



# **Kingdom: Plantae**

## ***Plants***



**Dominant kingdom in  
terrestrial ecosystems**

**Oxygen production**



**Food & Habitat for Animals**

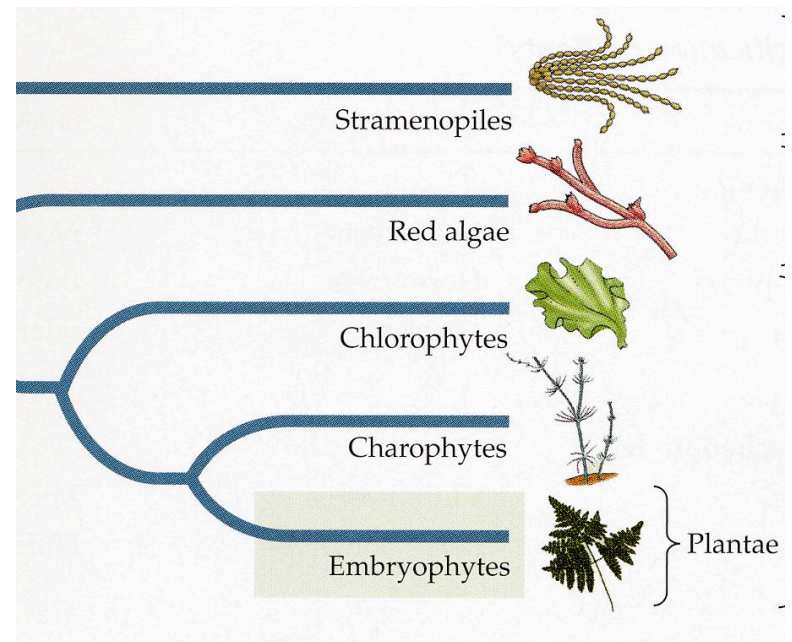




# Plants & Green Algae share a recent common ancestor

**Green Alga clade = Chlorophytes & Charophytes**

Charophytes are freshwater algae

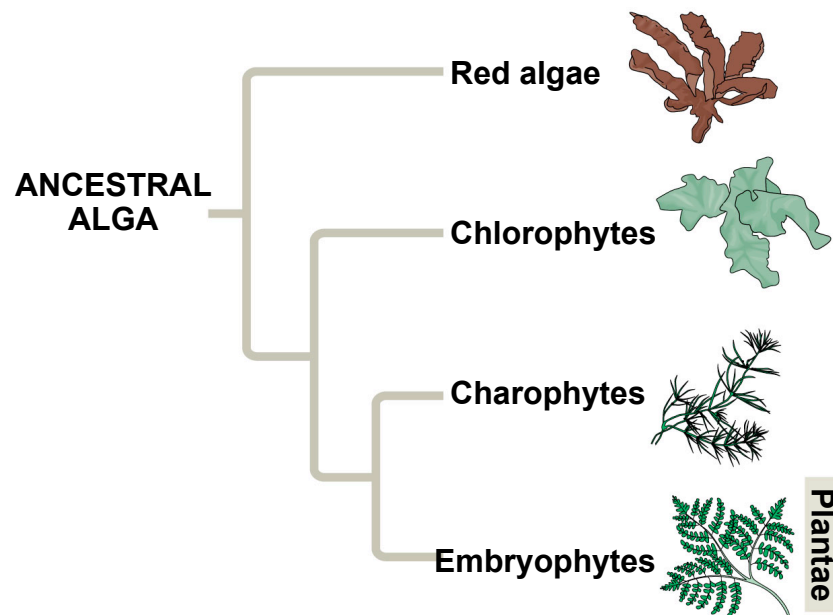


Charophytes have a protective layer  
of sporopollenin on surface to reduce water loss

# Evidence that plants & green algae share a recent common ancestor

## General homologous traits (shared features)

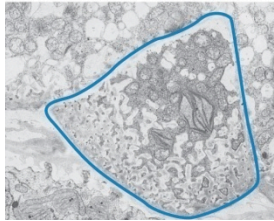
- Chlorophyll a & b
- Cellulose Cell Walls
- Starch as Carbohydrate Storage
- Alternation of Generations Life Cycle
- Molecular data - gene sequences
  - Similarities in nuclear and chloroplast genes



# Shared derived traits: unique features of plants

*Facilitated their survival on land*

Embryo (LM) and placental transfer cell (TEM) of *Marchantia* (a liverwort)

