

FERN S.

By JOHN DAVIDSON, A.H., R.H.S.

[Read 19th January, 1932.]

Ferns come under the name of Cryptogams, being flowerless plants, having to reproduce themselves from spores, or off shoots.

Ferns are a vast group enormously outnumbering all other vascular Cryptogams put together. The order, in a wide sense, includes sixty genera, or three thousand species at a low estimate. In our own native flora at least seventeen genera, and I would not like to mention the number of species. The limits of both genera and species are, however, rather indefinite among the majority of ferns. Ferns are the only order of vascular Cryptogams which has successfully held its own down to the present day. It need hardly be said that among this immense family of plants, every possible variety of habit is to be found, while in structure the differences are scarcely less great. In size we find every graduation, from the tree Ferns of the tropics and New Zealand, which may reach 60ft. in height, down to the minute Filmy Ferns, hardly larger than mosses.

The main outline of the life history are, however, with few exceptions, fairly uniform throughout.

THE MALE FERN. LASTRAE FELIX MASCULLA.

One of the commonest of British Ferns grows abundantly in our woods and hedgerows. The short, stout stem grows obliquely upwards and rises little above the surface of the ground. It often reaches a length up to twelve or fifteen inches, and a diameter of about one inch, but it appears much thicker than it really is, because it is completely covered with the bases of the old leaves. The stem at first has the form of a cone, with the thin end downwards, for it grows thicker for a time towards the top until a constant diameter is attained,

This is commonly the case with plants which have no secondary growth in thickness and in which, therefore, the increase in bulk must depend on gradual strengthening of the growing points. The leaves, often called fronds, are of very large large size, one to three feet long, and sometimes up to five feet in sheltered situations, and much divided. This is an example of a "compound" leaf. A compound leaf is one in which the lamina or blade is completely sub-divided, so that its several parts, called leaflets, resemble distinct leaves. The leaves of the Male Fern are pinnate, that is, the main stalk or "rachis" bears two rows of leaflets or "pinnae," one row on each side. The pinnae are often sub-divided themselves in the same way, and then the whole leaf is said to be "bi-pinnate." In this specimen the pinnae are deeply lobed, but not completely sub-divided. Each lobe, may be called a "segment." The segment is transversed by a mid-rib springing from the "rachis" and giving rise to lateral veins, which fork and end near the edge of the leaf. This type of venation is a common one in Ferns.

The stem and rachis, and sometimes also the larger veins of the leaflets are clothed with brown chaffy hairs, or scales, which are characteristic of most of the Fern order. The leaves develop slowly, arising in the bud, two years before the unfold. The growth of the leaf goes on at the apex, like that of the stem. Thus the leaf stalk is the first part to be formed, and is generally the only part developed in the first year of growth. The blade is formed later, and this also grows from the base upwards. The blade of the young leaf is rolled up in such a way that the rachis or mid-rib forms a spiral like a watch spring, the apex of the leaf being at the centre of the spiral. This applies to most of the Fern tribe.

Everyone who has watched a Fern coming up in the Spring must have noticed the form of the young leaves. The curvature is due to the greater growth of the underside of the leaf, which is external in the bud. Each leaflet is coiled up in a similar way. This mode of folding of the young leaf is called "circinate," or crozier-like vernation, vernation being

a general word for the folding of a leaf in the bud. When the leaf finally expands, the inner side grows faster than the outer, so that the curves become straightened out. Circinate vernation is characteristic of the Ferns generally. The branching of this Fern is peculiar; no branches are formed at all at the growing point, but buds arise on the petioles of some of the leaves, springing from their outer sides a little above the base. These buds, though their first origin takes place very early, only develop into branches at a much later time, and often not until the upper part of the leaf has died off. Few branches are formed in this particular Fern. Ferns vary very much as regards their branching; in some, as in the Bracken Fern, the stem forks at the apex; in a few, as in some Filmy Ferns, the branching is auxiliary like that of flowering plants, while in others, as in some of the Free Ferns, the stem does not branch at all.

