The Brink of Extinction

According to "The Bermuda Jubilee Garden" published by the Garden Club of Bermuda in 1971, the endemic fern Diplazium laffanianum, or Governor Laffan’s fern, was last found in Walsingham about 1900, "probably extinct."

I would like to report that Diplazium laffanianum is happily sending up tall fertile fronds from healthy plants in my little greenhouse (in Westboro, MA), although temperatures run as low as 45° in winter.

The spores, gathered from one surviving plant at the Bermuda Botanical Gardens, were planted in 1974. While the sporophytes were growing in my humidity cabinets, the pinnae often had black streaks through the tips and I was fearful the plants would not survive.

Now I anticipate gathering spores as those fertile fronds mature, and hope to produce more sporings. Spores will be sent to the American Fern Society’s spore exchange. What I would best to do is to carry spores back to Bermuda and help restore the species to its own ecological niche.—Virginia Otto

Pine Barrens Revisited

In an American Fern Journal of fifty years ago our Browsing Department stumbled across this account of an APS annual foray (AFJ 22:28-30. 1932). To those who went to the Pine Barrens under Jim Montgomery’s leadership last year it may have déjà vu overtones.

BROWN’S MILLS, N.J., OUTING, SEPTEMBER 25 to 27, 1931
Leaders: Mr. and Mrs. Wm. Cavin Taylor

"Eighty-eight members and friends of the American Fern Society attended this meeting at Brown’s Mills, New Jersey, in which the Torrey Botanical Club of New York and the Philadelphia Botanical Club participated. Friday evening was given over to social contacts and informal discussion. Saturday was spent in the field, visits being made to several widely separated stations, including West Plains, Keats, Atson, and Hanover Furnace. The characteristic landscape features were a new experience to many of the party. In the evening we listened to lectures by Raymond N. Torrey, on "The Relation of the Flora of New Jersey Pine Barrens to the Geological History of the Region"; Dr. Edgar T. Wherry on "Soil Characteristics Affecting Pine Barren Flora"; A. Tennyson Neals on "Mosses of the Pine Barrens"; Dr. W. A. Thomas on "Mushrooms of the Pine Barrens"; and Dr. W. A. Chrysalis on "Characteristic Flora of the Pine Barrens" with lantern illustrations made by natural color photography. On Sunday we visited the gardens of Miss Elizabeth White, at Whitehouse. Miss White has a very comprehensive collection of plants of the region, growing as they are found in their natural surroundings. She also had some fine specimens of the rare tree, Frankinia, in bloom, and cranberries and blueberries of many species under cultivation. Perhaps the most interesting flower found on the trip was the Pine Barrens Gentian, Gentiana Porphyra. Other interesting plants in bloom were the Orange Kilkwort, Polygala Longifolia; Golden Aster, Chrysopsis mariana; Small White Water Lily, Castalia odorata variety minor; Goat’s Russ, Crassus virginiana; Ladies’ Treasures, Cycomachus, and Pickerings Morning Glory, Browning pickeringii. Conrad’s Crowberry, Corina condialis; Turkey-beard, Xerophyllum asperfabricoides; Beach Heather, Hudsonia tomentosa; and Pumic, Puxinander barbulae, were among the interesting flowering plants which were found but not in bloom. The ferns deserving of special mention were the two chain ferns, Woodwardia virginica and Woodwardia areolata; the Massachusetts Fern, Aspidium simulatum; the Climbing Fern, Lygodium palmatum; and the very rare and elusive Curly Grass, Schizaea pusilla. Excellent stands of these ferns were found."

The discovery of Lygodium palmatum back then points up the increasing lack of success that the species is having in its struggle to survive — and we wonder if Miss White’s Frankinia trees are still in existence.—BNP

Looks at Books


For the amateur who wants to know about ferns and fern allies (Pteridophytes), this is an excellent source. The author characterizes the group and contrasts it with other groups. He then discusses the subgroups in an easily understood manner while gently introducing the reader to fern terminology, or "Pernese." Chapters are devoted to evolution and naming and classification. One interesting section discusses folklore and legend involving ferns. Propagation and both indoor and outdoor cultivation are discussed. Another chapter is devoted to fern crafts, the making of attractive and useful objects using ferns. Though the book does not enable one to identify the individual kinds of ferns, it does describe and illustrate the common genera found in the northeastern United States. One chapter, though interesting and informative, discusses the sources of energy and is but tenuously relevant to ferns.