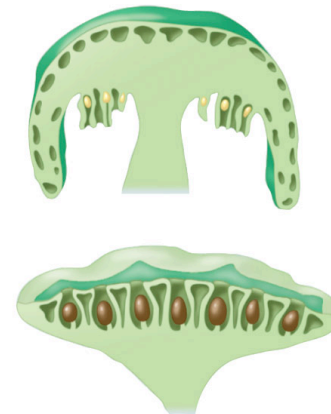
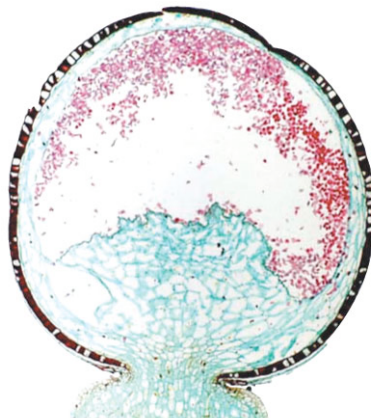


- Protected embryo



- Apical meristems

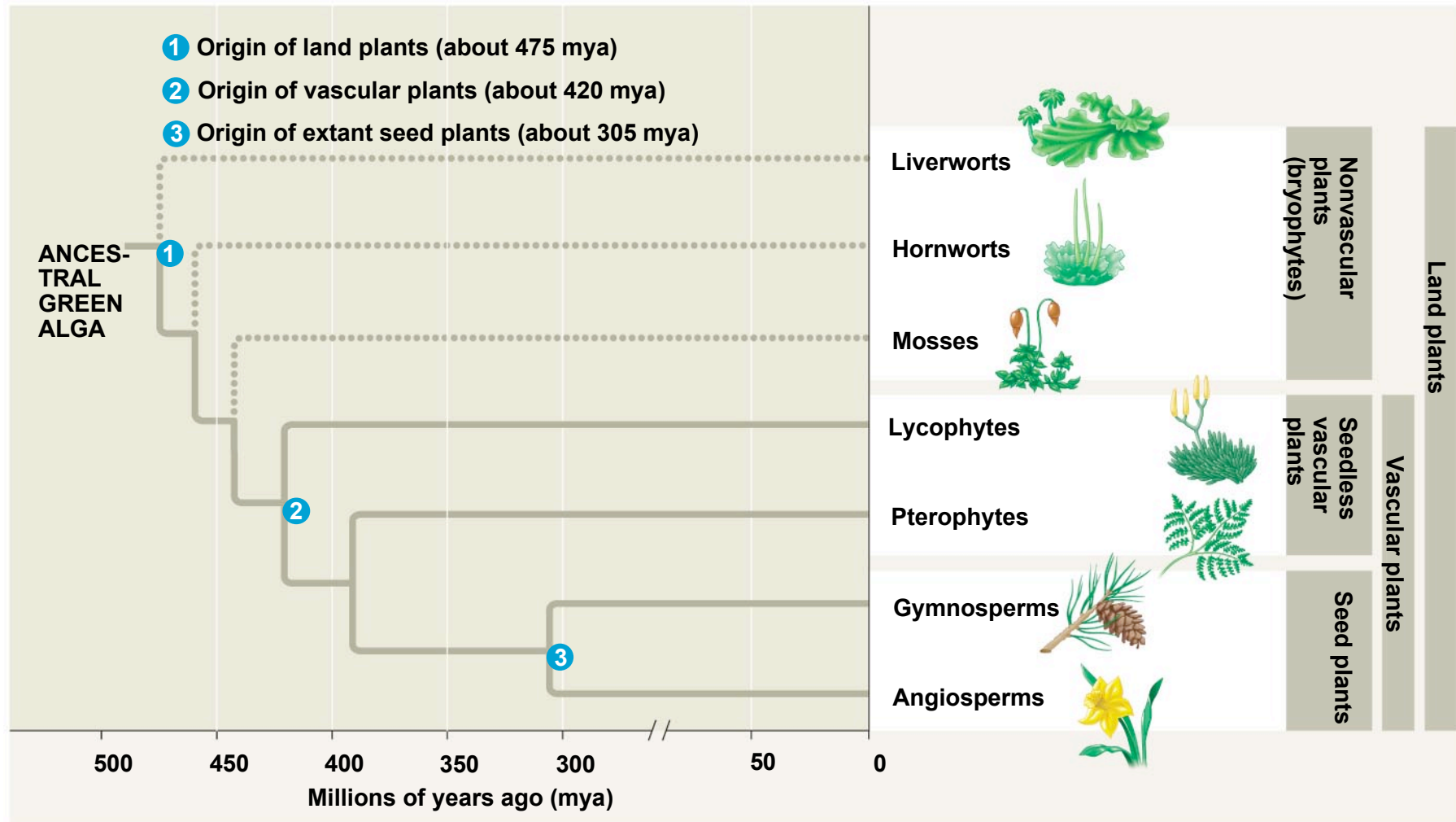
- Spores produced in sporangia



- Gametes produced in gametangia



***Plantae is the most recent kingdom (475 mya) - evolved on land***



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***Hard parts fossilize best; fossil record better for more recent phyla***

