Natural Sciences 360
Legacy of Life
Lecture 5
Dr. Stuart S. Sumida

Plants

Getting on Land and What We Eat

(In this course, a KEY INNOVATION is a feature that is not only a synapomorphy of a group, but also a feature that allows or facilitates a broad adaptive radiation.)

THREE GREAT KINGDOMS OF MEGAEUKARYOTIC PHOTOAUTOTROPHS:

- RED SEAWEEDS (ALGAE)
- BROWN SEAWEEDS (ALGAE)
- PLANTAE

OUR FOCUS ON PLANTS:

The Water to Land Transition

Flowering Plants

The Water to Land Transition: (How do you keep from drying out and falling over?)

- Cell Walls
- Cuticle – waxy layer on aerial surfaces
- Stomata (singular = stomate) – openings that can be controlled to prevent water loss
- Development of Embryos
- Spores for dispersal
- Plus TWO KEY INNOVATIONS

KEY INNOVATIONS OF LAND PLANTS:

Alternation of generations

Vascular Tissues

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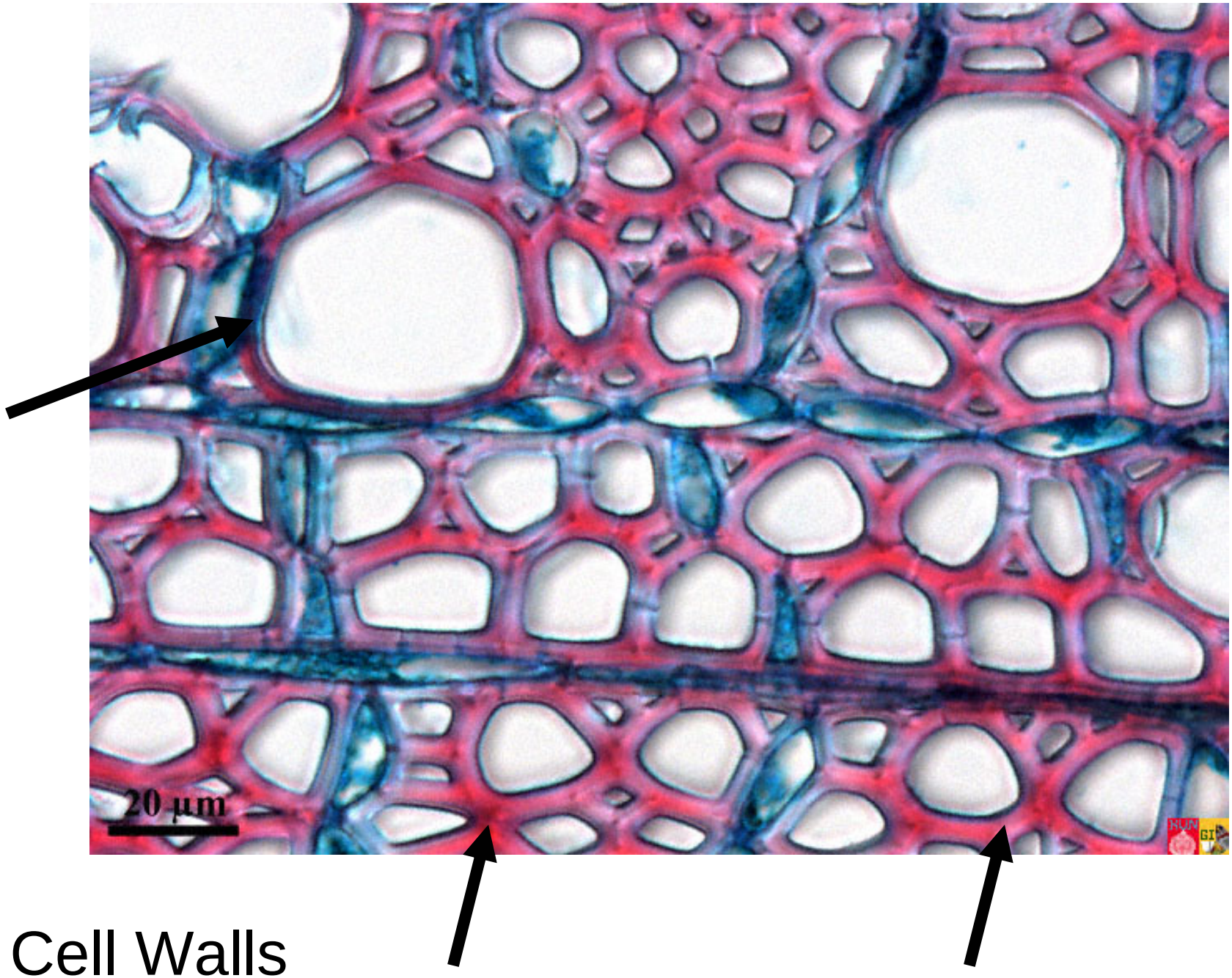
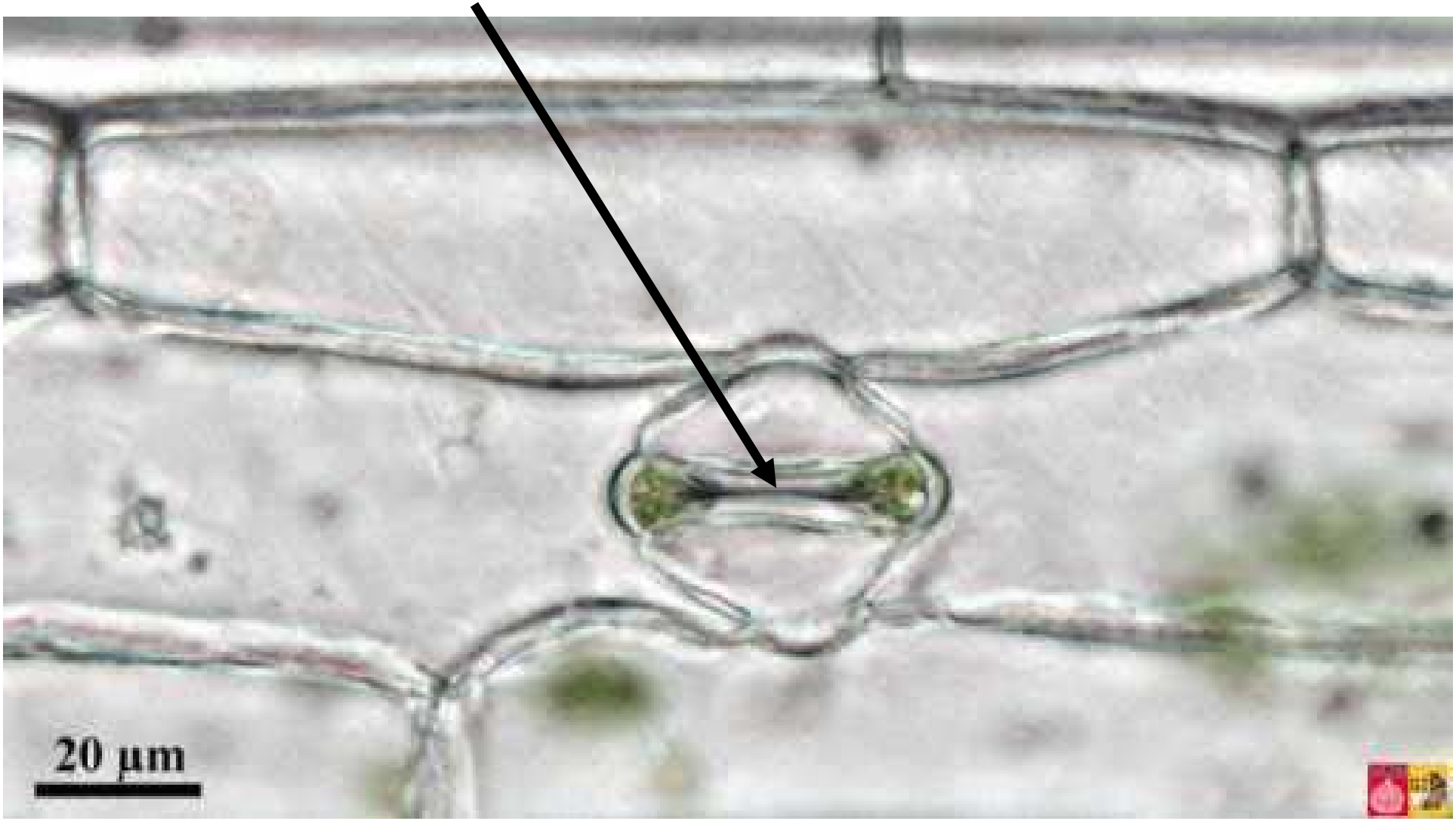
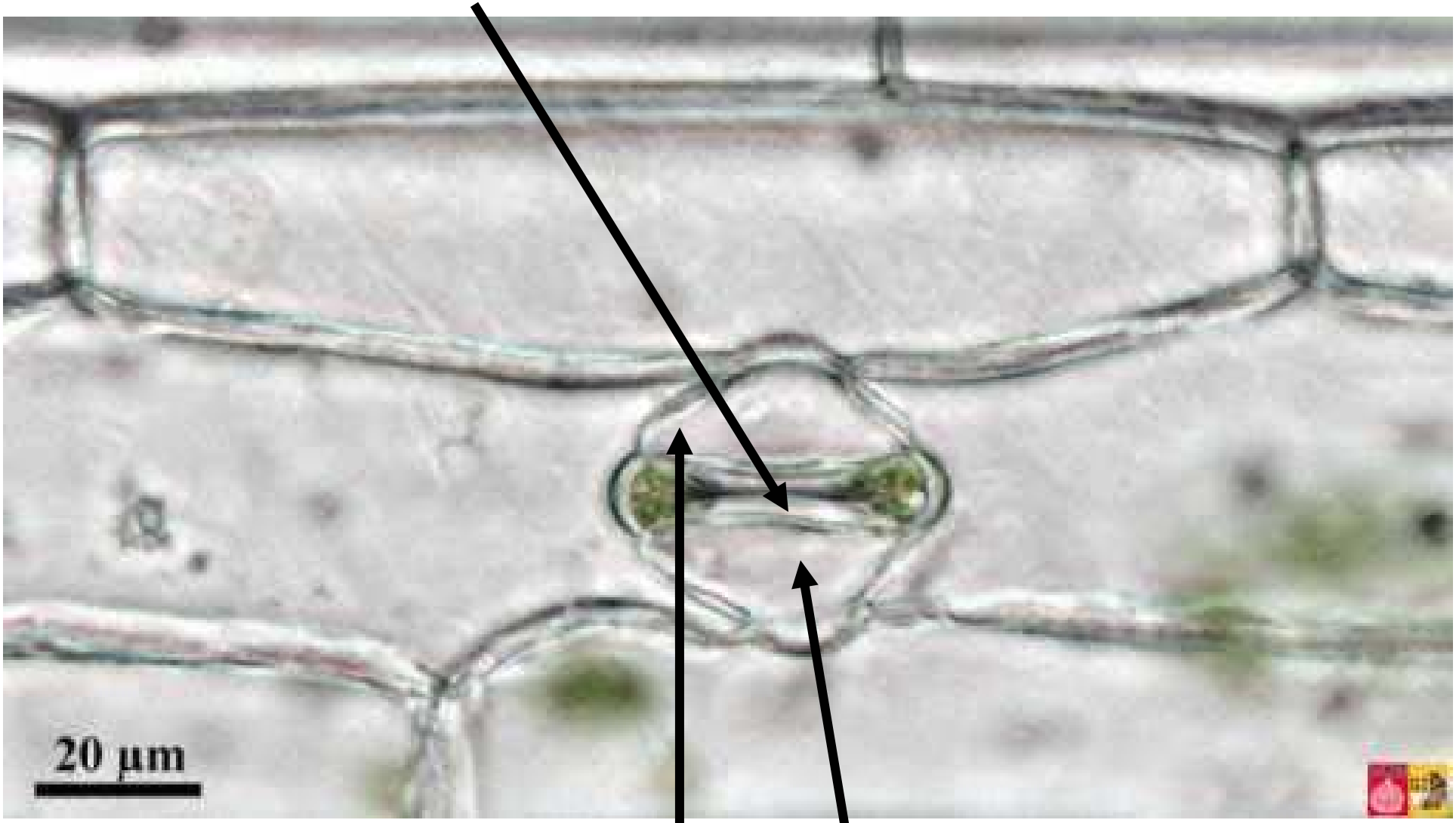


