Bank charges (service & activity)	1.80	1.80	
Moving Herbarium & Library to St. Louis	15.00	15.00	
Expense			
President	2.50	2.50	
Treasurer	45.08	45.08	
Secretary	34.78	34.78	
Editor	15.28	15.28	
Printing & mailing membership list	53.23	53.23	
Room rent, A.F.S. Chicago meeting	7.00	7.00	
Purchase, Index No. Amer. Ferns	2.00	2.00	
Recorder of Deeds, Wash'n D. C. (certified Treas. statement)	.50	.50	
Excess dues returned	.25	.25	$1,094.17
Cash on hand Jan. 1, 1949			$ 773.22

STATEMENT, DECEMBER 31, 1948

Assets

Cash on hand	$ 773.22	
Illustrations fund	117.94	
In Spec. Acct #1	524.26	
In Spec. Acct #2	345.79	
In Reserve fund	1,434.77	$3,195.98
Inventory A.F.J.	600.00	600.00
A.F.S. Library	340.00	340.00
		$4,135.98

Liabilities

Capital Acct	$1,951.44
Suspense Cr.	
1949 membership	79.35
1950 membership	5.10
1949 subscription	113.40
1950 subscription	1.35
1951 subscription	1.35
Gifts, Maxon mem. no.	196.00
Distrib. vol. 38, no. 4	800.00
Illustrations fund	117.94
Bissell Herb. Fund	524.26
Life memb. fund	345.79
	$4,135.98

Respectfully submitted,
WALTER S. ALLEN, *Treasurer.*

Report of the Auditing Committee

We certify that the 1948 Financial Statement of the American Fern Society, Inc., is true and correct. The Auditing Committee compliments Mr. Allen for his careful and efficient work.

HENRY K. SVENSON
HESTER M. RUSK,
Auditing Committee

Report of the Judge of Elections

The results of the balloting for officers of the American Fern Society for the year 1949 are as follows:

For President	
Joseph Ewan	155
R. C. Benedict	1
R. M. Tryon, Jr.	1
For Vice-President	
W. Herbert Dole	154
Richard C. Harlow	1

Mrs. Frank C. Smith, Jr.	1
E. T. Wherry	1
For Secretary	
Mrs. Elsie G. Whitney	157
R. M. Tryon, Jr.	1
For Treasurer	
Walter S. Allen	158
For Honorary Membership	
C. A. Weatherby	161
E. B. Copeland	Yes, 161; No, 1

I therefore declare the following candidates elected to the several offices: President, Mr. Joseph Ewan; Vice-President, Mr. W. Herbert Dole; Secretary, Mrs. Elsie G. Whitney; Treasurer, Mr. Walter S. Allen. Elected to honorary membership, Mr. Charles Alfred Weatherby and Dr. Edwin Bingham Copeland.

E. THAYLES EMMONS, *Judge of Elections.*

Report of the Librarian and Curator for 1948

In the Spring of 1948 the Library and Herbarium were moved to the Missouri Botanical Garden, St. Louis, Missouri. The Herbarium has been organized and stored in steel cases. A considerable amount of unmounted material has accumulated and this will be mounted and incorporated into the Herbarium as time permits.

At the request of the Council I am preparing an inventory of the Library with the object of preparing a list of duplicates and extraneous material for sale. This will include duplicate fern books and partial sets of periodicals, and books and reprints on subjects other than pteridology.

I am pleased to acknowledge the following gifts: "The Ferns and Fern Allies of Wisconsin," from J. C. Knotek, Christensen's "Index Filicum" and Supplement, from E. J. Winslow, and forty-four herbarium specimens from E. T. Wherry.

Respectfully submitted,

R. M. TRYON, JR., *Librarian and Curator*

NEW MEMBERS

Mrs. H. L. Barsalou, 1241 Linda Vista Avenue, Dayton 5, Ohio.

Mr. Alfred T. Beals, 274 Summit Avenue, Hackensack, New Jersey.

Dr. John Beard, 166 Burger St., Pietermaritzburg, Natal, S. Africa.

Mrs. H. P. Bracelin, Department of Botany, University of California, Berkeley, California.

Miss Babette I. Brown, Eastman Bldg., Prince St., Campus, University of Rochester, Rochester 7, New York.

Dr. Daniel F. Burton, State Teachers College, Mankato, Minnesota.

Dr. Herbert M. Clarke, Biology Building, University of Wisconsin, Madison 6, Wisconsin.

Dr. Edwin B. Copeland, Herbarium, University of California, Berkeley, California.

Dr. Pierre Dansereau, Service de Biogeographie, Université de Montréal, Montréal 26, Canada.

Miss Verona Devine, State Teachers College, Mankato, Minnesota.

Mrs. Horace Feight, 100 Springgrove Avenue, Dayton 9, Ohio.

Mrs. Spencer C. Flo, 19 James St., Greenfield, Massachusetts.

Dr. Donald A. Fraser, Department of Botany, University of Alberta, Edmonton, Alberta, Canada.

Dr. Helen M. Gilkey, Herbarium, Oregon State College, Corvallis, Oregon.

Dr. George J. Goodman, Department of Plant Sciences, University of Oklahoma, Norman, Oklahoma.

Mr. A. C. Grajek, 2928 South 15th St., Milwaukee, Wisconsin.

Mr. Hoyt S. Haddock, Route 2, Silver Spring, Maryland.

Miss Stella M. Hague, 607 South Van Buren St., Auburn, Indiana.

Mr. L. P. Hansen, P.O. Box 151, Carnation, Washington.

Dr. Jessie C. Harwood, 337 West Walnut St., Ashland, Ohio.

Dr. L. R. Holdridge, Inter-American Institute of Agricultural Sciences, Turrialba, Costa Rica.

Dr. Francis W. Holmes, Rockefeller Institute for Medical Research, Princeton, New Jersey.

Mrs. W. H. Jones, Thawville, Illinois.

Dr. Margaret Kaeiser, Southern Illinois University, Carbondale, Ill.

Mr. Baki Kasapligil, Department of Botany, University of California, Berkeley, California.

Mrs. Robert B. Keller, 700 North Irving Avenue, Scranton 10, Pa.

Dr. Walter Kiener, Biologist, Game, Forestation & Parks Commission, State Fair Grounds, Lincoln 3, Nebraska.

Miss Marie A. Lambert, 1411 Redondo Beach Blvd., Box 467, Gardena, California.

Mrs. T. J. Nunan, 1105 8th St., Eureka, California.

Mrs. Alex D. Reid, 260 Boulevard, Mountain Lakes, New Jersey.
Mrs. Ora E. Scott, Route 1, Box 292, Sanford, Florida.
Mr. Nerland T. Tobin, 1365 S. Carress Avenue, Compton, California.
Mrs. Alta L. Warner, 94–05 222 St., Queens Village 8, New York.
Mr. Paul O. Wiehe, Agricultural Research Station, Likuni, Lilongwe, Nyassaland, Africa.

CHANGES OF ADDRESS

Mr. Cecil Billington, 761 Southfield Road, Birmingham, Michigan.
Mrs. A. Viola Bissell, Route 5, Box 233, Watsonville, California.
Mrs. David C. Boyce, Irvington Gardens, Irvington on Hudson, New York.
Mr. Henry F. Dunbar, Box 332A, R.F.D. 9, Kingston, New York.
Dr. Frederick L. Fagley, 60 Gramercy Park, New York 10, N. Y.
Mr. C. R. Fessenden, 5820 Edgepart Road, Baltimore 14, Maryland.
Mr. Fred W. Kaye, 1961 West Verdugo Blvd., Montrose, California.
Mrs. W. R. Mathews, 2120 Amelia St., Shreveport, Louisiana.
Mr. Ernest J. Palmer, 321 South Main St., Webb City, Missouri.
Dr. Clyde F. Reed, Morehead State Teachers College, Morehead, Ky.
Miss Ruth Olive Schornherst, Florida State University, Tallahassee, Florida.
Mr. Bernard Strickler, 5818 Christiana Avenue, Chicago 45, Ill.

During the week beginning June 13, the American Association for the Advancement of Science and affiliated societies will convene in Vancouver, B. C. It will not be practicable for the Fern Society to hold a meeting or field trip at that time, but if any members anticipate being present at the meetings and would like to see a member of wide field experience in Canada, it is suggested that such parties write to Professor T. M. C. Taylor, University of British Columbia, Vancouver, B. C., at least three weeks before the meetings to arrange an informal foray or conference.

We have had a communication from the British magazine "Gardening Illustrated" inviting subscriptions by members of the Fern Society. The magazine has published a number of articles on the cultivation of ferns. Subscription rate, $1.30 per year (12 issues); United States business office: George Newnes, Ltd., 342 Madison Avenue, New York 17, N. Y.

Vol. 39 April-June, 1949 No. 2

American Fern Journal

A QUARTERLY DEVOTED TO FERNS

Published by the

AMERICAN FERN SOCIETY

CONTENTS

ANNUAL SUBSCRIPTION, $1.50; FOREIGN, $1.60

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The American Fern Society

Council for 1947

OFFICERS FOR THE YEAR

JOSEPH EWAN, Department of Botany, Tulane University, New Orleans, La. *President*

HERBERT W. DOLE, 23 Overlook Ave., W. Orange, N. J. *Vice-President*

MRS. ELSIE GIBSON WHITNEY, 274 South Main Ave., Albany, N. Y. *Secretary*

WALTER S. ALLEN, 144–19 35th Ave., Flushing, N. Y. *Treasurer*

C. V. MORTON, Smithsonian Institution, Washington 25, D. C. *Editor-in-Chief*

OFFICIAL ORGAN

American Fern Journal

EDITORS

C. V. MORTON .... Smithsonian Institution, Washington 25, D. C.
R. C. BENEDICT .... 1819 Dorchester Road, Brooklyn 26, N. Y.
IRA L. WIGGINS .... Dudley Herbarium, Stanford University, Calif.

An illustrated quarterly devoted to the general study of ferns.

Subscription, $1.50 per year, foreign, 10 cents extra; sent free to members of the AMERICAN FERN SOCIETY (annual dues, $2.00; life membership, $25.00). Extracted reprints, if ordered in advance, will be furnished authors at cost. They should be ordered when proof is returned.

Volume I, six numbers, $2.00; other volumes $1.25 each, except vol. 38, $2.00. Single back numbers 35 cents each through vol. 37; later numbers 40 cents, except vol. 38, no. 4, $1.00. Ten per cent discount to members and institutions on orders of six volumes or more. Cumulative Index vols. 1–25, 25 cents.

Matter for publication should be addressed to C. V. Morton, Smithsonian Institution, Washington 25, D. C.

Orders for back numbers and other business communications should be addressed to the Treasurer of the Society.

LIBRARIAN AND CURATOR OF THE HERBARIUM

R. M. TRYON, JR., Missouri Botanical Garden, St. Louis, Mo.

A regular loan department is maintained in connection with the library and herbarium. Members may borrow books and specimens at any time, the borrower paying all postal or express charges. The pages of the Journal also are open to members who wish to arrange exchanges; a membership list is published at intervals, to assist those interested in obtaining specimens from different localities.

American Fern Journal

Vol. 39 April–June, 1949 No. 2

Wax Glands and Prothallia

M. F. Ashley Giauque

During the course of studies on the ontogeny of the Cheilanthoid ferns, several instances of wax glands on prothallia have been observed. Since my attention has shifted to other genera, a brief report on the results of this earlier work may be made.

Helene Woronin,[1] in a paper dealing with apogamy and apospory, published a sketch of *Notholaena trichomanoides* showing glands on the edges and under surface of the prothallia and also on apogamous growths in *Pellaea nivea.* Recently, Alice F. Tryon[2] published a sketch of a *Notholaena Standleyi* prothallium showing wax glands on the edge of the prothallium.

My work shows that the wax production of the capitate glands varies considerably with the species and with the conditions under which the prothallia are grown. The prothallia of *Notholaena Aschenborniana, N. californica, N. candida, N. Galeottii, N. Grayi, N. Lemmonii,* and *N. Standleyi* present a grayish or moldy cast in a uniform nutrient solution. A single stray prothallium of a non-wax-gland-bearing species may be recognized at a glance. *Notholaena neglecta* also has these glands, but bears them less consistently; they are present in the region of the sinus and on the tips of serrate edges.

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[1] Flora: **98**: 101. 1907–08.

[2] This Journal **37**: 89. 1947.

[Volume 39, no. 1, of the Journal, pages 1–32, was issued April 8, 1949.]

On solution, prothallia of *Notholaena bryopoda* are very sparsely provided with wax. Wax was not seen on prothallia of *Notholaena Greggii,* although glands without wax were present, until the prothallia were transferred to sand with nutrient solution or soil. When the prothallia of both these species are on sand or soil the wax secretion is increased. The quantity of wax on other species of *Notholaena* seems to be increased also on transfer to soil. The parts of prothallia of *Notholaena Standleyi* floating above water bear wax; those below do not.

In *Pellaea nivea, Notholaena limitanea,* and *N. dealbata* wax glands are absent from the prothallia, although they are present on the initial necklike apogamous growths, giving the culture a hairy moldy appearance.

Prothallia of *Cheilanthes farinosa* will show an occasional gland, and wax will be observed on an occasional gland on prothallia bearing sporophytes. Those prothallia growing on soil or sand are better provided with glands than those on solution. In *C. farinosa,* and also in *C. argentea* and *C. anceps,* the initial frond is well covered with glands bearing wax, despite the scarcity of such glands on the prothallia.

On some prothallia, for instance those of *N. Standleyi,* the glands are confined to the edges. On others they are distributed over the surface, as on *Notholaena candida, N. Aschenborniana,* and, less abundantly, on older *N. californica.*

The glands on prothallia of some species, e.g., *Notholaena candida* and *N. Aschenborniana,* are borne on stalks with more cells than others.

The scales at the base of the young sporophytes are often tipped with capitate wax glands, as, for example, in *Notholaena californica, N. Greggii,* and *N. Standleyi.*

Often long hairs, several cells in length, with terminal wax glands appear at the base of the stipe. Upwardly on the stipe these hairs rapidly decrease in length and the stalk usually becomes unicellular.

Cheilanthes rufa is unique in having bristles several cells in length, and frequently two cells wide at base, on the edge of the prothallia. Some of these bristles are over a millimeter in length and hence readily visible. Bristles are also prominent on the young sporophyte, which, unlike its prothallium, is generously provided with wax glands. The bristles did not appear until the prothallia were over five months old, which is not surprising since the appendages perculiar to other species do not always appear early, sometimes not even by the time archegonia or antheridia have appeared. Conversely, sometimes appendages appear on young prothallia but are hard to locate on old ones, as they become more widely separated and have the tips broken off. It may be mentioned that *C. rufa* is also unique in its manner of growth—the fronds lying flat on the ground.

In all eight species of *Pityrogramma* examined wax glands are absent from the prothallia. These glands are likewise apt to be absent from the first frond and usually wax does not appear until the stipe of the third frond.

The sticky, club-shaped glands on the prothallia of *Cheilanthes Kaulfassii* are only at the base of the young apogamous sporophytes.

If a prothallium is almost covered with antheridia, the wax glands usually present in a species may be absent or few. Even rhizoids were lacking in two prothallia of *Notholaena Standleyi* which were well covered with antheridia.

Some of the prothallia of *N. Aschenborniana, N. californica, N. candida,* and *N. Standleyi* when growing on soil, and sometimes on solution, grow in an upright cornucopia shape, the bottom parts overlapping. This character is also shared by some other xerophytes.

BERKELEY, CALIFORNIA.

The Cultivation of Scott's Spleenwort

F. N. IRVING

On November 6, 1945, I arrived at the crossroad town of Havana, Alabama, about twenty five miles due south of Tuscaloosa. Near here is the famous glen where *Asplenium ebenoides* has become established and now is known to be self perpetuating. It was with no mean enthusiasm that I anticipated "chasing" this rare fern with the hope of finding a specimen, not represented in my collection at that time. I was met by Mr. R. B. Lavender, the plantation owner on whose property the glen is located. It was through his hospitality that I enjoyed a most delightful day.

A small, clear stream flows through the picturesque woodland. On the steeply sloping sides, almost perpendicular in places, are huge conglomerate rocks. It is in the small crevices of these rocks that *Asplenium ebenoides* grows. A careful search revealed thirty-one small plants with leaves not more than one inch long. One sizeable plant was taken for my collection.

From the spores of this specimen, fifty plants have been produced. The prothallia, which were then discarded, would have continued to produce hundreds of sporelings over an indefinite period. The spores were sown on April 18, 1946, and on April 18, 1948 the plant illustrated, having developed several fertile leaves seven to eight and one-half inches long, was preserved. Several of these plants have developed sporelings about their bases, and the prothallia lifted with the plants when they were individually potted obviously were alive and active at this writing.

The aerial growths which have developed on the tips of leaves of a few of the plants will continue to grow if placed in soil.

I wrote to the late Dr. William R. Maxon, who was wintering in Terra Ceia, Florida at the time, relating this experience, and from his reply, postmarked December 29, 1947, quote the following: "I visited that locality in 1900 with C. L. Pollard and got a good lot of material. This was very largely the circumstance that led me to publish in the Botanical Gazette (1900 or perhaps 1901) a paper entitled, as I recall it, "The Validity of Asplenium ebenoides". The plant was obviously fertile then and I so stated. I think your success in raising plants from spores deserves to be written up, and I want you to do this for publication in the Fern Journal. Probably you will want to wait until some of your plants have produced spores. We should like very much to have a specimen for the National Herbarium. . . ."

The spores were sown on peat in a two-inch pot, without sterilization, and developed in a six-inch covered glass bowl. A piece of glass, cut to size, served as a cover. An inch of washed gravel in the bowl served to hold the pot in place.

