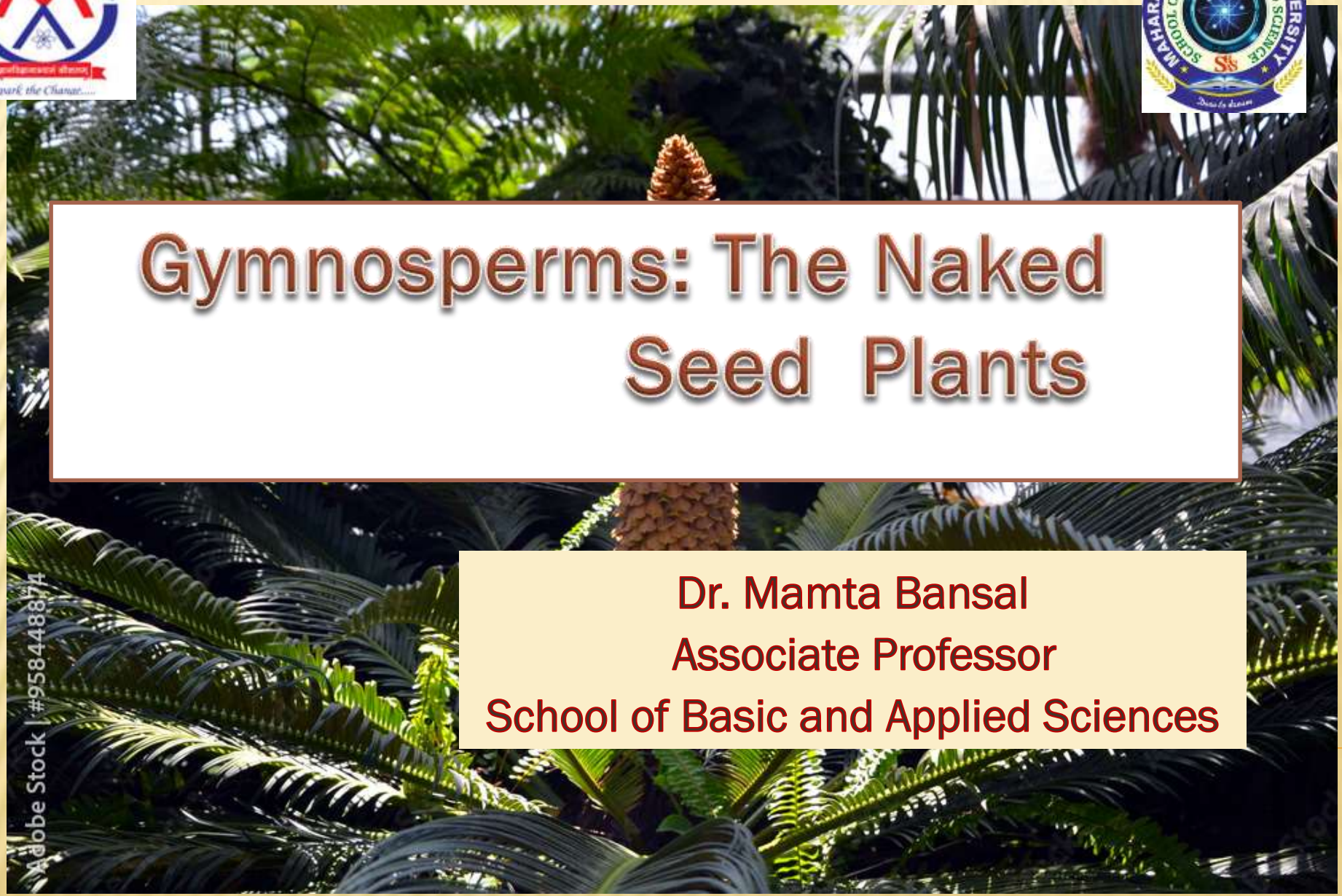

Gymnosperms: The Naked Seed Plants

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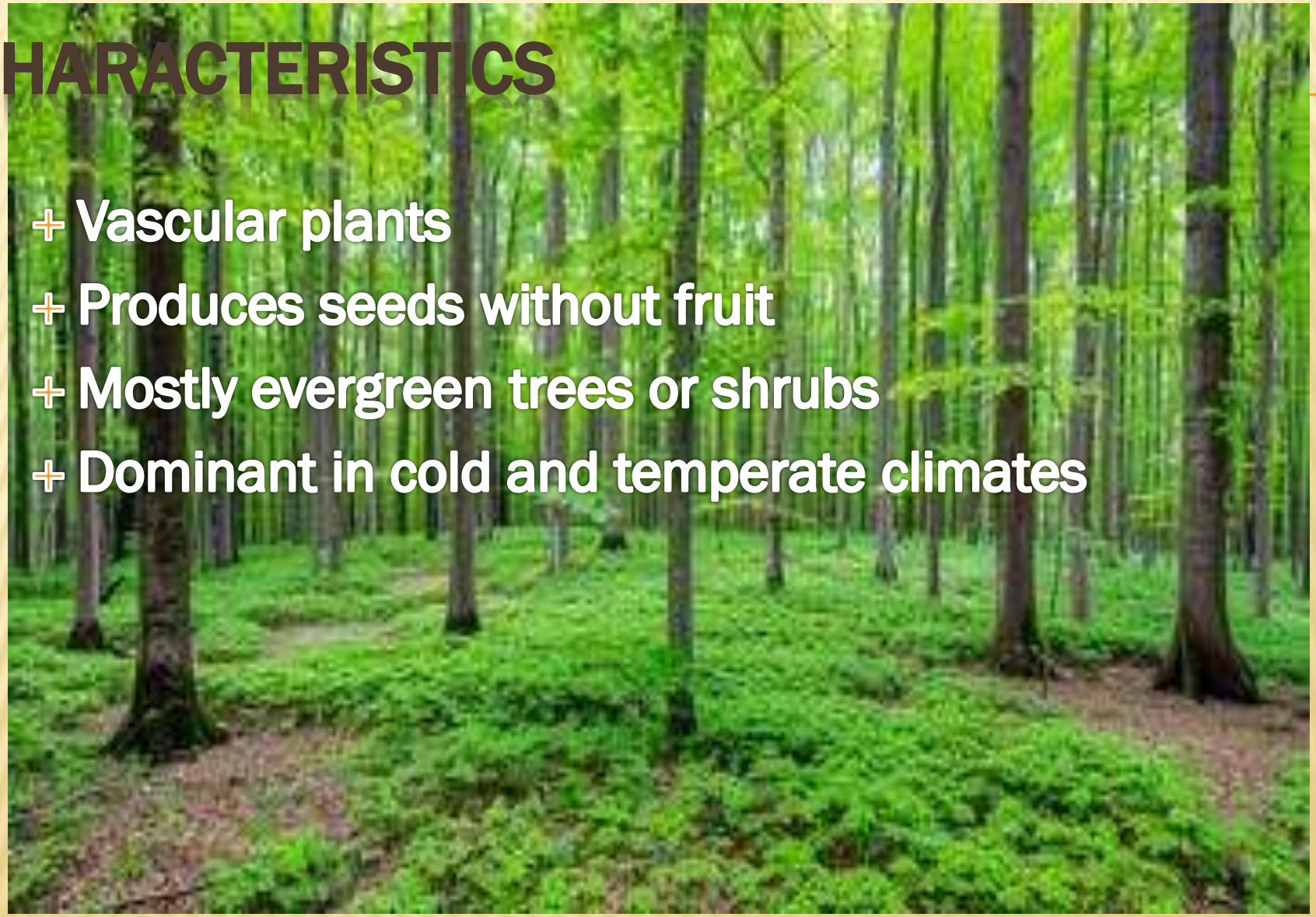
INTRODUCTION TO GYMNOSPERMS

Definition:

- Gymnosperms are seed-producing plants that do not form flowers or fruits.
- Their seeds are exposed on cones or other structures.

