Introduction to Horticulture

Liz Woodward

San Diego County Master Gardener

Class of 2010

hortus (garden) + *colere* (to cultivate)

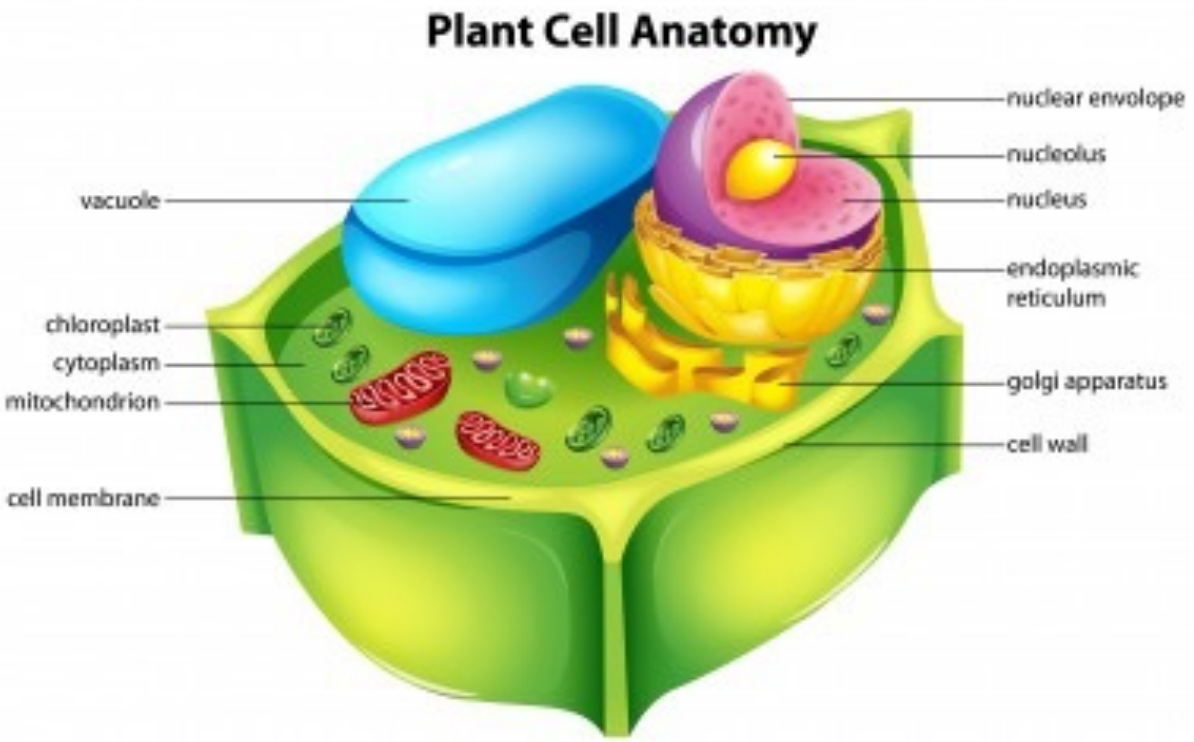
Culture of Gardens vs. Fields of Crops

