



**Chaudhary Mahadeo Prasad Degree College**  
(A Constituent Postgraduate College of Central University of Allahabad)

**E-learning module  
for  
M.Sc. Botany  
Course code BOT 503  
Pteridophytes**

**DR. SARITA SRIVASTAVA**

Assistant professor

Department of Botany

Email: [saritasrivastava21@gmail.com](mailto:saritasrivastava21@gmail.com)

# Ancient climate

- Land flora was possible only after the detrimental effect of UV rays was shielded by Ozone layer.
- Photosynthesis was made possible
- Little O<sub>2</sub> evolved
- Aquatic algae came into existence

# Landmarks in vascular plant Evolution

Formation of polymer lignin is paramount importance in evolution of land plants

- Ancient plant *Rhynia gwynne-vaughanii* was a rootless leafless plant with low stature, with simple and primitive vascular system.
- It has simple reproductive structures located at the tips of aerial branches

- Development of anchorage and water conducting system
- Development of water and mineral conducting system
- Lignin in xylem provided strength
- Formation of cuticle and prevention of dessication
- Development aerial structures for gaseous exchange
- Development of specialized photosynthetic tissue in aerial leaves
- Sporopollenin formation and spore dessication was prevented

# Pteridophyte

- **Pteridophytes** (Gr. pteron= feather, phyton = plant)
- They are the most primitive seedless vascular plants that reproduce by means of spores.
- Hence, they are known as ‘Vascular Cryptogams’.
- **Haeckel (1866)** called these groups of plants as “Pteridophytes” because of their pinnate or feather like fronds (leaves).

## Amphibians of plant kingdom

- Like reptiles (first true land animals that evolved after amphibian)
- Pteridophytes are considered as the first true land plants that evolved after bryophytes.
- Hence pteridophytes are some time called “Botanical Snakes” or “Snakes of plant kingdom.”
- They are also sometime called as “Amphibians is of plant kingdom” because like bryophytes they depend on an external source of water for fertilization.

# Age of Pteridophytes

- Fossil records indicate that they evolved about 400 million years back i.e. in the **Silurian period** of late **Paleozoic era**. Hence late Paleozoic can be regarded as “**Age of Pteridophytes.**”
- Tippo (1942) has placed them in **Tracheophyta** or Tracheata because these plants first developed vascular tissues (xylem and phloem) where the **tracheary elements** appear like **human trachea**.

# Landmark features

- **Origin of Seed habit-Heterospory**
- **Development of Stele**
- **Alternation of Generation:**
  - **Homosporous**
  - **Heterosporous**



# Salient features

- **Pteridophytes are the first true land plants.**
- **They are seedless, vascular cryptogams.**
- **Life cycle is heterologous diplohaplontic type.**
- **Sporophyte is the dominant plant body while gametophyte is a small, simple prothallus.**
- **Sporophyte has true roots, stem and leaves.**

## Salient features contd.

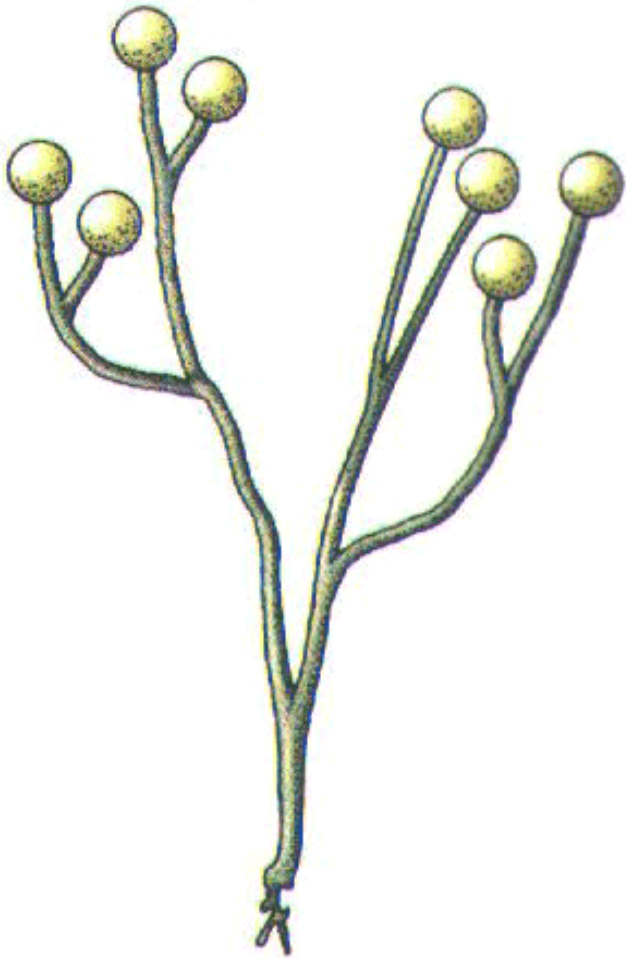
- In xylem, trachea (vessels) absent and, in phloem companion cells absent.
- Spores develop in sporangia are homosporous or heterosporous.
- Sporangia are produced in groups (sori) on sporophylls.
- Young leaves of sporophyte show circinate venation.
- Gametophyte develops small sessile antheridia and partially embedded archegonia with 4-rowed neck.
- Sex organs multi-cellular and jacketed.