The covered bowl was kept in a warm room in a north window, the temperature being 70° or often higher. In two to three months prothallia covered the surface of the media and shortly thereafter very small plants, composed of a single leaf, appeared. These were transferred, at intervals as they developed, to two inch pots, using the blade of a pocket knife to include a part of the prothallium. The pots accommodated sixteen to eighteen of the sporelings. The soil mixture used consisted of the following: One peck of woodland loam, gathered where leafmold is heavy, screened through quarter inch wire mesh. To this was added three rounded teaspoons of steamed bone meal, a generous quantity (about one 2½ inch potful) of well rotted cow manure (black or nearly so, from an old heap), some granulated plaster from between old bricks in lieu of limestone, a liberal quantity of crushed charcoal and one box of washed gravel used in aquariums, the latter to insure good drainage. These were all thoroughly mixed and sterilized in an oven. The temperature should not be high enough to burn the leaf and wood particles, but to eliminate infestation by small snails, worms, weed seeds, ants and other insects, and mold spores.

Concerning plant foods, in reference to ferns, well rotted cow manure has no peer for dependability. If in the proper stage of decomposition it will do the job without injury to the roots. Bone meal may also be used, but should be steamed to make the chemical foods more quickly available, and should be used with manure and not as a substitute. Combined with the humus contained in a rich loam-leafmold soil mixture, no other form of plant food should be necessary.

In due time the plants will require repotting and the new soil added during these operations will take care of the plants' needs until it again becomes necessary to supply a larger container. Our rock ferns often and perhaps usually grow in crevices of rock where there is but little soil of any kind and it therefore seems logical to assume that large quantities of food are unnecessary when ferns are grown under cultivation.

When a loose loam from woods where ferns grow naturally is used, I am of the opinion that a warm, humid atmosphere with some sunlight is more essential to successful culture than fertilizers. In tropical rain forests, where ferns the world over grow most luxuriantly, the atmosphere is literally charged with moisture.

After several weeks, the plants developed several leaves and were then transferred to individual two inch pots, using the soil mixture recommended. They were then housed in a glass case of appropriate size where they developed rapidly. A rectangular aquarium, with a piece of glass for enclosing the top will answer the purpose or a case to fit a special window may be ordered from a planing mill. Those I use are of one-half inch dressed cypress, grooved for the glass at the mill and completed by myself. One inch cypress (three-quarter inch dressed) is used for the base. The opening should be at the top, with the glass cut in three equal lengths to facilitate handling. With this arrangement it will not be necessary to expose all of the plants in the case at the same time and cause a rapid fall of both temperature and humidity. Except when access to the plants is necessary the case should be kept closed at all times. Do not make the mistake of thinking the plants need fresh air. They don't.

As the plants become potbound, they are moved to two and one-half inch pots. These pots are placed in a case ten by thirty inches and twelve inches high. This case, which is window size is set in a window during the day where a sprinkle of sunshine through the trees in the street is ample. In the winter a warm radiator, when the heat has been turned off, keeps the temperature from falling below seventy degrees at night.

In a sunny window in summer the temperature may rise to eighty-five or ninety degrees. A sheet or two of tissue may be used for shade if the sunlight is direct, but otherwise it may not be necessary.

Rain water is recommended for watering, but should be used only when necessary. A test may be made with an ordinary pen in holder. If the soil is grainy, separating easily, the plant is thirsty; if moist and sticky, adhering to the pen, water is not needed. A sufficient quantity of gravel in the soil mixture will afford the essential drainage. It is better, however, to be on the "dry side", for if a plant should wilt for lack of water at the roots, no

ASPLENIUM EBENOIDES, GROWN FROM SPORES

harm will result.

Mr. Albert Chandler, writing in the Fern Journal,[1] requests a formula for growing fern spores on agar. My experience with agar began about fifteen years ago when a batch of fertile leaves of the tree fern, *Cyathea*, arrived from the Philippine Islands.

The spores were germinated on a medium recommended by Dr. E. A. White for growing orchid seeds in Pyrex flasks. The chemical formula is as follows:

Calcium nitrate $Ca(NO_3)_2$	1 gm.
Potassium acid phosphate K_2HPO_4	0.25 gm.
Magnesium sulphate $MgSO_4NH_2O$	0.25 gm.
Iron Phosphate $FePO_4$	0.05 gm.
Ammonium sulphate $(NH_4)_2SO_4$	0.50 gm.
Agar agar	1.50 %
Distilled water	1,000 cc.

All media and vessels were autoclaved at fifteen pounds pressure for thirty minutes. To prevent the lodging of spores and microorganisms on the cotton stopper of the vessels, they were capped with small vials, fitting tightly over the cotton plug, including the upper third of the flasks. For sterilizing the spores 10 gm. of calcium hypochlorite was added to 140 cc. of distilled water. This was vigorously shaken for a few minutes and then filtered. A quantity of spores was placed in a test tube with the clear filtrate and shaken for about fifteen minutes.

The spores were then transferred from the sterlizing solution directly to the flasks by use of a sterilized platinum needle, the cotton plug and vial being replaced immediately. The cultures were kept in a temperature of seventy degrees or higher.

When the spores germinated a quantity of distilled

[1] 38: 12–16. 1948.

water was applied and the prothallia floated off into a bowl. A spoon was used in transferring the prothallia to pots of moist peat. In each spoonful of the liquid there were numbers of prothallia, barely large enough to see without the aid of a glass, yet large enough to permit a fairly even distribution. The pots were covered with glass jars.

The above formula is a very good one for growing fern spores on agar, but more than ordinary care is required because an aseptic condition must be maintained. The results obtained are not worth the extra trouble and expense involved. The flower pot and rock method will not compare with peat, which in my judgment is not only the most practicable, but affords the maximum protection.

WASHINGTON, D. C.

Fungi of Mount Shasta Ferns

W. B. COOKE

Fifteen species of ferns have been found on Mount Shasta in the last 10 years (Cooke 1, 2, 3, 4). Associated with these ferns several species of fungi have been found. This note on such occurrences has been suggested by a recent paper "Ferns and Fungi," by John A. Stevenson (7).

It may be of interest to note that fungi have not been found associated with ferns of dry locations, such as *Pellaea brachyptera*, *Cheilanthes gracillima*, *Polystichum scopulinum*, *Polystichum munitum* var. *imbricans* and *Woodsia scopulina*, nor have fungi been found associated with species of *Botrychium* and *Equisetum*.

As may be expected from the small number of fern species present Mount Shasta is a dry mountain. The small number of fungi found associated with these ferns is also indicative of the dry conditions on the mountain.

The first fungus found associated with a fern on the mountain occurred on a colony of *Cystopteris fragilis* which grew on a grassy bank which overhung a small stream in the Wagon Camp meadows. This small group of plants was heavily infected with the rust *Hyalopsora polypodii*. The colony was found to be infected year after year and in 1947 it was as heavily infected as it was in 1937.

One of the earlier fern parasite discoveries on the mountain was excellent material of *Gloeosporium pteridis*, which fruited heavily on many fronds of *Pteridium aquilinum* var. *pubescens* in the Wagon Camp meadows. Infected leaves were not found on plants found in the drier habitats in which this fern grows, such as open chaparral scrub. Although this species was observed regularly between 1937 and 1947 its probable perfect stage, *Cryptomycina pteridis*, was not found until 1947, and then only three fronds were found infected at Wagon Camp, and the imperfect stage occurred as well on these. The only time that *Uredinopsis macrosperma*, the bracken rust, was found on this host was in 1947 near the big spring of Squaw Valley Creek.

Athyrium filix-foemina var. *californicum* has been observed repeatedly in the big spring area at the foot of Squaw Valley Creek, in the boggy part of Wagon Camp meadows, and below the outlet of the Mt. Shasta Municipal Spring near Howard, where it attains its greatest height. However, it was not until 1947 that it was found to be infected with *Uredinopsis Copelandii*, a rust which was first collected at Sisson (now the city of Mt. Shasta) by E. B. Copeland in 1903. The type locality is hardly more than 10 miles in a direct line from Wagon Camp and the Squaw Valley Creek spring where the rust was found in 1947.

No parasitic fungi have been found associated with *Athyrium americanum* which grows in the bed of Horse Camp Creek at 8000 feet elevation, nor with *Cryptogramma acrostichoides*, which grows in the protection of large rocks and boulders at the same altitude. In the localities where these ferns grow the ground is entirely covered with a snow pack for at least six months of the year. The first is irrigated by water above ground in the creek bed in the early season and underground later in the season, and the second is irrigated by water stored in the ground from the melted snow pack. On the litter of these ferns several fungi have appeared. *Hysterium magnisporum* develops in occasional years on dead petioles of *Athyrium americanum* under the snow pack. On the litter of *Cryptogramma acrostichoides* small pustules of a pink mold have been observed in the last two summers. Unfortunately it was not possible to make a culture of this species, and the pustules were so old at the time of collection that the fungus was unidentifiable. On the litter of both species specimens of an unidentified sclerotium have been obtained. The cortical cells of this sclerotium are reminiscent of the epidermal cell pattern of many leaves that is typical of the cortical cells of *Typhula,* but the perfect stage has not yet been found.

SYSTEMATIC SUMMARY OF MOUNT SHASTA FERN FUNGI

ASCOMYCETES

1. CRYPTOMYCINA PTERIDIS (Rebent. ex Fr.) von Höhnel (Bache-Wiig 6, Stevenson 7).

Dothidea pteridis Rebent ex Fr.
Cryptomyces pteridis (Rebent. ex Fr.) Rehm
Phyllachora pteridis (Rebent. ex Fr.) Fckl.
Polystigma pteridis Link
Sphaeria pteridis Rebent.
Xyloma pteridis DC.

On *Pteridium aquilinum* var. *pubescens* Underw. Collected on living leaves, and associated with *Gloeosporium pteridis,* at Wagon Camp, at 5700 feet altitude. Only three fronds in a large colony were found to be infected. *Cooke* 20431, August 15, 1947. Associates: *Abies magnifica* var. *shastensis, Abies concolor, Libocedrus decurrens.*

2. HYSTERIUM MAGNISPORUM Ger.

On *Athyrium americanum* (Butters) Maxon. This species was collected only in 1937 and 1946, although litter of the host was searched for it in other years. *Cooke* 8565, July 7, 1937; 18152 A, July 2, 1946. The material of the earlier collection was distributed as No. 33 of the writer's ''Mycobiota of North America.''. Associates: *Cryptogramma acrostichoides.*

BASIDIOMYCETES

3. HYALOPSORA POLYPODII (Pers.) Magnus.

On *Cystopteris fragilis* (L.) Bernh. One colony of the host in the upper Wagon Camp spring area has been heavily infected during the last 11 years. *Cooke* 8620 B, August 8, 1937; 9198; 20319, July 18, 1947. This species has been distributed as No. 38 of the ''Mycobiota of North America.'' Associates: *Abies concolor, Abies magnifica* var. *shastensis.*

4. UREDINOPSIS COPELANDII Sydow.

On *Athyrium filix-foemina* var. *californicum* Butters. Based on a collection made by E. B. Copeland on August 13, 1903, near Sisson, near the west base of the mountain. Found at Wagon Camp in the bog (*Cooke* 20232, July 10, 1947) and at the big spring of Squaw Valley Creek, at 5000 feet altitude (*Cooke* 20315, July 18, 1947). Material of one of these collections will be issued as a forthcoming number of the ''Mycobiota of North America.'' Associates: At the first station, *Pinus ponderosa, Abies concolor, Libocedrus decurrens;* at the second, *Libocedrus decurrens, Abies concolor* and *Abies magnifica* var. *shastensis;* and at the third, *Pseudotsuga taxifolia, Abies concolor* and *Pinus Lambertiana.*

5. UREDINOPSIS MACROSPERMA (M. C. Cooke) Magnus.

On *Pteridium aquilinum* var. *pubescens* Underw. Collected from a number of fronds near the big spring of Squaw Valley Creek near the base of the bluff at the foot of Squaw Valley Creek canyon, about 6 miles north of McCloud, at 5000 feet altitude (*Cooke* 20233, July 10, 1947). Associates: *Pseudotsuga taxifolia, Abies concolor, Pinus Lambertiana.*

6. TYPHULA SP.

On *Athyrium americanum* (Butters) Maxon, and *Cryptogramma acrostichoides* R. Br. Occasional on litter of these species which has over-wintered under the snow pack in the Horse Camp Creek area near Horse Camp, at 8000 feet altitude. Only the sclerotium has been obtained to date. *Cooke* 18152, July 2, 1946; 20221, July 2, 1947. Associates: The association in which these species occur appears to be dominated by them, although some flowering plants are present.

FUNGI IMPERFECTI

7. GLOEOSPORIUM PTERIDIS (Kalchbr.) Kabat & Bubak (Gilman & Archer 5).

Cylindrosporium aquilinum (Pass.) Gilman & Archer
Septoria aquilina Pass.
Septogloeum septorioides Pass.
Gloeosporium leptospermum Pk.
Gloeosporium necans E. & E.
Gloeosporium pteridis Harkn.
Gloeosporium obtegens Sacc.
Ascochyta pteridis Bres.
Marssonia necans (E. & E.) Sacc.
Fusidium pteridis Kalchbr.
Marssonina necans (E. & E.) Magnus
Ascochyta necans E. & E.) Davis
Cryptomycella pteridis (Kalchbr.) Höhn.
Cryptomycella maxima Höhn.

On *Pteridium aquilinum* var. *pubescens* Underw. Found on a number of fronds in the Wagon Camp area, at 5700 feet altitude, as well as in the chaparral near Howard at 4200 feet, and in the chaparral above McCloud on the south side of the mountain at 4000 feet altitude. *Cooke* 10258, July 29, 1938; 13347, July 21, 1939; 18278, July 27, 1946; 20430, August 15, 1947. Associates: In the first area, *Abies concolor, Abies magnifica* var. *shastensis, Libocedrus decurrens;* in the other areas, *Ceanothus velutinus, Arctostaphylos patula.*

LITERATURE CITED

1. Cooke, W. B. Some Ferns of Mount Shasta. Amer. Fern Journ. **29**: 105–111. 1939.
2. ———. Flora of Mount Shasta. Amer. Midl. Nat. **23**: 497–572. 1940.
3. ———. Flora of Mount Shasta, First Supplement. *Op. cit.* **26**: 74–84. 1941.
4. ———. Flora of Mount Shasta, Second Supplement. *Op. cit.* **41**: 174–183. 1949.
5. Gilman & Archer. The Fungi of Iowa Parasitic on Plants. Iowa State College Journ. Sci. **3**(4): 279–507. 1929.
6. Bache-Wiig, S. Mycologia **32**: 214–250. 1940.
7. Stevenson, J. A. Ferns and Fungi. Amer. Fern Journ. **35**: 97–104. 1945.

Ferns and Fern Allies of the Central Yukon Valley

EDITH SCAMMAN

(Conclusion)

During my wanderings in the Miller House and Eagle Summit region I have never seen the oak fern, but on a talus slope above a road leading to the mines the limestone fern, as it is sometimes called, is plentiful (nos. 1972, 3447). One day I was surprised to find a few fronds growing in a space between the logs of the outer wall of Miller Roadhouse. In Livengood I have collected it two different years on a mossy shaded bank, where water is seeping down from overhanging cliffs, (nos. 1679 [1940], 4881 [1947]).

Collections preserved in the Gray Herbarium—all from the Central Yukon—include: Dawson Slide, *Eastwood* 361, 362; Dawson, *Malte* 72; woods 2 miles below Coal Creek, *Funston* 145; Fort Gibbon, 1899–1901, *Weirick.* Hultén's list mentions, also: Hunker Creek, July 22, 1902, *Macoun* (Can); 4 miles up Klondike River, Aug. 8, 1902, *Macoun* (Can); Rampart—Tanana, *Palmer*, 39 (Can.), and reports from: near mouth of the Klondike River, *Williams* (acc. to Underwood), and the Tatunduk—Nation River district (acc. to Mertie).

ATHYRIUM FILIX-FEMINA (L.) Roth. var. SITCHENSE Rupr. ex Moore. [var. *cyclosorum* (Rupr.) C. Chr.]. As has proved true with some other ferns treated in this paper, the hot springs afford the only known locations for the lady fern in the Central Yukon River District, and also the northernmost station for the species in Alaska, with a wide gap between these two stations and the Pacific Coastal regions where it is a common fern. Collections from the hot springs include: Circle, *Scamman* 19, 20, 3449, *Anderson* 7551 (G), and Manley, *Scamman* 3636, *Anderson* 7083 (G), Hitchcock, July 28–29, 1909 (US). At Circle Hot Springs the fronds are tall, lush and luxuriant, covering a wide bank just above the springs, where the hot water is seeping out and being carried to the baths in pipes.

There is a good deal of variability in the shape of the fronds, one of my specimens (no. 20) from Circle, corresponding to forma *strictum*.

I have collected the lady fern again in the interior, but in the Upper Kuskokwim, in the Lower Yukon District—Takotna (no. 1774).

CRYPTOGRAMMA STELLERI (S. G. Gmel.) Prantl. This rare fern, originally described from Siberia, bears the name of the first botanist to land on the shores of Alaska with the Bering Expedition. Only a few hours were allowed Steller to collect all the plants he could gather hastily in a then unknown world. In June, 1940, I was thrilled to find a few delicate fronds (no. 1681) hidden in a shaded moist spot at the base of the cliff that overlooks the mining camp of Livengood, now quiet and ghost-like, but once a beehive of activity in the boom days of 1918 and 1919. At first glance I assumed that they were the parsley fern, *C. crispa* var. *acrostichoides* (R. Br.) C. B. Clarke, which I had found previously on the coast at Seward. But a closer study revealed the rarer Steller cliff brake at one of the very few known stations in Alaska, the others, as cited by Hultén, being: Lower Tlehini, Aug. 2, 1882, *Krause* 218, in the Eastern Pacific Coast District; and Coldfoot, *Heideman* 262 (US), and Forty Mile Creek, *Tyrrell* (acc. to Macoun), in the Central Yukon River District. This last location has been verified by a collection at Forty Mile Creek by Anderson and Gasser (no. 7175, July 11, 1940, G). Last year, in 1947, on a second visit to Livengood, I visited the same station, and collected the fern again (no. 4882).

