
Preliminary study of plant
classification with emphasis on
Indian fossil plants

Nonvascular

Mosses,
liverworts,
hornworts



Ancestral
green alga

Vascular

Nonseed



Ferns

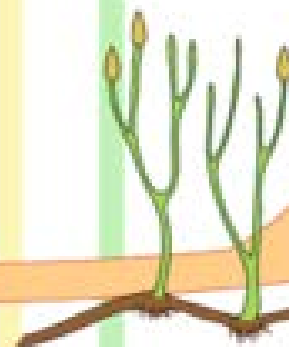
Seed



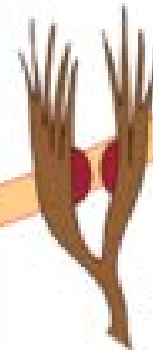
Conifers



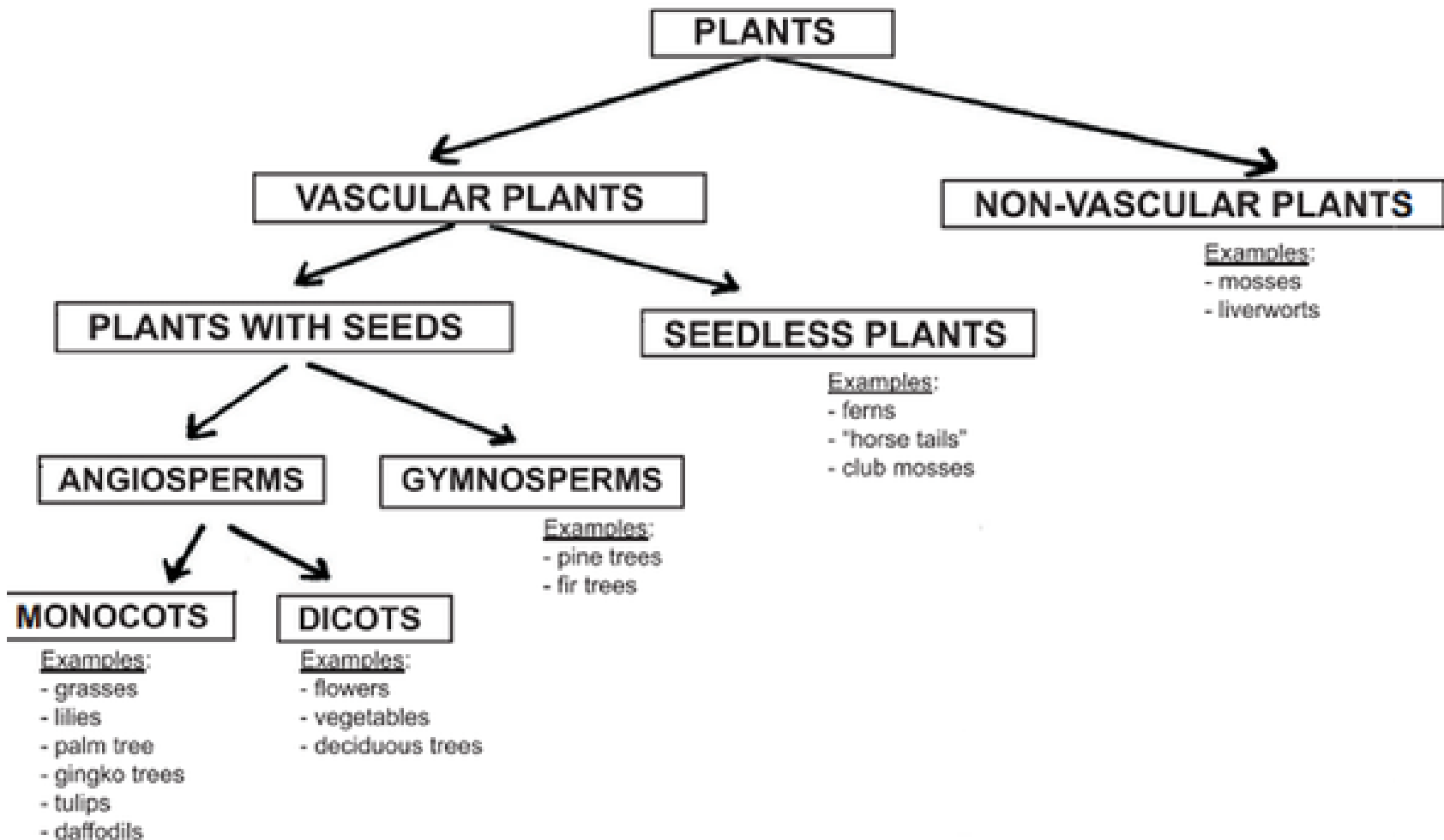
Flowering
plants



First vascular
plants



First seed
plants



Nonvascular Plants

These plants **do not** have a well-developed system for transporting water and food