## Origin of Land plants



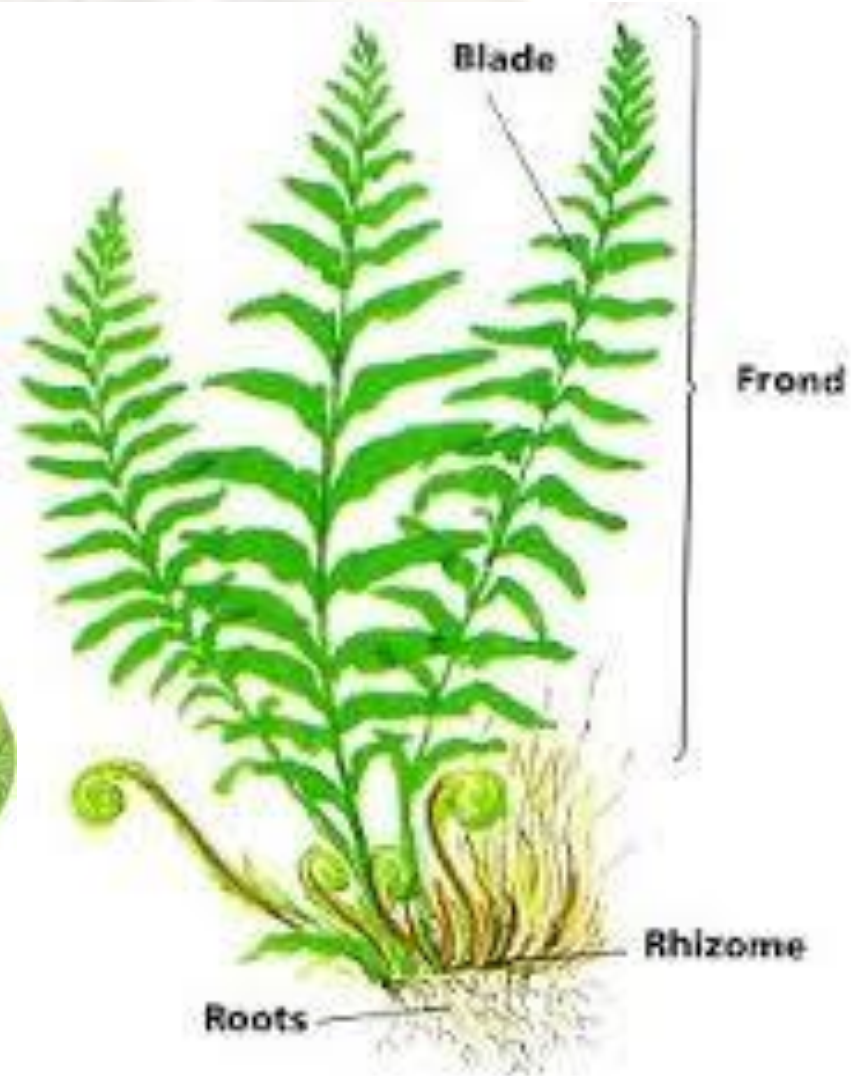
**Most primitive group  
that flourished in  
Devonian and  
Carboniferous periods  
of Paleozoic Era**

## *Cooksonia*



- *Cooksonia* is the oldest known vascular plant originated in Late Silurian period (400 million years) of Paleozoic Era.

- Young leaves of sporophyte show circinate venation.



# Leaves bearing spores are called sporophylls

Sporangia are produced in groups called sori (plural) (sorus sing.) on sporophylls.