CHARACTERISTICS



- Vascular plants
- Produces seeds without fruit
- Mostly evergreen trees or shrubs
- Dominant in cold and temperate climates

CLASSIFICATION OF GYMNOSPERMS

- Main Divisions:
  - Cycadophyta (Cycads)
  - Ginkgophyta (Ginkgo)
  - Coniferophyta (Conifers)
  - Gnetophyta (Gnetum, Ephedra, Welwitschia)

STRUCTURE OF GYMNOSPERMS

- Root System: Taproot system with mycorrhizal association
- Stem: Woody, with secondary growth
- Leaves: Needle-like, scale-like, or broad (in Ginkgo)

REPRODUCTION IN GYMNOSPERMS

- Heterosporous: Produces both microspores (male) and megaspores (female)
- Male and female cones:
  - Male cones produce pollen grains
  - Female cones contain ovules that develop into seeds
- Pollination: Primarily by wind
- Fertilization: Occurs via pollen tube formation

LIFE CYCLE OF GYMNOSPERMS

- Alternation of generations
- Sporophyte dominant stage
- Gametophyte dependent on sporophyte

ADAPTATIONS OF GYMNOSPERMS

- Thick cuticle and sunken stomata to reduce water loss
- Needle-like leaves for cold resistance
- Extensive root system for nutrient absorption

ECONOMIC AND ECOLOGICAL IMPORTANCE

- Timber production (Pine, Fir, Cedar)
- Resin and turpentine extraction
- Medicinal uses (Ginkgo biloba for memory enhancement)
- Landscaping and ornamental uses
- Carbon sequestration and oxygen production

EXAMPLES OF GYMNOSPERMS

- Pinus (Pine)
- Cedrus (Cedar)
- Ginkgo biloba (Maidenhair tree)
- Cycas (Cycad)
- Ephedra (Source of ephedrine)

GYMNOSPERMS VS ANGIOSPERMS

- Comparison table highlighting key differences:
  - Seeds: Exposed (Gymnosperms) vs. Enclosed in fruit (Angiosperms)
  - Leaves: Mostly needle-like vs. Broad
  - Flowers: Absent vs. Present
  - Pollination: Wind vs. Insects, wind, water

FOSSIL HISTORY OF GYMNOSPERMS

- Originated in the Paleozoic era
- Dominated Mesozoic forests (Age of Gymnosperms)
- Decline with the rise of Angiosperms

CONSERVATION OF GYMNOSPERMS

- Threats: Deforestation, climate change, habitat loss
- Conservation efforts: Botanical gardens, protected areas, seed banks

