



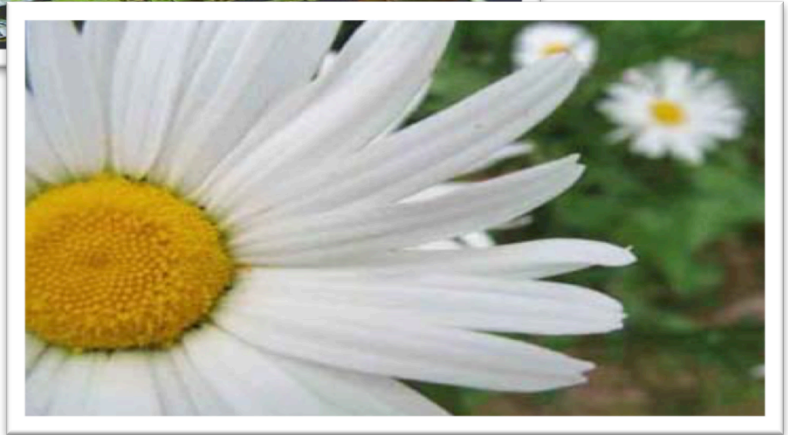
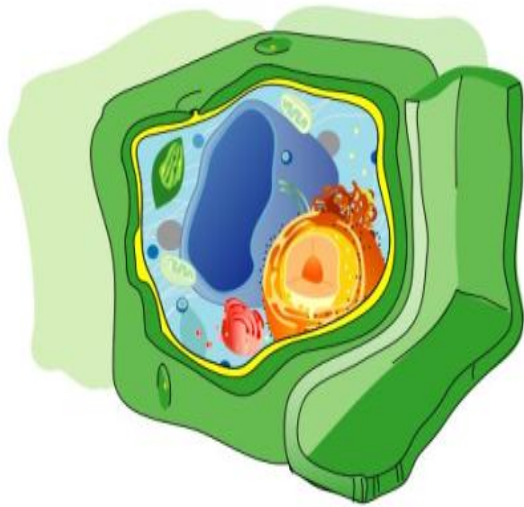
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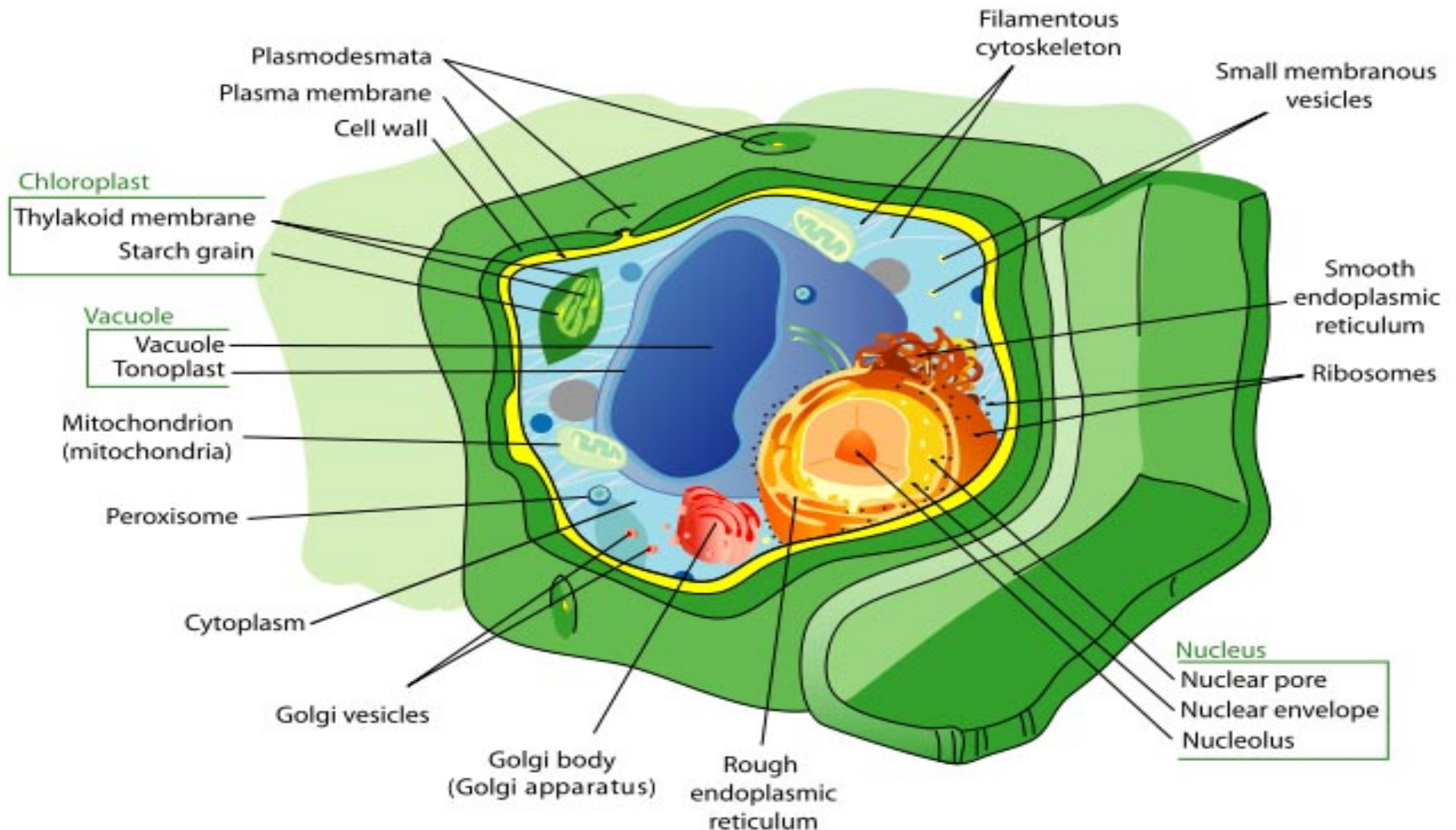
Tami Port, MS
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Land Plants



VIDEO: Plant Cells
from
Crash Course Biology

Plant Cell (Eukaryote)



Classifying Living Things

Three Domains

Eubacteria

- True bacteria
- Prokaryotes

Exs. *Streptococcus pneumoniae*
Escherichia coli

Archaea

- Were thought to be same as Bacteria until recently.
 - Prokaryotes
- Ex. *Extremophiles*

Eukaryota

- All eukaryotic organisms.

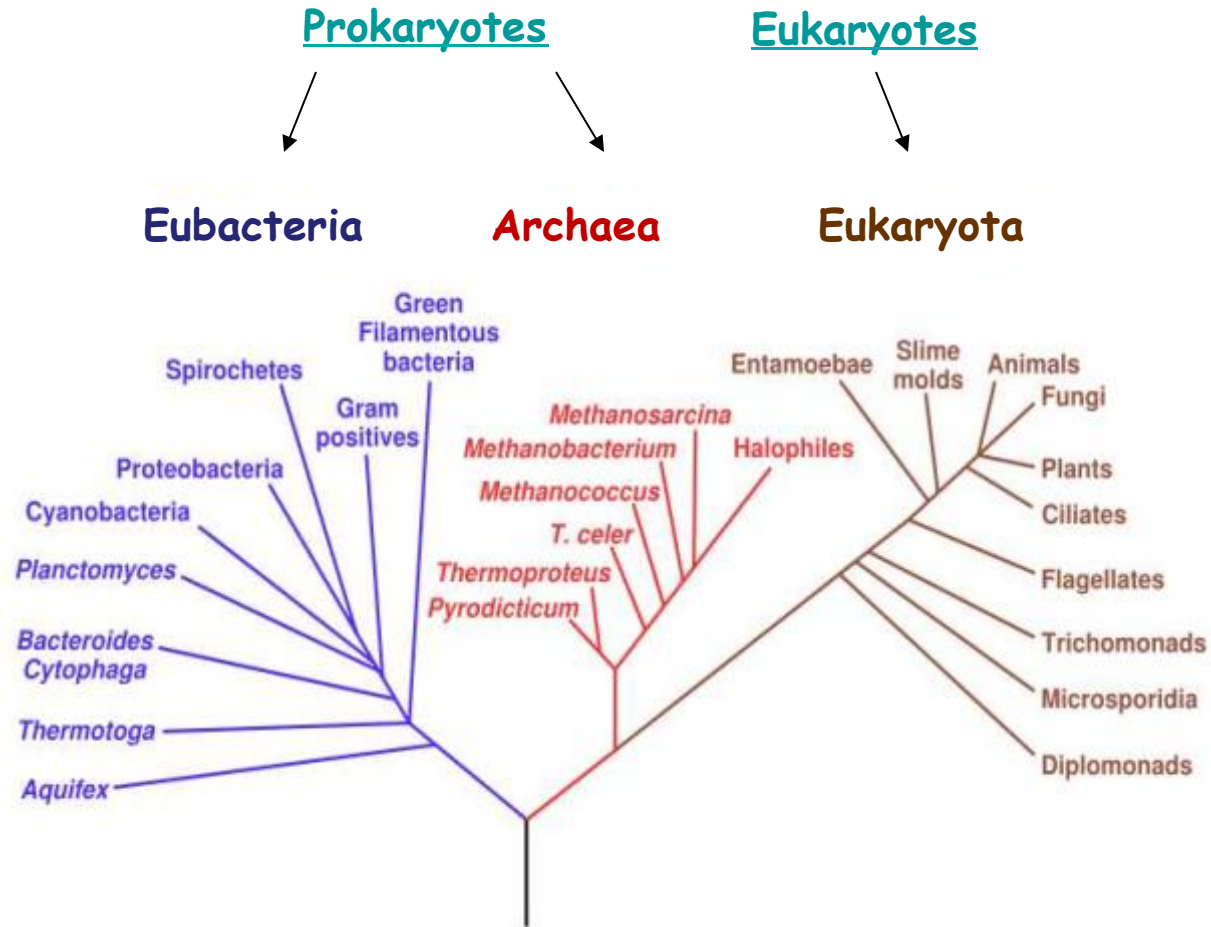
Fall into 4 Kingdoms:

Protista - Ex. *algae*

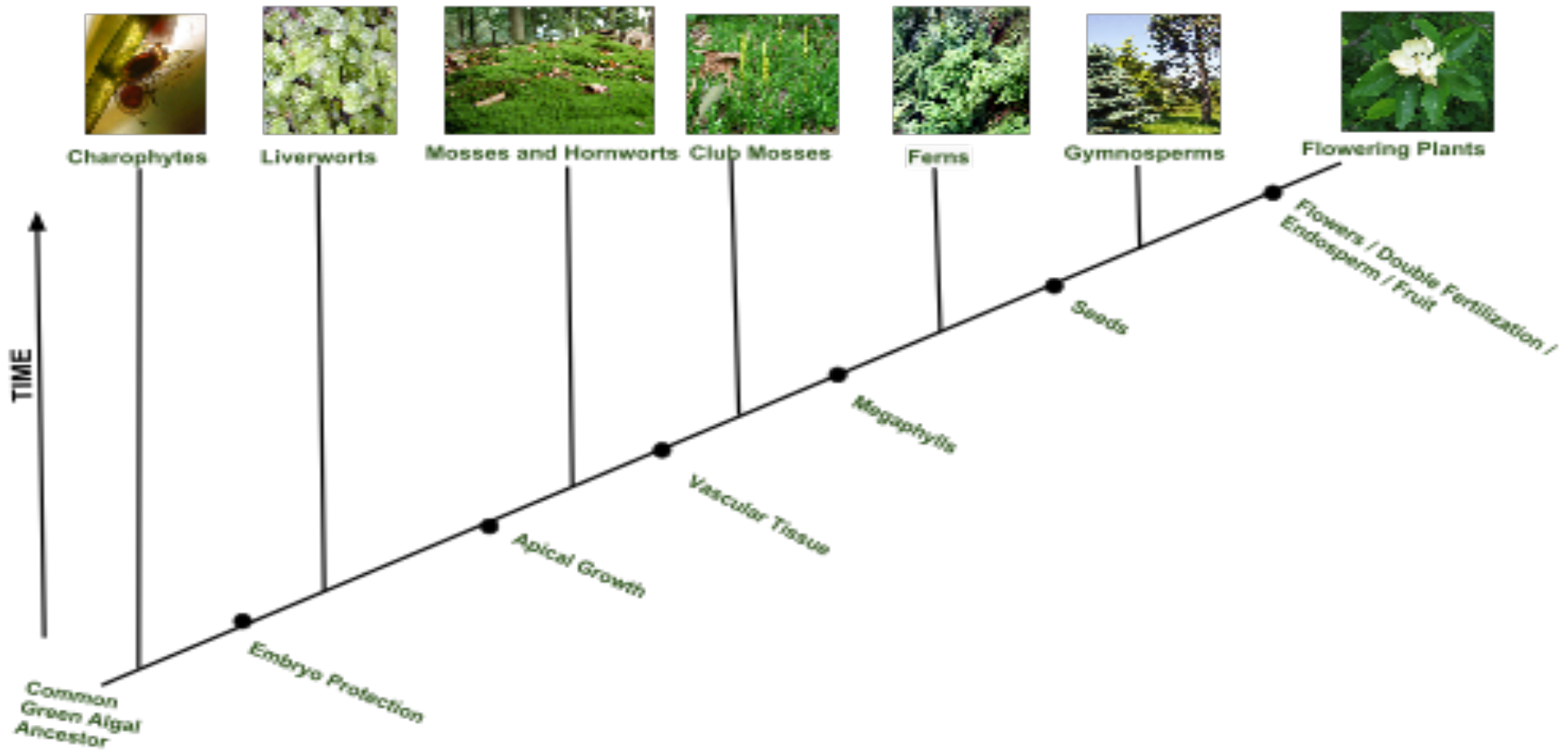
Fungi - Ex. *mushroom*

Plantae - Ex. *Maple tree*

Animalia - Ex. *you*



Evolutionary Relationship of Land Plants



Charophyta

Charophyta is a division of freshwater green algae.

Reproduce sexually & asexually.

Terrestrial plants emerged from a common ancestor.



Land Plants

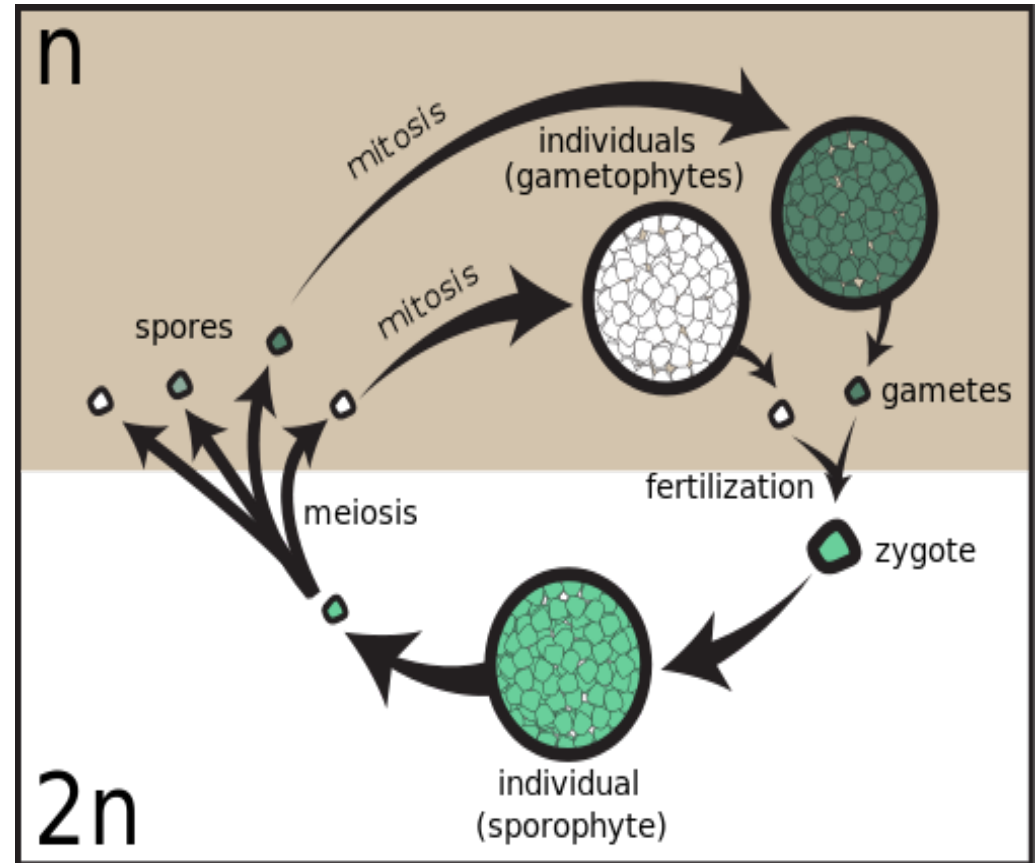
Alternation of Generations

ANIMATION:
Life Cycle of Plants
McGraw Hill

Two multi-cellular stages to life cycle:

1n. **Gametophyte** (haploid):
Produces gametes that fuse to form zygotes that develop into...

2n. **Sporophytes** (diploid):
Produce spores, haploid cells that can develop into a new organism without fusing with another cell.



Alternation of Generations

Zygote > *Sporophyte* > Spores > *Gametophytes* (get busy) > Zygote...etc.

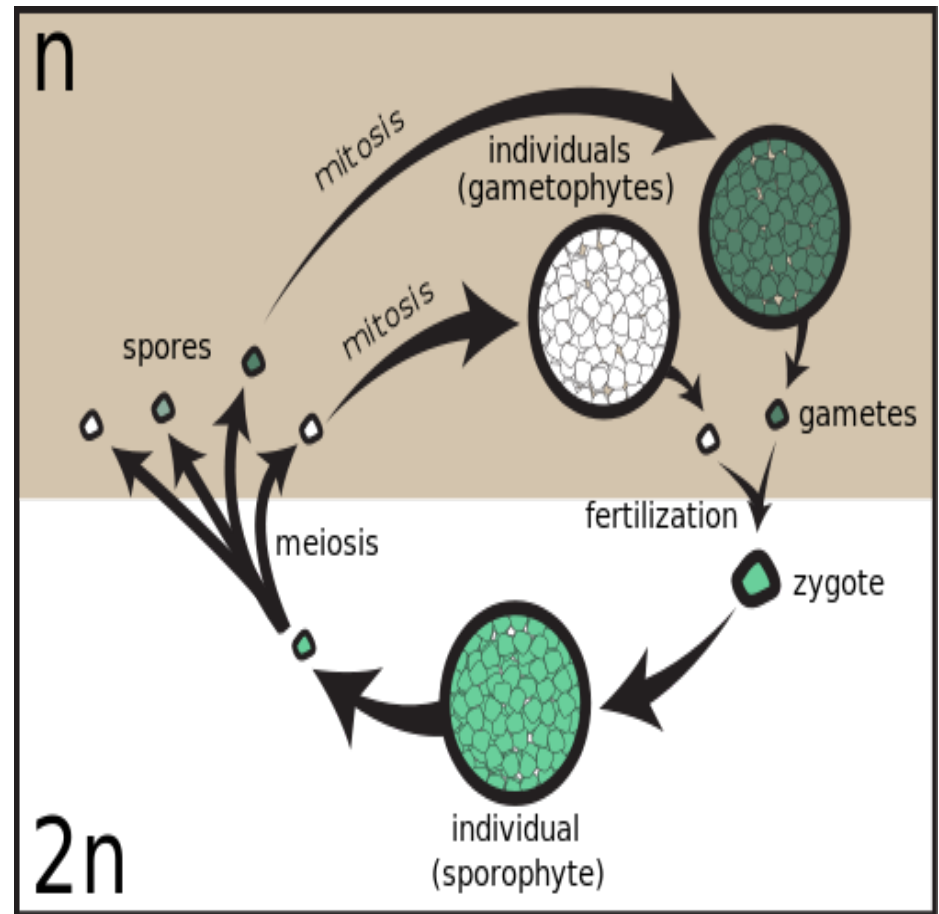
On land, more difficult to produce zygotes (fertilized egg).

No water for swimming sperm.

Each zygote produces a sporophyte, which can make many, many haploid spores.

When a spore lands in a suitable environment, it sprouts into a gametophyte.

Male & female gametophytes produce gametes (sex cells), that fuse into zygotes...starting the cycle again.



Types of Land Plants

1. Non-Vascular Plants

- **Bryophyta**: Mosses, Hornworts, Liverworts

2. Vascular Plants

a. Seedless Vascular Plants

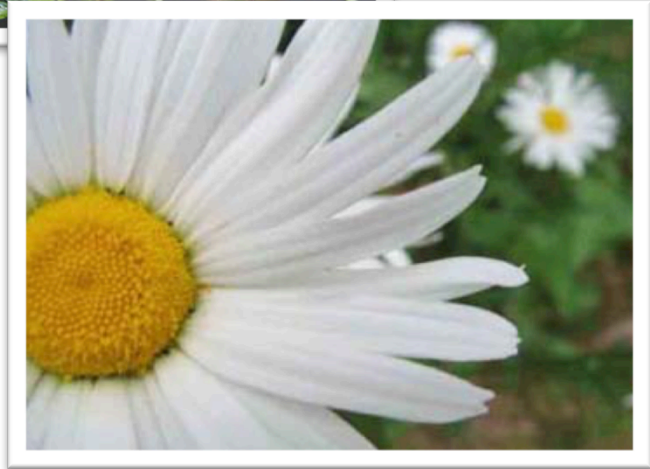
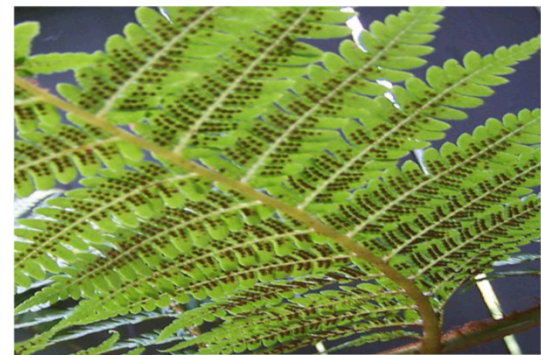
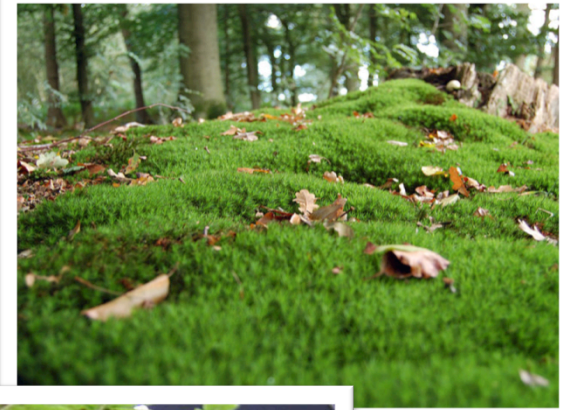
- Example: Pterophyta - Ferns
- Important parts to the life cycle: *sporophyte, sori, sporangium, spore, gametophyte*.

b. Gymnosperms

- Example: Pines & Spruces
- Produce naked seeds, but not flowers.

c. Angiosperms

- Flowering plants.
- Seeds are protected by growing in ovaries.
- These are the dominant type on the planet today.