# Vasculature in Rhynia

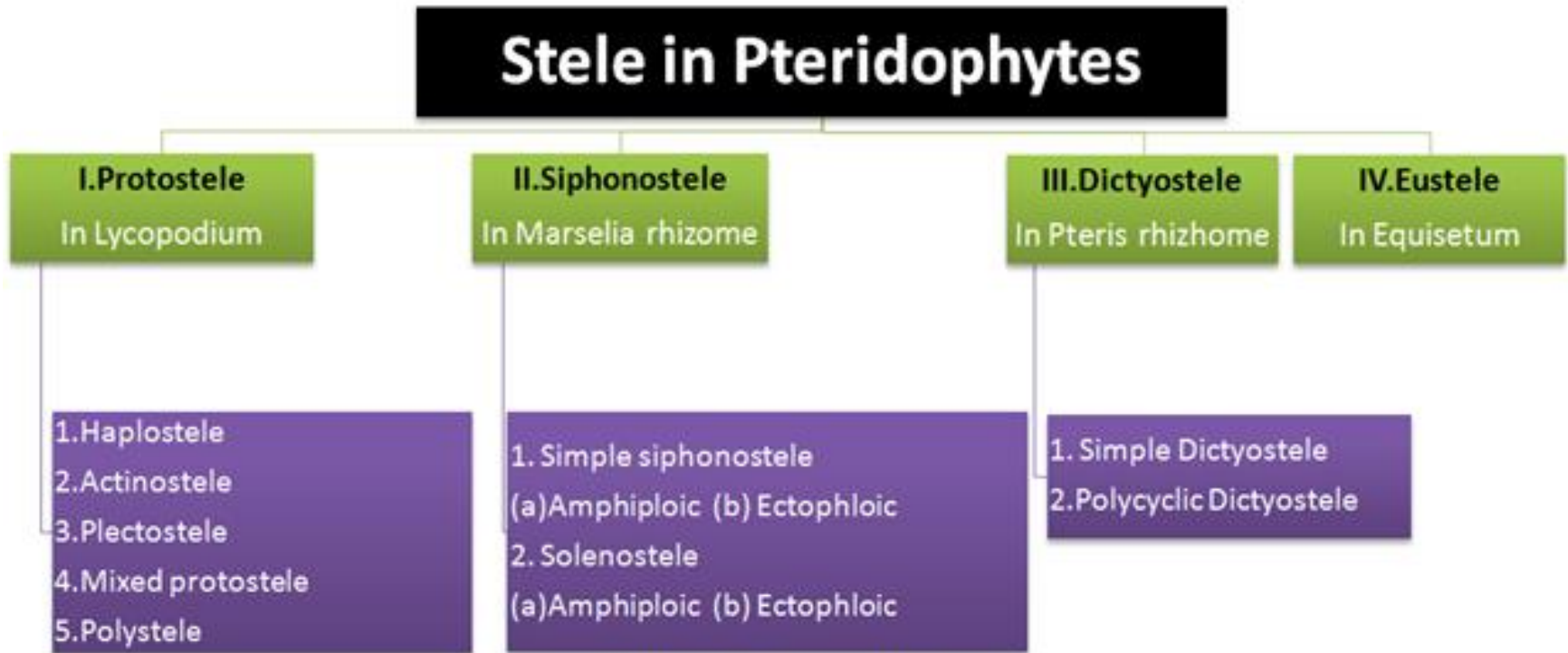


## What is stele

- **Stele is the central core of the stem and root of a vascular plant, consisting of the vascular tissue (xylem and phloem) and associated supporting tissue.**
- **It is with or without pith and surrounded by endodermis and pericycle**