The book is lavishly illustrated with attractive and accurate drawings by Edgar M. Paulson and a glossary and bibliography are included. The information is conveyed in a clear, interesting and often amusing manner.—Donald G. Swuletterton, Longwood Gardens, Kennett Square, PA
Fern Chemistry: An Introduction
by P. Mick Richardson, N.Y. Botanical Garden.

The chemistry of ferns is important to man for both economic and scientific reasons, and both will be briefly discussed here.

Economically, ferns are used as food (mainly as delicacies), wound dressings and vermifuges. Fiddleheads of several fern species, especially bracken and the ostrich fern, are considered delicacies and may be consumed in large amounts at certain times of the year, or even canned for year-round consumption. However, bracken contains carcinogens (chemical substances which cause cancer) and perhaps the fiddleheads should be consumed with caution.

Since time immemorial, fern extracts have been used in the treatment of open wounds and skin ailments. The compounds responsible for this healing and cleansing action have not been fully characterized, but it may very well be that the compounds are of a phenolic nature, related to phenol or carboxylic acid, a well-known early disinfectant. Another action known since ancient times is due to the irritation of the rhizomatous (vernifugal) action of Dryopteris extracts. These extracts are still used in some areas of the world, as indicated by their appearance in recent pharmacopoeas. Various intestinal worms, e.g., tapeworms, will not continue to survive in several parts of the world for many years to come, and it is fortunate that Dryopteris is such a widespread genus. The active ingredients in the Dryopteris extracts are a group of compounds known as acetylphloroglucinols (=6-sulfo-6-glucinol). The compounds occur in glands in the rhizomes and stem bases, and are used in the form of either powdered rhizomes (Rhizoma filicis or Radix filicis margin) or crude extracts (Extraitum filicis asthenum). The use of these compounds is not without its dangers, due to their widespread toxicity, but it may be worth the risk in order to remove a tapeworm. Acetylphloroglucinols also occur in some genera closely related to Dryopteris, such as Asplenium, Polystichum, Arachnoides, and Agrospernum. They are absent in some species of ferns which used to be placed in Dryopteris but are now placed in the genus Adiantum. A transfer supported by the absence of acetylphloroglucinols.

This brings me to the second half of this introductory paper - the use of chemistry in fern taxonomy. Perhaps the most useful compounds for taxonomic purposes are another group of phenolic compounds called flavonoids. Flavonoids are a large group of compounds that include the anthocyanin pigments, flavonoids and colorless vacuolar pigments.

We are all familiar with the red coloring of young fronds of Adiantum Osmunda, Pteris and Blechnum. These attractive colors are due to the presence of a group of flavonoids known as anthocyanins. Anthocyanins are the pigments responsible for the red colors in most plants, but those which occur in the ferns are of a slightly unusual kind, the 3-deoxyanthocyanins. These unusual anthocyanins also occur in the mimosas and occasionally in some flowering plants, such as geraniums. The occurrence of anthocyanins in large amounts in young fronds is known as 'juvenile pigmentation' and may be involved with the metabolism of the actively growing plant.

Most of us are also familiar with the 'farina' or farinose deposits of ferns in the genera Pityrogramma, Cheilanthes, and Botrychium. These yellow or white deposits on the lower surface of the fronds were first thought to consist of wax but they are actually composed of flavonoid compounds which are secreted by special glands. They also occur in some species of Adiantum, Dryopteris, Asplenium, Dryopteris, and Pteris, and in the soil of forests. The occurrence of farina is constant within a particular species and the flavonoid composition of a particular farina is also constant. This indicates that production of these compounds is under genetic control and we must assume that they have a necessary function in the life history of the fern in which they occur. The true function is unknown but several possibilities have been suggested: protecting the spores from water damage, reduction in water loss from the fronds, detering insect predation and preventing bacterial or fungal attack of the spores and the fronds.

