

CHAPTER 4. PTERIDOPHYTES

I. Introduction

- Pteridophytes are **cormophytes** (plants with stem, leaves, and roots).
- They belong to the **archaeoniate phylum**.
- **Reproduction:** Gametes are formed in **gametangia**.
- **Vascular system:** Present, with **scalariform xylem vessels**.
- Reproduction by **spores** (A dominant **sporophyte generation**)
- An **alternation of generations**
- **Sporophyte (2N):** Dominant, chlorophyllous, autonomous from gametophyte.
- **Gametophyte (N):** Often thalloid, lacks conducting vessels, is called a **prothallus**
- **Habitat:** Damp environments; some aquatic (e.g., *Azolla*).
- **Fossil record:** Flourished during **Carboniferous and Permian periods**, forming coal deposits.



II. Classification of Pteridophytes

Pteridophytes are divided into four main classes:

Class	Example	Main Characteristics
Psilophytinae	<i>Psilotum</i>	Primitive plants without true roots
Lycopodinae	<i>Selaginella</i>	Small leaves called microphylls
Equisetinae	<i>Equisetum</i>	Jointed stems (horsetails)
Filicinae	Ferns	Large divided leaves

1. Psilophytinae (*Psilotum*)

Morphology

- Most primitive vascular plants.
- **No true roots**; only a few species have microphylls.
- **Stem**: Smooth, naked.
- **Vascular tissue**: Present; absorbs water/nutrients via **horizontal root-like stems** and **mycorrhizal association**.

Habitat

- Grow in both dry and damp locations.



Fig. Psilotum

4. Lycopodinae (Selaginella / Club Mosses)

Sporophyte

- Herbaceous, leafy plant with **vascularized stems**.
- **Branching**: Dichotomous.
- **Leaves**: Small, lanceolate, spiral or opposite; **ligules** present near leaf insertion.
- **Roots**: From rhizophores, not directly from stem.

Sporangia

- Found on **fertile leaves (sporophylls)** in **spikes (strobili)**.
- **Heterospory**:
 - **Megasporangia**: Base of spike, produce 4 megaspores.
 - **Microsporangia**: Apex of spike, produce numerous microspores.

Gametophyte

- **Male (microgametophyte)**: Produces **antheridia** → **biflagellate sperm**.
- **Female (megagametophyte)**: Develops in megasporangium; **oosphere** in **archegonium**.

Fertilization

- **Zoidogamy:** Flagellated sperm swim to egg in water.
- Zygote develops into **sporophyte**, initially attached to gametophyte, later autonomous.



3. Equisetinae (Equisetum / Horsetails)

Morphology

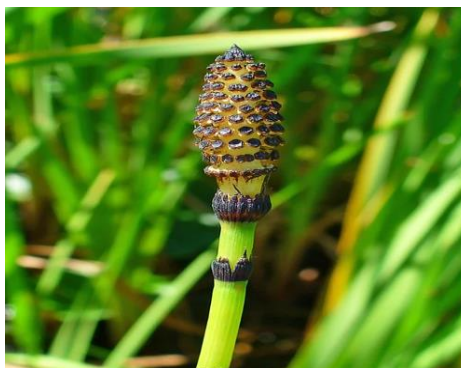
- **Stem:** Jointed, hollow, ribbed; photosynthetic.
- **Leaves:** Reduced, scale-like, in whorls at nodes.
- **Roots:** True roots from rhizomes.
- **Strobili:** Terminal cones with sporangia.

Reproduction

- Spores produced in **sporangia on sporangiophores**.
- Gametophytes are small, photosynthetic, free-living.
- Fertilization requires water (flagellated sperm).

Habitat

- Prefer **damp or marshy areas**, often near streams.



4. Filicinae (Ferns / Dryopteris filix-mas)

A. Sporophyte

- Dominant, diploid (2N), photosynthetic.
- **Root:** Adventitious, absorbs water and minerals, anchors plant.
- **Stem (rhizome):** Underground, horizontal, stores starch, produces leaves and roots.
- **Leaves (fronds):**
 - Petiole → Rachis → Pinnae → Pinnules
 - Chlorophyllous, photosynthetic, with stomata.

B. Reproduction

- **Sporangia:** On underside of pinnules, grouped in **sori**, protected by **indusium**.
- **Spore formation:** Mother cells undergo meiosis → haploid spores.
- Spores germinate in humid environment → **prothallus (gametophyte)**.

C. Gametophyte

- Small, flat, heart-shaped, photosynthetic, with rhizoids.
- **Antheridia (male):** Produce motile sperm (flagellated).
- **Archegonia (female):** Contain oosphere (egg).

D. Fertilization

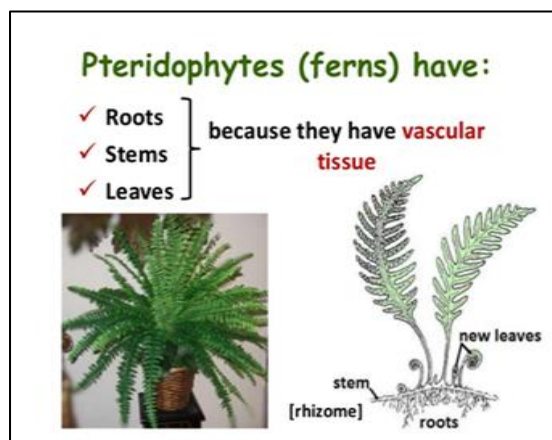
- **Zoödogamy:** Sperm swim to egg via water/chemotaxis → zygote (2N).

E. Sporophyte Development

- Zygote → embryo → root, stem, leaf; initially attached to gametophyte, then autonomous.

F. Life Cycle

- **Haplodiplontic (alternation of generations):**
 1. Sporophyte (2N) → produces spores
 2. Gametophyte (N) → produces gametes



G. Importance

- Evolutionary link between bryophytes and seed plants.
- Contribute to ecosystem diversity.
- Fossil ferns contributed to **coal formation during the Carboniferous**.

Conclusion:

Pteridophytes are **vascular, seedless plants** that reproduce via spores. Their life cycle exhibits **alternation of generations**, with a dominant sporophyte and a reduced, often short-lived gametophyte. They occupy an **important evolutionary position** between non-vascular plants and seed plants.