- **No true roots, stems, or leaves**

They get nutrients direct from environment and pass them **cell to cell**.

This keeps these plants very small in size.

Examples:

- Mosses, liverworts, hornworts.





Liverworts



Moss

Vascular Plants

This is the largest group in the Plant Kingdom.

These plants have a well-developed system for transporting water and food

- True roots
- True stems
- True leaves
- Vascular bundles

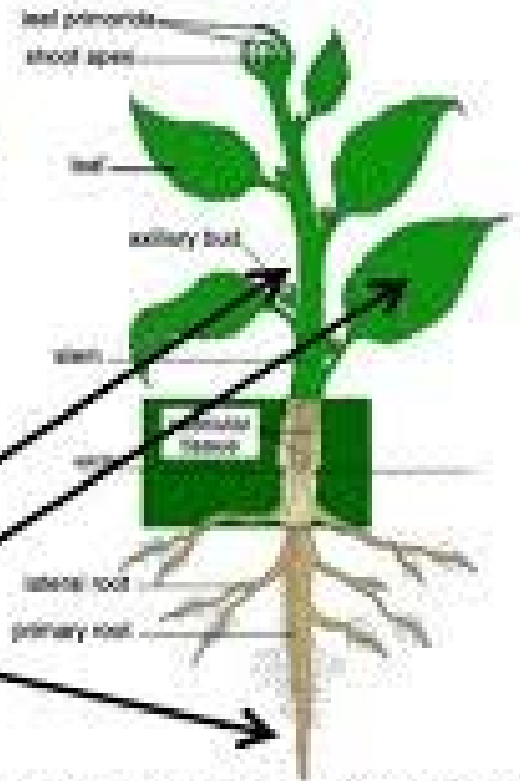


Figure 1. Principal Parts of a Vascular Plant



Vascular
plants



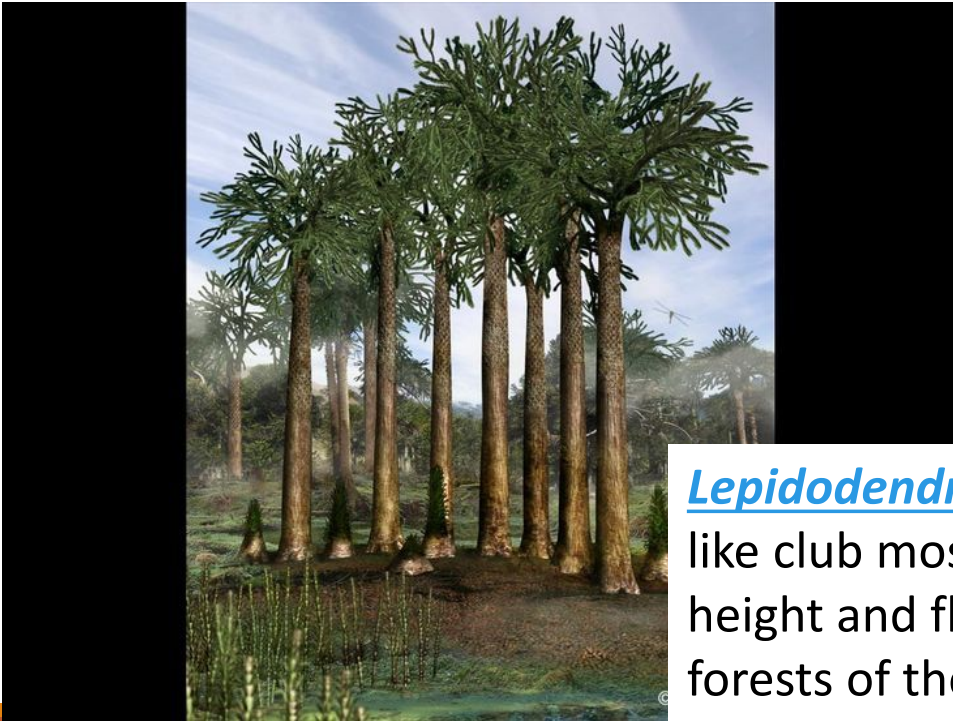
The body of vascular plants has highly organized food and water conducting system called the 'stele'.