Cell Walls


20 µm

Closed stomate

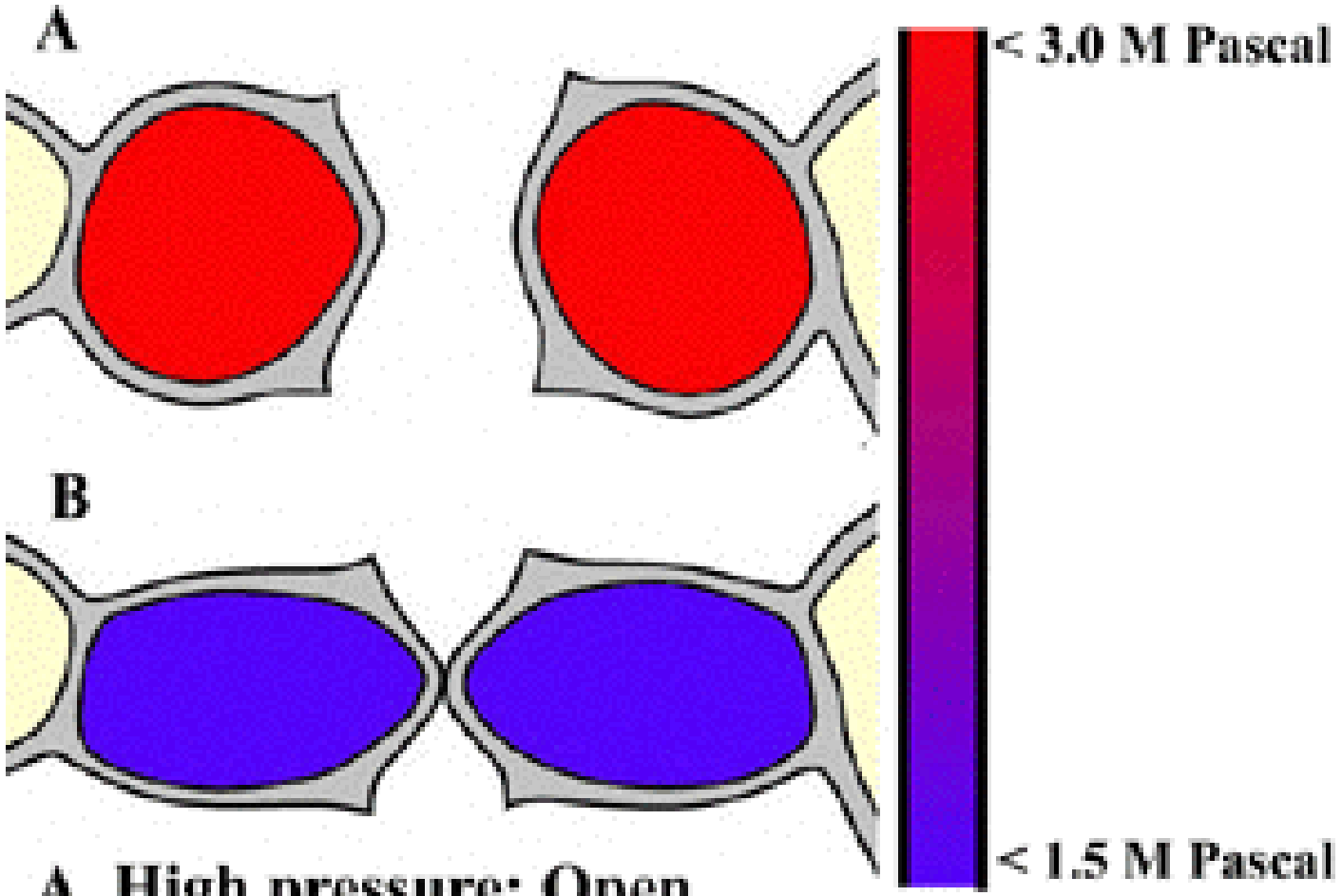


Guard Cells

Closed Stomate

Open Stomate

OPENING AND CLOSING MECHANISM OF STOMATA



A. High pressure: Open
B. Low pressure: Closed

Alternation of “Generations”:

An alternation between form that makes gametes (sperm and eggs) called the GAMETOPHYTE GENERATION.

And

The form that makes the spores for distribution called the SPOROPHYTE GENERATION.