The roots which we find on an ordinary full-grown plant are all adventitious, for the original main root of the embryo dies away very early. The adventitious roots, which arise at the base of the leaves, usually three below each leaf, are very tender and much branched. An old stem is densely clothed with a matted growth of adventitious roots.

REPRODUCTIVE ORGANS.

The ordinary Fern plant such as I have described is purely asexual. It bears, at this stage, sporangia only, the sporangia and the spores which they contain are all of one kind. The sporangia of the Male Fern, and most other Ferns, are borne on the lower surface of the ordinary foliage leaves and sporophylls. In some other genera, the vegetation leaves and the sporophylls are quite distinct.

If we examine one of the fertile leaves in the summer, the clusters of sporangia, or sori, as they are called, are very conspicuous on the under-surface. They are usually absent from the basal part of the leaf. On the larger segments the sori are mostly arranged in two rows, one on each side of the mid-rib, while on the smaller segments there may be only

one or two sori altogether. Each sori is covered by a kidney shaped covering, called an "indusium," and is seated just over one of the lateral veins. The individual sporangia, which cannot be distinguished very well without the aid of a lens, are very numerous in each sorus, so that the reproduction of plant is extremely well provided for.

What is a Fern? A Fern may be described in a popular way as a plant which bears leaves only, and no flowers. Ferns, then, are flowerless plants. They are furnished with roots, by which they obtain nourishment from the soil. They have stems, by which the conspicuous parts are borne up and supported. They have leaves, or fronds, to which their elegance is due. And these leaves bear on some part of their surface, but usually on the lower face, the seeds or spores by which the plants may be propagated. These are the several parts or external organs of the plants.

The stem of a Fern forms either an upright stock called a caudex, or it extends horizontally either on, or beneath the surface of the soil, and forms what is called rhizome, or creeping stem. These creeping stems when not buried in the earth, are generally clothed with hairs or scales, and sometimes to such an extent as to become quite shaggy; they vary greatly in size, some being as thick as one's thumb, and others, as in hymenophyllums, as fine as threads. The common Polypody has the thickest rhizome of any of the creeping British species; but the common Bracken, or Pteris, which is formed underground, creeps the most extensively. The stems of the Osmunda or Royal Fern, Lastrea Montana, Polystichum Angulare, have all a tendency to an upright growth.

The duration of the fronds of many species is comparatively short, some of them are gone by late summer, others go at the first touch of cold weather, others at the first touch of frost, while others of the Lastrea, Polypody, Polystichum, etc., are practically evergreen. The old fronds not decaying until new ones are formed, some even hanging on until late summer.

It is difficult to say whether it is ignorance of their many admirable qualities, or is it entire lack of knowledge that they exist. The reason so many people take no interest in Ferns.

The native Ferns of Great Britain are, undoubtedly, attractive objects of inquiry and of study amongst those who take an interest in natural objects. These plants are for the most part objects of exquisite elegance. Then again they are plants for the most part very easily cultivated, and are fine plants for room decoration.

There is something fascinating in the graceful outline and disposition of parts so common among Ferns. Gay colours are generally missing, and they wear, while growing, a livery of sober green.

In some of the Ferns of tropical countries, however, as for example in some species of *Gymnogramma*, or *Chielanthes*, the lower surface is more or less covered with a silvery or golden powder, which adds considerably to their beauty. The number of species of British Ferns may be taken at from forty to fifty. There are, however, a much larger number of curious and interesting variations. Naturally, Ferns are plants which do not like sunshine, especially in their young state. The spores, which are somewhat analogous to seeds, being like them endowed with that mystery, the vital germs. When placed under fitting conditions, become developed into young plants, but they differ from seeds in some important particulars.

All true seeds have a determinate structure. They have an embryo, provided with special organs; there is the plumule or germ of the ascending axis, the origin of the stem, and there is the radicle or germ of the descending axis, the origin of the root.

When a seed is planted in whatever position it may chance to have been deposited in the soil, the young root or radicle strikes downwards and the young stem or plumule grows upwards.

The Fern spores have none of the determinate parts, and when placed under circumstances which induce germination, that part which lies downwards produces the root, and that part which lies upwards produces the rudimentary stem. The whole producing root is called a prothallus, from this the axis with its roots and stem are eventually developed. In annual Ferns the mature character is soon attained, but in others two or more years of growth is required before they reach maturity; or to the stage when they can be partially identified or to which genera they belong.