They have proper roots, stems and leaves.

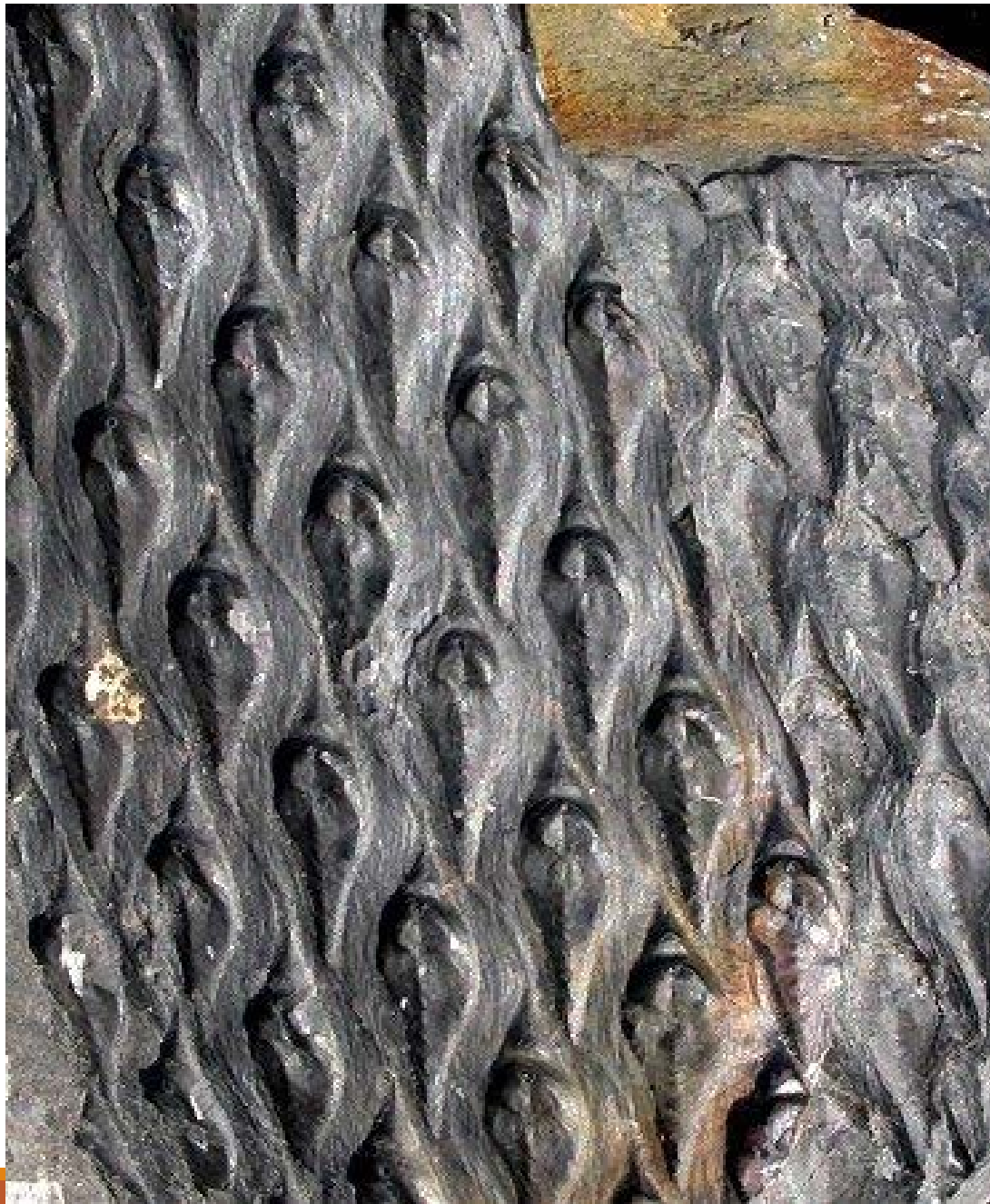
Vascular plants

Psilopsida – primitive forms, plant body shows low degree of differentiation.