# Plant adaptations to life on land

Features of plants that are not present in algae

## Problem

**Desiccation  
(drying out)**

## Solutions (Adaptation)

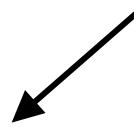
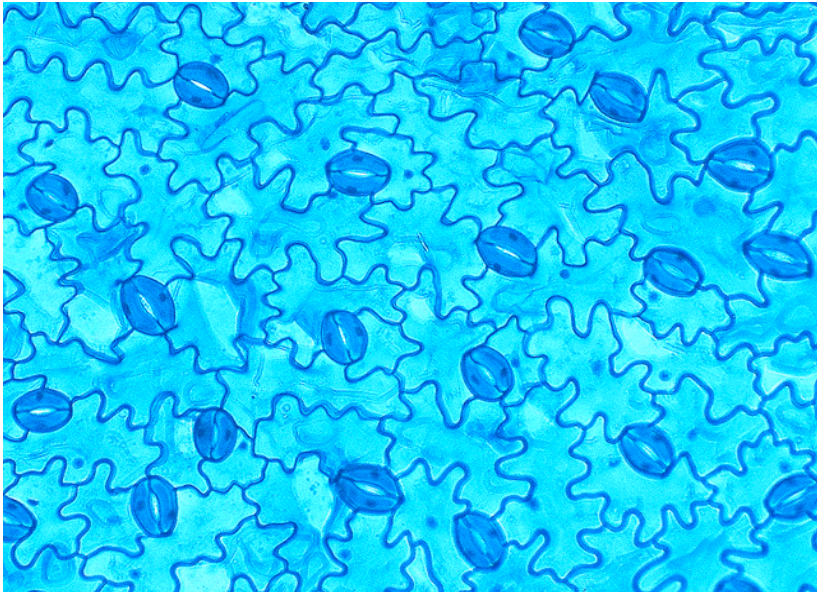
**Features to prevent drying out**