VASCULAR TISSUE

Tissues for:

transporting water – XYLEM

transporting food (sugars, etc.) – PHLOEM

Vascular Plants = “Tracheophyta”

Sphenophyta (Horsetails)
Pterophyta (Ferns)
“Gymnosperms”
    Cycadophyta
    Ginkophyta
    Coniferophyta
Anthophyta (includes flowering plants)

Equisetum arvense

Sphenophyta (Horsetails and their relatives)
From Late Devonian (dominant and common in Late Devonian and Carboniferous)

Adiantum

Pterophyta (ferns)
Known since the Carboniferous

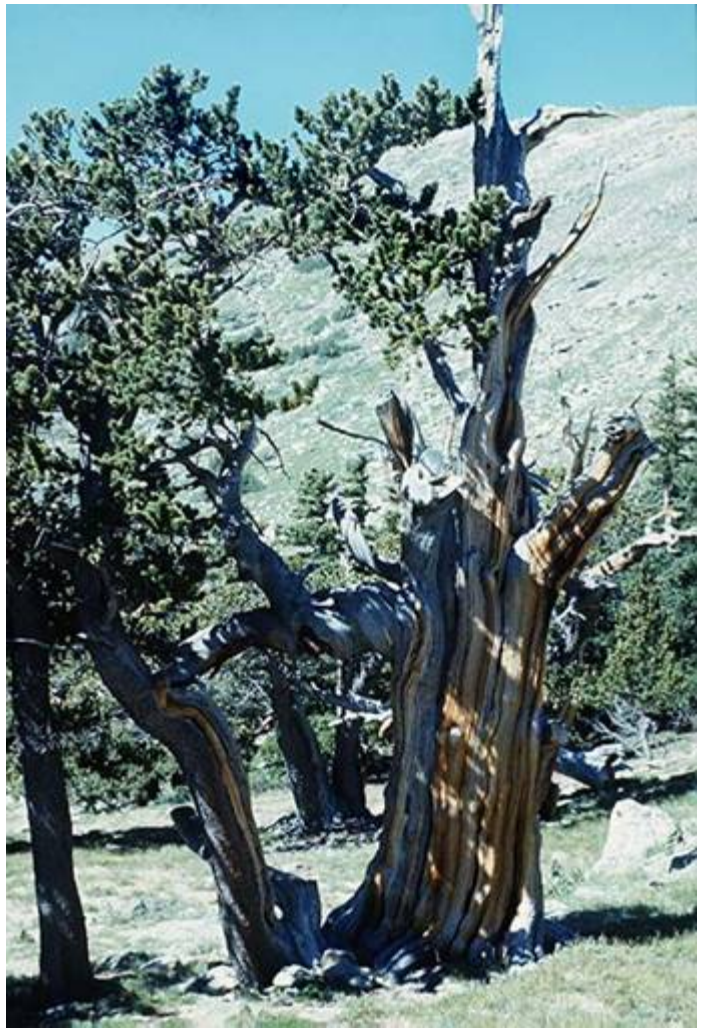
Cycadophyta (cycads) *Cycas*
Known from Carboniferous

illion
r old
ko
fossil

Ginkophyta
Known from end of Cretaceous (end of age of dinoaurs)

Coniferophyta (“evergreens” or “conifers”)
Known since Late Carboniferous

Pinus aristata



Coniferophyta (“evergreens” or “conifers”)
Known since Late Carboniferous

Anthophyta (includes flowering plants)

Some types known since Jurassic, but flowering plants known from end of Cretaceous

Flowering Plants

Monocots – Grasses and others

Dicots – Flowers that give fruits

The MONOCOTS comprise one-quarter of all flowering plant species. They include lilies, orchids, agaves, palms, and grasses.

Flowering Plants:

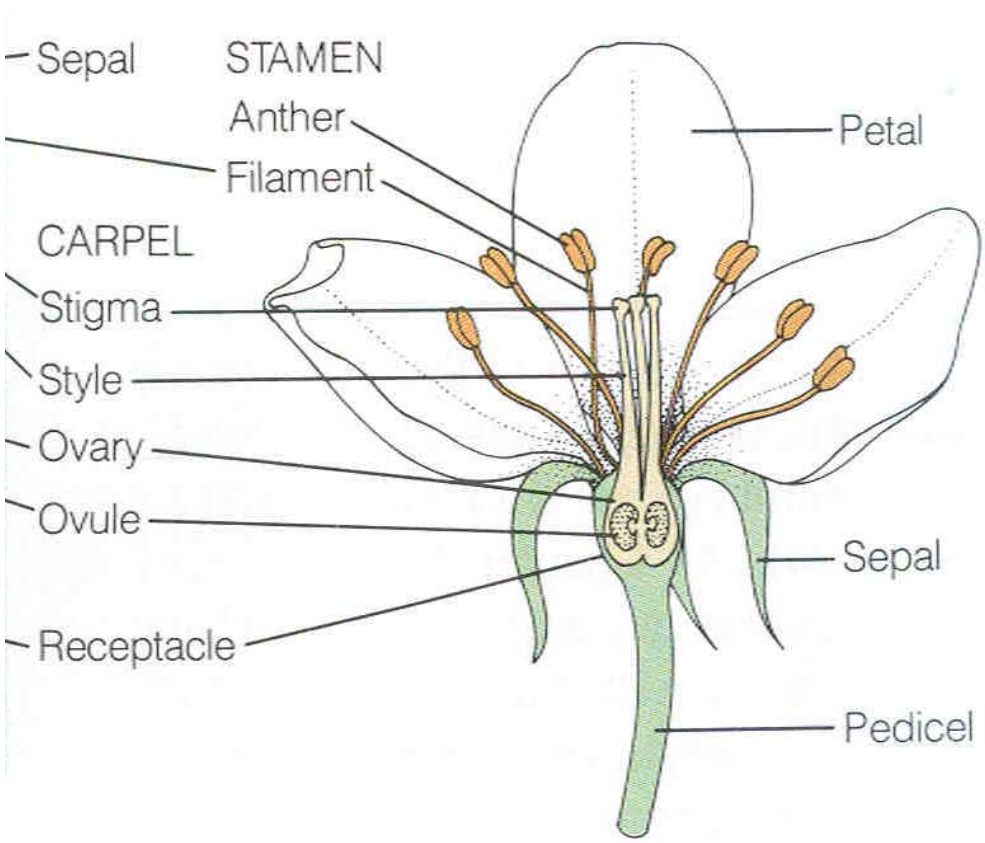
So just what ARE you eating?

Flowering plants produce not only seeds, but fruits.

So what exactly is a fruit?

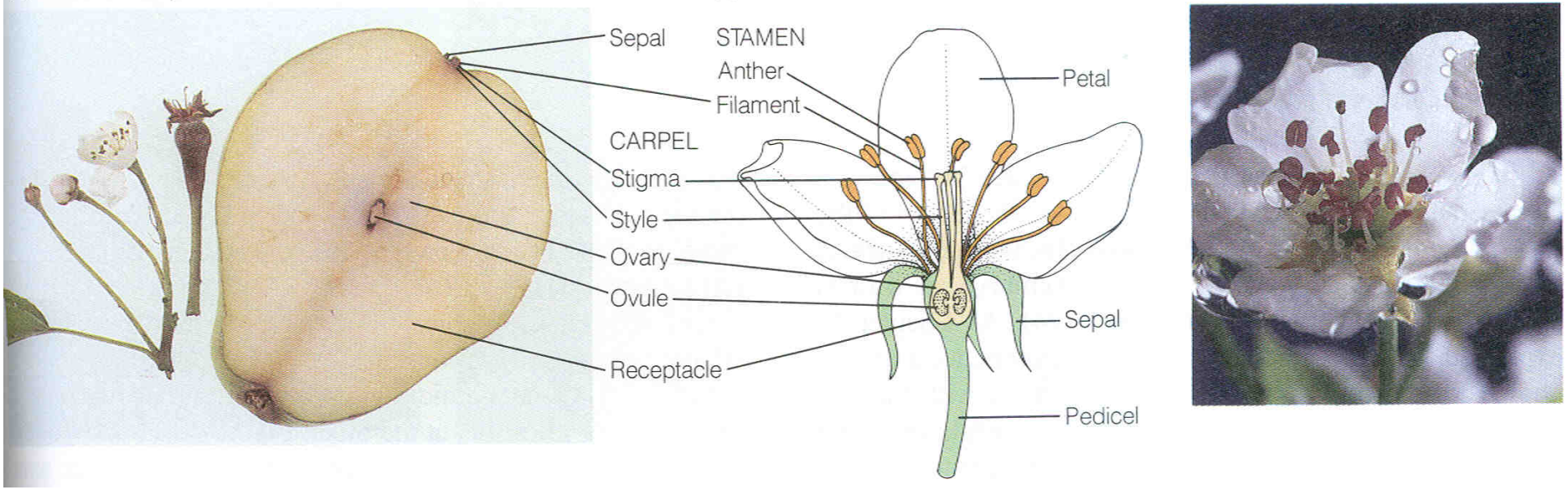
Or a vegetable for that matter?

