

Pteridophytes

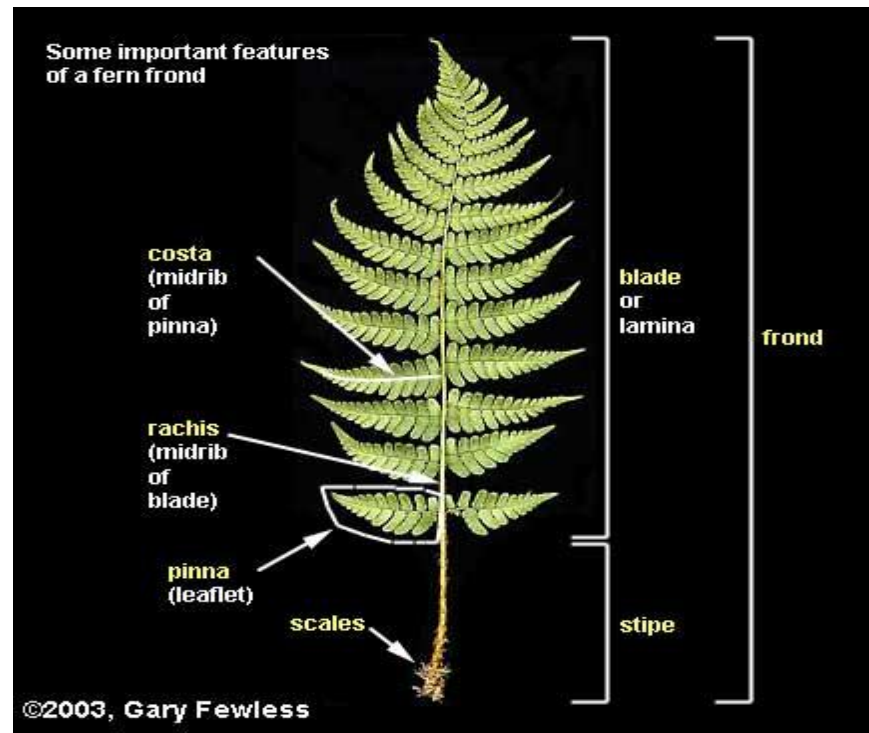
General Characteristics of Pteridophytes I

- The division **Pterophyta** includes a group of primitive vascular plants, commonly called pteridophytes. Pteridophytes are a group of plants which are well known as **ferns** and are considered as some of Earth's first land plants.
- Pteridophytes are mostly terrestrial or aquatic and some species are also epiphytes that grow without soil on the branches of trees.
- More than 12,000 different species of ferns are distributed worldwide.
- The adult plant body in these plants is known as a sporophyte i.e. it shows differentiation into true roots, stem and leaves. The stem is mostly **herbaceous**.



General Characteristics of Pteridophytes II

- They are generally considered non-woody plants, but some giant ferns can be considered semi-woody.
- The Leaves are called **fronds**, may be smaller or larger. Most are **compound** with a rachis and numerous pinnae. Almost all have **circinate vernation**, i.e. they are coiled (circinate) tightly over the growing tips. These unroll as they mature. New leaves grow out of a tight spiral called a fiddlehead. They also have specialized leaves that produce spores called sporophylls.



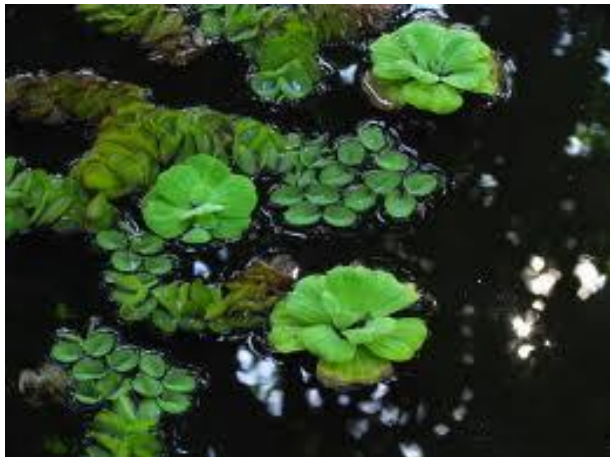
- They are "vascular plants" with well-developed internal vein structures (with xylem and phloem) that promote the flow of water and nutrients.
- Roots are simple and arise adventitiously along the rhizomes near the base of the stems.