Lycopsida – these have true roots, stems and leaves. During the Palaeozoic, these were



Lepidodendron was a giant tree-like club moss. It towered to 45 m in height and flourished in the swamp forests of the Carboniferous.



**LEPIDODENDRON
TRUNK**

**STIGMARIA
FICOIDES**

Vascular plants

Sphenopsida - They originated in the early Paleozoic, reached maximum diversity in late Paleozoic, when they formed a significant part of the vegetation, and then gradually decreased to only one genus *Equisetum* in the present time. Like the lycopsids, the Sphenopsida possesses true roots, stems and leaves.



Pteropsida

Ferns

Members have true roots, stems and leaves.

Large, typically pinnate, leaves - often termed fronds

Circinate vernation - protective coiling of young fern leaves into a spiral

Ferns typically have a horizontal (often underground) stem or rhizome, swollen with food reserves, from which the leaves and roots arise.



Cycads and conifers

First seed-bearing plants

Cycads – palm trees

Conifers – pine trees

Seeds without any covering

Gymnosperms



Angiosperms or Flowering plants

The flowering plants or angiosperms emerged in the Cretaceous period, some 130 million years ago. These are the most successful plant group, with something like a quarter of a million species described.

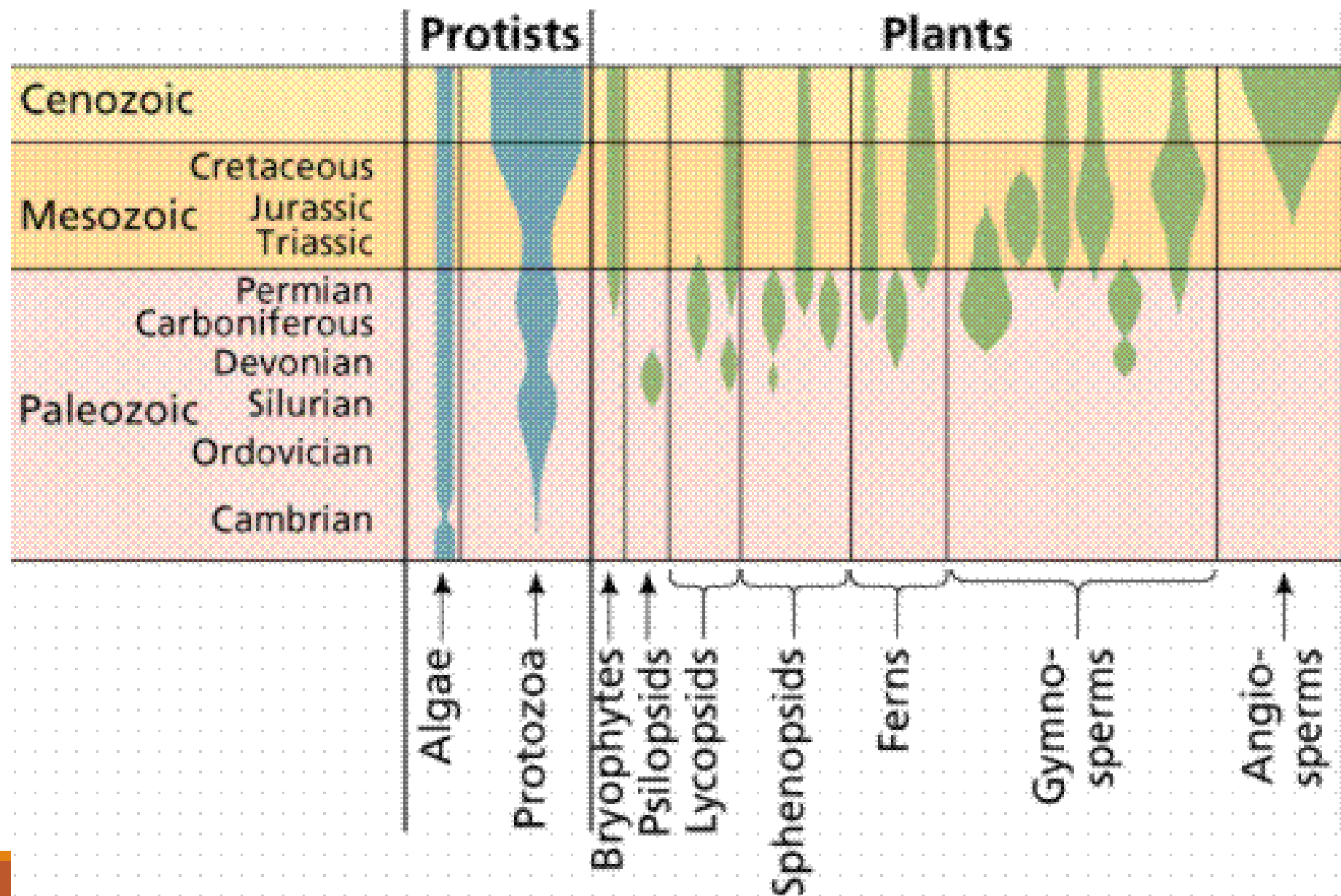
These are subdivided into two groups:

Monocotyledons (monocots) – Flowering plants containing seeds with one embryonic leaf. Example – major grains (rice, wheat), grass, bamboos.

Dicotyledons (dicots) – These contain seeds with two embryonic leaves. Most of the flowering plants fall within this group.

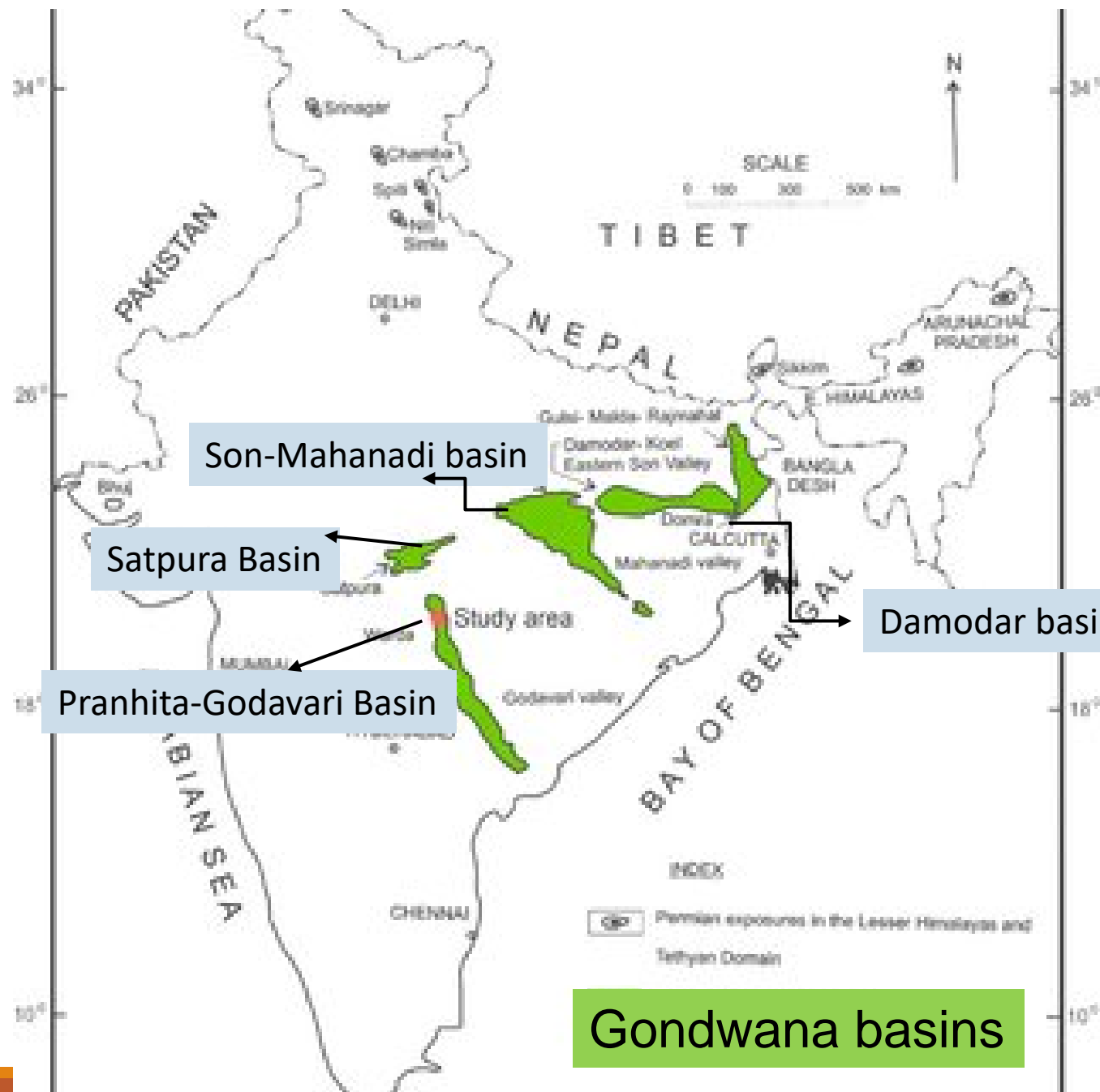


Plant evolution



Major plant fossils known from India

Important plant fossils of India



Paleozoic: Permian

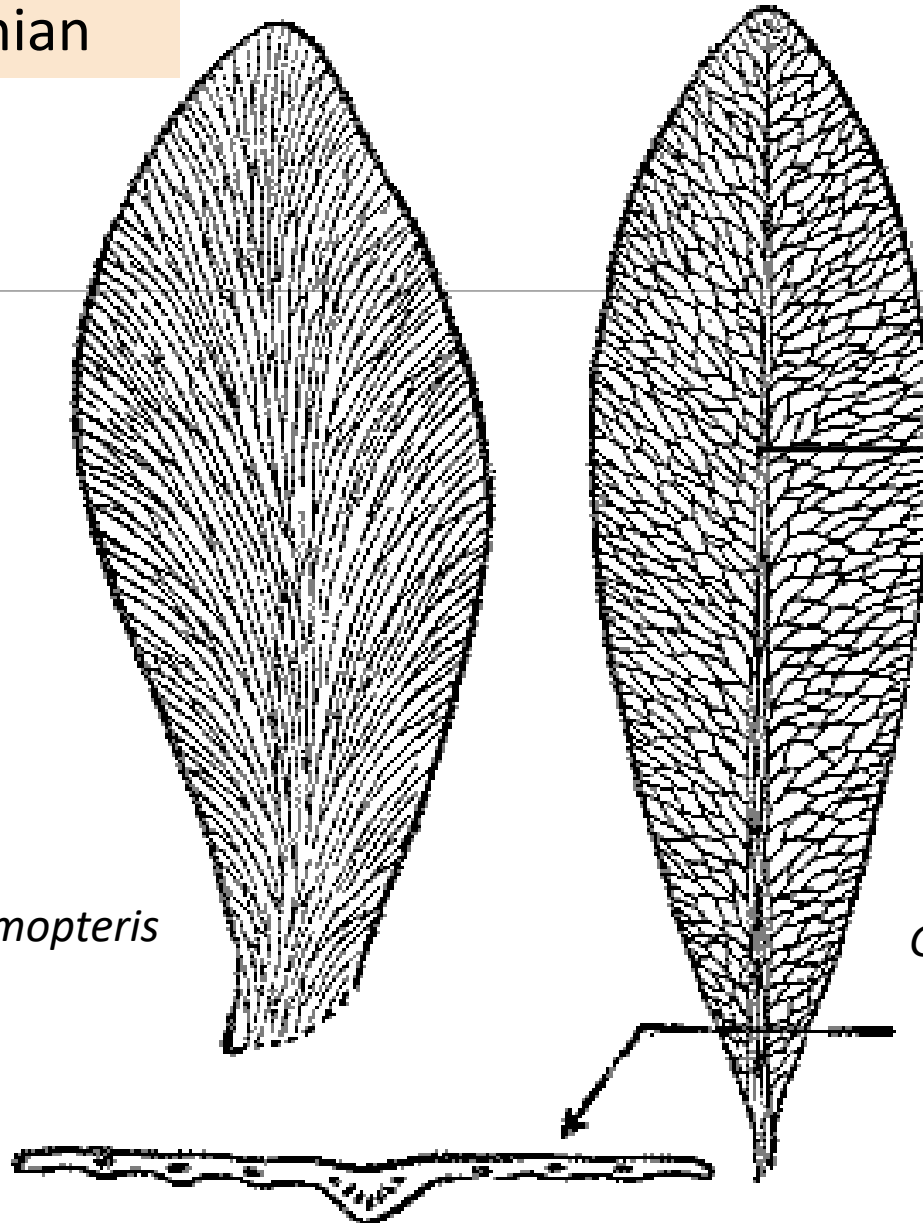