# Types of stele in Pteridophytes



protostele



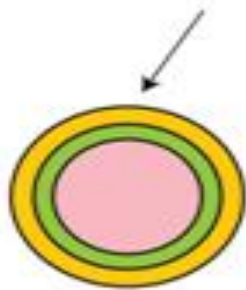
haplostele



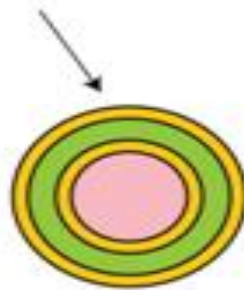
actinosteles



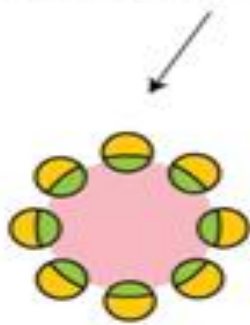
plectosteles



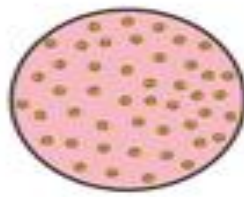
ectophloic siphosteles



amphiphloic siphonosteles



eusteles



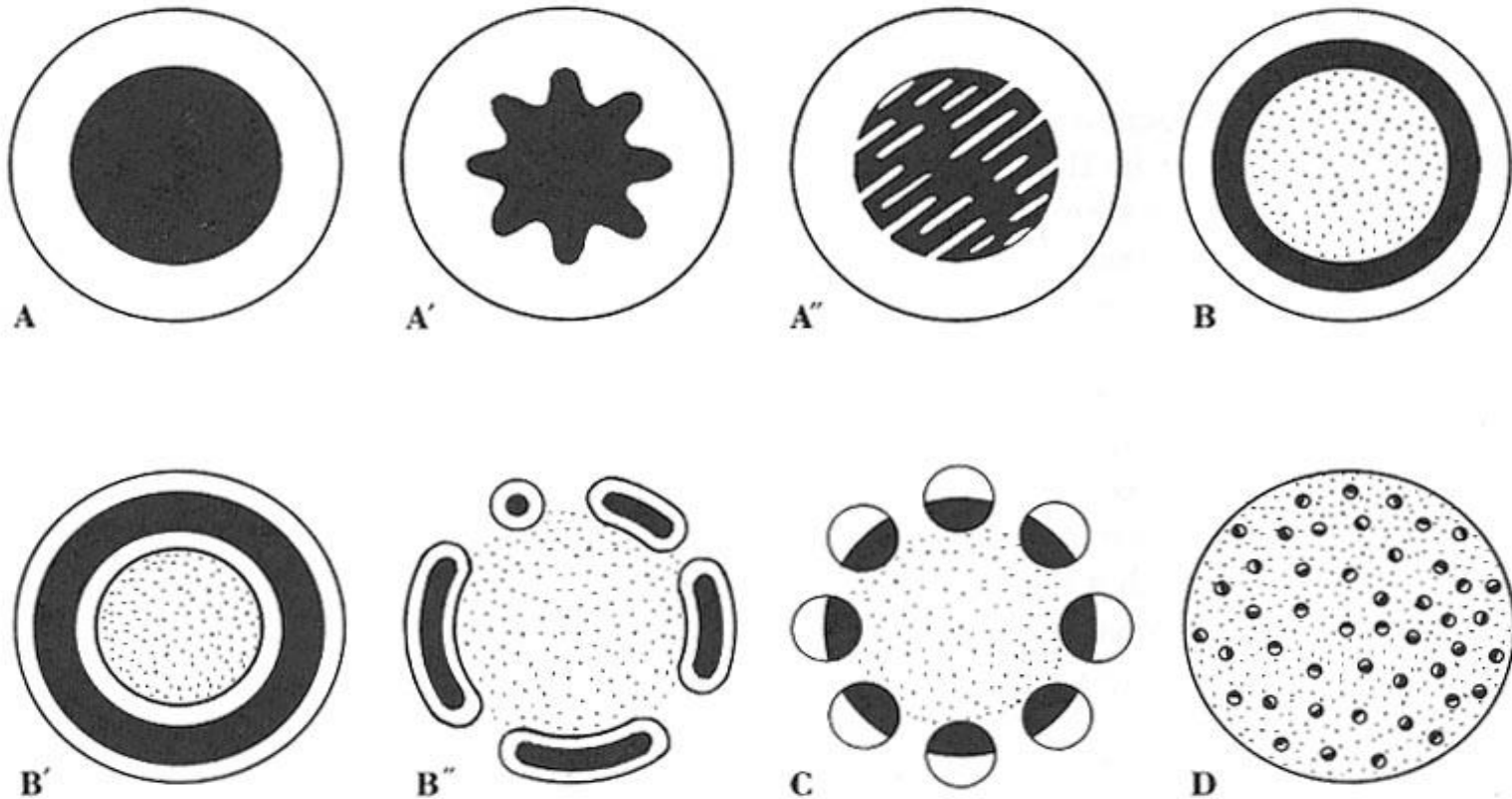
atactosteles



dictiosteles



# Development of stele

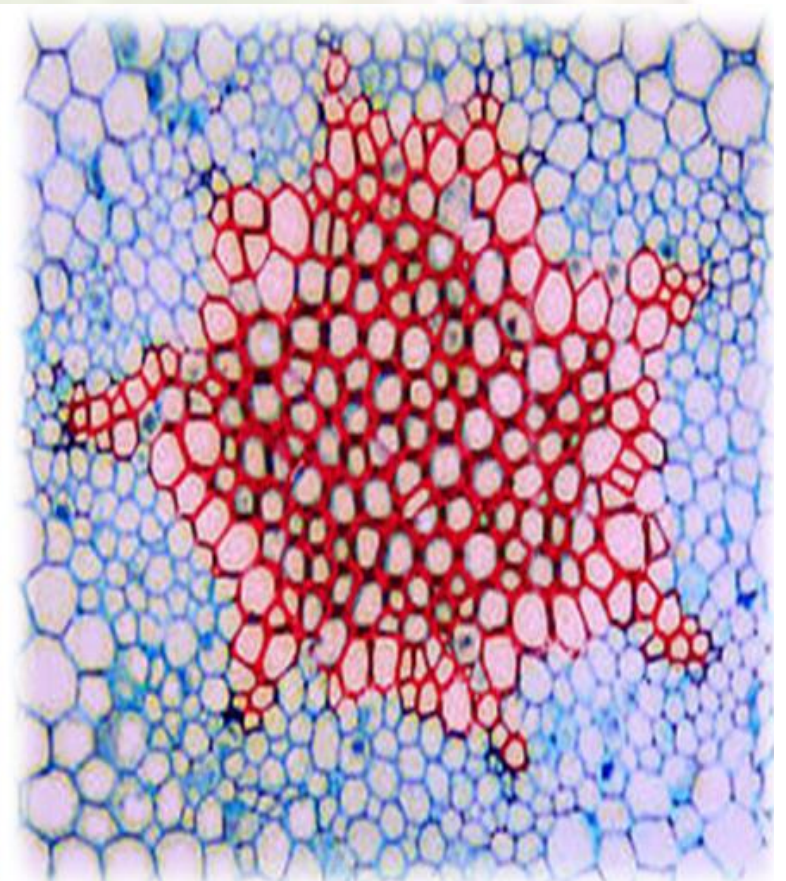


**FIGURE 13-6**

Types of stele, diagrammatic transections. A–A". Protosteles. A. Haplostele. A'. Actinostele. A". Plectosteles. B. Ectophloic siphonosteles. B'. Amphiphloic siphonosteles or solenosteles. B". Dictyosteles. C. Eusteles. D. Atactosteles. Xylem, black; phloem, white; pith, stippled.