POLYPODIUM VULGARE L. var. OCCIDENTALE Hook. The western polypody must be extremely rare in the Yukon Valley and the Alaska interior. Although it is common along the eastern Pacific Coast, Kodiak Island and the Aleutians, its presence in the interior seems to rest on Mertie's reference[8] to it being found in the Tatunduk—Nation River district. This region is near the boundary between Alaska and Yukon Territory, and is included within the limits of our Central Yukon River District, hence its mention here. According to Hultén's list it has been collected twice in the Upper Yukon River District, Y.T.—above "Le Barge," *Bolton* 1898 (US), and 50 miles above Stewart River, *Tarleton,* (acc. to Underwood). Hultén adds that "its occurrence in the upper Yukon Valley seems indisputable."

EQUISETACEAE

The Horsetails are extremely abundant in Alaska and form a characteristic ground-cover in many swampy places, mud flats, small ponds and along the borders of the winding, snakelike streams so typical of the interior.

EQUISETUM ARVENSE L. Doubtless the most common and widely distributed species of the genus, the field horsetail may be found under varying forms everywhere throughout the territory. My own collections in our district include: Along Yukon River (no. 31) [f. *diffusum* (A. A. Eaton) Clute]; Fairbanks (no. 34); Wiseman (no. 29); Livengood (no. 1682 B); Miller House (no. 30) [f. *diffusum*]. In the Gray Herbarium are specimens from Dawson, *Eastwood* 60 (f. *ramulosum* (Rupr.) Klinge], and Forty Mile Creek, Yukon Valley, *Funston* 45. Hultén cites the following additional stations: Moosehide, Eagle, Tatunduk—Nation River distr., Circle, Tanana River, Fort Yukon, Porcupine River, Old Crow River, Koyukuk River.

[8] U.S. Dept. Int. Bull. 836E: 363. 1932.

FRAGRANT FERN—DRYOPTERIS FRAGRANS

MILLER HOUSE

EQUISETUM PRATENSE Ehrh. The meadow horsetail, a lover of limy soil, while rare along the coast, is very common in the interior, wherever I have collected, especially in the Central Yukon River District: Miller House (nos. 1975, 3451); Manley Hot Springs (no. 3643); Fairbanks (nos. 1082, 1621); Wiseman (no. 2182); Livengood (no. 1682) [f. *nanum* Milde].

The following collections are mentioned by Hultén: Rink Rapids, July 9, 1902, *Macoun* (Can.); Klondike River, Aug. 8, 1902, Macoun (Can.); Tatunduk—Nation River distr. (acc. to Mertie); Fort Gibbon, *Heideman* 4 (US); Birches, *Porsild* 604 (Can.); Rampart, *Rader* 34 (US), *Jones* 49a (US); Fort Yukon, *Bates* (UC); 15 miles above Rampart House, Aug. 15, 1926, *Murie* (H); Porcupine River, *Turner* (UC); Black River, *Cairnes* (acc. to Macoun); Gens de Large and Koyukuk River, *Schrader* (acc. to Trelease); Fort Cosmos, Sept. 20, 1885 *Huff* (US).

EQUISETUM SYLVATICUM L. Most of our specimens of the wood horsetail have scabrous, roughened branches as compared with the variety of eastern North America. This horsetail, the most beautiful and decorative member of the clan, is frequently found growing in spruce or birch woods or under the shade of alders: Miller House (nos. 1974, 3450); Circle Hot Springs (no. 32); Fairbanks (no. 33); Manley Hot Springs (no. 3646); Livengood (no. 1683).

Specimens with smooth branches corresponding to var. *pauciramosum* Milde are: Dawson, *Eastwood* 197 (G); Franklin, Forty Mile, *Anderson & Gasser* 7318 (G); and to forma *multiramosum* Fernald: Dawson, *Malte* 78 (G); Bonanza Creek, *Eastwood,* June 19, 1914 (G).

Hultén records several other collections: Cleary, *Anderson* 2342 (H); Fairbanks, *Murie* 147; 50 miles north of Fairbanks, *Porsild* 112 (Can.), and cites reports from: Tatunduk—Nation River distr. (acc. to Mertie); Black River, *Cairnes* (acc. to Macoun); Pedro Dome (acc. to Harshberger).

EQUISETUM PALUSTRE L. Judging from the collections, the marsh horsetail is found more frequently in the interior than in the coastal areas. It grows plentifully in low, marshy ground and in the neighborhood of placer mining operations around Miller House (no. 3452), and at Livengood (no. 1685). This horsetail occurs in several characteristic forms: f. *polystachion* (Weigel) Duval-Jouve, in which the branches produce cones, Wiseman (no. 873); Fairbanks (no. 860), and also *Anderson* 7336; f. *ramulosum* (Milde) Klinge, in which the branches are again branched, Miller House (no. 1976); f. *filiforme* Lacks., along the Yukon River, Kokrines, *Porsild* 614 (G).

Other specimens cited by Hultén are: Hunker Creek, July 23, 1902, *Macoun* (Can.); Dawson, *MacLean* (UC); Tatunduk—Nation River distr. (acc. to Mertie); Circle, *Anderson* 2497 (H); Fairbanks, *Porsild* 156A, *Went;* Fort Gibbon, *Heideman* 12 (US); Camp 29, Aug. 2, 1899, *Schrader* (US).

EQUISETUM FLUVIATILE L. The typical form of the water horsetail has whorls of branches: Fairbanks (no. 1620); Manley Hot Springs (no. 3645); whereas f. *Linnaeanum* (Döll) Broun [*E. limosum* L.] is without or with almost no branches: Wiseman (no. 2183); Livengood (no. 1686).

A small delicate form is also found occasionally—f. *minus* (A. Br.) Broun, Fairbanks (nos. 34A, 860A); Miller House (no. 702); also Dawson, *Eastwood* 309 (G); Franklin, Forty Mile distr., *Anderson & Gasser* 7296 (G).

Other collections of this horsetail, which is common in our district, growing in shallow water, include: Mouth of Bonanza Creek, Aug. 11, 1882, *Macoun* (Can.); Klondike River, Aug. 4, 1902, *Macoun* (Can.); Yukon River, July 1–5, 1898 (Stewart River) *F. Andersson* (S); Richardson Highway, mile 312, *Anderson* 2608 (H); 10 miles east of Fairbanks, *Porsild* 158; 51 miles north of Fairbanks, *Porsild* 113 (Can.); Fort Yukon, *Bates* (UC); Old Crow River, Aug. 11, 1926, *Murie* (H).

EQUISETUM SCIRPOIDES Michx. This little scouring rush with curled, twisting stems grows usually in moist places in spruce woods: Miller House (no. 4639); Livengood (no. 1684); Wiseman (no. 2185); also Dawson, *Eastwood* 95 (G); 10 miles east of Fairbanks, *Porsild* 157 (G); Franklin, Forty Mile distr., *Anderson & Gasser* 7236 (G). Also, according to Hultén's list: Klondike River, Boulder Bow, Aug. 1, 1901, *MacLean* (UC); Yukon distr., June 5–10, 1898 (Black Hill Creek), *F. Andersson* (S); mountains back of Dawson, July 12, 1902, *Macoun* (Can); Tatunduk—Nation River distr. (acc. to Mertie); Fairbanks, *Palmer* 1524 (US); Fort Gibbon, *Heideman* 4 (US); Fort Yukon, 1881, *Bates* (UC); Old Crow River, July 8, 1926, *Murie* (H).

EQUISETUM VARIEGATUM Schleich. The variegated scouring rush is quite common in sandy hollows in calcareous soil beside the mining creeks at Miller House (nos. 701, 3453). I have found it also in Wiseman (nos. 874, 2184). Anderson and Gasser obtained it in the Forty Mile district, Franklin, (no. 7176, G) [var. *anceps* Milde].

Other collections, mentioned by Hultén, from the Central Yukon are: Coal Creek Hill, *Funston* (US); Steese Highway, mile 89, *Anderson* 2430 (H); Fairbanks, *Anderson* 2672 (H); Porcupine River, *Turner* (UC); Gens de Large and Koyukuk River, *Schrader* (US); Camp 21, Aug. 2, 1899, *Schrader* (US); Kokrines Mts., *Porsild* 689 (H).

The specimens which I have seen from the interior are low, with slender stems, in contrast to the generally tall, thick-stemmed plant of the coastal areas, which has been called var. *alaskanum* A. A. Eaton. Anderson considers this worthy of specific rank, as *E. alaskanum* (A. A. Eaton) Anderson.

EQUISETUM HYEMALE L. var. CALIFORNICUM Milde. The tall scouring rush is certainly very rare throughout Alaska and Yukon Territory. This variety is robust and has two rows of tubercles on the ridges of the stem. Hultén cites a collection from Hot Springs, Tanana (probably Manley), July 1927, *Palmer* 1713 (US).

There is a specimen of var. *affine* (Engelm.) A. A. Eaton in the Gray Herbarium from Dawson, *Malte* 80. Both stations are in the Central Yukon River District.

LYCOPODIACEAE

LYCOPODIUM SELAGO L. The fir clubmoss is common above timberline on the moist slopes of mountains in the interior: Eagle Summit (nos. 703, 1977, 3455); Harrison Dome (no. 4683); Mastodon Dome (no. 4810); Wiseman (no. 2186). All of the above specimens seem to belong quite definitely to var. *adpressum* Desv., as the leaves are appressed and the plant is yellowish-green in color. Specimens from Franklin, Forty Mile distr., *Anderson & Gasser* 7137 (G), resemble the typical form.

Other collections from our district cited by Hultén are: Klondike—Indian River divide, *Tarleton* 183 (US); head of Bonanza Creek, Aug. 1902, *Macoun* (Can.); Dawson, 24 mile House, *Eastwood* 392 (G); Black River, *Cairnes* (acc. to Macoun); Goldstream Creek and Pedro Dome, *Porsild* 111; Cleary Summit *Anderson* 2343 (H); Porcupine River, *Turner* (UC); mouth of Old Crow River, Aug. 11, 1926, *Murie* (H).

LYCOPODIUM ANNOTINUM L. The stiff clubmoss is a plant of lower levels in rich mossy woodland throughout most of Alaska, except beyond the limit of trees in the far north. My specimens from Manley Hot Springs (no. 3649), Eagle Summit (no. 704), and Wiseman (no. 876) resemble the typical form with thin, spreading leaves; but those from Miller House (nos. 1978, 3456), Eagle Summit (no. 37), Circle Hot Springs (no. 36), and Wiseman (no. 2187), having thicker, more ascending leaves, should be referred to var. *pungens* (LaPylaie) Desv. The latter is the more usual form in the Central Yukon River District, growing on alpine slopes in drier locations. Also under var. *pungens* may be placed these specimens in Gray Herbarium: Dawson, *Eastwood* 220; Rampart House, Upper Porcupine River, *Funston* 170. Hultén adds, as distinctly var. *pungens:* Hunker Creek, Aug. 1, 1902, *Macoun* (Can.); Bear Creek Aug. 18, 1898, *MacLean* (UC); Kokrines Mts. *Porsild* 691; Porcupine River, *Turner* (UC).

Besides these collections Hultén mentions the following: Bonanza River, Aug. 20, 1902, *Macoun* (Can.); Black River *Cairnes* (acc. to Macoun); Twelve Mile Summit, *Anderson* 2382 (H); 15 miles below Hot Springs Landing, *Murie* 17 (US); Fort Gibbon, *Heideman* 6 (US); Tyonek to Rampart, Sept. 8, 1902, *Brooks & Prindle* (US); Lower Ramparts of Yukon, July 28, 1889, *Russell* (US).

LYCOPODIUM OBSCURUM L., var. DENDROIDEUM (Michx.) D. C. Eaton. Only once have I seen the groundpine, so familiar in our woods of the East growing in Alaska—on a wooded hillside near the river at Manley Hot Springs (no. 3650). It is a rare plant in Alaska, having been collected but a few times from three separate regions, the Eastern Pacific Coast District, our Central Yukon River District, and Attu, the westernmost island of the Aleutian chain. The specimens from along the southern coast tend to approach the typical form.

In the Central Yukon Valley Porsild collected it in 1926 at Goldstream Creek and Pedro Dome, 51 miles north of Fairbanks (no. 108, G) and in the Kokrines Mts. (no. 693, G). Anderson obtained it at Cleary Summit on Steese Highway (no. 2346), and also at Takotna in the Upper Kuskokwim Valley of the Lower Yukon River District (no. 7400, G). It was reported from Hunker Creek (*Tyrrell*, acc. to Macoun).

LYCOPODIUM ALPINUM L. The alpine clubmoss with "its trowel-shaped leaves of the under row," while not common, is generally distributed throughout the different districts of Alaska except the far north. I have collected it at Wiseman, 80 miles north of the Arctic Circle (no. 2190), probably the northernmost station known in Alaska, and at Eagle Summit (nos. 1980, 3459), where it is found frequently growing in low scrubby vegetation above the tree line, and at Yankee Creek, in the Upper Kuskokwim Valley of the Lower Yukon District (no. 1784).

Other stations in the Central Yukon listed by Hultén include: Klondike—Indian River divide, *Tarleton* 184 (US); Dawson, the Dome (acc. to Hutchinson); Black River, *Cairnes* (acc. to Macoun); Cleary Summit, *Anderson* 2344; Goldstream Creek and Pedro Dome, *Porsild* 109A.

LYCOPODIUM CLAVATUM L., var. MONOSTACHYON Grev. & Hook. All the material from our district in interior Alaska belongs to this variety, bearing one spike on a short peduncle. Hultén suggests that "apparently only this reduced northern form survived the glacial period in the Yukon Valley." The running clubmoss is found frequently in dry spruce woods: Miller House (no. 3458); Manley Hot Springs, (no. 3647); Wiseman, on the hillside graveyard (nos. 40, 877, 2188).

Other collections from the Central Yukon cited by Hultén, include: Hunker Creek, July 24, 1902, *Macoun* (Can.); Bear Creek, Aug. 18, 1898, *MacLean;* Upper Stewart River, July 1918, *Cockfield;* Black River, *Cairnes* (acc. to Macoun); Cleary Summit, *Anderson* 2347; Goldstream Creek and Pedro Dome, *Porsild* 110; Fairbanks (acc. to Harshberger); College, *Porsild* 213; Kokrines Mts., *Porsild* 694.

LYCOPODIUM COMPLANATUM L. The ground cedar is found commonly in dry situations at the edges of woods throughout the interior: Miller House, (nos. 1979, 3457); Manley Hot Springs (no. 3648); Circle Hot Springs (no. 41); Wiseman (nos. 875, 2189). Our plants correspond to var. *canadense* Victorin. In the Gray Herbarium are specimens also from: Yukon Territory, Klondike, *MacLean*, 1898–1901; Franklin, Forty Mile, *Anderson & Gasser* 7322.

Hultén gives a long list of collections: Head of Bonanza River, July 14, 1902, *Macoun* (Can.); Hunker Creek, July 24, 1902 *Macoun* (Can.); Dawson, *Malte* 76 (H), trail to the Dome, *Moran* 102; between Yukon River, Nation River and International Boundary, *Mertie* 20 (US); Fairbanks, *Anderson;* Cleary Summit, *Anderson*, 2345; Goldstream Creek and Pedro Dome, *Porsild* 109; Tanana hills (acc. to Harshberger); Fort Gibbon, *Heideman* 86 (US); Lower Ramparts, July 28, 1889, *Russell* (US); Tyonek—Rampart, Sept. 8, 1902, *Brooks & Prindle* (US); Porcupine River, 1891, *Turner* (UC): Kokrines Mts., *Porsild* 692 (Can.).

SELAGINELLACEAE

SELAGINELLA SIBIRICA (Milde) Hieron. The Siberian Selaginella is found frequently on barren rocky cliffs and ledges in the Central Yukon. I have collected it at

Eagle Summit (no. 1981); Livengood (no. 1687); and Wiseman (nos. 878, 2191). Other stations given by Hultén are: Dawson, *MacLean* (UC), *Tarleton* 188 (US); Fairbanks, *Anderson;* Rampart, July 1916, *Kusche* (US); 15 miles above Rampart House, *Murie* 2233 (H); Kokrines Mts., *Porsild* 690 (G).

SELAGINELLA SELAGINOIDES (L.) Link. From Hultén's list and map there is no indication that this little, circumboreal Selaginella, which grows in bogs and marshy places in many northern regions of the world, has ever been found in the Yukon Valley. In the Gray Herbarium is a specimen of Porsild's from Nenana Valley, near Lignite (no. 277), in the Alaska Range, south of our Central Yukon District.

Anderson, in his "Flora of Alaska," gives as its distribution in Alaska, "Aleutians, Bering Str., and Wiseman southward and eastward." So I am including in my list this little plant, which is doubtless so low and inconspicuous as to have escaped notice.

SACO, MAINE.

Shorter Notes

LYGODIUM PALMATUM IN ONONDAGA COUNTY, N. Y.—On November 24, 1948 we found the first known station for *Lygodium palmatum* in this county. The area is a wet, sandy opening in Cicero Swamp. There are two colonies 13 feet apart. One is 9 feet long and 6 feet wide and the other 17 feet long, 12 feet wide at one end and 8 feet at the other. The plants form an almost solid mat of yellowish green sterile and fertile fronds some of which are climbing on *Pteridium latiusculum, Vaccinium corymbosum* and *Viburnum.* A search in the immediate locality resulted in no other colonies being found. Specimens are in the Liberal Arts Herbarium at Syracuse

University, and are being sent to the State Herbarium at Albany and Cornell Herbarium at Ithaca.—MILDRED E. FAUST and NETTIE M. SADLER, *Syracuse, N. Y.*

HORSETAIL: BAD FOR HORSES.*—A letter in The Times last Sunday referred to *Equisetum arvense* (Horsetail), the scouring rush, being so called on account of its use in polishing floors and utensils. I never heard of its being so used, but if any appreciable quantity of it gets into hay or green fodder, it has a most unwholesome effect on horses and cattle, as the silica which gets into the stems scours their intestines. Animals will not eat it if there is plenty of other food; and if there is only a small quantity, it probably will not do them much harm. —FLORENCE BAYARD KANE, *Wellesley, Mass.*

Recent Fern Literature

A RE-ARRANGEMENT OF SCHIZAEACEAE.—We have recently had occasion to notice several reclassifications of Polypodiaceae in the light of phylogenetic theory; we now have one of Schizaeaceae by Dr. Clyde F. Reed. Dr. Reed's paper comprises an introduction dealing with the fossil members of the group and their relationships, and with its taxonomic history; and a detailed systematic treatment, well articulated and technically skillful[1], which is carried down to the level of subsection and includes both fossil and living groups, *pari passu*. Species are merely enumerated, with bibliographic references and such new combinations as are necessary to fit them into

* Excerpt from a letter in The New York Times a few years ago.