**Protected embryo**

**Waxy Cuticle**

**Stomata & Guard cells**

**Seeds & spores**





# Plant adaptation to life on land

## Problem

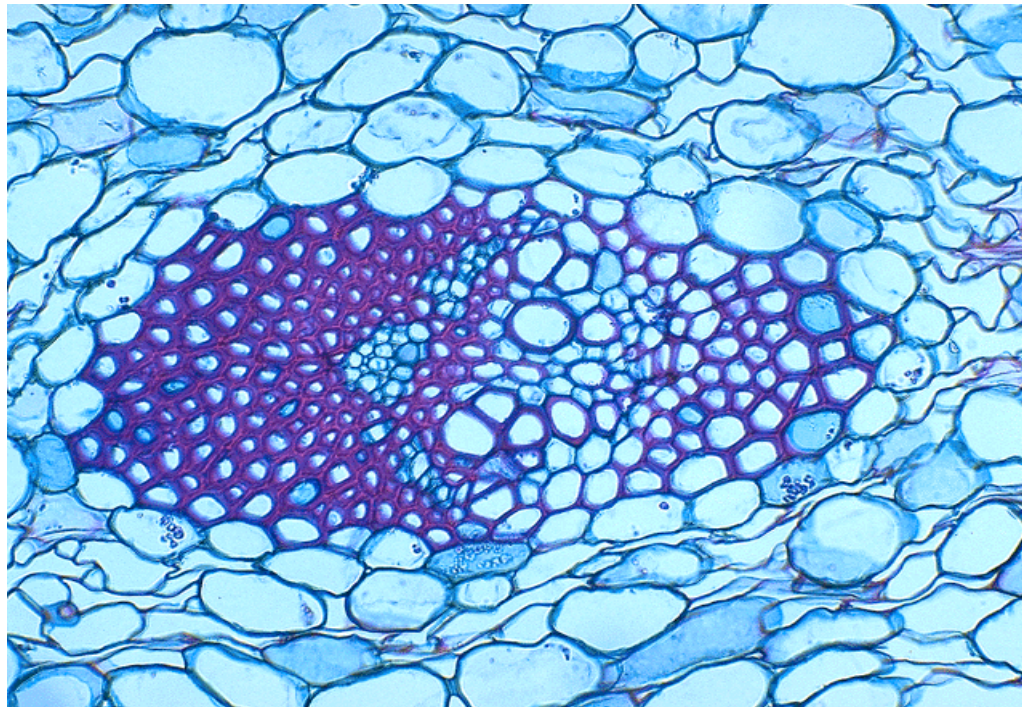
**Transport**

## Solutions (Adaptation)

**Vascular System (veins)**

**Xylem** - water & minerals

**Phloem** - sugar



# Plant adaptation to life on land

Problem  
**Support**

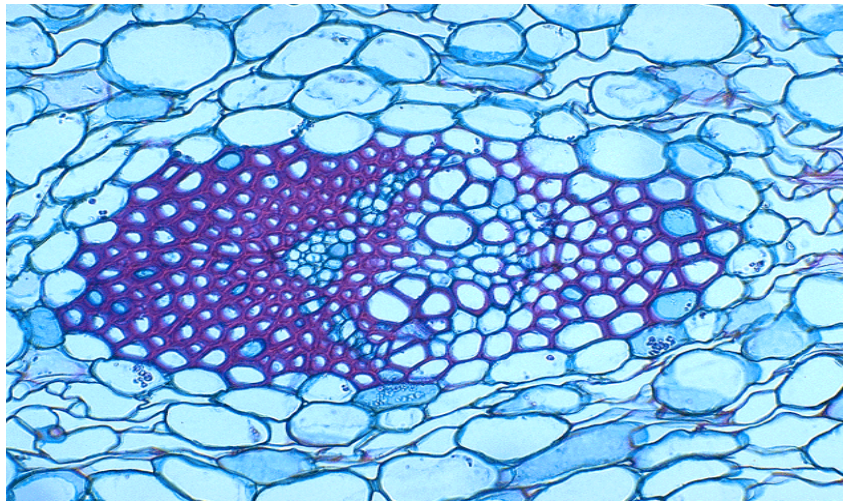
Solutions (Adaptation)

