

LIFE CYCLE OF A FERN

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SECTION XVII. CRYPTOGAMOUS OR FLOWERLESS PLANTS.

Even the beginner in botany should have some general idea of what cryptogamous plants are, and what are the obvious distinctions of the principal families. Although the lower grades are difficult, and need special books and good microscopes for their study, the higher orders, such as Ferns, may be determined almost as readily as phanerogamous plants.



Ferns, or Filices, a most attractive family of plants, are very numerous and varied. In warm and equable climates some rise into forest-trees, with habit of Palms; but most of them are perennial herbs. Most Ferns are circinate in the bud; that is, are rolled up in the manner shown in Fig. 197. Uncoiling as they grow, they have some likeness to a crosier.

197 The fructification (the state or result of fruiting) of Ferns is borne on the back or under side of the leaves. The early botanists thought this such a peculiarity that they always called a Fern-leaf a FROND, and its petiole a STIPE. Usage continues these terms, although they are superfluous. The fruit of Ferns consists of SPORE-CASES, technically SPORANGIA, which grow out of the veins of the leaf. Sometimes these are distributed over the whole lower surface of the leaf or frond, or over the whole surface when there are no proper leaf-blades to the frond, but all is reduced to stalks. Commonly the spore-cases occupy only detached spots or sines, each of which is called a SORUS, or in English merely a Fruit-dot. In many Ferns these fruit-dots are naked; in others they are produced under a scale-like bit of membrane, called an INDUSIUM. In Maidenhair-Ferns, a little lobe of the leaf is folded back over each fruit-dot, to serve as its shield or indusium. In the true Brake or Bracken (*Pteris*) the whole edge of the fruit-bearing part of the leaf is folded back over it like a hem.

The form and structure of the spore-cases can be made out with a common hand magnifying glass. The commonest kind (shown in Fig. 503) has a stalk formed of a row of jointed cells, and is itself composed of a layer of thin-walled cells, but is incompletely surrounded by a border of thicker-walled cells, forming the RING. This extends from the stalk up one side of the spore-case, round its summit, descends on the other side, but there gradually vanishes. In ripening and drying the shrinking of the cells of the ring on the outer side causes it to straighten; in doing so it tears the spore-case open on the weaker side and discharges the minute spores that fill it, commonly with a jerk which scatters them to the wind. Another kind of spore-case (Fig.

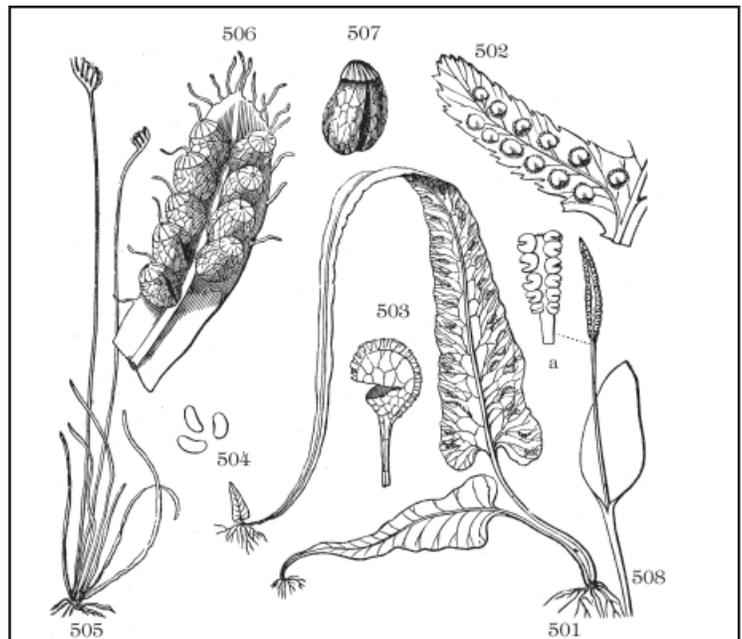
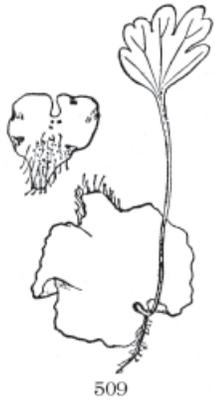


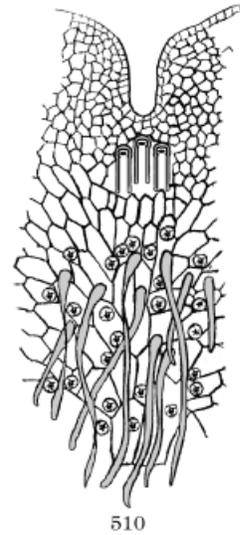
Fig. 501. The Walking-Fern, *Camptosorus*, reduced in size, showing its fruit-dots on the veins approximated in pairs. 502. A small piece (pinnule) of a Shield-Fern: a row of fruit-dots on each side of the midrib, each covered by its kidney-shaped indusium. 503. A spore-case from the latter, just bursting by the partial straightening of the incomplete ring; well magnified. 504. Three of the spores of 509, more magnified. 505. *Schizaea pusilla*, a very small and simple-leaved Fern, drawn nearly of natural size. 506. One of the lobes of its fruit-bearing portion, magnified, bearing two rows of spore-cases. 507. Spore-case of the latter, detached, opening lengthwise. 508. Adder-tongue, *Ophioglossum*: spore-cases in a kind of spike: a, a portion of the fruiting part, about natural size; showing two rows of the firm spore-cases, which open transversely into two halves.

507) is stalkless, and has its ring-cells forming a kind of cap at the top : at maturity it splits from top to bottom by a regular dehiscence (splitting). A third kind is of firm texture and opens across into two valves, like a clam-shell (Fig. 508a): this kind makes an approach to the next family.

The spores germinate on moistened ground. In a conservatory they may be found germinating on a damp wall or on the edges of a well-watered flower-pot. Instead of directly forming a fern-plantlet, the spore grows first into a body which closely resembles a small Liverwort. This is named a PROTHALLUS or GAMETOPHYTE (Fig 509): from some point of this a bud appears to originate, which produces the first fern-leaf, soon followed by a second and third, and so the stem and leaves of the plant are set up.



Investigation of this prothallus under the microscope resulted in the discovery of a wholly unsuspected kind of fertilization, taking place at this germinating stage of the plant. On the under side of the prothallus, two kinds of organs appear (Fig. 510). One, the female organ or ARCHEGONIA, may be likened to an open and depressed ovule, with a single egg cell at bottom; the other, the male or ANTHERIDIA, to an anther; but instead of pollen, it



discharges corkscrew-shaped microscopic filaments or FLAGELLAE, which bear some cilia of extreme tenuity, by the rapid vibration of which the filaments move freely over a wet surface. These filaments travel over the surface of the prothallus, and even to other prothalli (for there are natural hybrid Ferns), reach and enter the ovule-like cavities of the archegonia, and fertilize the cell. This thereupon sets up a growth, forms a vegetable bud, and so develops the new plant.

509. A young prothallus of a Maiden-hair, moderately enlarged, and an older one with the first fern-leaf developed from near the notch. 510. Middle portion of the young one, much magnified, showing below, partly among the rootlets, the antheridia or fertilizing organs, and above, near the notch, three pistillidia or archegonia to be fertilized.