[1] One might take exception to certain slips in Latin, which, though pardonable in these days of non-classical education, could have been reduced in number by a little more attention to a grammar, a lexicon, and to the good models provided by Prantl.

their assigned places, but without description or synonomy. The back-bone of the taxonomic scheme is taken from Prantl; but some of his groups are modified and new key-characters, such as the nature of the rhizome and the structure and color of its trichomes are employed—characters which, more easily seen than Prantl's highly technical ones, should be correspondingly easier to use. In addition, *Schizaea* becomes three genera and *Anemia* four (mostly founded on Prantl's subgenera), with various subgenera, sections and subsections recognized. A wholly new genus, *Microschizaea,* is set up to contain our curly-grass and its immediate allies in the Old-World tropics. The four traditional living genera in the family (or the groups of segregates derived from them) are each erected into a family.[2] Three new families are proposed to provide for fossil genera. And, as a logical consequence of the lifting of levels, the whole aggregate is made to constitute a new order, *Schizaeales.*

Dr. Reed's work began with a study of spore-morphology and spore-characters are freely used throughout. Five plates give microphotographs of spores of some of the segregates of *Anemia.* They are beautifully engraved and give the outlines and marginal sculpturing clearly; but they also give the impression that photography is perhaps not the best medium for illustrating such subjects. The spores of *Hemianemia* are described as striate, but of the ten illustrations under that genus only three show visible striae.

Dr. Reed seems to have taken Ching as his model. Like Ching, he fails to give any direct or adequate answer to the query which at once arises: why and how does phylogeny require the erection of genera into families and

[2] Nakai had already done this for three of them. Always an enthusiastic splitter, he was more liberal than Dr. Reed in the matter of segregate genera, setting up twelve of them.

the more or less general jacking up in rank of previously recognized groups? This is an unfortunate lack, for it generates in skeptical minds the suspicion that phylogeny is, in these cases, only camouflage for plain, old-fashioned splitting. Whether or not this suspicion is justifiable, there is no doubt that, in such work as the present, taxonomy (properly, the construction of cross-sections of lines of descent) and phylogeny (properly, the conjectural following back of these lines into the geologic past) tend to become synonymous. In spite of their interlocking nature, they are not the same thing. When this is recognized and really interpretative discussion provided, work like Dr. Reed's, which undoubtedly represents a strong present trend in classification, will become more convincing.[3]—C. A. WEATHERBY, *Cambridge, Massachussetts.*

Miss Farida A. Wiley has issued a second edition of her pocket-size ($6\frac{1}{4}$ by $4\frac{1}{4}$ inches) "Ferns of the Northeastern United States." The new edition follows the plan of the old. In most cases, each species has a much reduced habit-sketch, a drawing of a pinna or other significant part of the frond as nearly life-size as possible, and a brief description. A few errors which crept into the first edition are corrected, and a new section added giving drawings of cross-sections of the stipe at various levels for each species. This is, of course, very helpful in naming non-fruiting specimens; it will add to the usefulness of this handy little manual.[1]—C. A. W.

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[3] Reed, Clyde F. The phylogeny and ontogeny of the Pteropsida. I. Schizaeales. Bol. Soc. Broteriana (Lisbon), ser. 2, 21: 71–197, 5 pls. (1947).

[1] Wiley, Farida A. Ferns of the Northeastern United States. 1948 (no place of publication given). 108 pp., numerous text figures.

Gualterio Looser maintains the high standard of technical excellence and scholarship which we have learned to expect in his studies of Chilean ferns. The latest which has come to our notice is a revision of the Chilean species of *Blechnum*. Thirteen species are recognized, all but two in the subgenus *Lomaria*, with dimorphic fronds. This subgenus is divided into two sections, one with erect, the other (of one species only, *B. Schottii* of the Juan Fernandez Islands) with creeping rhizome. The former is again divided, according to habit, into three subsections, pretty well defined by their names—*Arborescentia, Stolonifera*, and *Prolifera*. Each species is given full synonomy, detailed description, citation of specimens, notes on habitat, and excellent critical discussion. Most are illustrated. One new variety, *B. blechnoides*, var. *fernandezianum*, is proposed. There is a geographic and historical introduction. Altogether, this revision is a mine of reliable information and a necessary work of reference for anyone studying the genus in temperate South America.[1]—C.A.W.

The 35th edition of "The Naturalists' Directory" has recently been published. It contains the names, addresses, and special subjects of study of professional and amateur naturalists of North and South America and some foreign countries, and also lists of scientific periodicals and natural history museums.[2]

American Fern Society

THE COMING NEW YORK MEETING—In connection with the scheduled Christmas meetings of the American Association at New York, a meeting of the American Fern Society is planned. The exact details of time and place

[1] Looser, Gualterio. Los Blechnum (Filices) de Chile. Rev. Universitaria (Univ. Catol. de Chile) 32: 7–106. *16 figs.* 1947.
[2] The Cassino Press, Salem, Mass. $3.00.

will be announced. The success of this meeting will depend, as always, upon members' participation in the program. Reports on life history studies, field ecology, especially with accompanying kodachrome transparencies, notable range extensions, as well as systematic notes and discussions will be welcomed. Titles to be presented, along with information as to need for a projector, should be sent to the Program Chairman, Dr. Frederick L. Fagley, 60 Gramercy Park, New York 10, N. Y., by October 1, to be certain of inclusion in the AAAS printed program.

Mrs. Elsie W. Cisler, 1777 Morena Boulevard, San Diego 10, California, is interested in the question of the hardiness of western ferns in the northeastern United States. She invites correspondence on the subject.

The Rev. E. A. Elliot, South Stoke Vicarage, near Reading, Berkshire, England, one of our English members, will supply a limited quantity of spores of the European Hart's-tongue to members requesting them. He may be able to help in securing spores of other European ferns.

NEW MEMBERS

Dr. Alberto Castellanos, Canning 2904, bajo C, Buenos Aires, Arg.
Miss Dorothy E. Christopher, 1840 Idlewood Avenue, East Cleveland 12, Ohio.
Miss Grace Denny, 1104 Houston Avenue, Crockett, Texas.
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Mr. Ed Lee, 677 Page St., San Francisco 17, California.
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Mr. J. F. Locke, Box 1568, State College, Mississippi.

Mr. Robert C. Lommasson, 2640 South 13th St., Lincoln 2, Neb.

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Dr. Harold McIlvane, Botany Department, University of Idaho, Moscow, Idaho.

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Dr. Joseph C. Placak, Jr., 2404 Overlook Road, Cleveland 6, Ohio.

Prof. G. Thomas Robbins, Department of Biology, East Central State College, Ada, Oklahoma.

Mr. Robert L. Schaeffer, Jr., 30 North 8th St., Allentown, Pa.

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Dr. Budd E. Smith, Department of Biology, Wake Forest College, Wake Forest, North Carolina.

Mrs. Joseph G. Switzer, 1720 West Taylor St., Kokomo, Indiana.

CHANGES OF ADDRESS

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American Fern Journal

VOL. 39 JULY–SEPTEMBER, 1949 NO. 3

Evelyn James Winslow

(1870–1949)

R. C. BENEDICT

The American Fern Society and the Fern Journal owe much of their present strength to Evelyn James Winslow. A member of the Society from 1902, President in 1909, Life Member from 1915, one of the founders of the Journal in 1910 and an editor for the next twenty-five years, a contributor of about twenty briefer articles to the pages of the Journal—the recital of these specific recorded connections does not begin to convey a true concept of the quality or amount of the services actually rendered to our organization by this quiet, unassuming member.

Books are written about people whose lives attract attention by some sort of spectacular success which may receive publicity in some dramatic fashion. Such biographies often cite as background an appalling series of handicaps and hardships in early life, which had to be surmounted before success was achieved. Other books are written about people who may fail dramatically, and whose failures, often tragic, are condoned or explained away because of early environmental difficulties.

Winslow's life was not "news" in either respect, but it did involve an early boyhood with enough difficulties

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EVELYN JAMES WINSLOW

to have produced any amount of psychological maladjustment. He got his education and start in life in the hardest kind of way. His father died when he was six years old; in the next ten years his mother had to move ten times with her brood of three children. Young Winslow was shifted through ten different local schools in those ten formative years. Arrived at Bates College, he had to drop out the second half of his freshman year and work. He earned his living teaching Latin, but carried on his regular college work so successfully that he was able to resume his place with his regular class at the start of his sophomore year.

Presumably he did not know that his background of difficulties were enough to lead to maladjustment and discouragement for he achieved a more than average success in undergraduate work. He played the violin in the college orchestra, sang baritone solos, was class poet as a senior, and was awarded senior honors in mathematics. His formal education was concluded by graduate work in chemistry at Tufts and at Harvard.

The next forty years of Winslow's life were spent professionally as a teacher, a service which covered five states, at Orleans and Lyndon, Vermont, at Farmington in New Hampshire, at Auburn, Maine, and at Elmira, New York, with the last twenty-three as Vice-President and science teacher in the Lasell Junior College for Women, at Auburndale, Massachussetts. While he was predominantly trained in the physical sciences, he developed great interest in living natural history. He seems to have become specially interested in ferns while in Maine.

After retirement as a teacher in 1932, he settled down to farm life at Chesterfield, New Hampshire, but did not by any means conclude his active interest and service as a citizen. Actively interested for forty years in the study and promotion of good government, his "retirement" seems to have meant merely a greater opportunity for participation in public service. As a New Hampshire resident, he served as Grange Lecturer, Library Trustee, Town Moderator, and for seven terms, he was an elected representative for the Chesterfield and Keene district in the New Hampshire Legislature. His death stroke occurred in the midst of a speech he was making on behalf of better government for the Keene community.

Winslow's versatility and diversity of interests are further shown by a portion of a letter from his daughter, Mrs. Rosalind Meyers. "When at home, Dad played the piano an hour or more every single day from my earliest memories until the day before he was stricken. The piano was as much a part of his life as eating or sleeping. He had received a few lessons when he was about nine years old, but otherwise was self-taught. I remember many times at Auburndale of seeing him come in from the garden with tools sticking out of his pockets and sitting down, tools and all, at our grand piano and playing Chopin for an hour before changing his work clothes. Even at seventy-eight, he could execute Albeniz's brilliant "Seguidilla" very commendably, his hands flying over the keys as supplely, it seemed to me, as when he was many years younger."

In his botanical activities, Winslow manifested not only another facet of his wide-ranging interests, but also his response and readiness to serve others when opportunity offered. His interest in ferns began about 1901 and he has written in the Fern Journal of his surprise and pleasure at discovering that there was a cooperative society of fern students in which an interchange of specimens and experiences was actively in evidence. My personal contacts began when, as a beginner in fern research in 1906 at the N. Y. Botanical Garden, I found he had contributed an extensive suite of specimens of the little botrychiums to the Garden Herbarium. To a letter asking about these species, his response was a very generous supply of additional specimens. Thereafter, for nearly thirty years, we were in frequent correspondence.

Winslow's contributions to the Fern Society were an expression of his general attitude of service. Writing in the Fern Bulletin during his year as President (1909), he was one of the first in the Society to express confidence in the future possibilities for fern study and in the opportunities for the organization. "The idea seems to have gained acceptance in some quarters that the Fern Society has fulfilled its mission and that further increase in membership and interest in our specialty is not to be looked for. I have no sympathy with this view. A year ago, I counted myself pretty well acquainted with the ferns of the eastern United States. and yet I found during the past season and in the very locality where eight years ago I began the study of ferns the most interesting fern collecting of my experience." Writing later, (1918) "During the year 1911 the growth in membership exceeded that for any other year in the history of the Society. And though the four years of the war have been unfavorable to the peaceful pursuit of fern lore, we have maintained our membership near the 275 mark."

The point of view indicated in the foregoing quotations was characteristic of Winslow's connection with the Fern Society. When it seemed desirable to explore the possibilities of founding and publishing a new fern magazine as a Society organ, he was one of those who contributed time, work, and money to the issuance of the first two experimental issues, which constitute numbers 1 and 2 of Volume 1 of the present Fern Journal, now in its fortieth year. Thereafter, besides contributing to the pages of the Journal, he carried on for twenty-five years the essential and laborious but inconspicuous duties involved in the ordering, storing, and mailing of the Journal, the correspondence regarding back numbers, and so forth. His own home and the school at Auburndale served as the storage and business headquarters of the Journal until the Brooklyn Botanic Garden opened its shelves to our greatly expanded files.

Winslow's specific botanical contributions are indicated by a reference to the 25-year Index of the Journal prepared by Dr. Edgar Wherry, where about twenty titles are reported. A few earlier fern notes appeared in the Fern Bulletin and one other fern article was published in the Vermont Botanical Club Bulletin. Two papers on mosses appeared in The Bryologist. One new fern type was found and reported by him: *Dryopteris filix-mas* x *marginalis*.[1] In his early years, he collected extensively. Over seven hundred of his specimens are filed in the National Herbarium at Washington, and considerable numbers were contributed also to the herbaria at Harvard and New York. He was a member of four botanical societies: the New England Botanical Club, Vermont Botanical Club, American Bryological Society, and Fern Society.

The American Fern Society owes much to Evelyn James Winslow for his patient, unremitting, dependable service, and for his optimism and constructive ideas.

BROOKLYN COLLEGE.

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[1] Amer. Fern Journal, 1: 22. 1911.

Some Mutations in Polypodium aureum

W. N. STEIL

Polypodium aureum L. has been grown in the Marquette University greenhouse, mainly for class use, the past 25 years and during this long period of time a number of leaf mutations have been observed in the plant. This fern is known to be variable, since frequently it produces different forms of leaves, some of which, although rarely, have been observed by the writer to form more or less distinctly serrate margins. Occasionally parts of the leaves are laciniate. Hence, these resemble somewhat the leaves of *Polypodium Mandaianum,* its well known mutant, discovered by W. A. Manda of South Orange, New Jersey, some time before 1912, when the fern had already been introduced in the markets and exhibited at flower shows in this country and in Chelsea, England.

Two years ago, one of the *P. aureum* plants in the greenhouse formed, in addition to the typical leaves, a fertile leaf similar in all respects to that of *Polypodium Mandaianum.* The fern and its mutant are similar in the nature of the rhizomes, the petioles, and in the distinct silvery and bluish cast of the fronds. However, in two respects the two are different: The leaves of the mutant are generally broader at the base, and hence are sometimes triangular in form, and those of *P. Mandaianum* are laciniate, the distinguishing character of the mutant.

During the past year, a frond similar to that just described was formed by another *P. aureum* plant which had for many years produced typical leaves.

In each of the two plants which produced the laciniated frond, the foliage leaf was distal and hence the mutation was produced back of the apical region of the rhizome.

POLYPODIUM AUREUM, BEARING NORMAL AND MUTANT FRONDS. ABOUT 1/9 NATURAL SIZE. DRAWING BY ROBERT McGRAY.

It is, therefore, not likely that the mutation will be propagated. Nevertheless, the plants will be kept under observation.

The occurrence of the two mutations, so similar in all respects, is not only unusual, but indeed rare.

These mutations suggest a possible origin of *P. Mandaianum* from the rhizome of *P. aureum,* although Bailey[1] states that the mutant originated as a spore sport.

No positive evidence is offered by the writer in regard to the reputed origin of the mutant, but it seems that there may be some doubt that it originated as a "seedling" or a young sporophyte produced in the ordinary way by fertilization. In regard to the origin of the mutant, Mr. Albert Manda, of W. A. Manda, Inc., in a recent letter to the writer, made the following interesting statement: "We do not know whether it sported originally from *Polypodium aureum* or as a seedling."

The mutant was propagated for many years by Mr. W. A. Manda by means of divisions of the rhizome, and not by means of the spores, which were never produced in the Manda greenhouses. However, the fern purchased by Henry A. Dreer, Inc., formed spores which were used for the propagation of the fern, and, according to Mr. A. B. Graf,[2] of the Julius Roehrs Company of Rutherford, N. J., bred true. He writes: "In reply to your letter of September 7th regarding *Polypodium Mandaianum,* we are quite sure that the Henry A. Dreer Co. grew this fern from spores, but they made sure to select yearly the finest, most crested forms as spore plants to maintain the character. From my observation, the resulting plants came more or less true, some perhaps less crested, but all had the silvery blue color."

Mr. J. F. Anderson,[3] fern specialist, of Short Hills.

[1] Bailey, L. H. Manual of Cultivated Plants. 63. 1925.
[2] Formerly with the Henry Dreer Company.
[3] Letter of August 25, 1948.

N. J., made the following statement in regard to the propagation of the mutant: "We are growing all our *Polypodium Mandaianum* plants from spores taken from the most distinct plants, but about 50% revert back to *P. aureum* and are sold as such." According to the facts given by Mr. Anderson, the mutation which originated from *P. aureum* is dominant and is undoubtedly, from its behavior, of the nature of a hybrid.

A single *P. Mandaianum* plant, purchased many years ago from the Henry A. Dreer Company, has produced spores annually in the greenhouse. The writer plans to sow the spores of the fern in the near future to determine the nature of the sporophyte plants which will be produced.

Several years ago, one of the *Polypodium aureum* plants produced a single leaf with nearly white or albinic portions. The leaf was, no doubt chimeric, and was, therefore, not produced by disease or environmental factors. No other leaf of this nature has been produced by the many plants—about 25 in all—grown in the greenhouse.

Although mutations are rare in plants, including ferns, many which occur in nature are, no doubt, unobserved. Perhaps, some "fernologists" will continue to look for them in the group of plants in which they are especially interested and be rewarded by their discovery of a new form or species.