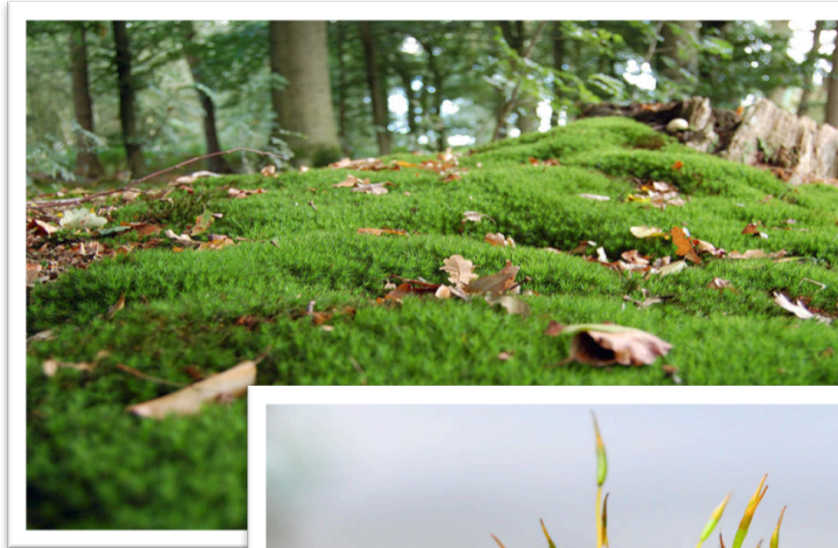


Non-Vascular Land Plants

Bryophyta:
Mosses,
Liverworts,
Hornworts

Lack vascular tissue
(other land plants have
vascular tissue).

Gametophyte (haploid) is
dominant phase in the
Bryophyte life cycle
(Other plants have
sporophyte as dominant
phase of life cycle).



A patch of moss showing both **gametophytes** (the low, leaf-like forms) and **sporophytes** (the tall, stalk-like forms).

VIDEO:
[The Sex
Lives of
Non-
Vascular
Plants](#)

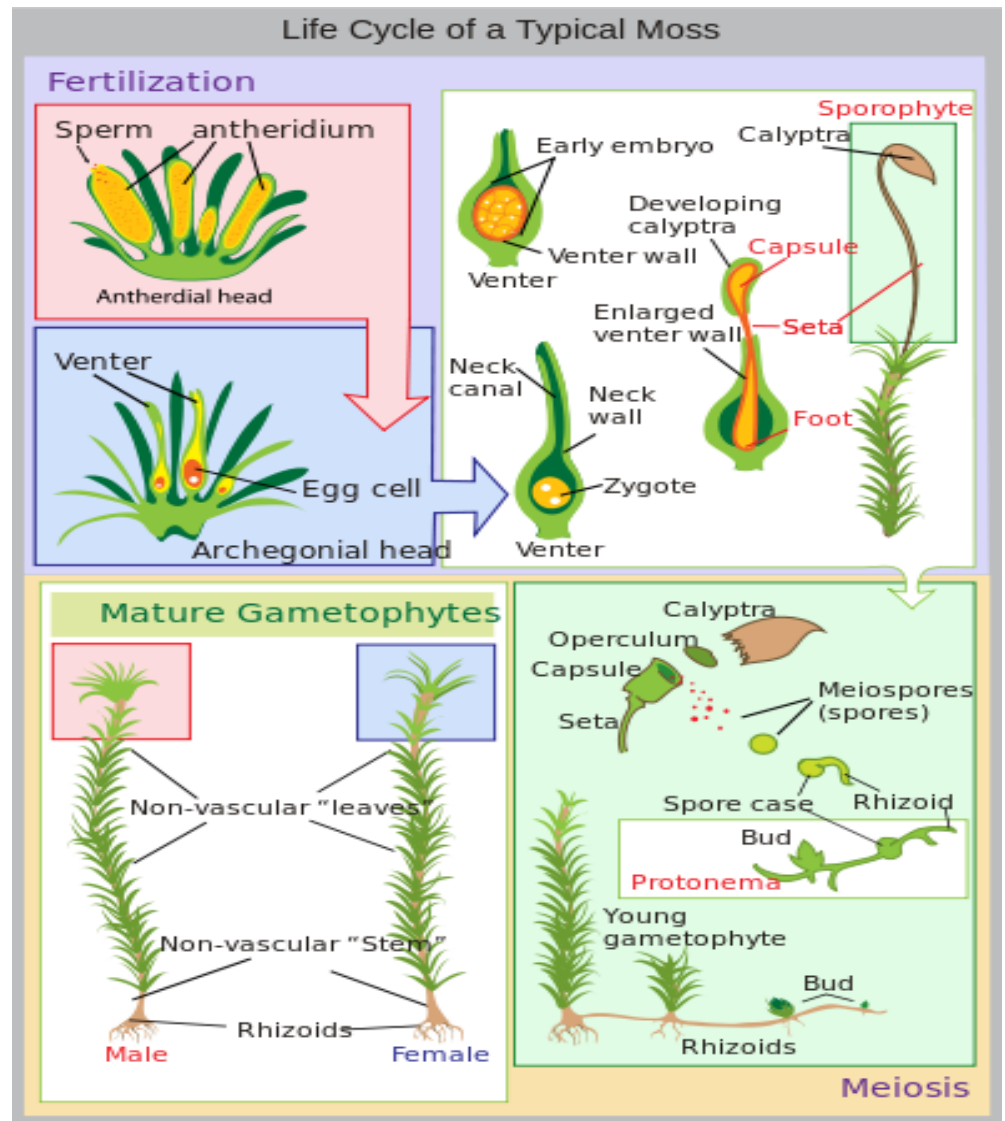
from
Crash Course
Biology

Mosses

Small flowerless plants that usually grow in dense green clumps or mats, in damp, shady locations.

Individual plants composed of simple, one-cell-thick leaves, covering a thin stem that supports them but does not conduct water and nutrients (nonvascular).

They do not have seeds or any vascular tissue.



ANIMATION: [Life Cycle of Moss](#)
FROM McGraw Hill

Types of Land Plants

VIDEO:
Vascular Plants =
WINNING!
from
Crash Course Biology

1. Non-Vascular Plants

- Bryophyta: *Mosses*, *Hornworts*, *Liverworts*

2. Vascular Plants

a. Seedless Vascular Plants

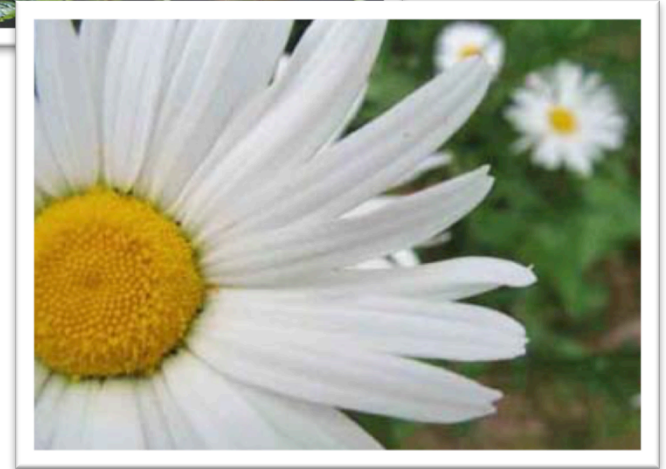
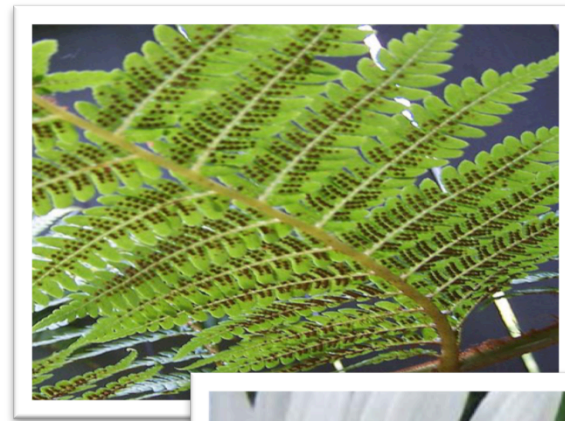
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Images:: [Moss](#), Wiki; [Fern sori](#), Wiki;
[Conifer cone](#), Wiki Daisy, T. Port

Vascular Tissue of Plants

Complex conducting tissue, formed of more than one cell type.

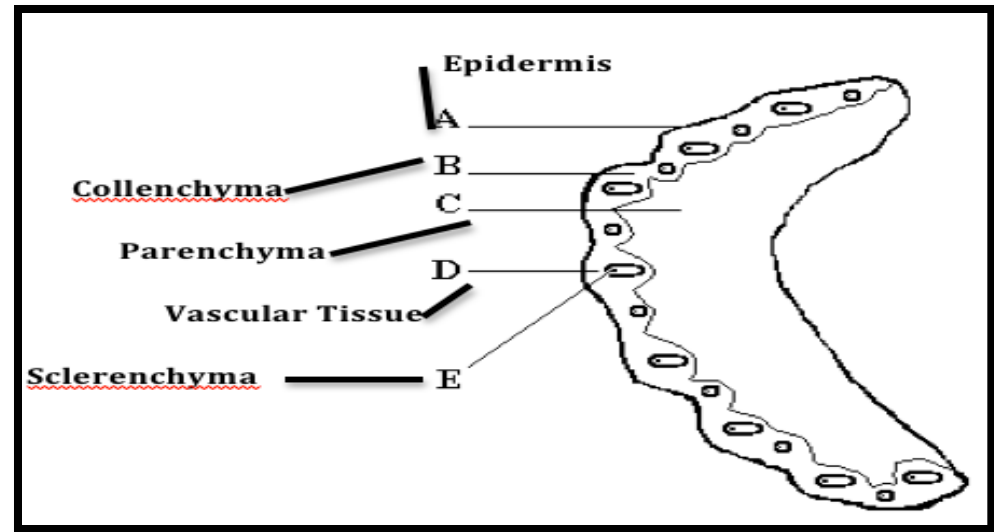
Primary components: *xylem* and *phloem*.

Xylem: dead cells that carry water and nutrients from roots to the rest of the plant.