Fruits, Vegetables, Ornamentals, Herbs, Specialty Crops

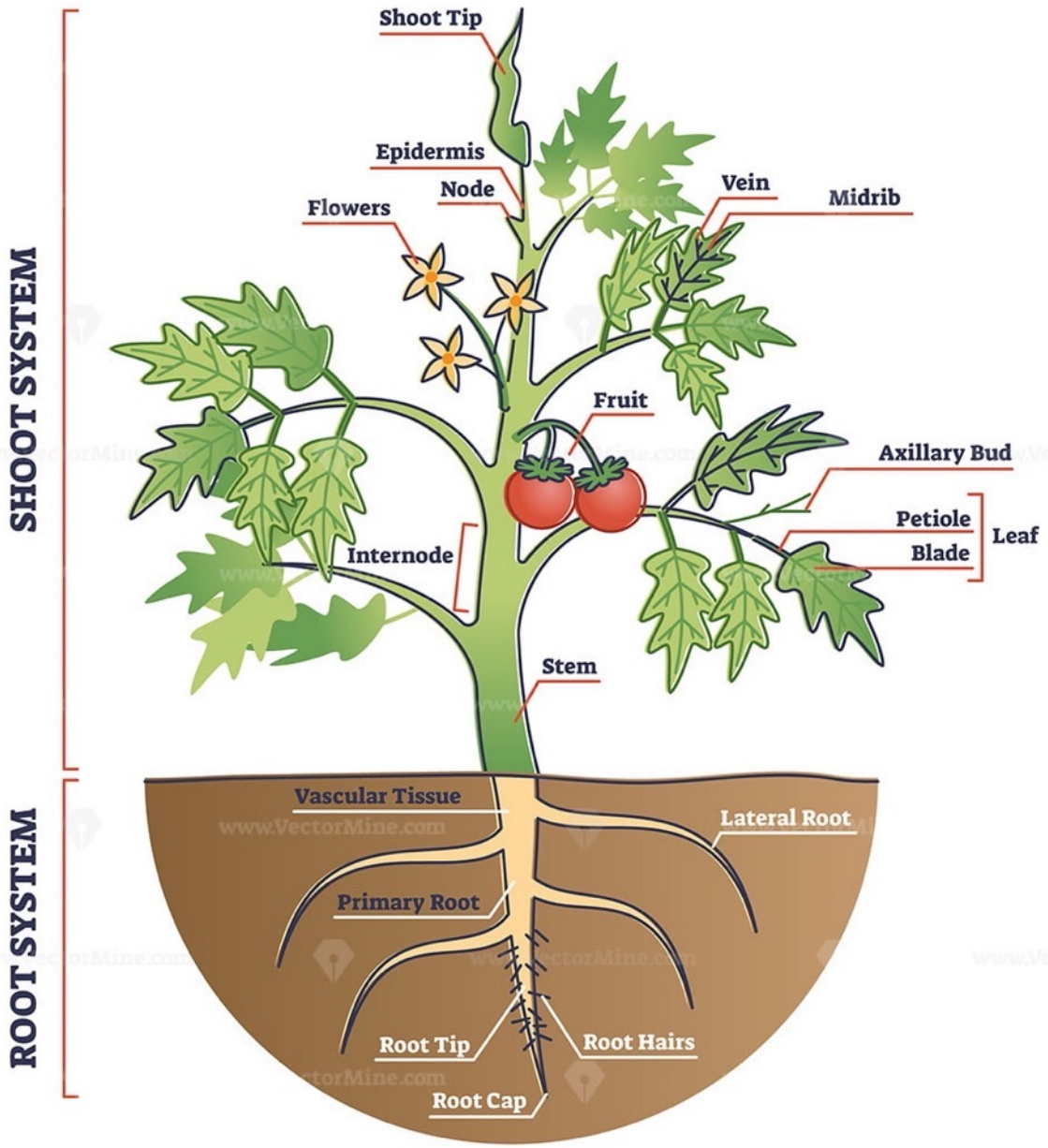
Horticulture Defined

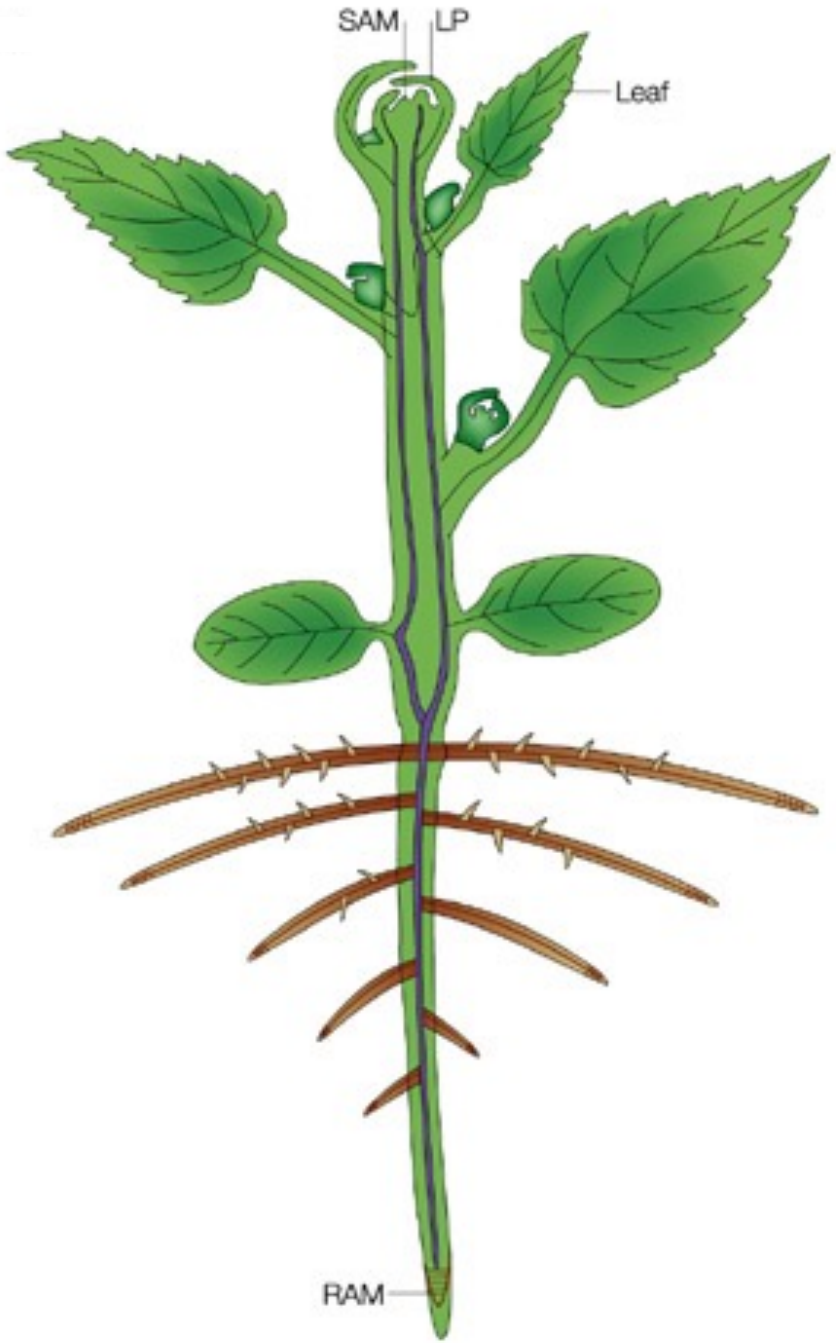
What is a Plant?

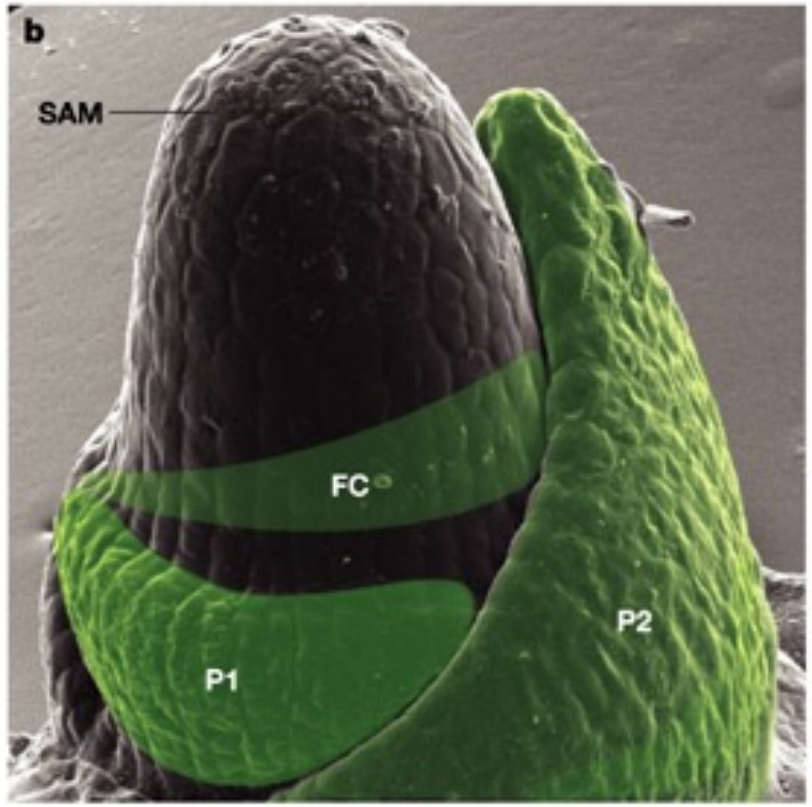
- Member of the kingdom Plantae
- Living, immobile, without consciousness
- Rigid cell walls made of cellulose
- Can regenerate lost tissues and organs
- Carry out photosynthesis
- They are able to make their own food (autotrophs)