The author wishes to thank the following for information received in regard to *Polypodium Mandaianum*: J. F. Anderson, Short Hills, New Jersey; A. B. Graf, Julius Roehrs Co., Rutherford, N. J.; Albert Manda, W. A. Manda, Inc., South Orange, N. J.; C. V. Morton, Smithsonian Institution, Washington, D. C.; and George A. Perry, Henry A. Dreer, Inc., Philadelphia, Pa.

MARQUETTE UNIVERSITY, MILWAUKEE, WIS.

Index of Illustrations
American Fern Journal, Volumes 1–38

C. V. MORTON

The following index, prepared originally for my own use, has proved invaluable to me and I think that it may be useful to others also. A good many fine illustrations have been published in the Journal from time to time, such, for instance, as the drawings of Botrychium by Mr. E. W. Graves in volume 25, and fern students, both amateur and professional, can derive much satisfaction from a study of them.

Although many of the ferns of the eastern United States have been illustrated (Scott's spleenwort the most frequently. The evidence suggests that no more photographs of it are really required), there are some striking omissions; and relatively few of the species of the southern and southwestern states have been illustrated in the Journal. The present index will, therefore, serve in a way as a guide to future contributors in the matter of picking species to illustrate, which is not to say that good new drawings of species already illustrated are not desirable.

The illustrations are grouped below as line drawings (these are generally the most useful in identification work), photographs (i.e. photographs of isolated fronds or herbarium specimens), and habitat photographs, these showing the plants *in situ*.

In order to group together all the illustrations of a single species, I have chosen to follow the nomenclature of Broun's Index to North American Ferns, and have ignored the names under which the illustrations were published, when these are synonymous.

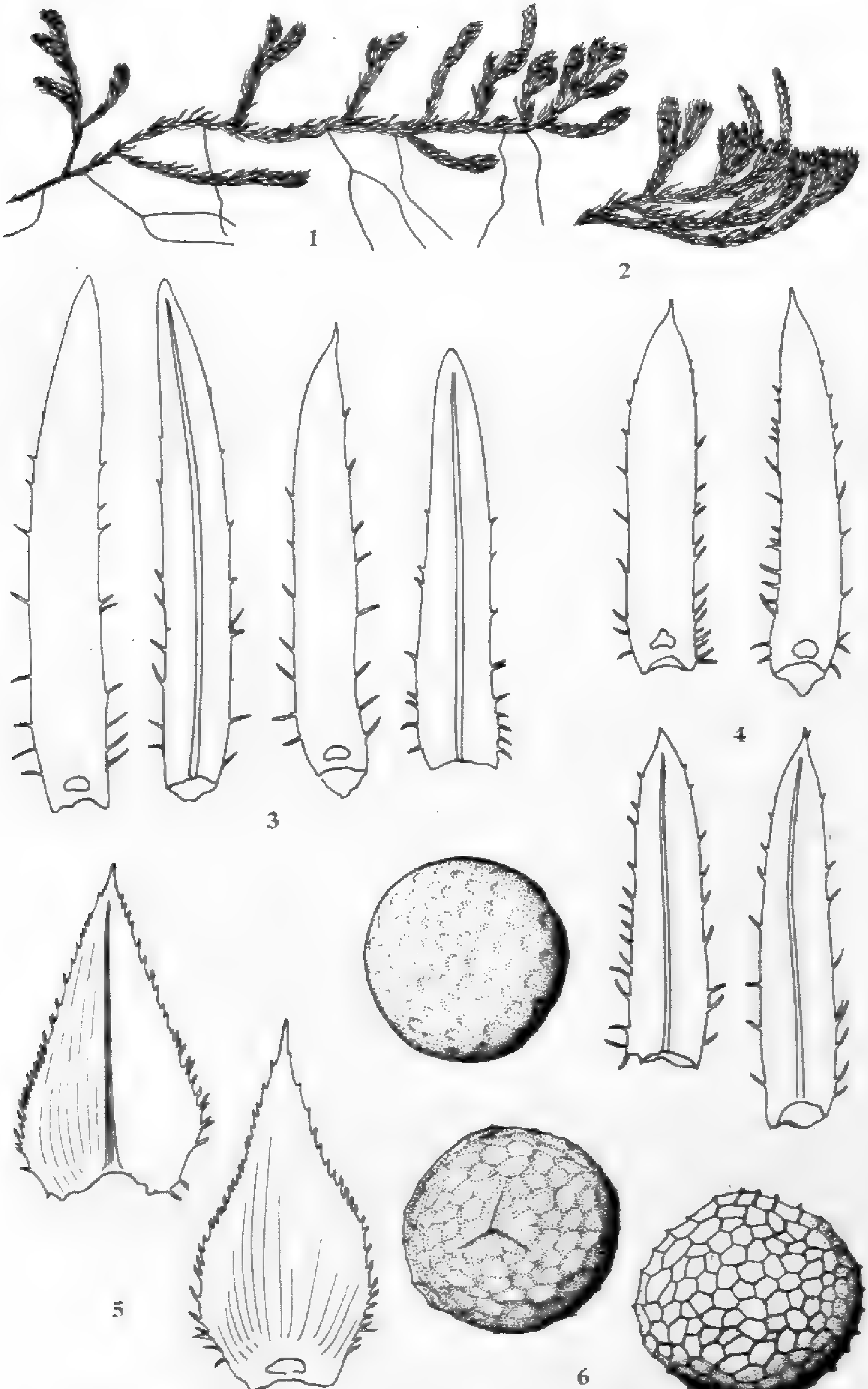
A New Selaginella from Southwestern Utah

SEVILLE FLOWERS

A new species, superficially resembling *Selaginella Watsoni* Underw., has been found in Washington County, Utah. It may be described as follows:

Selaginella utahensis sp. nov. Plantæ dense vel laxe caespitosae, pallidae vel glauco-virides; caulis prostratus, subpinnatus, 2–6 cm. longus; ramuli breves, distantes vel densi, ascendentes, curvati, 0.5–1.5 cm. longi. Folia ramulorum dense imbricata; folia caulina appressa vel erecto-patentia, rigida, oblonga vel lineari-lanceolata, 2–3.2 mm. longa, 0.4–0.5 mm. lata, acuta vel auguste obtusa; folia superiora saepe in mucrone brevi, hyalino vel lutescente, laevi aut bidentato, minus quam 0.14 mm. longo terminantia; cilia marginales utrinque 6–12 (17), obliqua vel dilatata, minus quam 0.15 mm. longa, sursum breviora. Spicae breves, minus quam 1 cm. longae; sporophylla deltoideo-ovata vel ovato-lanceolata, 2–3 mm. longa, 1–1.5 mm. lata, ad apicem acuta vel mucronata, gradatim angustata vel aliquanto acuminata, in marginibus dense ciliata vel spinuloso-denticulata, utrinque 16–30, obliqua. Megasporae 360–460 μ diametro, flavae vel luteae, fere laeves reticulatae; costae humiles et angustae areolis latis, aut latissimae, alveolis parvis. Microsporae 20–282 μ diametro, flavescentes, reticulatae.

Plants rather loosely to densely caespitose, pale green to subglaucous, often with a bluish cast above, light brown below; main stems creeping, 2–6 cm. long, the branches obliquely spreading to curved and ascending, the lower ones more distant, up to 1.5 cm. long, the leaves loosely but rigidly erect-patent to somewhat spreading; upper branches approximate to dense, often short and bud-like, the leaves dense and closely imbricated. Leaves oblong to linear-lanceolate, 2–3.2 mm. long, 0.4–0.5 mm. wide, gradually or rather suddenly narrowed upward, sharply acute to narrowly obtuse, some of the upper ones terminating in a short, hyaline or pale yellowish, entire or occasionally forked mucro up to 0.14 mm. long; marginal cilia 6–12 (17) on each side,



SELAGINELLA UTAHENSIS SP. NOV. FIG. 1. HABIT ×1; FIG. 2. PORTION OF A DENSELY BRANCHED SHOOT, ×1; FIG. 3. FOUR LOWER LEAVES, ×15; FIG. 4. FOUR UPPER LEAVES, ×15; FIG. 5. TWO SPOROPHYLLS, ×15; FIG. 6. THREE MEGASPORES, ×60.

up to 0.15 mm. long, oblique to spreading at right angles, a few reflexed at the base. Spikes short, less than 1 cm. long (probably becoming longer), ascending; sporophylls triangular-ovate to ovate-lanceolate, 2–3 mm. long, 1–1.5 mm. wide, evenly tapered to an acute apex or more often briefly acuminate to a short, hyaline or pale yellowish mucronate tip, up to 0.21 mm. long; marginal cilia 16–26 (30) on each side, strongly oblique (a few spreading or reflexed), dense below, shorter and more distant above. Megaspores yellowish-orange, 360–460 μ in diameter, nearly globose, the apical carinae weak when fully mature, reticulate, with low, narrow, sharp-crested, widely spaced ridges or with very low and broadly rounded ridges enclosing small, shallowy depressions; microspores 20–28 μ in diameter, yellowish-orange and finely reticulate.

Type in the herbarium of the University of Utah, collected south of St. George, Washington County, Utah, in wash bottom, at 6,500 feet elevation, April 5, 1931 (*Cottam* 5644). Another specimen (*Cottam* 8817) is from 16 miles north of St. George, Washington Flat, Washington County, on shady slopes, at 4,000 feet elevation, June 18, 1941. Both of the above specimens are in the Herbarium of the University of Utah. These two localities are about 20 miles distant on a direct line. A duplicate of the type is in the herbarium of Brigham Young University.

In habit of growth there is little to distinguish this species from *S. Watsoni*, although the former is a lighter and more pale glaucous green in color. The most significant differences appear in the leaves. In *S. utahensis* the leaves are, on the whole, narrower and somewhat longer, more gradually tapering upward and less strongly dorsally convex at the tip, the apex being acute to narrowly obtuse and without a terminal bristle, although many leaves terminate in a short, hyaline or lutescent mucro, this at most reaching 0.14 mm. in length. Generally the tip is directed ventrally. The marginal cilia are more numerous, 6–11 or more on each side. The sporophylls also have a very short mucro and the marginal cilia are dense and numerous. In contrast *S. Watsoni* has, on the average, shorter leaves, these more abruptly narrowed or obtuse, thicker, more strongly dorsally convex, and terminating in a distinct lutescent bristle 0.2–0.35 (4) mm. long. The marginal cilia are frequently entirely lacking but when present vary in different plants, the usual range being 3–10 on each side although in a few leaves there may be more. The cilia of the sporophylls generally correspond in number quite closely to those of the leaves of the same plant, but are never as dense as those in *S. utahensis.*

University of Utah, Salt Lake City, Utah.

Notes on Isoëtes in Maryland

GEORGE R. PROCTOR

Several times[1] I have collected *Isoëtes* plants from the gravelly eastern shore (Cecil County) of the Susquehanna River near its mouth (at an obscure place called "Frenchtown" on the topographic map), and upon study it seemed evident that at least three entities were present. Two of these were rather difficult to separate, belonging to the *I. riparia* complex (the Chesapeake region components of which have long been lumped under the name *I. saccharata*, a matter which I shall discuss at length elsewhere). The third, which formed a large clump submerged in 1 to 3 feet of water (depending on the tide), appeared at first, to my astonishment, to have gynospores like those of the New England *I. foveolata.* However, despite the late date of collection (September 1), there can be no doubt that this material

[1] These observations were made in 1947, in part while doing field work on another problem aided by a grant from the American Philosophical Society.

represents partially immature or abortive *I. Engelmanni*. In some of the sporangia, *foveolata*-simulating gynospores were mingled with larger, unmistakable gynospores of *I. Engelmanni*. Furthermore, the plants have long (up to 25 cm.), slender green sporophylls, entirely lacking the peculiar reddish, fleshy aspect of *I. foveolata* as I have seen it near the type locality in New Hampshire.

Not far from this locality, on the gravelly shore of Chesapeake Bay itself, below Havre de Grace (where the water is essentially fresh), I collected more *Isoëtes* plants representing the *riparia* complex (both typical *riparia* and its too-close relative *saccharata* being present), and also a few rather stout specimens, some of whose gynospores held a striking resemblance to those of *I. Eatoni* (a species whose closest known locality to this station is Morris Pond in northern New Jersey). But here again I feel safe in saying that it is merely abnormal material, probably best referred to so-called *I. saccharata*.

The above observations are mentioned mainly to point out that many pitfalls (no pun intended) confront the *Isoëtes* student, and to stress to collectors the need for ample quantities of mature plants. Incidentally, it is surprising how little one can really depend on the few available vegetative characters for determination in this critical genus.

The writer would be very grateful to receive specimens of *Isoëtes*, especially from regions other than eastern United States, and would be glad to identify such material in return.

Temple University, Philadelphia.

Two Mexican Ferns

C. A. WEATHERBY

Among the collections made by Dr. H. E. Moore, Jr., in Mexico in 1947 are two ferns of especial interest, a striking new species of *Woodwardia* and the second known collection of *Cyathea delicatula* Maxon. The former proves to have been taken, at the same locality, by Prof. M. Martinez in 1940. Dr. Maxon then gave it a name, but never published upon it: it is here given a description and technical publication. The latter was described from incomplete material; Dr. Moore's carefully prepared specimens enable me to fill out the original description. It is a privilege to carry to completion these unfinished bits of Dr. Maxon's work.

Woodwardia Martinezii Maxon in herb., sp. nov., textura, margine cartilagineo spinuloso-serrulato, venatione extra areolas costales plus minusve areolata, sporisque *W. spinulosae* similis, differt: paleis rhizomatis pallide brunneis vix ultra 1 cm. longis; lamina deltoidea pinnis imis inaequilateraliter dilatatis; soris superficialibus valde elongatis contiguis secus costas costulasque lineas sicut continuas formantibus; indusiis basi chartaceis margine hyalinis.—Rhizoma longe repens basibus stipitum marcescentium dense obsitum. Pinnae 6–8-jugae, acuminatae; inferiores liberae profunde pinnatifidae catadromae, laciniis oblongis vel lineari-oblongis acutis acuminatisve cum apice pinnarum leviter undulato-crenatis, sinubus rotundatis; superiores ala lata secus costam conjunctae pinnatifidae, laciniis ovatis late obtusis. Costae, venulae, paginaque inferior laminae fibrillis longis pluricellularibus brunneis glandulisque stipitatis sparse obsitae. Areolae extra costales ad sinus incomplete 3-seriatae. Sori secus costam ad 2 cm. longi-

Sporae ellipsoidales vel subreniformi-ellipsoidales granulatae exalatae, ca. $60 \times 35\ \mu$.

TYPE: near Zacualtipán, State of Hidalgo, Mexico, alt. 1800 m., April 15, 1940, *M. Martinez* 27, sheet no. 1,791,-178 in U. S. Nat. Herb. (photo in Gray Herb.)

Other specimens examined: same locality, Jan., 1940, *Martinez* 14 (U. S. Nat. Herb.); rich, mixed woods in ravine beside Río Teponapa, Zacualtipán, alt. 2000 m., July 2, 1947, *H. E. Moore, Jr.* 3202 (Gray Herb.)

W. Martinezii combines the texture, spinulose-serrulate margin, areolate venation (outside the costal areoles) and spore-characters of *W. spinulosa* with the creeping rhizome, the strong development of costal soriferous areoles and the superficial sori of *W. virginica.* From all other pinnate-pinnatifid species of the genus it differs in its very narrow and elongate sori and in its development of a tendency cropping out in many groups of ferns of like architecture—the tendency to a shortening and compensatory broadening of the lamina, accompanied by a reduction in the number of its divisions and a considerable increase in the size of the lowest ones.

The mingling of characters in *W. Martinezii* emphasizes the untenability of *Anchistea* as a genus. As represented by its type and sole original species, *W. virginica, Anchistea* is characterized by a creeping rhizome; superficial sori, placed along both costae and costulae and with flattish, somewhat membranous indusia; veins mostly free except for the costal areoles; and smooth, winged spores—the "wing" being presumably a loose perispore as viewed by transmitted light. True *Woodwardia,* as represented by its generally accepted lectotype, the European *W. radicans,* has a thick, erect or ascending rhizome; sori immersed in short, shallow pits along the costules only and with a vaulted and thickened indusium; the veins with one or two rows of areolae outside the costal ones; and spores granular as seen by transmitted light and quite wingless or at most with a few tiny and irregular bits of tissue clinging to them.[1] These contrasting characters, or most of them, should remain correlated if *Anchistea* is to stand.

Four other species beside *W. virginica* have superficial sori. In the east-Asiatic *W. Harlandii* these are found along both costae and costules, and rhizome and spores are as in *W. virginica;* but the venation is almost as completely areolate as in *Lorinseria*. In *W. Martinezii* rhizome and sori (except that these are much longer) are of the same sort as in *W. virginica*, but there are extra-costal areoles and the spores are as in *Euwoodwardia*. *W. japonica* and *W. Cochinchinensis* have superficial sori and mostly free veins; but the sori are along the costules only and rhizome and spores are as in *Euwoodwardia*. That is, no two of the four features which should characterize *Anchistea* remain linked together through the five species, though one or more occur in each.

Incidentally, assuming a blechnoid origin for *Woodwardia* (as most phylogenists do), the two characters which should be primitive—elongate costal sori and free veins—part company quite completely.

CYATHEA DELICATULA Maxon, Contrib. U. S. Nat. Herb. **13**: 4 (1909). This species was described from specimens lacking the stipe and accompanied by no information as to the trunk. So far as I am aware, it has hitherto been known only from the type-collection—between Tactic and Coban, Alta Verapaz, Guatemala, v.

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[1] *Woodwardia,* as originally delimited by J. E. Smith, Mem. Acad. Turin, 5: 411 (1793), included *W. areolata, W. virginica, W. japonica* and *W. radicans.* Presl, Epim. Bot. 71 (1849), set off the first two species as *Lorinseria* and *Anchistea* respectively, leaving the name *Woodwardia* for the two remaining. His implicit typification has been accepted by all subsequent authors. *W. radicans* was probably first definitely designated as type by John Smith, Hist. Fil. 309 (1875), who also has been generally followed.