A mode of raising Ferns from spore which I practise myself very successfully is to fill flower pots to within an inch of the top with loamy or peaty soil, "sterilised," sow the spores very thinly, and cover the pot with a piece of glass, put a saucer under the pot filled with water, so that the soil is kept moist, put the pot in a shaded place from strong light, and in a short time the spores soon begin to grow, when they can be given more light as they get larger.

Before sowing Fern spore on any soil or situation, always sterilise it, which can be done by heating the soil, etc., to at least 100° C., or pouring boiling water over it.

Spores which in their resting period are without chlorophylla will keep for a considerable time. In such varieties as the Royal Fern, the spores are green, and will only germinate if sown at once.

I mentioned before in my notes that the soil or situation ought to be sterilised. This is done by heating the soil to a temperature of 100° C., the boiling point of water, or by watering the soil thoroughly with boiling water before sowing the spores.

LIST OF BRITISH FERNS FOUND GROWING IN THE
COUNTY OF BUTE.

Allosorus Crispus, Parsley Fern,	Arran
Asplenium Adiantum Nigrum,	Bute Arran
Asplenium Marinum, Sea Spleenwort,	" "
Ruta-Muraria, Wall Fern,	" "
Tricomanes, Black stem, Spleenwort,	" "
Veridi, Green stem, Spleenwort,	" "
Athydium Felix-Femina, Lady Fern,	" "
Bechnum Spicant, Hard Fern,	" "
Ceterach Officinatum, Fish scale Fern,	" "
Cystopteris Fragilis,	" "
" Dickieana,	" "
Hymenophyllum Tunbridgense,	" "
" Unelateral,	" "
Lastrea Delatata, and various varieties,	" "
Lastrea Felix-Mas, Male Fern, and varieties, including Montana, Regida, and others,	" "
Osmunda Regalis,	" "
Polypodium Dryopteris, Oak Fern,	" "
" Phegopteris, Beech Fern,	" "
" Vulgaris,	" "
Polystichum Acutatum various varieties,	" "
Pteris Aquilina, Bracken,	" "
Scolopendrium, various forms,	" "

A great variety of Fern allies have also been found, including various varieties of Equisetum and Lycopodiums too numerous to mention in this short paper.

ON A GROUP OF SHORT CISTS AT
LITTLE KILMORY, BUTE.

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The group of cists described in the following paper was laid bare by the plough in March, 1933. The piece of level ground on which they are placed stands 40 feet above the sea, and some 200 yards from the shore. When the cists were

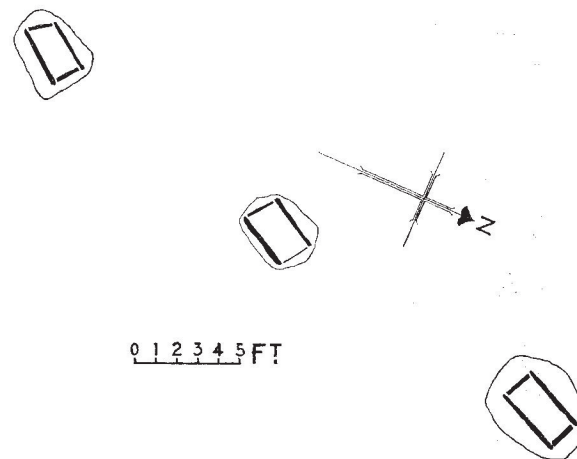


Fig. 1.—Plan of Short Cists at Little Kilmory, Bute.

first discovered, Mr Charles Duncan, the farmer at Little Kilmory, lifted the capstones, but left the contents as he found them, except that he removed, for safe preservation, the fine food-vessel urn contained in one of the cists, to the Bute Museum. The capstones were carefully replaced and in their exact original position, and the cists were left undisturbed by the directions of the Marquis of Bute until 19th June, 1933, when they were re-opened by Dr. Marshall and Professor Bryce in the presence of Lord and Lady Bute.