Phloem: living cells that distribute sugars and amino acids throughout the plant

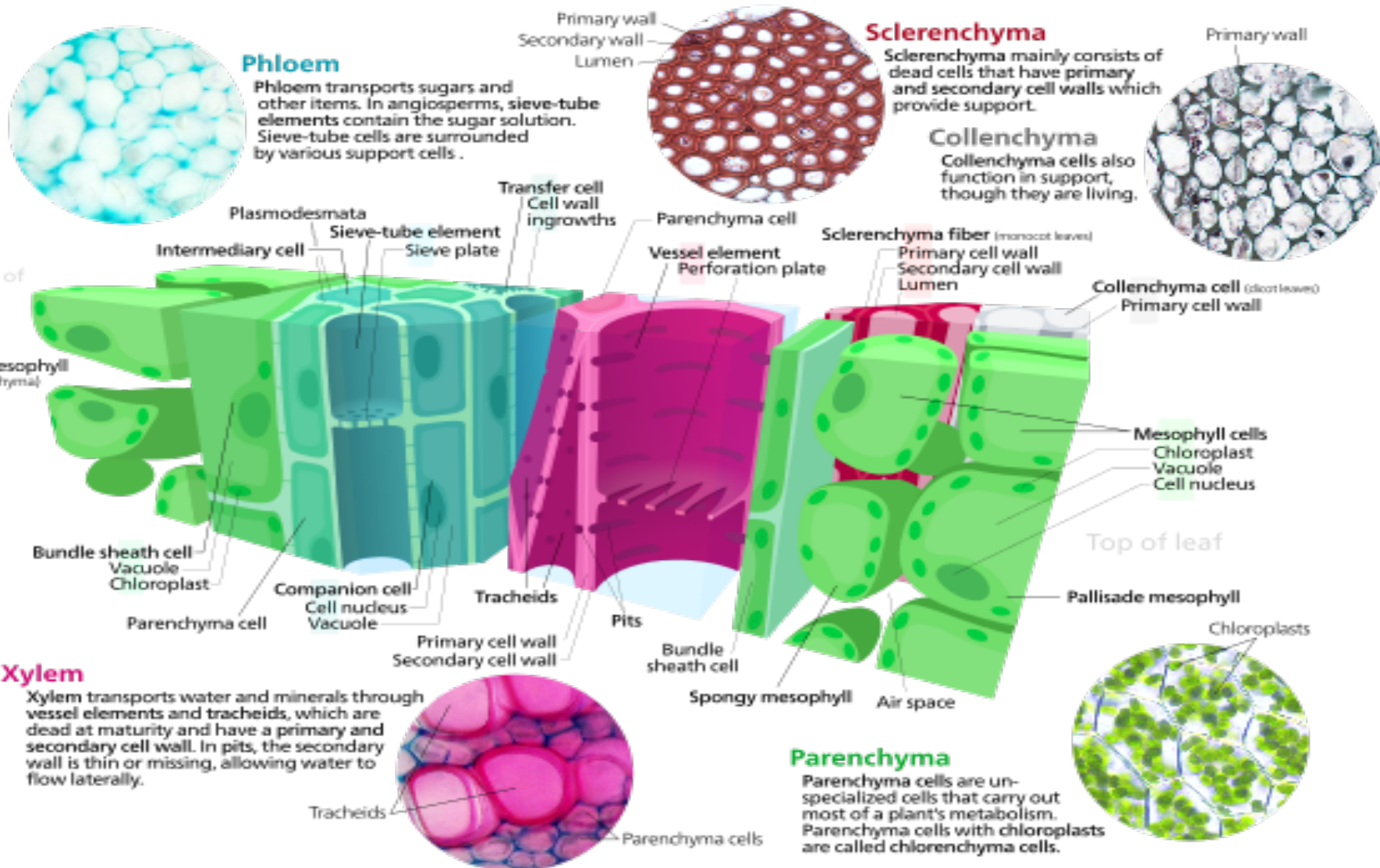
Cells typically long and slender .

Function in the conduction of water, minerals, and nutrients throughout the plant (similar to pipes).

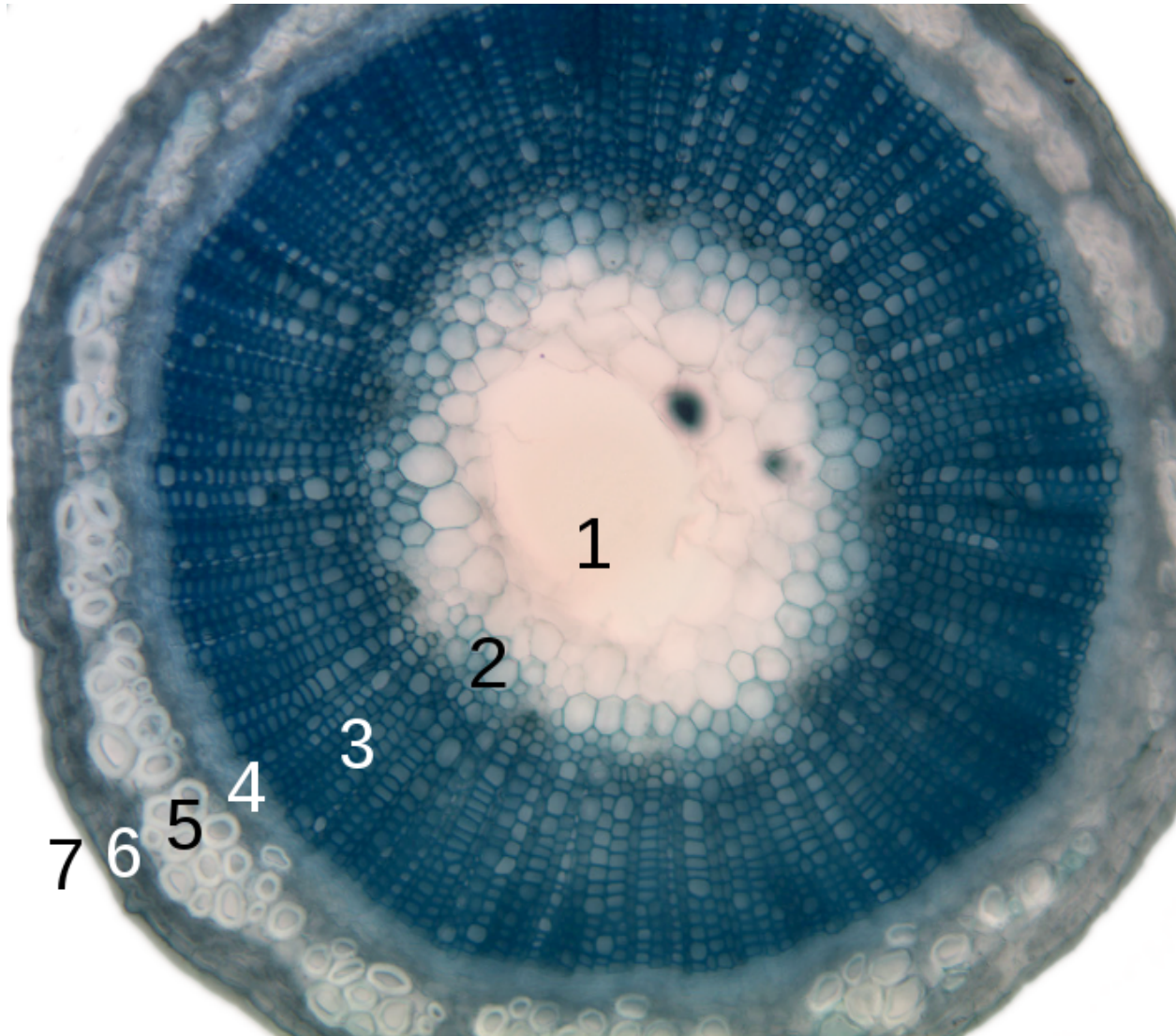


Cross section of celery stalk, showing vascular bundles, which include both phloem and xylem.

Vascular Tissue of Plants



Vascular Tissue of Plants



LEGEND:

1. **Pith:** soft, spongy central tissue that is not dermal or vascular.
2. **Protoxylem**
3. **Xylem**
4. **Phloem**
5. **Sclerenchyma**
6. **Cortex:** tissue found between the epidermis and vascular tissue.
7. **Epidermis**

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Seedless Vascular Plants

Major groups:

- Psilophyta - Wisk ferns
- Sphenophyta - Horsetails
- Lycophyta - Club Mosses
- *Pterophyta* - *Ferns*

Reproduce via spores. No seeds or flowers.

Important parts of the life cycle: *sporophyte*, *sori*, *sporangium*, *spore*, *gametophyte*.



Fern Sporophyte

Fern sporophyte: What you recognize as "a fern."

Fern sori: A sorus is a cluster of sporangia. Where spore are formed.

Fern spores: Unit of asexual reproduction adapted for dispersal and survival, often for extended periods of time, in unfavorable conditions. Spores are the products of meiosis in sporophytes.



Images: [Fern sori](#), [Round sori up close](#), [Fern sporangium](#), Wiki.

Fern Gametophyte

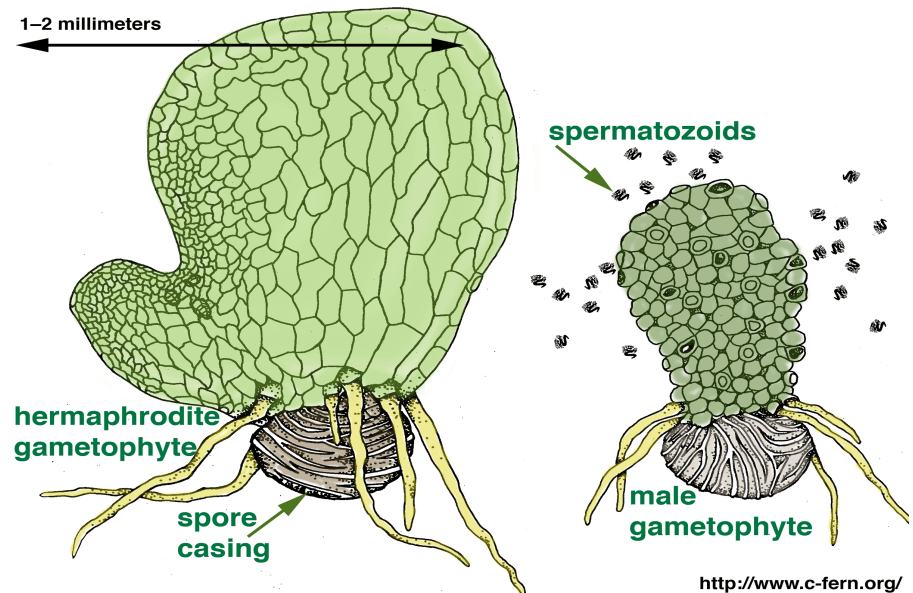
Haploid multicellular stage.

Develops from a spore by mitotic cell division.

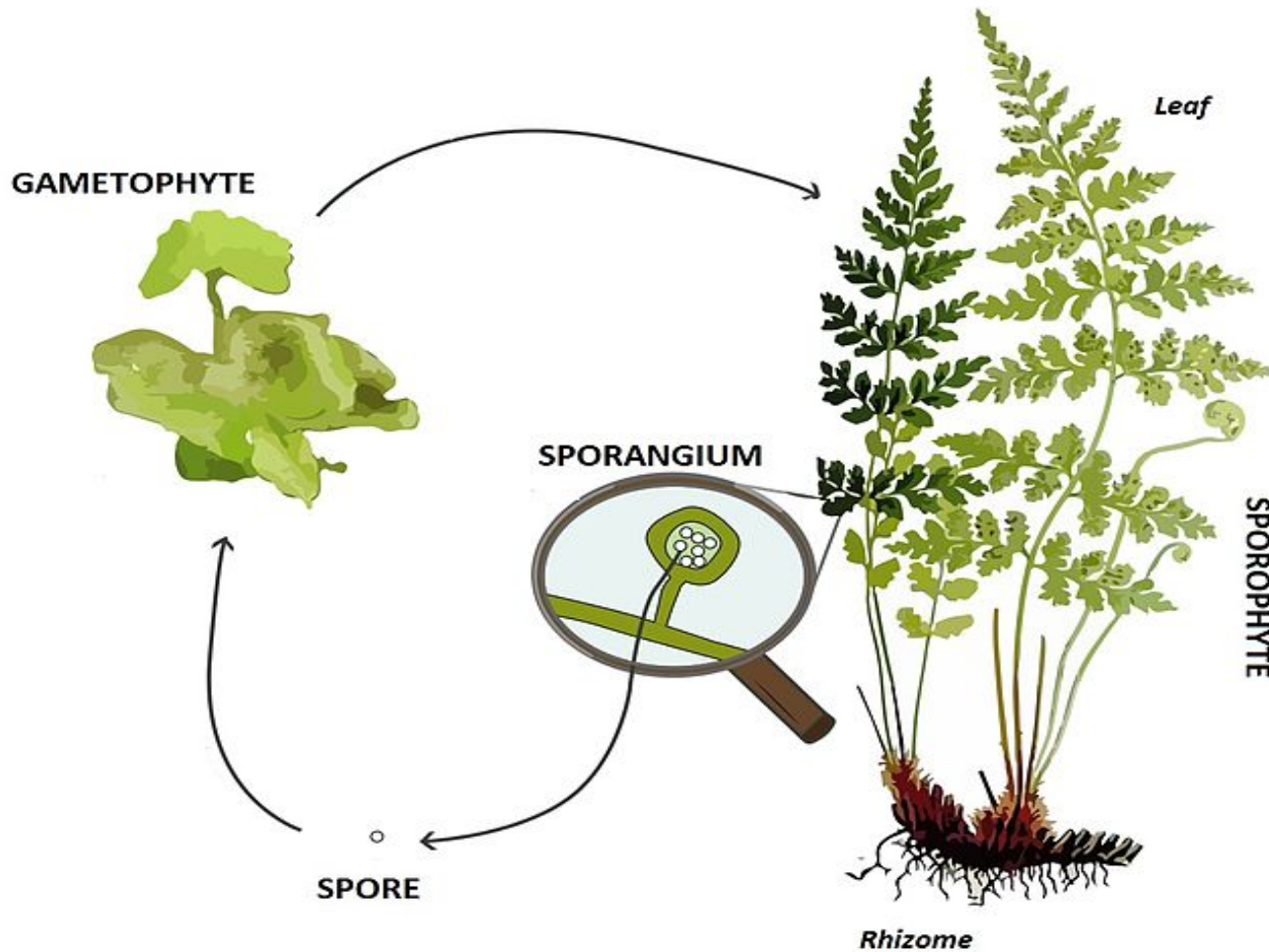
Gametophytes produce more haploid gametes by mitosis.