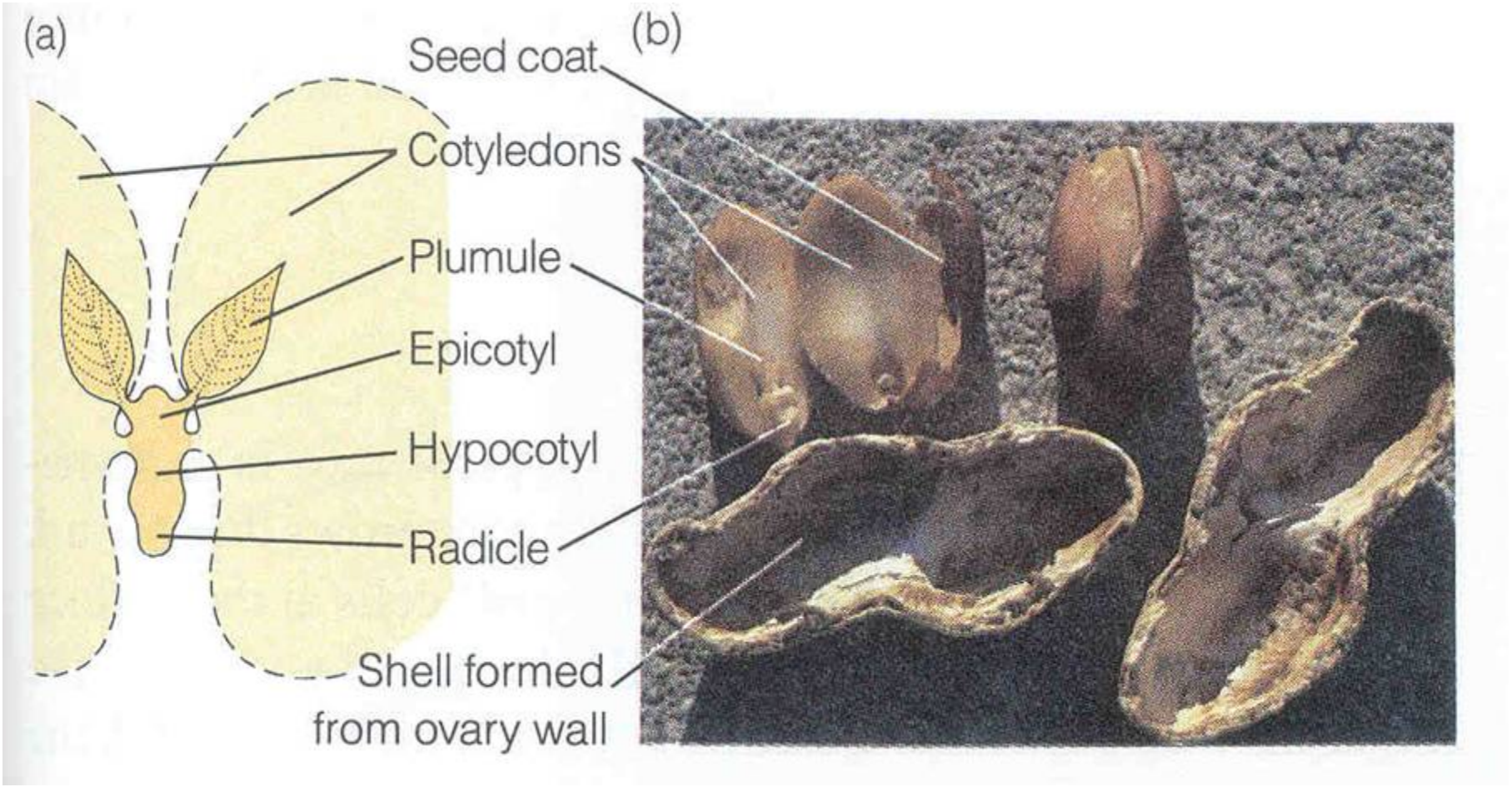
To understand, we have to turn to flowers and flower structure…


Sepal
STAMEN
Anther
Filament
CARPEL
Stigma
Style
Ovary
Ovule
Receptacle
Petal
Sepal
Pedicel

(a) Growth of a pear

(b) Pear flower




(a)
(b)
Seed coat
Cotyledons
Plumule
Epicotyl
Hypocotyl
Radicle
Shell formed
from ovary wall