CYCAS: INTRODUCTION

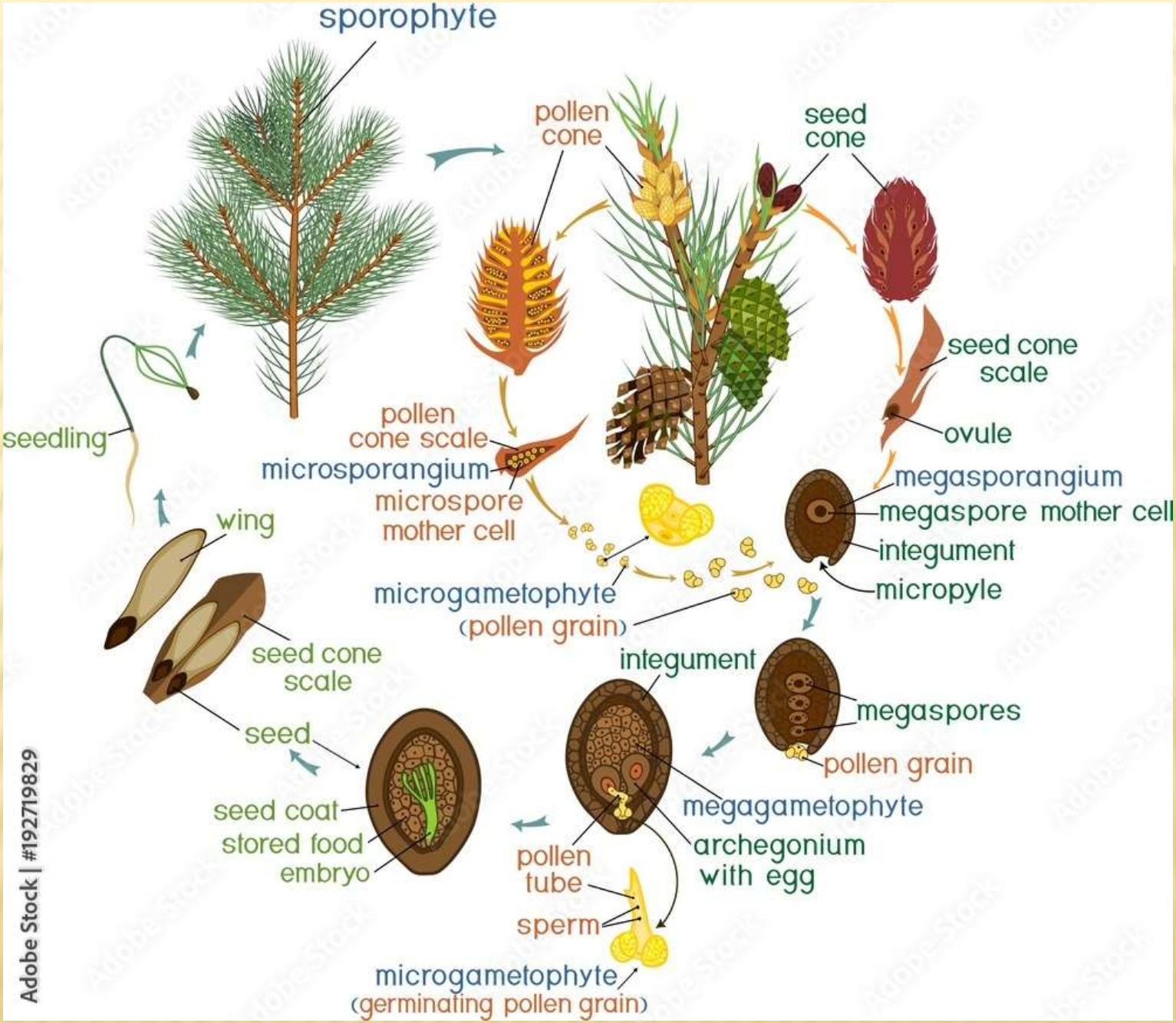
- Cycas: Introduction
- Cycas is a genus of gymnosperms belonging to the Cycadophyta division.
- Commonly known as cycads, they resemble palm trees.
- Found in tropical and subtropical regions.

MORPHOLOGY OF CYCAS

- Leaves: Pinnate and leathery
- Stem: Woody, unbranched, with leaf scars
- Roots: Coralloid roots with nitrogen-fixing cyanobacteria

REPRODUCTION IN CYCAS

- Dioecious: Male and female plants are separate.
- Male cones produce pollen grains, while megasporophylls bear ovules.
- Pollination primarily by wind.
- Fertilization occurs via motile sperms, a primitive feature.


sporophyte
pollen cone
seed cone
seed cone scale
ovule
pollen cone scale
microsporangium
microspore mother cell
megasporangium
megaspore mother cell
integument
micropyle
microgametophyte (pollen grain)
seedling
wing
seed cone scale
seed
seed coat
stored food
embryo
integument
megaspores
pollen grain
megagametophyte
archegonium with egg
pollen tube
sperm
microgametophyte (germinating pollen grain)
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ECONOMIC AND MEDICINAL IMPORTANCE OF CYCAS

- Ornamental plant in gardens and landscapes.
- Starch-rich seeds used as food after detoxification.
- Traditional medicine: Used for treating various ailments.
- Toxicity concerns: Raw seeds contain harmful compounds.

CONSERVATION OF CYCAS

- Threats: Habitat destruction, overharvesting, climate change.
- Conservation efforts:
  - Cultivation in botanical gardens.
  - Seed banks and protected areas.
  - Awareness programs.
- Image: Conservation efforts worldwide

CONCLUSION

- Gymnosperms are vital to ecosystems and human economy.
- They are ancient plants that have adapted to various environments.
- Conservation efforts are necessary to protect rare gymnosperm species.
- Image: A forest of gymnosperms


THANK YOU