Gametophytes come in two "flavors":

- hermaphroditic (produce both male and female gametes)
- male



Seedless Vascular Plants - Life Cycle



ANIMATION:
[Life Cycle of a Fern](#),
McGraw Hill

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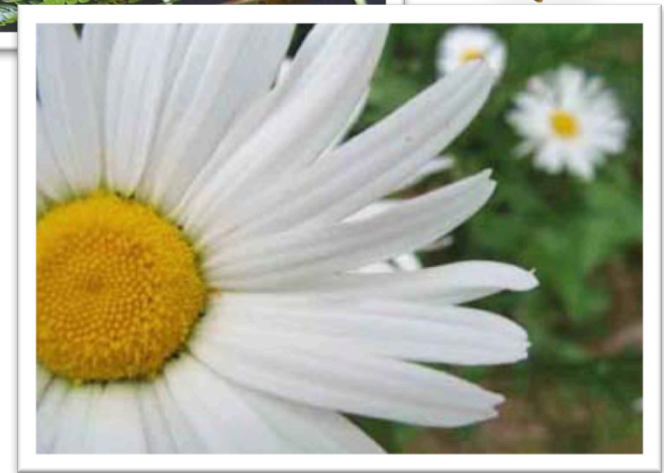
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- Example: Pines & Spruces
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Gymnosperms

Major groups:

Cycadophyta - Cycads

Ginkgophyta - Ginkos

Coniferophyta - Pines & Spruces

"Gymnosperm" comes from Greek (*gymnos* = "naked" and *sperma* = "seed"), after the unenclosed condition of their seeds.

This naked seed condition contrasts with the seeds and ovules of flowering plants (angiosperms), which are enclosed within an ovary.

Pine seeds develop either on the surface of scales or leaves, often modified to form cones.

ANIMATION:
Life Cycle of a
Conifer,

Sinauer & Associates



Pines

Male Pine Cone [microstrobilus] has microsporophylls (modified leaves) extending out from a central axis . Under each microsporophyll are one or many microsporangia (pollen sacs).

Female Pine Cone [megastrobilus] contains ovules that, when fertilized by pollen, become seeds.



Microstrobili



Megastrobilus

Female Pine Cone

Have two types of scales:

- **Bract scales**
 - Derived from a modified leaf.
 - Bract scales develop first.
- **Seed scales**
 - Derived from a highly modified branchlet.
 - Each supported by a bract scale.
 - On the upper-side at base of each seed scale are two ovules that develop into seeds after fertilization by pollen grains.

Scales open temporarily to receive gametophytes, then close during fertilization and maturation, and then reopen again at maturity to allow the seed to escape.



Pine Pollen

Most modern conifers, including pines, are wind-pollinated. (Cycads, which were prehistorically more abundant, are insect pollinated.)

Microscopically, pine pollen has one large inflated chamber flanked by two smaller chambers.

These air bladders that help keep the pollen afloat.



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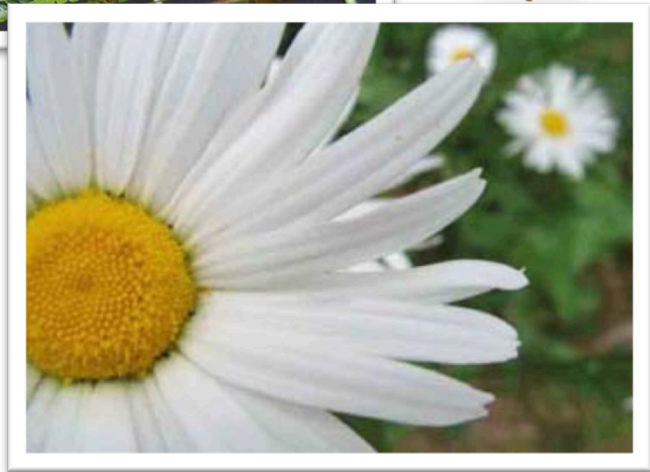
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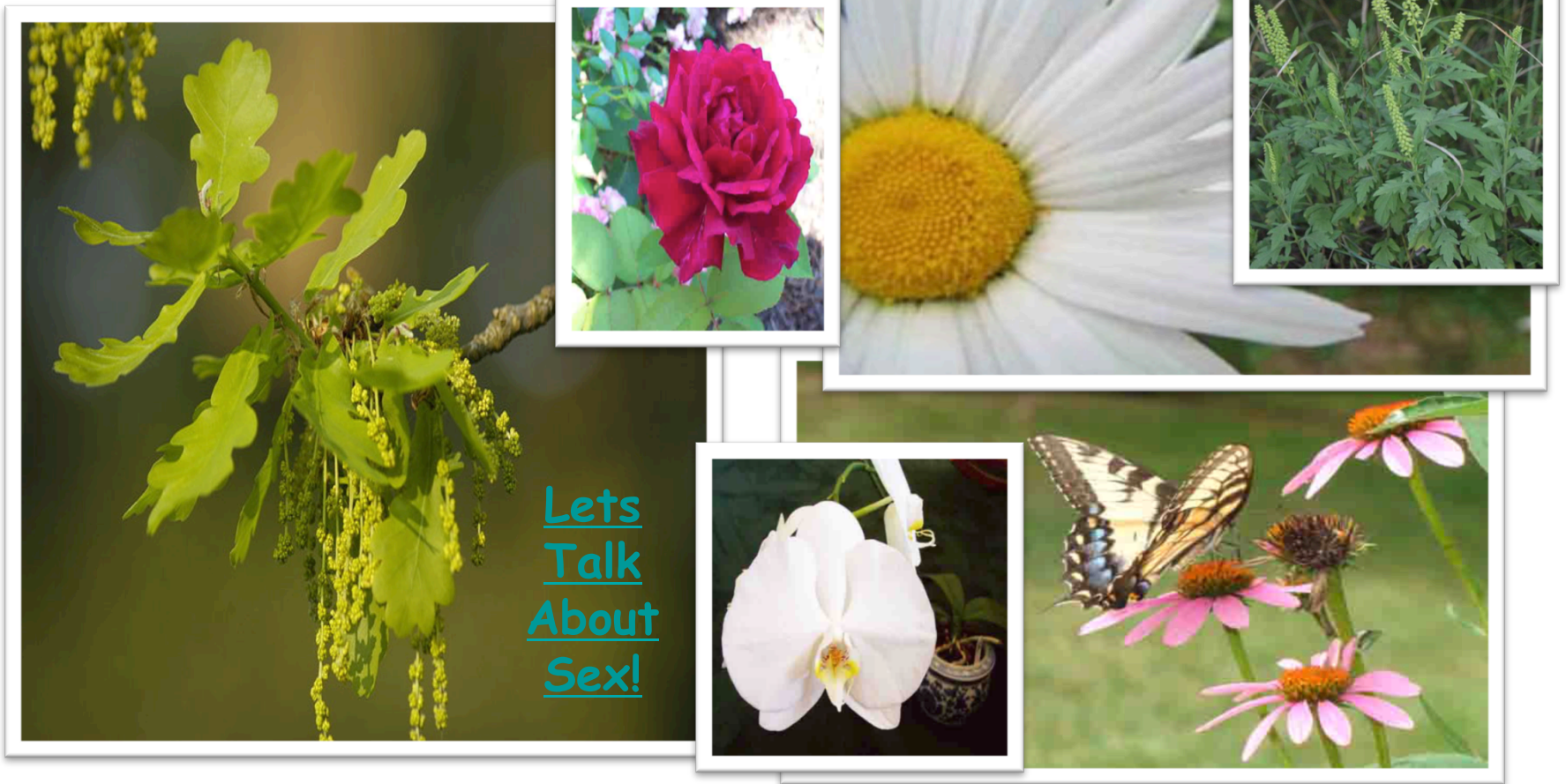
c. Angiosperms

- Flowering plants.
- Seeds protected inside ovaries.
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Angiosperms: Flowering Plants

VIDEO: [The Plants & the Bees:
Plant Reproduction](#)
from
Crash Course Biology



Lets
Talk
About
Sex!

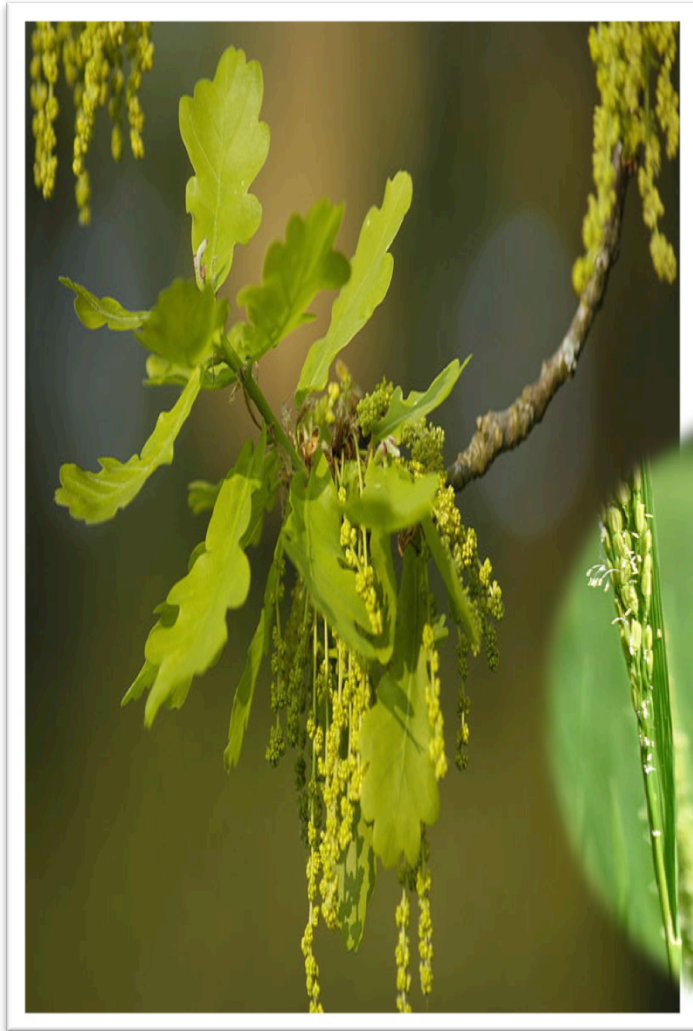
Images: [Ragweed](#), [Oak flowers](#), Wiki; Daisy and *Echinacea* with Eastern Tiger Swallowtail feeding, Orchid, Rose, T. Port