Parallel to
subparallel
venation

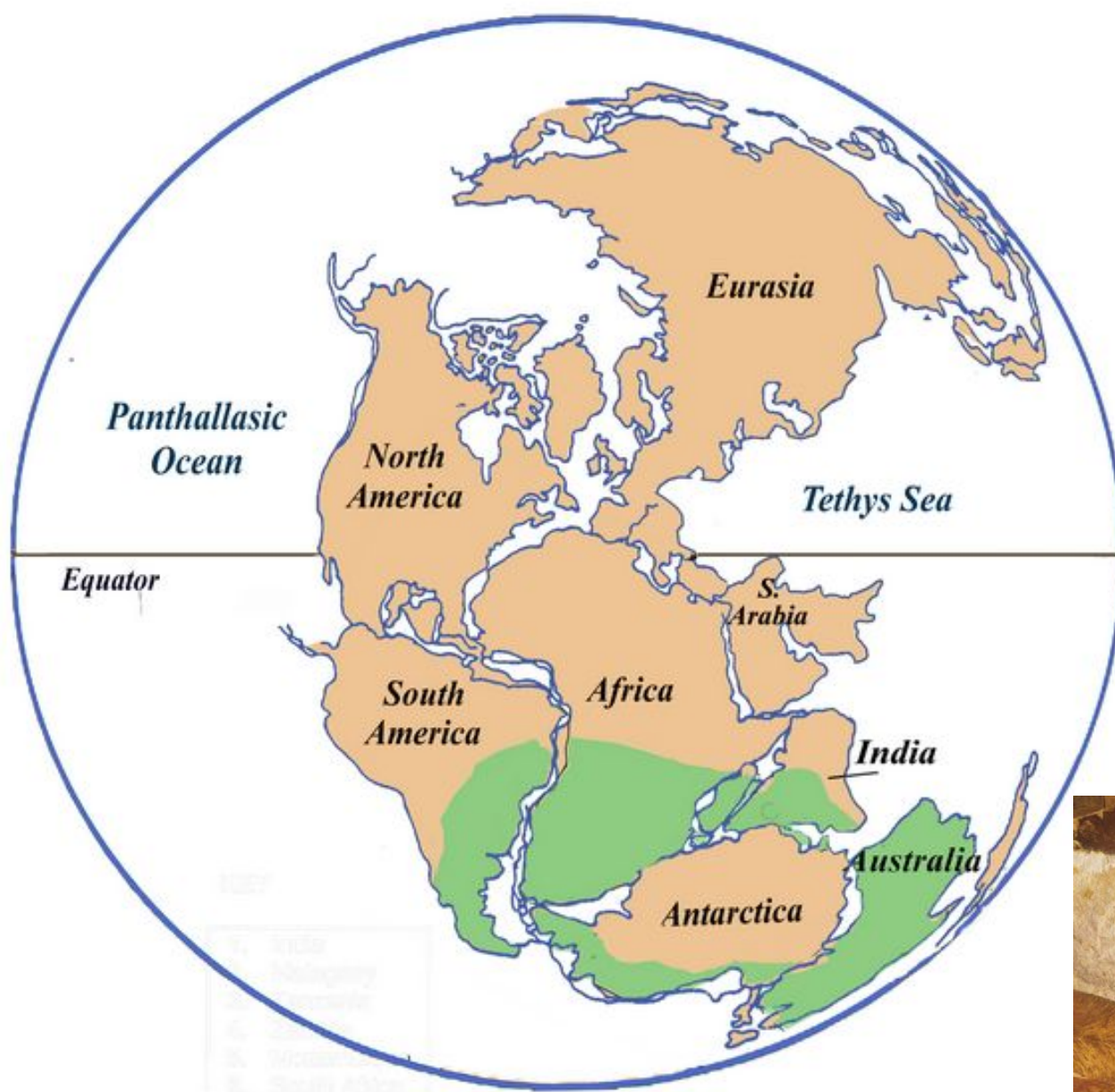
Gangamopteris

Reticulate
venation

Mid vein

Glossopteris

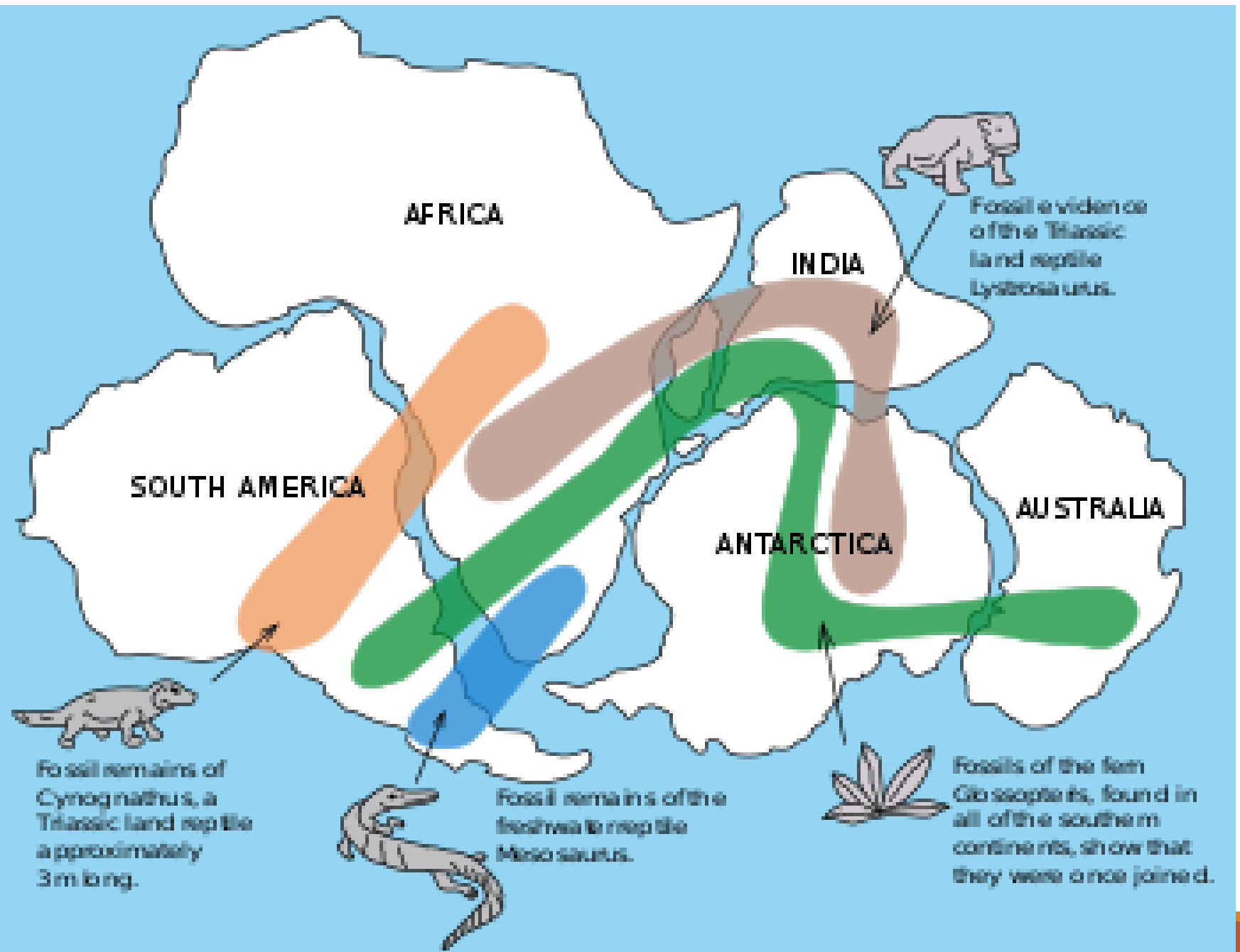




Distribution of *Glossopteris* in the Permian period

Glossopteris





Early Triassic



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Dicroidium

Late Mesozoic (Middle
Triassic onwards)



Fossil park, Jabalpur, MP



Cretaceous plant fossils