However, most of the flavonoids which occur in ferns are invisible to the naked eye. They occur inside the individual cells as colorless pigments in the cell sap. It is these compounds which are of most interest to the taxonomist who wishes to use chemistry to help in his classification of ferns. One of the earliest examples, and still one of the best, is the occurrence of flavonoids in the Appalachian spleenworts. The species, Asplenium platyneuron, A. montanum, and A. rhizophyllum (= Comptosorus rhizophyllum) each contain a characteristic array of flavonoid compounds. A. montanum actually contains some xanthones, which are compounds very similar in structure to flavonoids and can be considered as flavonoids for the purpose of the following discussion. Hybrids between any two of the parental species contain all the flavonoids which occur in both parents. The flavonoids are thus inherited in an additive fashion and the hybrids exhibit the parent's genetic makeup. For example, the well-known hybrid Asplenium eburneum contains the flavonoids that occur in A. platyneuron and those which occur in A. rhizophyllum. Similarly, the hybrids A. pinnatifidum and A. bradleyi contain the flavonoids of both their respective parent species. The results of A. aethiops and A. gravesii are hybrids derived from all three parental species and actually contain the flavonoid compounds of all three species. This knowledge was then applied to the problem of the taxonomic status of Asplenium stotleri. Three hypotheses had been advanced: first, it was a hybrid between A. pinnatifidum and A. platyneuron; second, it was a hybrid between A. pinnatifidum and A. trichomanes; and third, it was a minor morphological variant of A. bradleyi, the hybrid between A. platyneuron and A. montanum. Examination of the chemistry of A. stotleri showed it to be indistinguishable from A. bradleyi, confirming the third hypothesis. This interesting example of the Appalachian spleenworts has served to demonstrate the great potential use of flavonoid compounds in fern taxonomy.

The following is a simplified description of how we actually examine the flavonoid composition in a plant. The process involves three steps: extraction, purification, and identification: The compounds are extracted from the plant material in a suitable solvent, such as alcohol, in a blender (Fig. A). Each plant generally contains several flavonoids and the mixture must be separated into individual components. This is most often performed by paper chromatography. The mixture of compounds is applied to a corner of a sheet of blotting paper (Fig. B) and one end of the paper is dipped into a solvent mixture (Fig. C). The solvent slowly moves to the other end of the paper, taking with it the flavonoid mixture. Each flavonoid has a slightly different solubility in the solvent and stops at a different place on the paper. The paper can then be dried, turned through 90° and then run in another solvent in the second dimension (Fig. D), thus producing a characteristic 'spot pattern' for each plant (Fig. E). Most of the flavonoids are colorless in daylight but can be seen by using ultraviolet light.

The purified compounds are then identified by a combination of several methods: their characteristic ultraviolet absorption at varying wavelengths, their reaction to various enzyme and acid hydrolases, and their comparison with compounds which are already known. The typical flavonoid is shown in Fig. F. It is quercetin, 3,7-diglucoside. (Figures drawn by BPM)
This seems to be the place to mention Asplenium, which pops up now and then. It was first proposed in 1937 when Scott's spleenwort was finally nailed down as a hybrid of the Ebony spleenwort and the Walking Fern. The name applies to all hybrids involving prowunciou species of Asplenium with Campylostemon rhizophyllus.

Ceratopteris is the next candidate for analysis, and we find **Cerato** in the Greek for 'horn' and **pteros** means 'fern'. This must refer to the horn-like appearance of the fertile fronds which suggest miniature antlers. The common name of Water Fern refers to all three species indigenous to tropical America — **pteridioles**, **richardii**, and **thalictroides**; since they are all lovers of mud and tranquil waters, any dispute as to which is the more worthy of the name will be left to them to fight it out. **C. pteridioles** however, means 'fern-like' and despite the fact that its appearance is not likely to have it selected as a typical fern with its broad sterile dimorphic fronds, it still retains some fern-like qualities. We may be faced here with a tongue-in-cheek epithet. **C. richardii**, on the other hand, was named for L. C. Richard, a French botanist of the 15th century. **C. thalictroides** means 'like Thalictrum,' the meadow rue, although the resemblance does not seem close.

Ceterach we have discussed in the past (PF 6(3):4), the name being derived from the Arabic for spleen but the epithet **salinos** is a Latinized form of the Greek **thalamos**, meaning a 'chamber' or 'margin' and **anthea**, a flower, which in this case is the sorus. The two words together give a simple description of the main characteristic of this genus, i.e., the grouping of the sori along the margins or lip of the pinnule. The common name of Alpine Fern therefore is as close a literal translation as makes sense.

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**Steps in Fern Chemistry Analysis**

1. **Extraction**
2. **Spotting**
3. **2D Chromatogram**

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**Typical Flavonoid**
Membership in the American Fern Society at the end of 1981 totaled approximately 1047 regular and journal memberships, 44 life memberships, and 12 honorary memberships. In addition, there were about 450 institutional subscribers to the American Fern Journal.