Türckheim II 1629. Dr. Moore found it again in the vicinity of Molango, State of Hidalgo, Mexico (his no. 3484). From his material and notes it is now possible to supply the data lacking in the original description.

Trunk 1 dm. in diameter, about 1.5 m. tall; fronds about 1.75 m. long; stipe ca. 6.5 dm. long, 3 cm. thick at base, dark brown below, becoming pale above, channeled on the upper side and here strigose-pubescent with short, rather thick, jointed, appressed or incurved hairs, on the lower, rounded surface aculeate toward the base (the broad-based aculei 3 mm. or less high, above passing into minute tubercles), sparsely scurfy with small, pale brown, much dissected scales. Scales of the base of the stipe entire, pale brown, shining, deltoid-lanceolate or deltoid-linear, up to 4.5 cm. long, tapering rather evenly from a subtruncate base about 4 mm. wide to a long capillary tip, which often occupies half the total length of the scale.

Gray Herbarium.

Shorter Notes

Another Station for *Asplenium ebenoides*.—In the summer of 1940 two plants of *Asplenium ebenoides* were found on a calcareous sandstone cliff on the north slope of a ravine in the northern end of Powell's Fort Valley about one mile southwest of Elizabeth Furnace Forest Camp, Shenandoah County, Virginia.

One desiccated plant of this fern was removed from its hopeless position in a semi-detached bit of moss. Transplanted to a more favorable habitat, it still survives. The other plant, in a small crevice beneath overhanging rock, had all but a small portion of soil removed from its roots by erosion. Earth packed about its roots and small check dams built above and below saved this *Asplenium ebenoides* from which there are specimens in the Gray Herbarium and in the herbarium of the University of Missouri.

The sandstone cliff previously mentioned, is well covered with such mosses as *Anomodon attenuatus* and *Mnium cuspidatum*. Mingled with them, as might be expected, are *Asplenium platyneuron* and *Camptosorus rhizophyllus*. In addition, *Woodsia obtusa* and *Polypodium vulgare* grow upon the cliff, and in the nearby woods *Adiantum pedatum* and *Polystichum acrostichoides* are conspicuous features on the steep slope of the ravine.

This is the first reported station for *Asplenium ebenoides* from Shenandoah County, Virginia, the seventh Virginia county in which it has been found. Other Virginia counties are Augusta, Fairfax, Isle of Wight, Montgomery, Page, and Rockbridge. For stations in these last six counties see *Ferns and Fern Allies* by A. B. Massey, V.P.I. Bul. Vol. XXXVII No. 7, May 1944.

The analysis of the rock of which the cliff consists was made by Jewell J. Glass, U. S. Geog. Survey. Dr. Paul Patterson, Hollins College, Virginia, checked the identity of the mosses mentioned.—LENA ARTZ, *Waterlick, Virginia.*

A NEW FORM OF THE BROWNSTEM SPLEENWORT.—On Friday, June 21, 1946, a new and most unusual form of *Asplenium platyneuron* (L.) Oakes was found in Upshur County, West Virginia. This form is an extreme variant of this highly variable *Asplenium*. It may be described as follows:

Asplenium platyneuron f. **multifidum** Tetrick, f. nov. a forma typica frondibus cristatis multifidis differt.

Plant 7.5–19 cm. tall; fronds much branched, the ultimate divisions crested; sterile fronds evergreen, as in typical *A. platyneuron*, prostrate or nearly so, and not so many times forked as the fertile ones; fertile fronds subevergreen, erect, and spreading, with a fan-shaped appearance; pinnae variously cut and auricled, 3–25 mm. long; sori often borne on widely separated pinnae, some of the sori never maturing. Spores seemingly viable, since three plants are known.

Type in the herbarium of the University of West Virginia, collected at an altitude of 1500 feet above sea-level in rocky woods on upper Hacker's Creek, Upshur County, West Virginia, June 21, 1946, by R. M. Tetrick II.

For some time after its discovery the fern remained tentatively identified merely as *Asplenium*, but it was finally sent to the University of West Virginia at Morgantown, where Professor M. G. Brooks kindly determined it to be a variant of the brownstem spleenwort.—R. M. TETRICK II, *Buckhannon, West Virginia.*

SPONTANEOUS REPRODUCTION IN SCOTT'S SPLEENWORT.—I do not say that Scott's spleenwort multiplies fast outdoors, but in my box it does very well. I have never brought a plant in from the outdoors, as I try to be a real conservationist, but some years ago, probably four or five, Dr. Everett G. Logue sent me some plants that he had raised. I took a flat wooden box 16 × 12 × 7 inches, filled it with soil and put the plants (three) in it. Then I took four pieces of glass and stood them on edge on the ends and sides and also placed one over for a roof to form a little hothouse. I left plenty of air-space at the corners. The plants grew beautifully, but in time I noticed that the soil took on a greenish appearance. I thought it was a kind of fungus and said to myself: "That will be the end of my plants." I once thought of stirring up the soil to discourage the new growth but for some reason didn't do it. Well, in time I discovered the green growth was the prothallia of new plants. The spores from the fronds had been discharged and were germinating. I certainly was pleased and tried not to let them get too dry or too wet. In time my box was covered with small plants, so many that it was a case of the survival of the fittest as they grew.

I have had lovely plants from them and there is no question as to their being Scott's spleenwort. Some are much more irregular in their cutting than others. I have had some that showed the characteristics of the walking fern in that they developed small plants on the ends of the fronds. In my herbarium I have a frond (grown by a friend in an aquarium-jar) that has four small plants on the pinnae.—MARY EMMA GROFF, *Lancaster, Pennsylvania.*

Recent Fern Literature

It is a pleasure to record another addition to the series of excellent state fern-floras published during recent years. This time the state is Maine and the author Mrs. Edith Bolan Ogden.[1] Mrs. Ogden has searched widely in herbaria and literature, and in the field, for pertinent information and has produced a work which, except that it puts forward no novelties in classification, is as much a monograph of the true ferns of Maine (the "fern allies" are not included) as it is a local flora.

All species, varieties and named forms known to occur in the state, to the total number of 94 plus six hybrids, are fully described and well keyed, with important taxonomic characters italicised. Each species is illustrated with a small, but good, line drawing. Some of the drawings are taken, by permission, from another very good fern flora, that of West Virginia by Brooks and Margolin. All of them have the useful device employed in that work of indicating on the plate, by arrows and in-

[1] Ogden, Edith Bolan. The Ferns of Maine. (University of Maine Studies, no. 62). Maine Bull. 51, no. 3. Oct., 1948. 128 pp., 10 pls., map. $1.00 from Univ. of Maine Library, Orono, Maine.

scriptions, the significant features to be looked for in the plant illustrated. On the geographic side, every township from which the author has seen a specimen is listed under the proper species; reports not backed up by specimens are listed in equal detail, but in a separate series—a method which makes strongly for accuracy. There is an unusually full bibliography.

With all this, the book should serve especially well its double purpose, as a means of identification and a geographic record. It is very free from obvious error. One slip, however, due to a misunderstanding, should be noted, since it may be geographically misleading. Certain specimens from York and Cumberland counties in southwestern Maine are listed under typical *Botrychium lanceolatum;* they should be under its var. *angustisegmentum*. True *B. lanceolatum* occurs in New England only at a single locality in extreme northern Maine.—C. A. WEATHERBY

American Fern Society

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American Fern Journal

Vol. 39 October–December, 1949 No. 4

New Fern Variants from Westchester County, New York

Charles Neidorf

This paper is based on some ten years of intensive fern collecting in lower Westchester County, confined almost entirely to an area not exceeding four square miles near Yonkers, N. Y. Restriction of attention to this one locality was at first primarily a matter of convenience, the area selected being reasonably easily accessible from New York and having the richest fern flora of any known to the writer so close to home. As time went on and more and more variants were found, however, the restriction became a matter of policy, the intention being to see how far one could go in bringing to light new or rare fern variants through the sustained application of intensive collecting methods. Whether the self-imposed restrictions have been justified should be decided on the basis of the results achieved. Only those variants are discussed here which have not hitherto been described (or, in one instance, not previously formally published) and which in the writer's opinion merit formal recognition. Several other variants of lesser rank, in addition to a number of previously described but rare forms, were also found—and the end is not in sight.

That it should still be possible, at this late date, to find new variants of common fern species, particularly in an area so close to New York[1] that it must undoubtedly have been visited many times by other collectors,

[1] The area is not identified more specifically in order to protect the plants.

[Vol. 39, No. 3, of the Journal was issued September 29, 1949.]

PHEGOPTERIS HEXAGONOPTERA F. TERNATA

may come as a surprise—but only to those who do not fully realize how infrequently intensive collecting methods have actually been applied or how blind the untrained eye can be. Reference to notes and floras published in preceding volumes of this Journal lends support to the thesis that those few collectors who have been most successful in locating rare or undescribed fern variants have in general followed the same procedure used by the writer, restricting their attention over long periods of time to relatively small areas.[2] The point which must be emphasized is that what these few have been able to do others can do likewise. If it accomplished nothing else it would be a source of satisfaction to the writer if this paper helps to strengthen the conviction in a few receptive minds that the task of bringing to light, and describing, new and legitimate variants is by no means completed.

One feature of the collecting methods used merits special attention. As the result of repeated visits to such a small area it has been possible to re-locate and to re-examine annually many individual plants of several (though unfortunately not all) of the variants herein described. In effect, then, the area has become a sort of fern garden, making it possible to determine whether a particular variation is random or reappears annually. To be sure, this is not the equivalent of raising the plants from spores. But as far as the former, less rigorous criterion is concerned, none of the variants which have been re-located has failed to meet the test.

Specimens of *Polystichum acrostichoides* f. *ventroperaferens*, and the forms of *Onoclea*, *Osmunda*, *Polypodium*, and *Thelypteris* have been deposited in the her-

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[2] Cf., among others, the work of E. M. Kittredge in Vermont (this JOURNAL **12**: 53. 1922; **15**: 95. 1925; **16**: 98. 1926; **19**: 56. 1929; **20**: 124. 1930; **24**: 84. 1934) and that of C. L. Gruber in the Kutztown-Fleetwood area, Pennsylvania (this JOURNAL, **30**: 41–49; 89–98. 1940; **31**: 73. 1941; **32**: 151. 1942).

baria of the Fern Society, New York Botanical Garden, and in the Gray Herbarium.

PHEGOPTERIS HEXAGONOPTERA forma **ternata** Neidorf, f. nov.

Pinnae infimae magnopere ampliatae, lamina itaque ternata.

Lower pinnae strongly enlarged, the blade thus being ternate in outline.

Type in U. S. National Herbarium, collected Sept. 8, 1940. Based on three fronds. Two additional fronds were collected Aug. 10, 1941; not found since then.

DIPLAZIUM THELYPTEROIDES forma **cristatum** Neidorf, f nov.

Laminae pinnarumque apices cristati.

Apex of the blades and pinnae cristate.

Type in U. S. National Herbarium, collected August 7, 1941; based on two dwarf sterile plants with all apices cristate.

Cristate *D. thelypteroides* (of normal size) was described and illustrated, but not named, by W. R. McColl in this Journal (**14**: 104. 1924). M. R. Sharpe listed *Athyrium thelypteroides* var. *cristatum*, without description, in this Journal (**24**: 91. 1934), but this does not constitute formal publication (confirmed in a letter from Mr. C. A. Weatherby dated Sept. 25, 1941).

OSMUNDA CLAYTONIANA forma **tomentosa** Neidorf, f. nov.

A forma typica stipitibus persistenter brunneo-tomentosis differt.

Differs from f. *typica* in having the stipe bearing a persistent, pale-brown tomentum.

Type in U. S. National Herbarium, collected Sept. 28, 1940.

This form, although considerably less frequent than the typical form with glabrous light green stipes from which the woolly tomentum is shed at an early stage, is so well established in the collecting area (at least four stations) that it seems more than likely it will be found elsewhere. That it has not previously been reported would seem to be the result of insufficient attention being paid to the species. As evidence for this statement it may be pointed out that the writer has been unable to find any reference to the fact that the typical, glabrous-stiped form has *glaucous* stipes. The bloom is, to be sure, rather slight, but if a living plant is observed in strong oblique light (i.e., with the sun directly overhead) and a finger is run down the lower end of the stipe it will leave an area slightly darker than the untouched portion, indicating the presence of a bloom. This character, being at best quite inconspicuous, is not observable in herbarium specimens. On the other hand, *f. tomentosa* has a pale brown tomentum, persistent throughout the season, covering the stipes (more abundantly on the dorsal side) and extending up past the lowest 3–4 pairs of pinnae. In the original station of some 75 plants most of the plants have reddish-brown stipes, the pigmented area being roughly co-extensive with the pale brown tomentum; however, plants of this variant in other stations lack this pigmentation, being green throughout. A Himalayan *O. Claytoniana* var. *vestita* (Wall.) Milde is described by M. L. Fernald[3] as having "more abundant, more persistent wool of a strong ferrugineous color." The color would seem to indicate that it is distinct from *f. tomentosa.*

THELYPTERIS NOVEBORACENSIS f. **excurrens** Neidorf, f. nov.

Frons apice truncata, rhache in spina parva usque ad 5 mm. longa excurrente.

Fronds truncate at apex, the rhachis ending in a small slender spine up to 5 mm. long.

Type in U. S. National Museum, collected Oct. 26,

[3] **Rhodora 32: 71–76. 1930.**

Polystichum acrostichoides f. ventroperaferens

1941 (very late in the season; all the fronds had begun to turn brown but were still intact).

Two other stations were subsequently found and have been re-visited; in addition, isolated specimens of this variant in widely scattered locations were found at least five times. All told not less than 150 modified fronds were seen, though never constituting a pure stand. Apparently its local abundance is a function of the relative ease with which this species reproduces itself. As was found to be the case with another highly fertile, rapidly-spreading species, *Onoclea sensibilis*, far more variant plants were found growing together than was the case with a slow-growing species such as *Polypodium virginianum* (see below).

POLYSTICHUM ACROSTICHOIDES forma **gymnosorum** Neidorf, f. nov.

Indusia nulla; sporangia paucissima, solitaria vel in soris summopere deminutis, submarginalia; pinnae fertiles vulgo contractae.

Indusia none, the sporangia few, solitary or borne in small submarginal sori; fertile pinnae normally contracted.

Type in U. S. National Herbarium, based on a single plant found August 14, 1938 and since repeatedly re-examined.

Indusia have never been observed at any stage during the development of the fertile fronds.

POLYSTICHUM ACROSTICHOIDES f. **ventroperaferens** Neidorf, f. nov.

A f. *Gravesii*[4] pera[5] reversa differt: pinnae mutatae

[4] See this JOURNAL, 37: 71. 1947, for photograph of modified pinna.

[5] Lit., bag or wallet, referring to the apical pocket or cup; appears in the British varietal name *peraferens* of *Phyllitis Scolopendrium*; see "The Book of British Ferns," by C. T. Druery, p. 84 (1901). This book is of interest in that it lists peraferent or excurrent variants of five British species. See also, "Ferns, Horned and Thorned," by C. T. Druery, British Fern Gazette 3: 28. 1915.

truncatae, apice cuspidatae, costis in spinis brevibus rectis excurrentibus, pera subterminali quam spinis plus minusve longiore in superficie ventrali ferentes; frondis rhachis et pinnarum auriculae paucae raro similiter mutatae.

Form with some of the pinnae (and also rarely the apex of the frond and some of the auricles of the pinnae) truncate (the costa being excurrent as a short, straight spine), and the leaf tissue enlarged to form a subterminal pocket on the ventral side. Forma *gravesii* Clute is similar but bears the pocket on the dorsal (i.e. spore-bearing) side.

Type in the U. S. National Herbarium, collected Sept. 2, 1936.

The form has been re-collected many times. An extremely intensive search over several years resulted in the discovery of some 50 plants of this variant and about the same number of f. *gravesii*. Most of these were very widely scattered and could not subsequently be re-located, but one small colony of f. *ventroperaferens* has been under observation since 1937 and a colony of f. *gravesii* since 1941. Amongst the hundreds of fronds examined not a single instance has been found of both types of variation occurring on the same plant nor of intermediates between the two nor even of separate plants of the two extremes growing near one another. On the basis of the relatively large number of specimens found it seems entirely possible that this variant may be not so much rare as easily overlooked. Certainly, in the writer's experience, it was found possible to locate it only as a result of the most determined and persistent search. Some three years ago the objective of the writer's field trips was changed and this variant was no longer made the object of special attention. As a direct result the number of specimens found dropped sharply.

POLYPODIUM VIRGINIANUM f. **peraferens** Neidorf, f. nov.

Pinnae paucae mutatae, truncatae, cuspidatae, costis in spinis brevibus terminalibus rectis excurrentibus, pera subterminali in superficie dorsali ferentes; frondis rhachis raro similiter mutata.

Form with some of the pinnae (and rarely also the apex of the frond) truncate and cuspidate (the costa being excurrent as a short, straight spine) and the leaf tissue enlarged to form a subterminal pocket on the dorsal side.

Type in the U. S. National Herbarium, collected Oct. 27, 1940.

The original station, where this form occurs scattered sparingly in a patch of otherwise normal polypody, has been revisited many times. Two other stations have been located since.

ONOCLEA SENSIBILIS f. **ventroperaferens** Neidorf, f. nov.

Frondis apex truncatus, rhache in spina terminali recta brevi excurrente, pera subterminali in superficie ventrali ferens; pinnae raro similiter mutatae.

Apex of the frond truncate, the rhachis excurrent as a small straight spine, bearing a subterminal pocket on the ventral side of the frond.

Type in the U. S. National Museum (a single frond), collected Aug. 24, 1941.

On September 7, 1941, a very large station, comprising scores of variant plants, was found about a half mile away and has been kept under observation since. Other scattered stations have also been located, indicating that the variant is well established and should be looked for elsewhere. One inconspicuous example of this variant is in the herbarium of the N. Y. Botanical Garden, collected Aug. 29, 1875, near Germantown, Pa., by Isaac C. Martindale. The "cup" in this variant is sometimes elaborately hypertrophied and lopsided, with the spine adnate to one side of the notch.