From the [Virtual Biology Classroom](#) on [ScienceProfOnline.com](#)

Angiosperms: Monocots & Dicots



Wind Pollenated Flowers

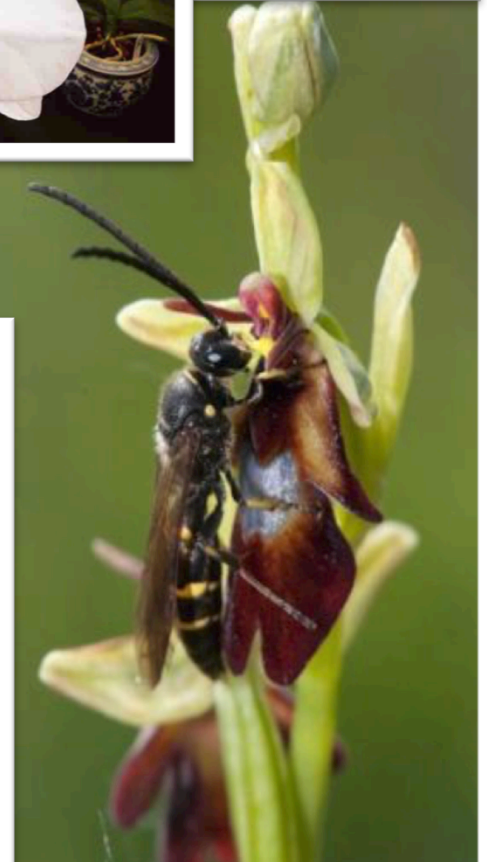
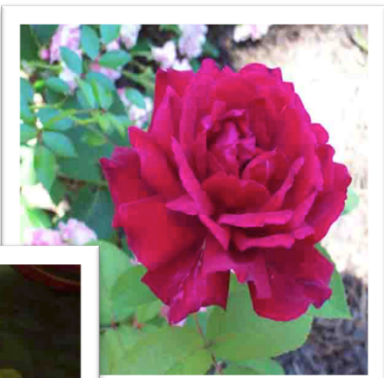


Wind Pollenated Flowers



Insect Pollinated Flowers

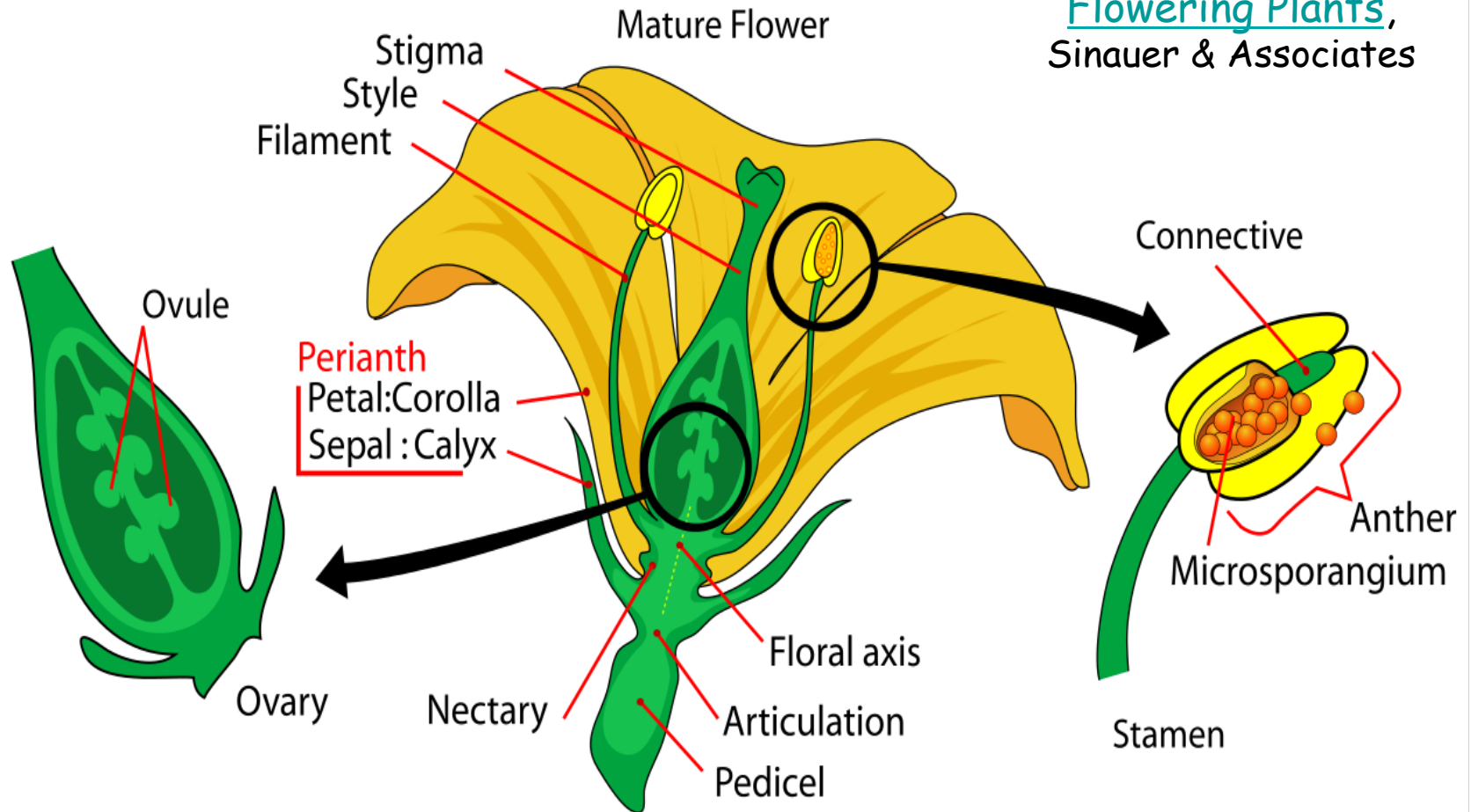
Advertising, Bribery and Deception!



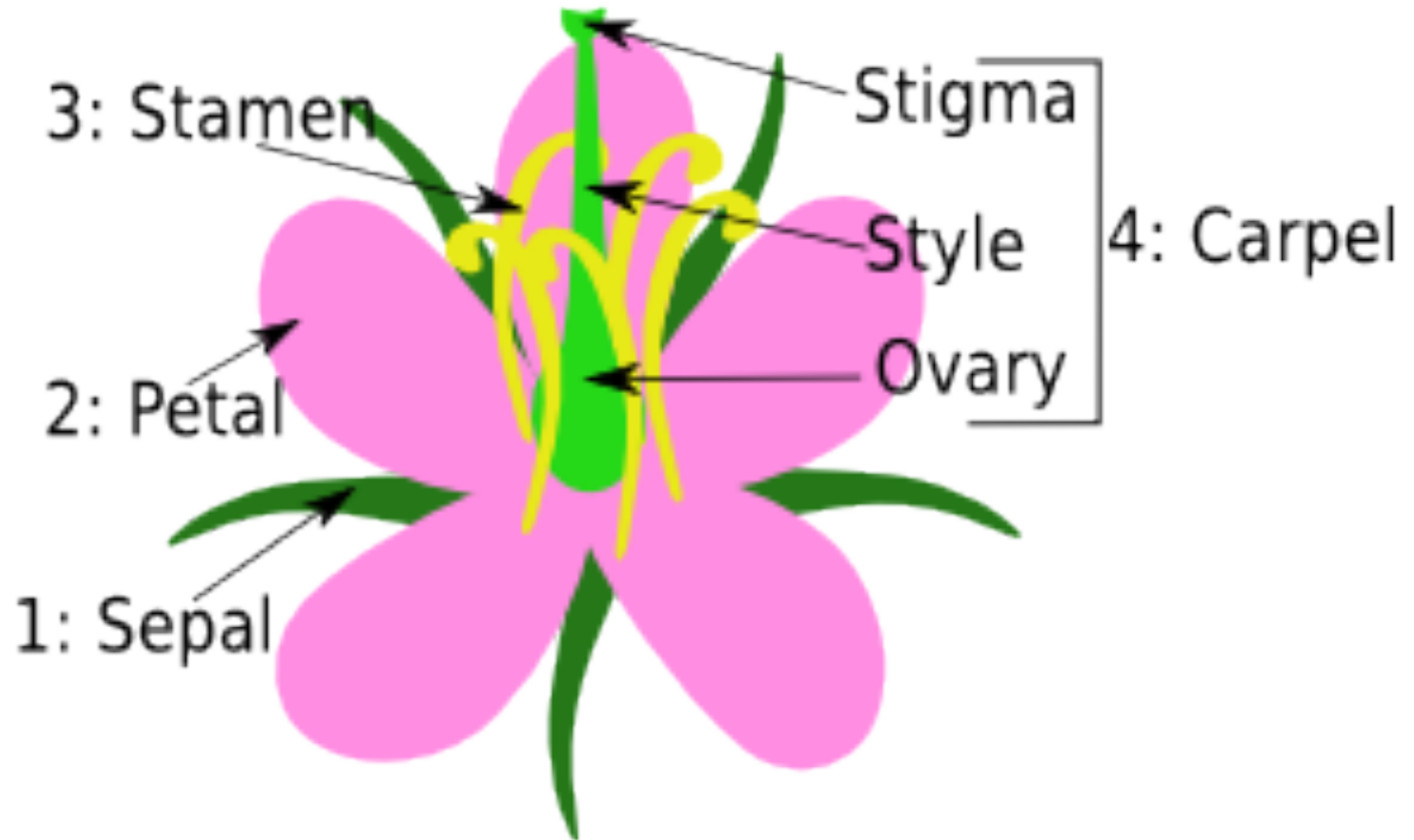
Images: Top row - Daisy, Red Crocosmia, Moth Orchid, Rose, T. Port; Bottom row - *Echinacea* with Eastern Tiger Swallowtail feeding, T Port; [Carrion flower with fly pollinator](#), Wiki; Wasp Pollinated Orchid

Flowering Plant Reproductive Parts

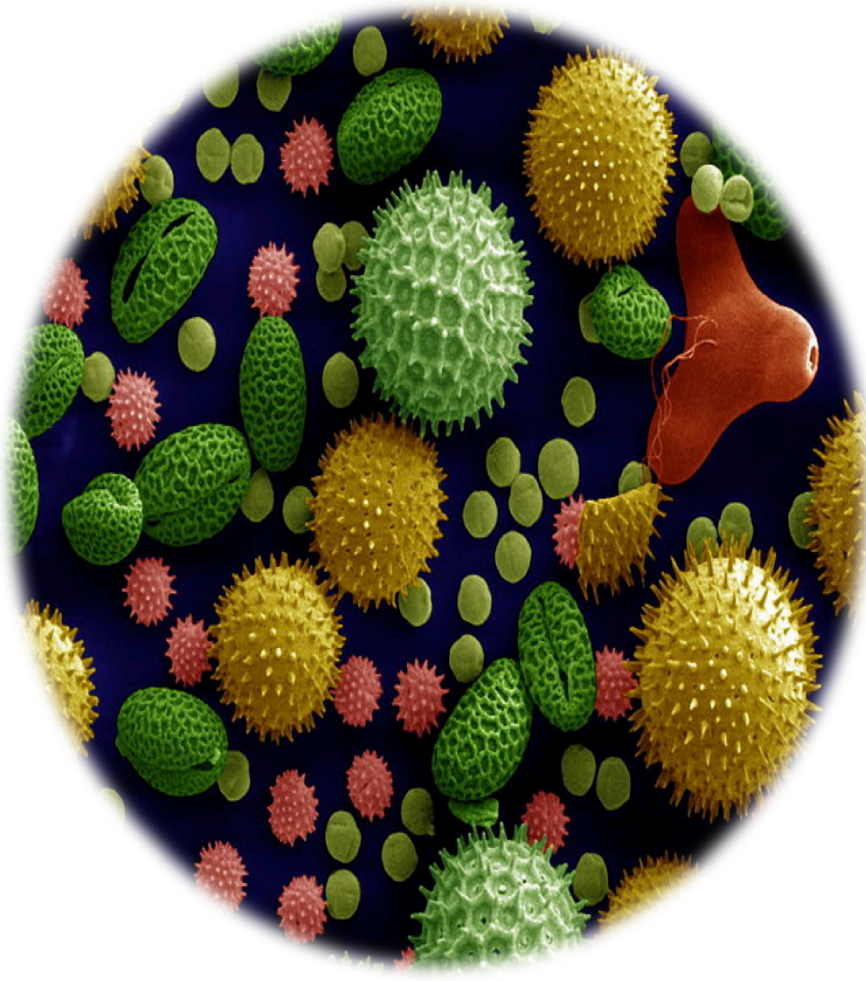
ANIMATION:
Life Cycle of
Flowering Plants,
Sinauer & Associates