**Cell walls**

**Central vacuole**

**Lignified cell walls in  
xylem & fibers**

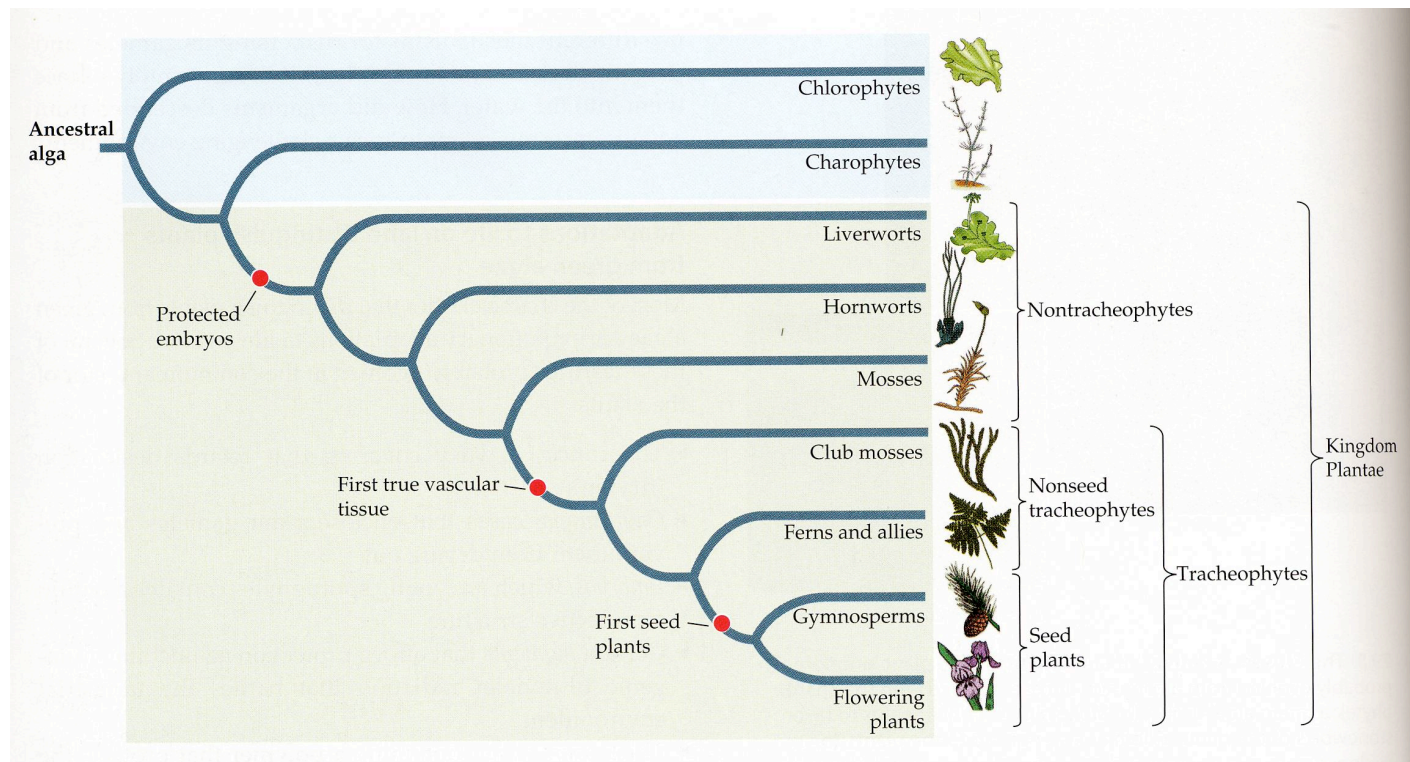
**(stains red)**





# The first lineages of plants were spore producers

1. Spore producers with no vascular system  
= Non-tracheophytes
2. Spore producers with a vascular system  
= Non-seed Tracheophytes



# Spores or Seeds for dispersal & dormancy

**Dispersal** = move to a new habitat

**Dormancy** = "resting" stage to survive unfavorable conditions

## Spores

- Single cells
- Wind dispersed
- Spores develop into gametophytes

## Seeds

- Multicellular
- Animal, wind, water or gravity dispersed
- Seeds develop into sporophytes



# Alternation of Generations Life Cycles in Seaweeds and Plants

## 2 multicellular stages:

Sporophyte ( $2N$ )

Gametophyte ( $1N$ )

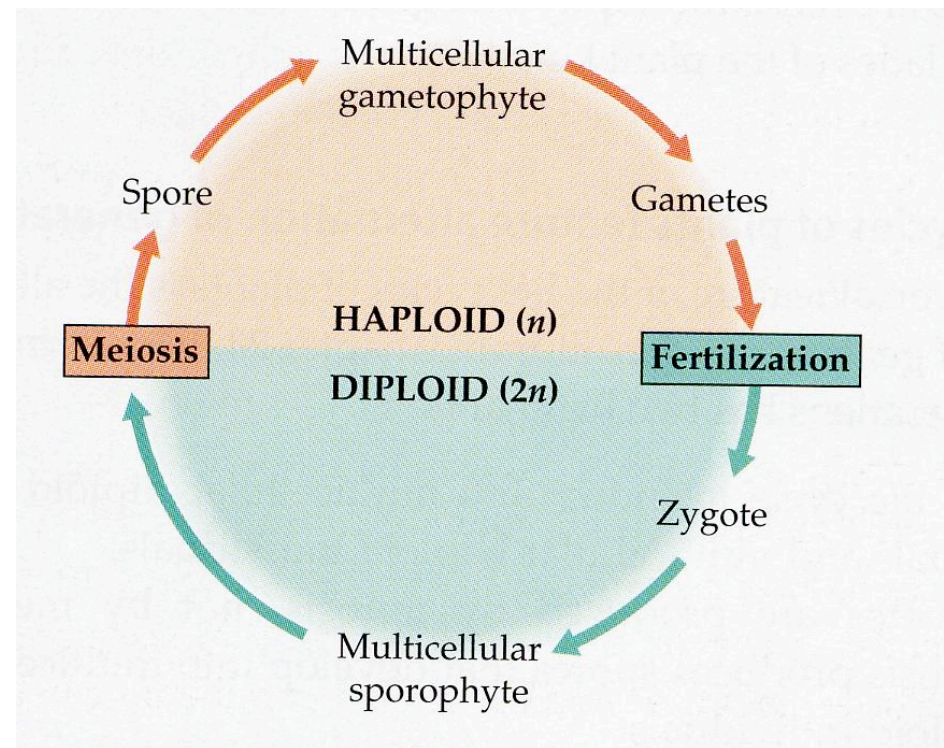
## 3 unicellular stages:

Spores ( $1N$ )

Gametes ( $1N$ )

Zygote ( $2N$ )

## Haploid phase / Diploid phase



# Reproduction in Spore producing plants

## *Sporophytes produce Spores* (asexual)

- **Sporocytes** (2N) inside of **Sporangia** (2N)  
produce **Spores** (1N) by meiosis
- Spores divide by mitosis to produce gametophyte

## *Gametophytes produce Gametes* (sexual)

- **Antheridia** (1N) produce **sperm** (1N)
- **Archegonia** (1N) produce **eggs** (1N)
- Fertilization produces zygote
- Zygote divides by mitosis to produce sporophyte