Several members of the Council met and discussed issues informally at the A.F.S. meetings held at Indiana University. A quorum was not present as other Council members attended the Botanical Congress in Australia. It was suggested that the Journal be housed with the Society library at the New York Botanical Garden and cease its cross-country travels with the beginning of each secretary's new term.

The regional fern foray program was reviewed. Although participation in several of the forays has been high, others have not been well attended. For 1982 and 1983 the Society will assist in planning regional forays when potential local foray leaders express an interest, but we will not initiate planning for these trips. If you would like the A.F.S. to help or advise in organizing a local foray in 1982 or 1983, please write the current secretary, which is still me for 1982.

Nineteen papers and one poster were presented at the annual meeting, co-sponsored with the Pteridological Section of the Botanical Society of America, held in conjunction with A.F.S. at Indiana University, August 16-20. It was widely agreed that the diversity and quality of work in the many areas of pteridology have improved with each year. The paper sessions were very well attended and all scheduled papers were presented. James A. Tanno, a doctoral candidate at the University of Connecticut, was awarded the Pteridological Section permanent set of the Journal for his paper, "Plastid Ultrastructure in Salagedeina murtensii from Albovariegata." We congratulate James and his major professor Dr. Terry R. Webster for their excellent work.

An afternoon workshop, Applications of New Experimental Techniques and Methods to the Study of Fern Development, Morphogenesis, and Phylogeny, was organized by A.E. Demaggio and D.A. Steller. This session was attended by more than 75 people, and conveyed the continuing excitement of the advances of pteridology.

The ballots have been counted for the 1981 election. Dean P. Whittier, Vanderbilt University, will serve as President for the 1982-84 term. Dean served admirably as Vice President prior to this. Terry R. Webster, University of Connecticut, will serve as the new Vice President, and James D. Caponetti was elected to another term as Treasurer.

Other Council members who continue to serve the Society are Judith E. Skog, Records Treasurer; David B. Lellinger, Journal Editor; Alan R. Smith, Memoir Editor; and John T. Mickel, Bulletin Editor. The Society owes thanks to its Council, and especially to the outgoing President, Robert M. Lloyd, for their hard work and leadership.

Respectfully submitted,

Michael I. Cousens
Secretary
Merry Stems
Growing Tips for Horticulturists

DIATOMACEOUS EARTH (cont'd.). Mister nozzles clopped with d.e. have surely temporarily dammaged much of the interest in this effective organic insect spray. Tim Morehouse, Prontos, Inc., Cincinnati, Ohio, writes that his artist-wife gave him a pastel-fixative atomizer which can be used in a jar, or other jar to blow the d.e. mixture over the aphids or other insects. A hole punched in the top of the jar lid through which the long part of the atomizer can be inserted will keep the solution within the jar as it is being agitated to maintain the powder in suspension. Tim says that the trick is to blow in a steady stream, hard enough to produce a spray, take a breath, then blow again. The recipe is for 2 Tbl of diatomaceous earth to 1 gallon of water plus a shaving or two of flax or Fels Naptha soap. D.E. can be found in some aquarium-pet stores. So, we're off again!

HARDY FERNS with emphasis on British cultivars are available at FANCY FRODS, Judith Jones, 4911 4th Ave West, Seattle, WA 98119. A list is available on receipt of a self-addressed stamped envelope. Fern Society number Judith will be happy to respond to letters with queries or fronds for identification, and if she does not know the answer herself, she “will enjoy the challenge of the search to track down the solution or the proper person to ask.”

WINTERING OVER YOUNG HARDY AND MARGINALY HARDY FERNS (New York area), in a cold greenhouse, minimum temperature 45°, resulted in strong root growth and a readiness to grow vigorously when in late March I raised the minimum temperature to 58° to speed up Spring and achieve maximum growth before planting outdoors later on. The amount of root growth told me that they should have been put in very roomy pots in the fall. The small ferns in 2-inch pots, not big enough for outside life except in a specially prepared nursery bed, needed to be moved to larger pots.