Flowering Plant Reproductive Parts



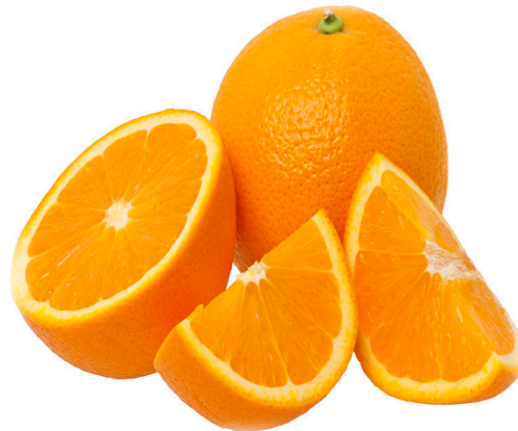
Angiosperm Pollen



Fruit or Vegetable?

WATCH THIS!

Time lapse film of
Pear growing from flower to fruit.



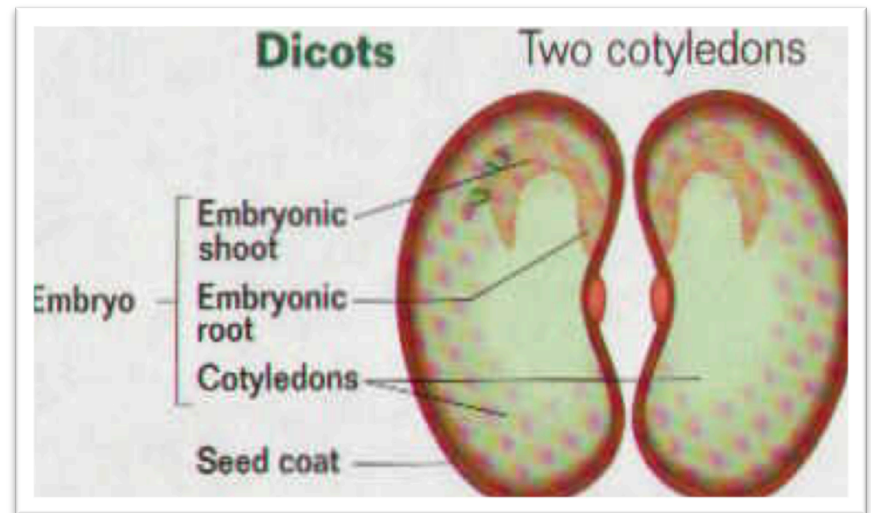
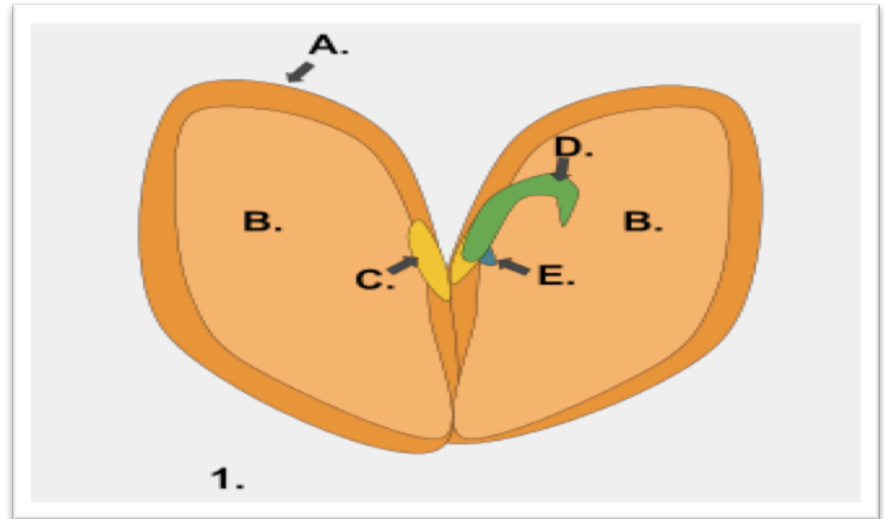
Images; Apple, T. Port; [Red bell pepper](#), Wiki;
[Tomato flowers an immature fruits](#), [Red onion](#), Wiki.

Angiosperm Seeds: Dicots

There are five major parts of a **DICOT** (1) seed:

- A. Seed coat: Protects embryo.
- B. Cotyledon: Stores food.
There are two in dicot seeds.
- C. Hilum: Point of attachment to ovary wall. On bean seed, the hilum is called the "eye".
- D. Plumule: Shoot of seed, where leaves will first appear.
- E. Radicle: Root of the seed.

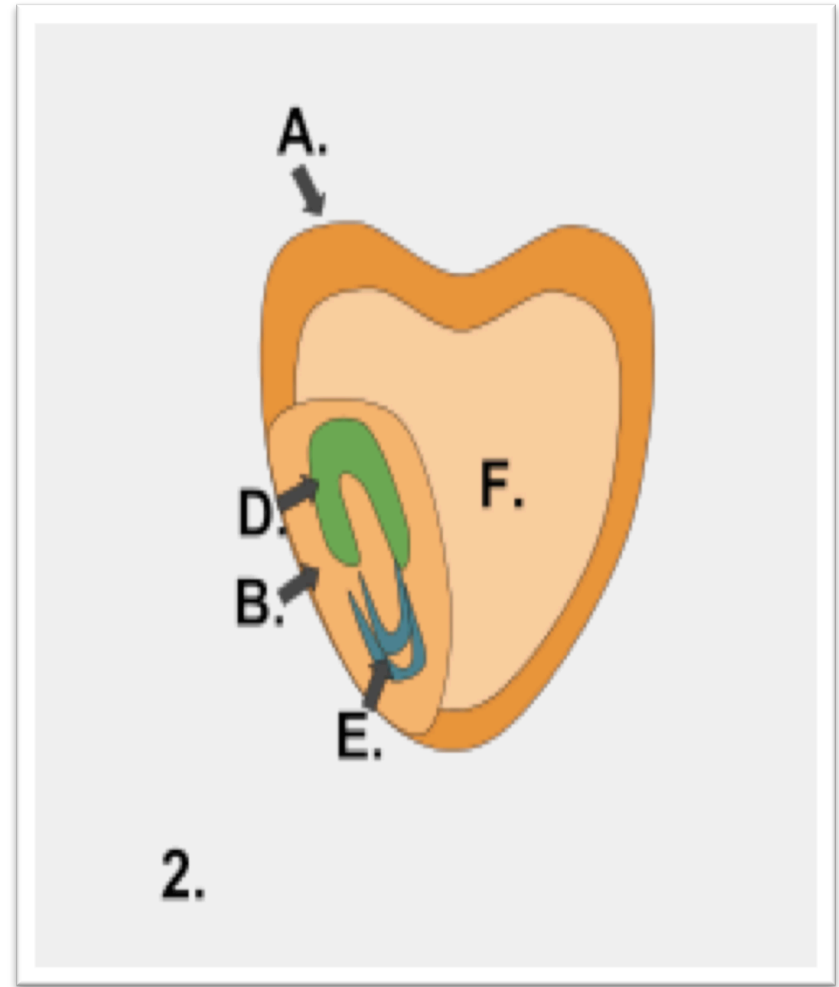
F. Some dicots contain endospore in mature seeds.



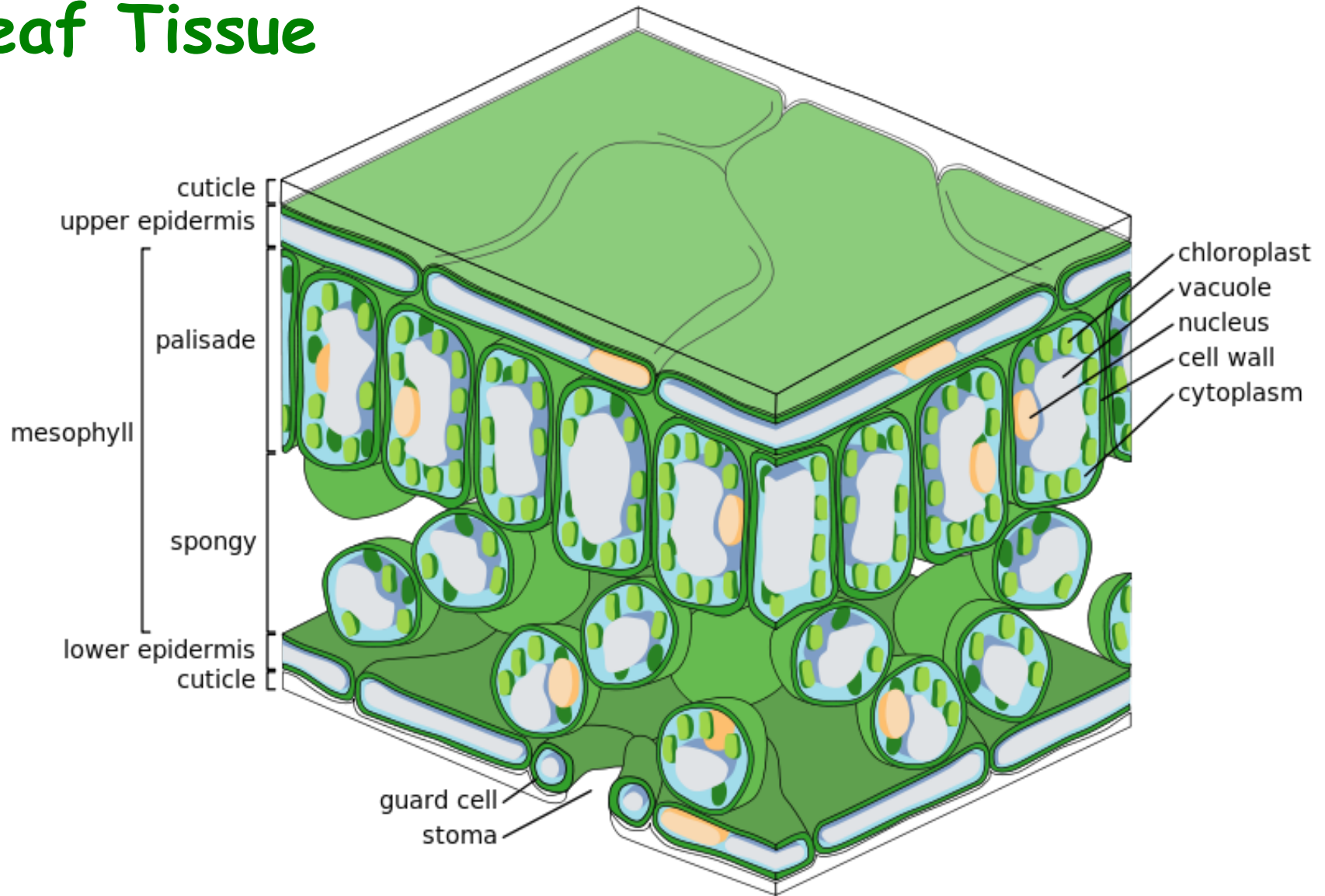
Angiosperm Seeds: Monocots

There are five major parts of a **MONOCOT** (2) seed.