HABITAT

- The pteridophytes are (relatively) delicate plants that only grow in areas where there are suitably moist conditions.
- They favour sheltered areas under the forest canopy, along creeks and streams and other sources of permanent moisture.
- They cannot grow readily in hot dry areas like flowering plants and conifers.

Pteridophyte habitat



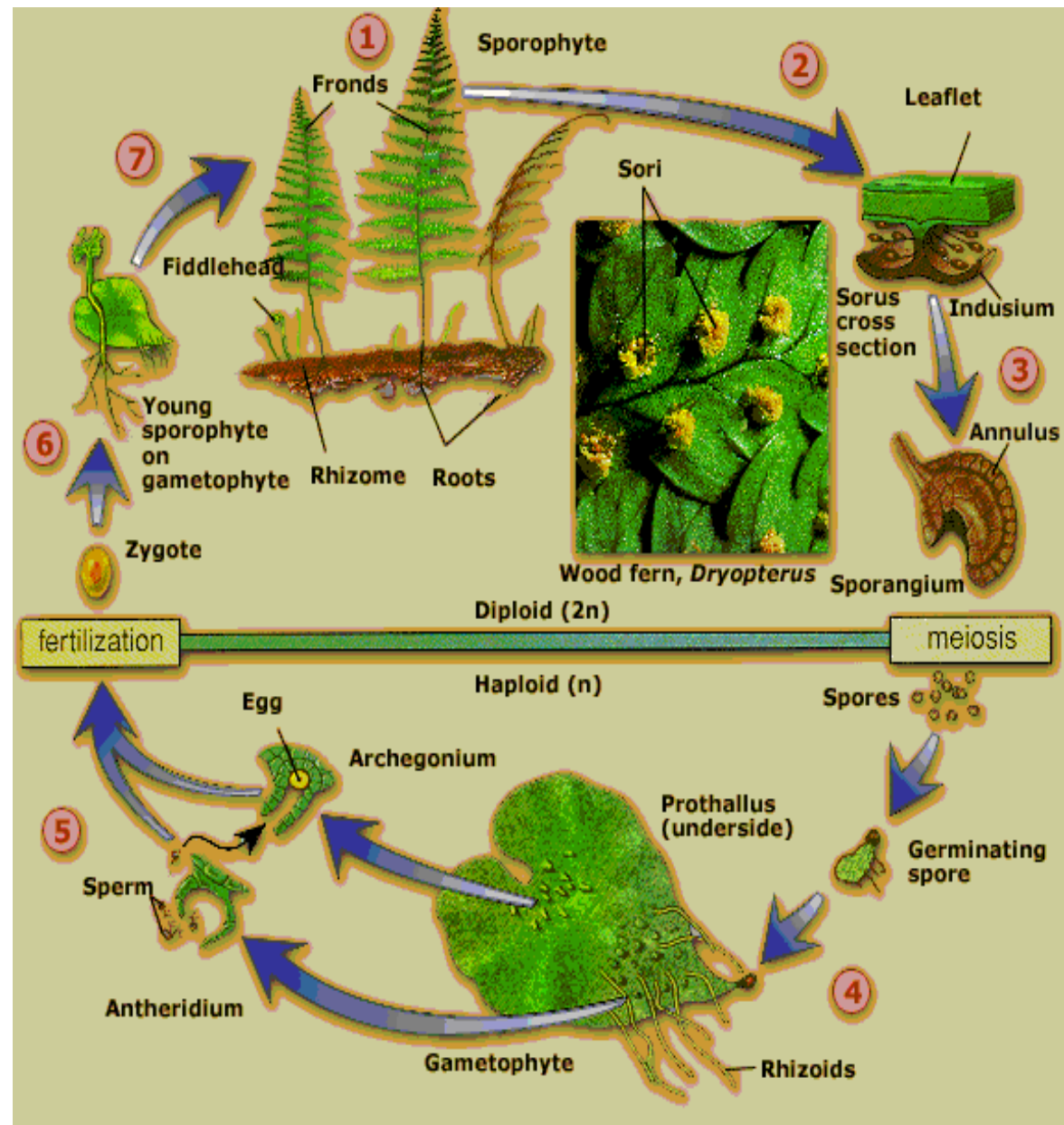
REPRODUCTION I

- Ferns are strongly distinguished from higher plants by their method of reproduction.
- Instead of producing seeds like other flowering plants, they reproduce by producing spores.
- Reproduction involves production of **spores** inside special structures called **sporangia** which occur on the ventral surface of fertile leaves called **sporophylls**.
- The plants may be **homosporous** - producing only one type of spore or **heterosporous** - producing two different types of spores; smaller **microspores** and larger **megaspores**.

REPRODUCTION II

- The spores germinate to produce a haploid gametophyte, called prothallus. A prothallus is a tiny heart shaped thalloid structure with rhizoids. It is independent and chlorophyllous. It bears male reproductive organs called antheridia and female reproductive organs called archegonia.
- The homosporous pteridophytes produce **bisexual** gametophytes while heterosporous pteridophytes produce **unisexual** gametophytes.
- In gametophytes, reproduction is of oogamous type. Antheridia produce antherozoids and archegonia enclose the egg cell.
- Fertilisation requires water. The diploid zygote is retained in the archegonial venter (neck of archegonia) where it develops into an embryo.
- An embryo develops *in situ* after fertilization and the sporophyte remains attached to the gametophyte till the development of root.

- Subsequently it becomes a young sporophyte and grows into an independent adult plant.