Truly hardy ferns carried over:
British cultivars of Athrixium and Dryopteris
Thelypteris decursiva-pinnata

MARGINALY HARDY FERNS carried over:
British varietes of Polystichum and Phyllitis
British hybrid Phyllitis schloependorm X Ceratopteris officinarum
British Ceratopteris officinarum
Cycatnium falcatum

Non-hardy ferns able to co-exist with the hardies at
Actinomenas australis (dormant)
Adiantum hispidulum
Anemia rotundifolia
Arachnomos aizieata var. variegata
Baskets of Davallia fejeensis and Rumata tyermanii
Colesiopteris francoana
Dipodium japonicum
Nephrolepis exaltata and cordifolia
Pellaea rotundifolia and falcoa
Pterocerium bifurcatum, superbus, willinkii, leoninei
Selaginella kraussiana
Pyrrotilia lingue and others

FLOWERING PLANTS that grow well:
Asarabrumatius and Colurnnes bloomed
Begonia rubra, listida, miniatures
Brassavola
Episcia dichotomiflora and Begonia schmidtiana decided to live when moved next to a warm pipe.
Epiphyllum species
Phalaenopsis (Easter cactus now full of buds)
Phalaenopsis
Schlumbergera (Christmas cactus)
Streptocarca
Zygocactus (Thanksgiving cactus)

Watering proved to be a critical factor. Over- and under-watering made the difference between survival and failures: plants that stayed wet were more than usually subject to infection and rot, especially since the greenhouse saw the sun only about two hours on good days in the wintertime. Dying was fatal. The plants needed closer checking on the cold, dark days when one was less drawn to spend time in the greenhouse. On sunny days the care was better!

The hardy and marginally hardy ferns unquestionably grew stronger at the lower temperature, and although many favorite ferns and flowering plants excluded themselves, some searching will not doubt turn up other varieties that will tolerate the temperature to give more color and variety to the greenhouse.

A Fern for All Reasons

Our thanks and a tip of the indium to Harold Freeman of Little Neck, NY for this tidbit.

In the recently published volume of the journals of James Boswell, "The Appearance of the Jury" (McGraw-Hill), edited by Irma S. Lustig and Frederick A. Pottle, we read the following for August 14, 1785:

"... Dined at home a good number with us. Was worn out with too hard living. After dinner was somewhat dreary and restless. Lay down and slumbered. Up and played whist. Mrs. Conway came and played the pianoforte. I grew easier, bathed feet and went early to bed and drank capillaire."

What is "Capillaire"? A footnote by Dr. Lustig tells us:
"A once fashionable drink, an infusion of maidenhair fern, sometimes flavored with orange-flavors, to which a great many medicinal properties were ascribed. (Samuel) Johnson poured it into port. Boswell used it for a hangover cure and sometimes, as here, to avoid wine."

EPATHETIC DIFFERENTIONS

acanthocneta: with a row of spines
Fern Fun
Our Potpourri of Pteridological PTrivia

Preferred Prefixes

Brush up on your terminology? The place to begin should be with prefixes - and here they are. You are expected to identify each one with the English equivalent. Write the correct letter in the ( )

(a) dicha(o) 1. double, of two kinds ( )
(b) myrio 2. many, numerous ( )
(c) amphi 3. in two ( )
(d) pluri 4. countless ( )
(e) sesqui 5. several ( )
(f) terni 6. all ( )
(g) pan 7. one and a-half ( )
(h) multi 8. in threes ( )
(i) oligo 9. one hundred ( )
(j) poly 10. few ( )
(k) haplo 11. many ( )
(l) pasci 12. double ( )
(m) centri 13. few ( )
(n) pleio 14. single ( )
(o) diplo 15. few ( )

Answers

(a) c (b) m (d) a (e) p (i) o (j) l (k) n (l) d

Pteridophyte Anonymous

Ella looked across the table at her husband.
"I don't understand you, Fred," she said. "Just look at those bottles - one Scotch, one rye, a vodka, three of gin, two of bourbon - and we haven't got enough money to buy food. What can I do?"

Fred was a man of few words. He leaned over and picked a small, creeping, moss-like pteridophyte out of the terrarium and handed it to his wife. It answered her question.

What kind of pteridophyte was it?
Ans. on Page 20

Ah! Sow!

We thank Paul Weissich, Director of the Honolulu Botanical Garden for the following ancient Japanese proverb.

If you want to be happy for one hour, get drunk.
If you want to be happy for one day, get married.
If you want to be happy for one week, kill your pig and eat it.
If you want to be happy for your whole life, be a gardener.