- A. Seed coat: Protects the seed.
- B. Cotyledon: Leaf of the seed. There is only one cotyledon in monocot seeds.
- D. Plumule: Shoot of the seed.
- E. Radicle: Root of the seed.
- F. Endosperm: Food supply for the seed.

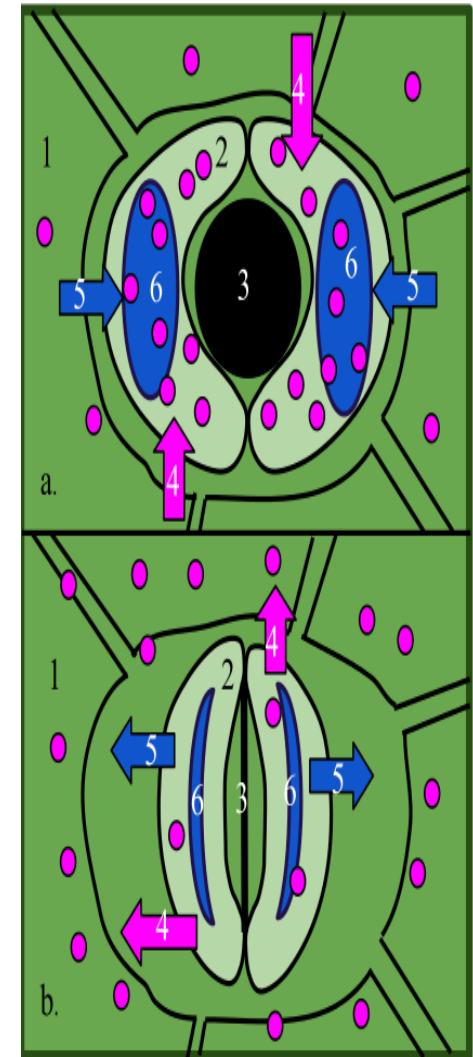
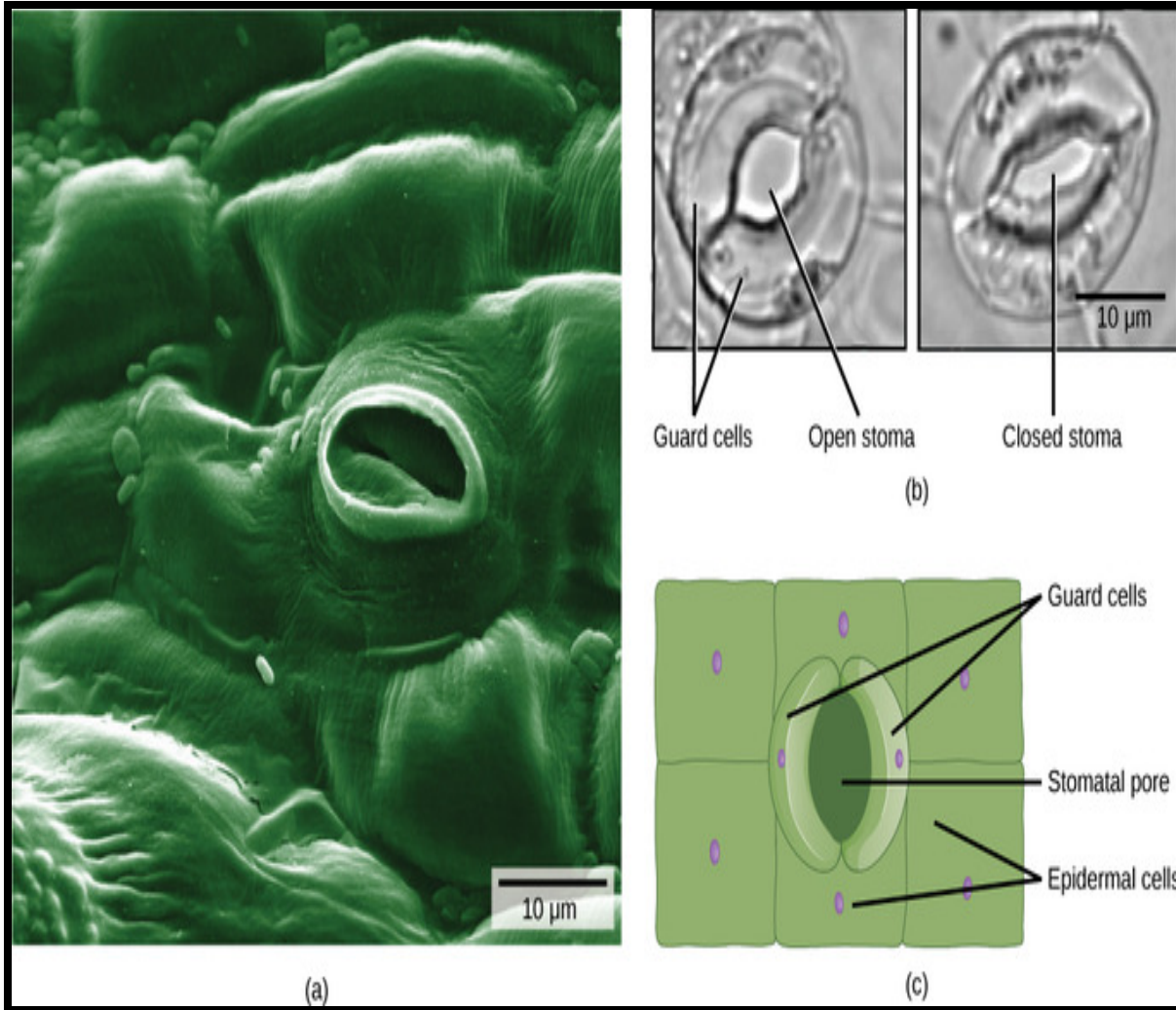


Angiosperm Leaf Tissue



Angiosperms

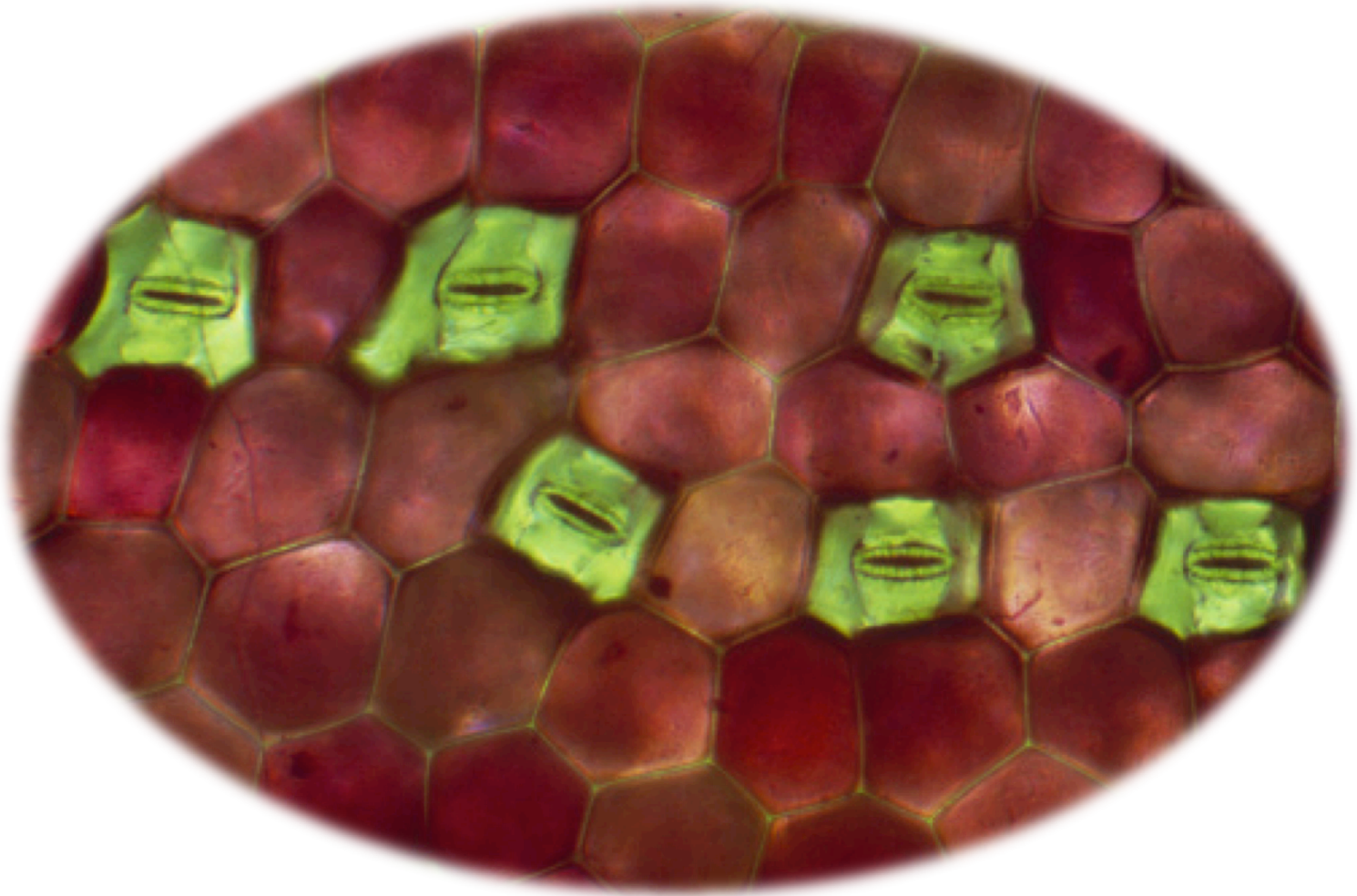
Leaves & Stomatal Apparatus



An open stoma (a) and a closed stoma (b): 1 Epidermal cell; 2 Guard cell
3 Stoma; 6 Vacuole

Stomata

Zebrinus (Wandering Jew)



Confused?

Here are some links to fun resources that further explain Cell Biology:



- [Eukaryotic Cells](#) Main Page on the Virtual Cell Biology Classroom of [Science Prof Online](#).
- [Plant Cell Structure & Function](#) from Science Prof Online.
- [Plant Cells](#) from Crash Course Biology.
- [Plant Photosynthesis](#) from Encyclopedia Britannica..
- [Eukaryotic Cell](#): Structures, Functions & Diagrams, article from SPO.
- [The Sex Lives of Non-Vascular Plants](#) from Crash Course Biology.
- [Plant Asexual Reproduction](#) from Encyclopedia Britannica
- [Plant Reproduction: Methods of Pollination](#) from Encyclopedia Britannica.
- ["Do Plants Have Sex?"](#) from Livescience.
- [Vascular Plants = WINNING!](#) from Crash Course Biology.
- [Plants & Bees: Plant Reproduction](#) from Crash Course Biology
- [Angiosperm \(Flowering Plant\) Lifecycle](#), Youtube.

(You must be in PPT slideshow view to click on links.)



What if plants decided that humans were a threat to the planet that had to be eliminated?