- Thus the life cycle includes an alternation of diploid sporophytic generation with a haploid gametophytic generation.
- Sporophytic generation is dominant in the life cycle.
- Seed formation never takes place in living pteridophytes.



Economic importance

- **Horticulture** – Many Pteridophytes or ferns are popular horticultural plants and are grown as landscape plants, for cut foliage and also as houseplants. E.g. *Nephrolepis* spp. (Boston fern), *Asplenium nidus* (The Bird's Nest Fern), etc.
- **Fossil fuel** - Several hundred million years ago ferns and fern allies were the dominant terrestrial plants. Thus, the fossils of these plants have contributed greatly to the formation of our fossil fuels—coal, oil and natural gas.
- **Food** - Various non-western cultures have used the starch rich rhizome and stems of some fern species as a food. Tubers from the King fern (*Ptisana salicina*) are a traditional food in New Zealand and the South Pacific. Fern tubers were used for food 30,000 years ago in Europe.
- **Medicine** - Herbalists have advocated some fern species for treatment of ulcers, rheumatism, intestinal infections, and various other ailments.

- **Biological Fertilizer** - Ferns of the genus *Azolla* commonly known as mosquito fern are very small, floating plants have ability to fix nitrogen from the air into compounds that can then be used by other plants, are used as a biological fertilizer in the rice paddies of Southeast Asia.
- **Removal of heavy metals** - Ferns have been studied and found to be useful in the removal of heavy metals, especially arsenic, from the soil. E.g. *Pteris* sp.
- **Noxious weeds** - Several ferns are noxious weeds or invasive species. E.g. Japanese climbing fern (*Lygodium japonicum*), mosquito fern (*Azolla* spp.) and sensitive fern (*Onoclea sensibilis*).
- Giant water fern (*Salvinia molesta*) is one of the world's worst aquatic weeds.