An Occurrence of Gametophytes of Equisetum in Cheboygan County, Michigan[1]

MARGARET FEIGLEY

While exploring a hardwoods area on Colonial Point on the shore of Burt Lake, Cheboygan County, Michigan, in July, 1948, numerous gametophytes of horsetail were found along the roadside. Since the reports of gametophytes of *Equisetum* growing under natural conditions are rather infrequent, another record of their occurrence should be of interest.

Matzke (1941) found gametophytes of *E. arvense* L. growing in an empty iron mine pit at Orehill, Connecticut. Of the habitat Mr. Matzke writes, "The slopes are fairly steep, but the width of the pit is so great that there is little shading of the bottom, except in early morning and late afternoon. Consequently the fine soil at the base becomes alternately inundated in wet weather and more or less baked, though never completely so, in dry periods, cracking into characteristic 'cakes.' It was on this substratum that hundreds of gametophytes were found several hundred yards distant from mature sporophytes." Miss Walker (1921, 1931, 1937) studied the gametophytes of several species, some of which were growing in the wild. Other fairly recent reports on the morphological detail of *Equisetum* gametophytes include those of Kashyap (1914), Campbell (1930), Goebel (1930), Eames (1936), and Smith (1938).

The Colonial Point Hardwoods represents a maple-beech forest climax area. It is only recently that the road shown in Figure 1 was cut through in connection with lumbering operations, and it was in this area that

[1] Contribution from the University of Michigan Biological Station. The writer wishes to thank Dr. Margaret Fulford for suggestions in preparing the manuscript.

the plants were found. Most of the gametophytes were growing on the compact soil of the vertical walls of the roadside ditch and on the new "shoulder" of the road (see Fig. 1 at X).

At the time of their discovery in July, the gametophytes were associated with numerous fern prothalli and young plants of the liverwort *Marchantia polymorpha.* Later in the summer, mosses and seedlings of higher plants were also present in the area in large numbers.

The *Equisetum* gametophytes formed bright green rosettes. These were rounded to oblong in outline, 3 to 10 mm. in longest diameter, and were irregularly lobed. Each gametophyte consisted of a flattened to cylindrical parenchymatous thallus densely covered with more or less fan-shaped branches which were usually curved in the upper part. The individual rosettes varied in height from 0.5 to 1.0 cm. and were anchored to the substratum by numerous unicellular rhizoids, which arose as outgrowths of superficial cells on the ventral surface. The upright branches (see Fig. 3) were from 1.5 to 2.5 mm. long and were densely packed together, so that the plant had a crisped ruffled appearance (see Fig. 2) not unlike that of *Anthoceros crispulus.* Archegonia were found between and at the base of these upright branches. There appeared to be no antheridia on the plants examined.

Many of the gametophytes bore one or more young sporophytes (see Fig. 2). These were obviously growing at the expense of the gametophyte, since the tissue of the latter was reduced in direct proportion to the number and vigor of the sporophytes upon it. In August one rosette was found which bore four sporophytes varying from 2.0 to 8.5 cm. in length. One of the largest of these had two branches, one at the first and one at the second node. The main axis consisted of 10 nodes and 9

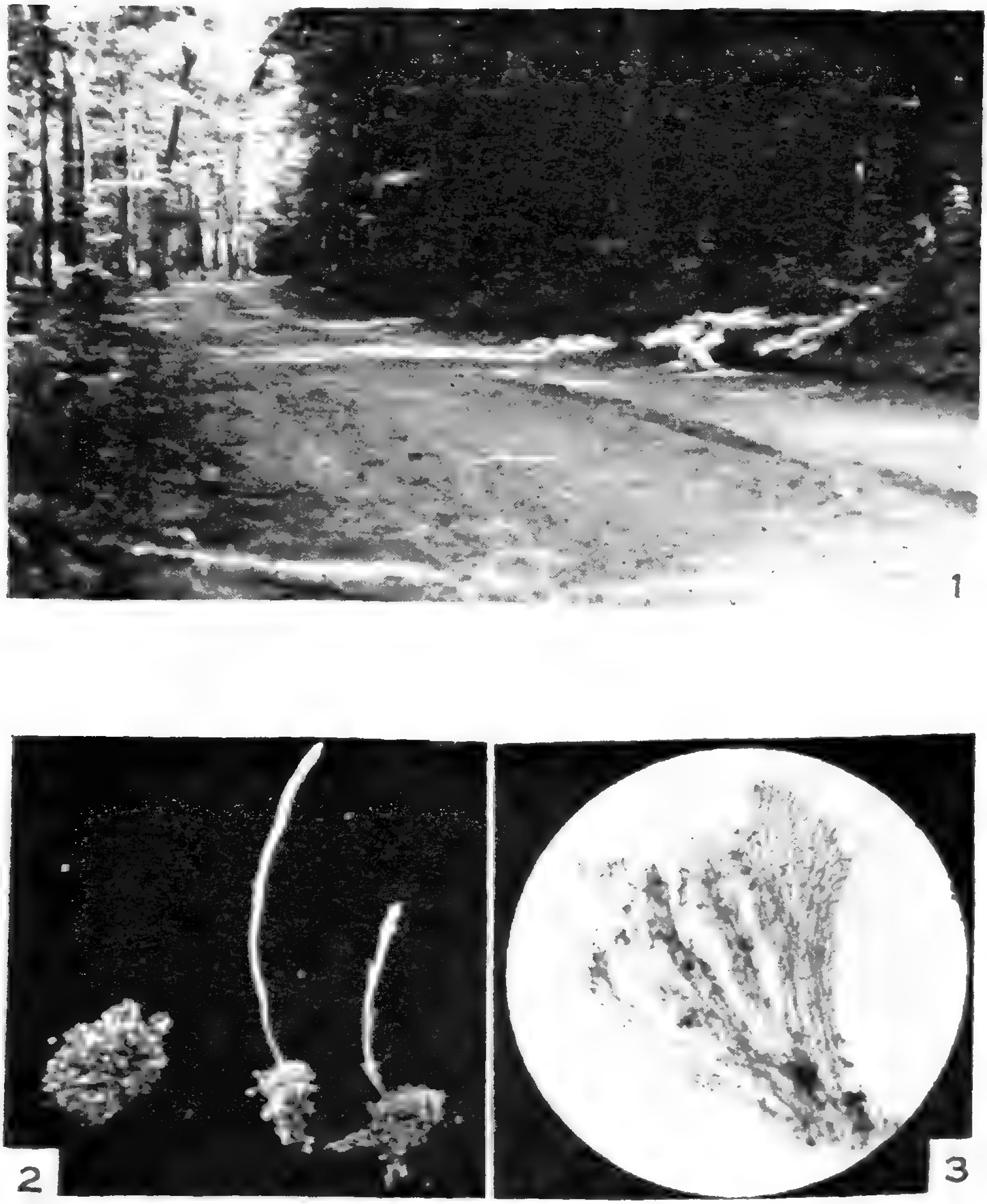

Fig. 1. Road recently cut through Maple-beech forest, Colonial Point, Cheboygan County, Michigan. X indicates ditch and bank where large numbers of gametophytes were found. Fig. 2. Gametophytes of *Equisetum* sp. Sporophytes have developed on two of them × 1.5. Fig. 3. Photomicrograph of an upright branch of an *Equisetum* gametophyte × 50.

internodes, the latter varying in length from 0.5 to 1.0 cm. The internodes were triangular in cross section and solid in the center. At each node there were three scale-like, triangular, appressed to erect-spreading leaves (see Fig. 2). The silica so characteristic of older *Equisetum* stems was already present in this young sporophyte.

Upon returning to the University of Michigan Biological Station in the summer of 1949, I visited the area where the gametophytes of *Equisetum* were found in the summer of 1948. Numerous sporophytes of *Equisetum scirpoides* were growing in the place where the gametophytes were found the previous summer. It can be assumed then that the gametophytes discussed in this paper were those of *Equisetum scirpoides.* Miss Walker (1937) reported gametophytes of *Equisetum scirpoides* from Reese's Bog at the north end of Burt Lake. Reese's Bog is about 2½ miles from the Colonial Point area.

LITERATURE CITED

Campbell, D. H. 1930. The Structure and Development of Mosses and Ferns. Third Edition. New York.

Eames, A. J. 1936. Morphology of Vascular Plants. Lower Groups. New York.

Goebel, K. 1930. Organographie der Pflanzen. Zweiter Teil, Bryophyten-Pteridophyten. Dritte Auflage. Jena.

Kashyap, S. R. 1914. The Structure and Development of the Prothallus of *Equisetum debile* Roxb. Ann. Bot. **28**: 163–181.

Matzke, E. B. 1941. Gametophytes of *Equisetum arvense* L. Torreya **41**: 181–187.

Smith, G. M. 1938. Cryptogamic Botany, Vol. 2. New York.

Walker, E. R. 1921. The Gametophytes of *Equisetum laevigatum.* Bot. Gaz. **71**: 378–391.

————. 1931. The Gametophytes of three Species of *Equisetum.* Bot. Gaz. **92**: 1–22.

————. 1937. The Gametophyte of *Equisetum scirpoides.* Amer. Journ. Bot. **24**: 40–43.

WINNETKA, ILLINOIS

Isoëtes riparia and Its Variants[1]

GEORGE R. PROCTOR

The genus *Isoëtes* has long presented systematists with some difficult problems. Because of the morphological simplicity of the plants (apparently a derived rather than a primitive condition[2]) and the lack of constant and striking differences in outward form from species to species, taxonomic differentiation has, perforce, been based primarily on the configuration of the gynospore walls. Correlations of other characters have been mostly unsuccessful. An additional difficulty is that collections from many regions have been scanty, likely due to the inconspicuousness of the plants rather than to their rarity. In few parts of the world have the quillworts been more intensively collected and studied than in the northeastern United States; yet even here many entities remain poorly understood. With this in mind, the present attempt is made to reorganize the taxonomy of the *Isoëtes riparia* complex, so as to bring out more clearly the natural relationships involved.

Isoëtes riparia and its apparent relatives are usually included in the somewhat arbitrary and artificial section *Cristatae*, characterized by crested rather than tuberculate, spiny, or reticulate gynospore-prominences. Within the section, sub-groups cannot be clearly differentiated, as there are exceptions to most separating criteria. Generally speaking, the *I. riparia* complex can be distinguished by the plants each having 2 corm-lobes (exception: *I. riparia* var. *amesii*); by an amphibious habitat with accompanying constant presence of stomata, which

1 The writing of this article was stimulated by observations in the summer of 1947, during the course of field-work made possible by a grant from the American Philosophical Society. Also, I am very grateful to Mr. C. V. Morton for valuable advice and suggestions.

2 See Stewart, Amer. Journ. Bot. 34(6): 315–325. 1947.

are usually numerous; by the absence of peripheral vascular strands in the leaves (exception: *I. riparia* "var. *canadensis*"); by granular to jagged gynospore-prominences that are not clearly reticulate (exception: *I. riparia* var. *reticulata*) or meandriform; and by a narrow velum that ordinarily covers ⅓ of the sporangium or less. The members of this somewhat ill-defined and rather diverse group are confined to the northeastern United States and adjacent Canada, where they most often occur along the muddy, sandy, or gravelly borders of streams and fresh-water estuaries, or of ponds subject to rather wide fluctuations of water-level. Several of the variants have been described as separate species, but the present writer, after considerable experience with them, both in the field and in the herbarium, has arrived at the conclusion that but one polymorphic species is involved.

Isoëtes riparia Engelm. was first described by A. Braun[3] in 1846 from the tidal shore of the Delaware River near Philadelphia, and in subsequent years was collected in large quantities not only at various points along the lower Delaware to Wilmington (where now extinct), but allegedly northward at scattered riparian and lacustrine localities as far as northern New England and perhaps Canada. It is apparently quite distinct from the strictly northern European *I. lacustris* L. (the type species of the genus), with which it was once confused.

In 1867, Engelmann[4] described *Isoëtes saccharata* from river shores near Salisbury, Maryland (where it has since been all but exterminated by water pollution), and plants accounted this have been collected at many places within the Chesapeake Bay drainage system, usually along fresh-water shores affected by tides. It has long been observed to intergrade with *I. riparia*, but has

[3] Flora 29: 178. 1846.
[4] In A. Gray, Man. ed. 5, 676. 1867.

nearly always been formally maintained as a separate species on the basis of geographical discontinuity. In exception to this practice, Broun[5] reduces it to complete synonymy under *I. riparia*—not, however, a satisfactory solution to the problem.

In 1882, Engelmann somewhat diffidently proposed an *Isoëtes riparia* var. *canadensis*,[6] based on material from Maine and Canada, and differing from typical *riparia* by having less abundant stomata, by the presence of two ("weak") marginal vascular strands (which he called "bast-bundles"), and by other rather minor characters. His treatment does not, however, constitute a valid description for nomenclatural purposes.[7] Validation apparently must be credited to Pfeiffer in 1922.[8]

A. A. Eaton described *Isoëtes dodgei*[9] in 1898, based on material similar to Engelmann's *I. riparia* var. *canadensis*. This fact he recognized in 1901, when he renamed the entity at species rank as *I. canadensis*.[10] Some recent authors, notably Wherry, have preferred to maintain this as a species, *I. dodgei*; however, too many variations toward typical *I. riparia* occur to justify such a course, despite the undoubted distinctness of the extremes and the plausibility of arguments based on supposed habitat differences. If such habitat differences really exist, may these not be at least partly the cause of the morphological variation? And since the morpho-

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[5] Index to N. Am. Ferns 103. 1938.

[6] Trans. St. Louis Acad. Sci. 4: 383. 1882.

[7] Engelmann's description is: "Farther northward, in Maine, J. W. Chickering, and in Canada West, Crow River, Hastings Co., J. Macoun (here in running water with *Brasenia* and *Potamogeton*), a form occurs with very few stomata on leaves and apparently two weak bast-bundles, an upper and a lower one, very pale spots on the sporangia and smoothish microspores. This might be designated as var. *Canadensis* but too little is known about it as yet to form a definite opinion." Inasmuch as Engelmann did not definitely accept the variety it is not validly published (International Rules, Article 37).

[8] Ann. Mo. Bot. Gard. 9: 184. 1922.

[9] Fern Bull. 6: 6. 1898.

[10] Proc. U. S. Nat. Mus. 23: 650. 1901.

logical criteria are not consistent, and fail to coincide with ecological and distributional differences, the case for specific separation seems very weak.

Eaton, one of the most observant and persevering of all *Isoëtes* students, in 1901 added *I. saccharata* vars. *palmeri* and *reticulata*[11] from Maryland and Virginia, respectively, remarking that both varieties had the "aspect" of *I. riparia* rather than that of *I. saccharata*. In 1903[12] he described *I. saccharata* var. *amesii* from eastern Massachusetts, Connecticut and New York. This he later raised to specific rank,[13] but confused the issue by listing *I. riparia* var. *canadensis* and *I. dodgei* as synonyms. Vars. *palmeri* and *reticulata* were later reduced to synonymy under *I. saccharata* by Pfeiffer in her Monograph of the Isoëtaceae,[14] var. *amesii* being overlooked in that publication; and all three of them were placed under *I. riparia* by Broun (l.c.).

The case of *Isoëtes saccharata* var. *amesii*, usually submerged in the synonymy of *I. riparia*, needs looking into. Here is an entity whose distinctness seems too often to have been minimized, yet it appears to be as fully entitled to recognition as *I. riparia* var. *canadensis*, with which it was later associated by Eaton. The two are entirely unlike in gynospore characters, and var. *amesii* exhibits an unusual vegetative distinction in the multiple lobing of the "corm." In all the other phases of *I. riparia* the condition of 2 corm-lobes remains constant, and, considering the genus as a whole, represents a conservative morphological character of considerable reliability. Unfortunately, I have been able to examine of this entity only a sheet of the type collection and a few plants collected by myself near North Easton, Mass.; but, if Eaton is correct in attributing it to a number of

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[11] Steele, Proc. Biol. Soc. Wash. 14: 49. 1901.
[12] Rhodora 5: 278. 1903.
[13] Fern Bull. 11: 103. 1903.
[14] Ann. Mo. Bot. Gard. 9: 179. 1922.

localities from Massachusetts to New York, I see no reason why it should not provisionally enjoy equal status with the other major variants of the *I. riparia* group. It seems to grade into *I. saccharata,* but further collections are needed in order to clarify its relationships.

Eaton also named *Isoëtes canadensis* var. *robbinsii,*[15] which after various vicissitudes was reduced to synonymy under *I. riparia* var. *canadenis.*[16] It seems to represent a transitional form between var. *canadensis* and typical *riparia,* and thus supports the argument against the specific separation of these two entities. When he described var. *robbinsii,* Eaton believed that typical *riparia* did not occur in New England, but Pfeiffer, on the basis of more abundant collections, cites many specimens of it from that region.

Still another supposed entity described by Eaton in 1903[17] was that which he called *Isoëtes foveolata* var. *plenospora.* The plants upon which he based his description came from several ponds in east-central Massachusetts, the first-listed being Ames Pond near North Easton. Examination of isotype material from this locality, deposited at the National Herbarium (sheet no. 510831), shows that these plants belong in part, at least, to the *I. riparia* complex as understood by the present writer, with most gynospore configurations not even slightly resembling those of true *I. foveolata.* Eaton apparently based his determination mostly on the reddish color of the leaves, and their tendency toward fleshiness. Such characters, however, are very unreliable. It is interesting to note, incidentally, that Ames Pond is also the type locality for *I. saccharata* var. *amesii,* and that some of the smaller gynospores of "*I. foveolata* var. *plenospora*" resemble those of the former. The largest, best-

[15] Rhodora 5: 279. 1903.
[16] Pfeiffer l.c. 184.
[17] Rhodora 5: 280. 1903.

developed gynospores of "var. *plenospora*" seem to me fairly representative of *I. riparia*, and accordingly I am placing Eaton's name in the synonymy of that entity. Actually, his type material is rather diverse, and seems to include plants transitional toward *I. tuckermani* A. Br., if not actually referable to that species.