# Variation of stele in *Lycopodium*

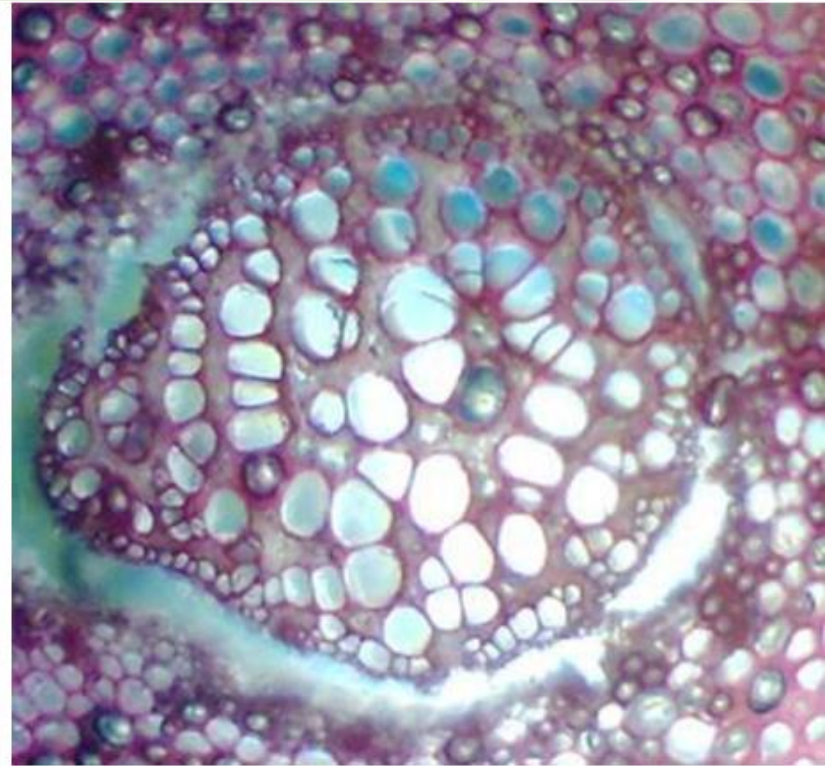
## Actinostelele in *L. phlegmaria*



# Plectostele in *L.clavatum*



# Mixed protostele *L.cerennum*



## Questionnaire

1. When did Cooksonia invaded land? What were its special characters that led it to invade land?
2. Write one pteridophytic an angiospermic character of Gymnosperms?
3. Define phyllospermy and stachyospermy
4. Write botanical names for Royal fern, Stag horn fern, Umbrella fern, (any two) ?
5. Who gave the term Tracheophytes; define Tracheophytes?
6. Who gave the term Pteridophyta?
7. What are moniliophytes?