After the untimely death of Eaton, little study of our eastern quillworts was done until Pfeiffer prepared her Monograph (1922), which considered the family on a world-wide basis. It is interesting to note that she treated the puzzling *Isoëtes riparia* group essentially as Engelmann had 40 years previously—as if the important field observations of Dodge, Eaton, and Palmer had never been made. Let us see if such a position is tenable today.

According to Pfeiffer, the significant differences within the group, as brought out by her key, are as follows:

Megaspores[18] with very crowded prominences, leaves 8–25. *I. saccharata*
Megaspores with less densely crowded prominences, leaves 10–75.
  Smaller form, leaves 10–30, 9–30 cm. long .... *I. riparia*
  Larger form, leaves 15–75, 10–45 cm. long .... var. *canadensis*

Although Pfeiffer's experience with these plants seems to have been mostly limited to dried herbarium material, actually not much was lost thereby. I have found that, generally speaking, the various species of *Isoëtes* in the northeastern United States vary so much in growth-form according to season and habitat, that it is usually extremely difficult to recognize them consistently by field characters (so much stressed by Eaton), though some species can often be guessed at with fair success. In the last analysis, it seems primarily to be the gynospore sculpture that counts, and this can be observed accurately only when the spores are dry. On the whole, therefore, Pfeiffer's treatment is probably sounder than the extreme "splitting" of Eaton, though some of the

[18] Term used by Pfeiffer in preference to gynospore.

latter's entities may deserve more recognition than has been accorded them.

One is, of course, faced with the question of how many named entities to recognize in a variable complex, no two specimens of which are exactly alike. It must be kept in mind that the descriptions of the major variants refer to the bulk of the material, but that many puzzling specimens exist, which, although recognizable as more closely related to this group than to another, nevertheless fail (alas!) to conform well to any of the various man-made categories. I feel that such forms (even if they should prove ephemeral) deserve some sort of nomenclatural recognition, because their burial in synonymy tends to obscure the details of variability in the group. In *Isoëtes* the problem is made especially difficult by the fact that the physiological relationships between these plants and their environment are not well known, and the lack of genetic study leaves us uncertain as to what constitutes inherited variation as distinguished from merely somatic response to particular (and perhaps changing) environments. It is better, therefore, to recognize by name (at least as *formae*) as many variants as possible. These "labels of convenience" may later form the basis for experimental work, and eventually the really useless ones can be weeded out and forgotten.

To return to our immediate subject, the separation of *Isoëtes riparia* and *I. saccharata* (hitherto nearly always maintained as distinct species) poses a more difficult problem than one might think. A casual glance at Pfeiffer's key indicates a certain amount of overlapping, but does not bring out the actual fact of almost complete intergradation. She has elsewhere emphasized (and other recent botanists appear to have concurred) that in such "pairs of species" absolute separation on the basis of spore or other morphological characters is difficult, and suggests that geographical criteria might have to be the deciding factor in questionable instances. Such an arbitrary distinction, however, is unsatisfactory in the present case. Roughly speaking, *I. saccharata* is characteristic of the Chesapeake Bay drainage system, *I. riparia* reaches (or did reach, before the days of excessive stream pollution) its best development in the Delaware River estuary, while var. *canadensis* seems to prefer a colder climate, being mainly native to New England, although sporadic in occurrence. But I have seen both Chesapeake and New England material that can only be *riparia,* good Delaware River material of *saccharata* (see especially *Proctor* 3113), and New England specimens that strongly suggest this entity (*Proctor & Knowlton* 3555), while var. *canadensis* is (or was) certainly found in the upper and middle Delaware, though apparently not in the Chesapeake region. Intergrades and puzzling forms (perhaps due to immaturity[19]) are frequently found, distinct though the extremes may appear. Accordingly, these three entities, together with var. *amesii* (already discussed), seem best treated as geographic varieties of one polymorphic species. It is worth noting that (except for var. *amesii*) A. A. Eaton apparently came to the same conclusion (as reported by Poyser[20]) but his untimely death in 1908, at the age of 43, prevented him from expressing this view in print.[21]

Incidentally, I am unable to concur in the identifica-

[19] Size of plant apparently has little to do with spore maturity, at least in this group. I have seen very large robust plants in early fall, filled with obviously juvenile gynospores, or with some spores of a puzzlingly transitional nature, the rest being typical. At the same time and place will often be much smaller plants with perfectly mature gynospores. It appears that several years are required to produce a mature plant from a sporeling.

[20] Fern Bull. 15: 18. 1907.

[21] His treatment in the 7th edition of Gray's Manual, 1908, followed his earlier conception of the group.

tion by Eaton of certain material from Delair, New Jersey,[22] as *Isoëtes saccharata* (Poyser, l.c.). The gynospores of these plants correspond closely to those of *I. saccharata* var. *reticulata* A. A. Eaton, described from Hunting Creek and adjacent waterways near Washington, D. C. Until recently, such material had seemed to me best treated as an immature stage of typical *I. riparia,* a viewpoint apparently supported by my finding gynospores with the rather thread-like reticulations of this form mixed with more typical *riparia* gynospores in the same sporangium, together with intermediate stages, in plants collected at Havre de Grace, Maryland (*Proctor* 3054). However, Mr. C. V. Morton of the National Herbarium has brought to my attention a series of specimens from the upper Potomac estuary, in which the spore characters of var. *reticulata* hold with reliable constancy. It would appear, then, that a fifth geographic variation of *I. riparia* must be recognized, representing essentially the most southwesterly phase of the complex, with sporadic specimens occurring northeastward as far as the lower Delaware. Like other members of the group, it is not a clear-cut entity, grading in some cases into both *I. saccharata* and typical *I. riparia.* Indeed, I have seen reasonably good *saccharata* material from the type locality of var. *reticulata.*

If the *Isoëtes riparia* complex is considered to consist of 5 geographic varieties of one variable species, in the rearrangement of available names, certain unfortunate nomenclatural changes are made necessary by the International Rules. The southwesternmost entity remains var. *reticulata,* but the other major southerly variety, which consists of a major and a minor phase only for-

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[22] *Isoëtes* plants were once abundant on the tidal shores of the Delaware River at Delair, above Camden, but recent search indicates that extreme water pollution has completely wiped them out at this locality. The lowest point on the Delaware where such plants still persist appears to be the Bucks County (Pa.) shore about one mile north of the Philadelphia line.

mally distinct from each other, must suffer a reversal of status, because of the rule that the earliest name in any given category must be adopted. The minor phase, formerly *I. saccharata* var. *palmeri* becomes *I. riparia* var. *palmeri,* while the major variant known heretofore as *I. saccharata* becomes *I riparia palmeri* f. *saccharata.* Likewise, since the name *canadensis* in varietal status was not validated until 1922, this entity becomes a form of var. *robbinsii* (1903). Besides the typical phase of *I. riparia*, then, the other four geographical variants must be called respectively vars. *reticulata, palmeri, amesii*, and *robbinsii.* The nomenclature of the whole complex may be summarized as follows:

ISOËTES RIPARIA Engelm. in A. Br., Flora **29**: 178. 1846.[23]
- *Calamaria riparia* (Engelm.) Kuntze, Rev. Gen. Pl. **2**: 828. 1891–93.
- *I. foveolata* var. *plenospora* A. A. Eaton, Rhodora **5**: 280. 1903, in part.

Var. **reticulata** (A. A. Eaton) Proctor, comb. nov.
- *I. saccharata* var. *reticulata* A. A. Eaton in Steele, Proc. Biol. Soc. Wash. **14**: 49. 1901.

Var. **palmeri** (A. A. Eaton) Proctor, comb. nov.
- *I. saccharata* var. *palmeri* A. A. Eaton in Steele, l. c.

Forma **saccharata** (Engelm.) Proctor, comb. nov.
- *I. saccharata* Engelm. in Gray, Man. ed. 5, 676. 1867.
- *Calamaria saccharata* (Engelm.) Kuntze, Rev. Gen. Pl. **2**: 828. 1891–93.

Var. **amesii** (A. A. Eaton) Proctor, comb. nov.
- *I. saccharata* var. *amesii* A. A. Eaton, Rhodora **5**: 278. 1903.
- *I. amesii* A. A. Eaton, Fern Bull. **11**: 103. 1903.

Var. **robbinsii** (A. A. Eaton) Proctor, comb. nov.
- *I. canadensis* var. *robbinsii* A. A. Eaton, Rhodora **5**: 279. 1903.
- *I. dodgei* var. *robbinsii* A. A. Eaton, Rhodora **10**: 42. 1908.

Forma **canadensis** (Engelm. ex Pfeiffer) Proctor, comb. nov.
- *I. dodgei* A. A. Eaton, Fern Bull. **6**: 6. 1898.
- *I. canadensis* A. A. Eaton in Maxon, Proc. U. S. Nat. Mus. **23**: 650. 1901.
- *I. riparia* var. *canadensis* Engelm. ex Pfeiffer, Ann. Mo. Bot. Gard. **9**: 184. 1922.

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[23] The typical phase may be called var. *riparia* or var. *typica,* but preferably without varietal author-citation.

TABULATION OF THE MORPHOLOGY AND ECOLOGY OF THE MAJOR VARIANTS OF ISOETES RIPARIA

CHARACTER or condition	Var. RETICULATA	Var. PALMERI f. saccharata	Var. AMESII	Var. TYPICA	Var. ROBBINSII f. canadensis
Gynospore size:	400-450 u	400-520 u	420-600 u	440-660 u	440-650 u
Gynospore sculpture:	Very smooth, with low, threadlike reticulations, these sometimes tending to be slightly disjunct so as to form obscure crests or granules.	Distinctly granular, mostly crowded (though sometimes rather sparse) prominences, sometimes produced into short crests near commissural ridges.	Distinctly granular, mostly very crowded prominences, so close as to give the effect of fine reticulations in places.	Rather jagged crests forming irregular discontinuous ridges and occasional partial reticulations.	Jagged crests, rather disjunct, sometimes forming short separated ridges, the spore surface between often being very smooth.
Androspore size:		23-29 u	28-32 u	25-33 u	27-37 u
Androspore sculpture:	Smooth	Almost smooth or finely granular	Finely granular	Tuberculate	Rough to spinulose
Corm lobes:	2	2	2-5	2	2
Leaf habit:	Spreading or slightly recurved	Most often recurved, though sometimes straight	Erect to spreading or strongly recurved	Usually straight, rather rigid	Straight or twisted, or long and flexuous
Leaf number:	6-22	8-30	10-30	10-30	15-100
Leaf length:	7-17 cm.	6-18 cm.	8-30 cm.	9-30 cm.	10-45 cm.
Peripheral vascular strands:	0	0	0	0	2-4
Stomata:	Numerous	Numerous	Numerous or few	Numerous	Numerous
Velum:	Narrow	Narrow	Narrow	Narrow	Narrow
Habitat:	Gravelly or muddy freshwater tidal shores	Gravelly or muddy freshwater tidal shores	Gravelly or muddy shores of non-tidal freshwater ponds and streams	Gravelly or muddy freshwater shores, most often tidal	Gravelly or muddy freshwater shores, usually non-tidal

KEY TO THE MAJOR VARIANTS OF ISOËTES RIPARIA

A. Gynospores with low, rather thread-like reticulations, otherwise quite smooth; best developed in southwestern Chesapeake Bay estuaries .... *I. riparia reticulata*

A. Gynospores not clearly or smoothly reticulate, the prominences variously irregular, disjunct, crestlike, or granular .... *B.*

B. Prominences mostly disjunct but tending to be low and crowded, presenting a rather granular appearance; leaves 8–25 .... *C.*

C. Corm uniformly 2-lobed; gynospores 400–520 μ; primarily found along tidal fresh-water estuaries of Chesapeake Bay.
I. riparia palmeri f. *saccharata*
(Var. *palmeri* itself is actually a minor variant of this more widespread form, and may be distinguished from it chiefly by its stouter, fleshier leaves and taller, slightly more crowded gynospore prominences; grading into typical *I. riparia*).

C. Corm 2–5-lobed; gynospores often larger, 420–600 μ; plant of ponds and streams, not tidal, Massachusetts to New York (?).
I. riparia amesii

B. Prominences larger and less densely crowded, more jagged and sometimes relatively sparse, tending to form short irregular crests or partial reticulations; leaves 10–100 .... *D.*

D. Gynospore crests tending to be irregularly and raggedly confluent; leaves 10–30, 9–30 cm. long.
I. riparia typica

D. Gynospore crests tending to be very disjunct, the spore surface between often being noticeably smooth; leaves 15–100, 10–45 cm. long.
I. riparia robbinsii f. *canadensis*
(Var. *robbinsii* itself is a minor variant of the above, grading into var. *typica* in gynospore sculpture, and characterized by its rigid habit, "broader velum", etc.)

NEW CASTLE, DELAWARE.

Shorter Notes

HABITATS OF CLIMBING FERN IN WEST VIRGINIA.—Until recent years the climbing fern, *Lygodium palmatum,* was regarded as a rare and local plant in West Virginia. Of late, however, the discoveries of Miss Thacker, Legg, Elliott, Tetrick, and the writer have shown that the species is much more common, and more widely distributed, than was formerly supposed. We now have records from Preston, Upshur, Webster, Nicholas and Greenbrier Counties, all in the Allegheny Plateau region.

Wherry (*Guide to Eastern Ferns,* p. 43) gives the habitat of *Lygodium palmatum* as "wet sphagnous thickets, moist open woods, and springy banks; soil intensely acid". The Greenbrier County station for this plant, the first one I examined in Upshur County, and the Nicholas County stations found by Legg are all in moist open woods or on moist banks, thus corresponding to Wherry's requirements. Others which have been found, however, depart widely from the conditions which Wherry regards as essential.

A station found in Upshur County by Miss Thacker was near the top of a high hill in an exceedingly dry open field. There was a wooded border some 75 yards away, but the *Lygodium* was growing in a situation with no hint of any spring or seep nearby. Plants were twining through a colony of *Dennstaedtia punctilobula.* Surrounding vegetation consisted of poverty grass (*Danthonia spicata*), broomsedge (*Andropogon virginicus*), and blackberry (*Rubus*), a typical plant cover of poor, dry, acid hillsides.

Another Upshur County station, reported by Tetrick, is in a similar situation. The Webster County station (since destroyed) was on comparatively level land, but in a dry, open location. Elliott's Preston County station is on the steep slope of a hill. It is shaded somewhat by low trees, but the plants are growing in the open, with no moisture nearby. Here too, the climbing ferns are twining over *Dennstaedtia.*

Abundant summer rainfall, which is characteristic of the higher Allegheny Plateau in West Virginia, may partially explain the presence of *Lygodium* in open, hillside situations. With a wider variety of habitats in which to look for the plant, it may be expected that many more stations will be discovered.—MAURICE BROOKS, *West Virginia University, Morgantown, W. Va.*

HORSETAIL AND HORSES AGAIN.—On page 59, volume 39 of the Journal there is a short note: "Horsetail: Bad For Horses." The statement is made there, which is usually made, that its effect on the intestines of horses is abrasive or scouring.

There is another reason for its injurious effect which is pointed out in Circular No. 74, Dominion Experimental Farms, Ottawa, Canada. According to this circular, the horsetail contains an alkaloid which is definitely poisonous and results in the death of animals, particularly horses. Cattle, sheep, and hogs are not subject to harm.

We have had a little experience with this action on horses in the Homer area on the Kenai Peninsula. Several horses have died there and we have very good reason to believe they were poisoned eating horsetail along with their hay. I saw some of the hay which had been put up for feed and it consisted quite appreciably of horsetail. In its dried condition it is considered more injurious than if eaten green.

Members of the Fern Society may be interested in knowing that the evil effects of horsetail are due not entirely to its scouring action, but due also to the alkaloid which it contains.—G. W. GASSER, *Commissioner, Alaska Department of Agriculture.*

DRYOPTERIS SETIGERA IN ALABAMA.—On October 3, 1948, *Dryopteris setigera* was discovered growing in Conecuh County, one mile south of Evergreen. It grows in an open *Pinus taeda-Liquidambar* woodland on damp, sandy soil along the edge of a small stream. Two colonies of the species have been found approximately 75 feet apart. One colony covers an area of about 30 square feet and the other occupies approximately five square feet. Further search for the fern has not led to its discovery in neighboring localities. It is growing among several other species of ferns: *Polystichum acrostichoides, Thelypteris normalis, Athyrium asplenioides,* and *Woodwardia virginica.*

This fern is an old world tropical species and is known in the United States only from several countries in central Florida. Most botanists believe it to be naturalized in these localities.

The writer is indebted to Dr. Donovan S. Correll for the identification of the specimens. Dr. Correll is inserting these specimens in the National Arboretum Herbarium and there are also several preserved specimens at the University of Alabama.—LLOYD C. CRAWFORD, *University of Alabama.*

A NEW RESPONSIBILITY PLACED ON FERNS.—One of the major fields of speculation has long been concerned with the problem of accounting for the complete disappearance of the dinosaurs and the other giant reptiles that flourished during the Mesozoic period. All sorts of suggestions have been made, including changes in climate, development of mammals that ate the dinosaurs' eggs, and so forth. Still a different suggestion[1] brings ferns into the picture:

"It has been suggested, interestingly if rather speculatively, that another reason for the extinction of the

[1] Ernest Baldwin. Introduction to comparative biochemistry. Cambridge.

reptiles was that the ferns which had previously been the dominant form of plant life were being replaced by flowering plants, thanks largely to the fertilizing activities of the insects which began to be abundant about the same time. This then meant a change in reptilian diet which, when one remembers the purgative action of fern oils, may be thought to have caused many of the animals to die of constipation."—R. C. Benedict, *Brooklyn College.*

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Miss Muriel Hegwood, School of Biology, University of Virgina, Charlottesville, Va., would appreciate receiving plants or viable spores of *Asplenium montanum.*

Index to Volume 39

ERRATUM

Page 22, line 9 from bottom: For 57, read 67.