PLANT STRUCTURE







MERISTEMS

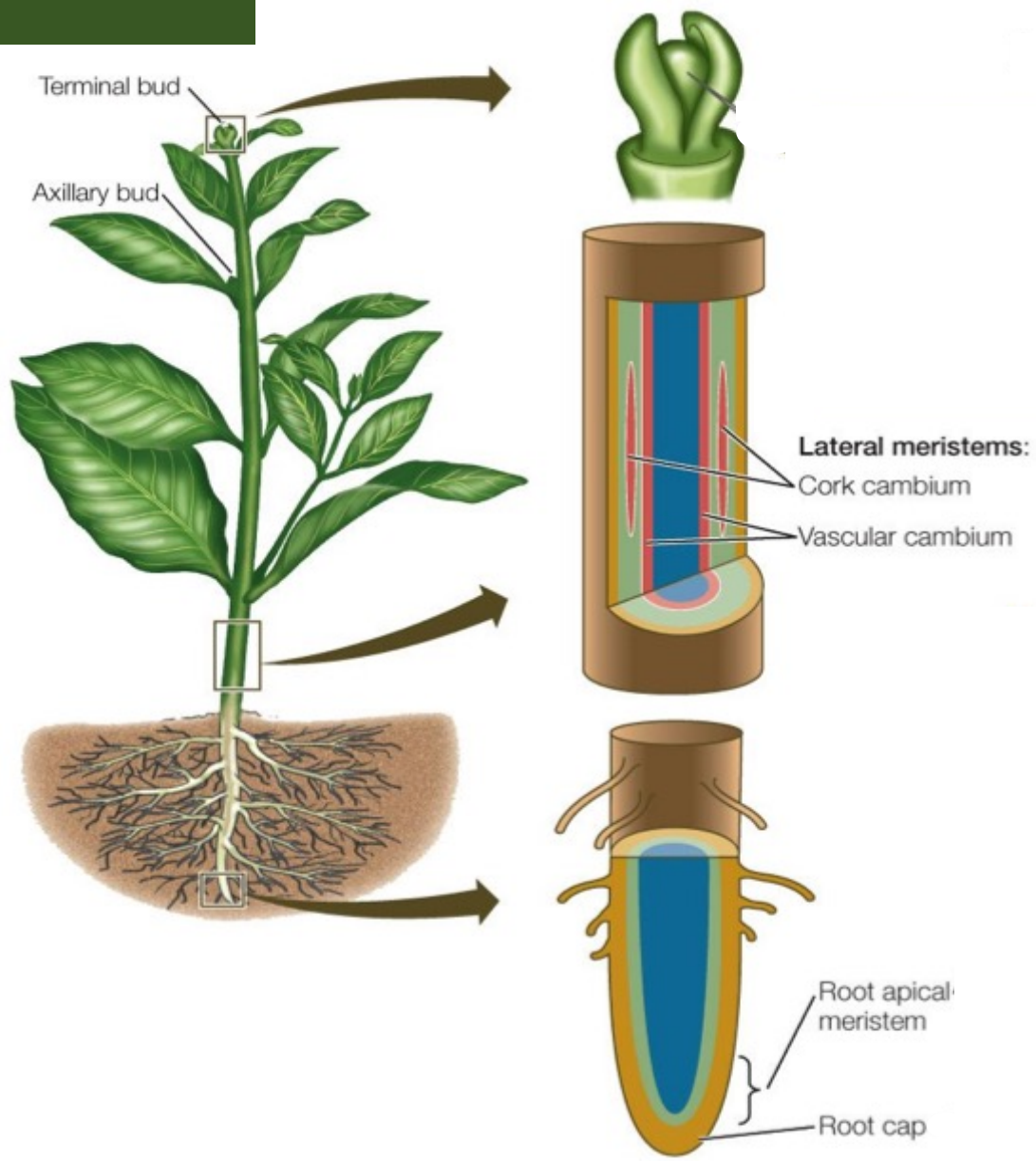
Primary vs. Secondary Growth

Apical Meristems

- Primary growth
- Occurs in roots and shoots
- Increase in length

Lateral Meristems

- Secondary growth
- Occur in cambium & similar tissue
- Common in trees (wood and bark)
- Increase in girth (width)

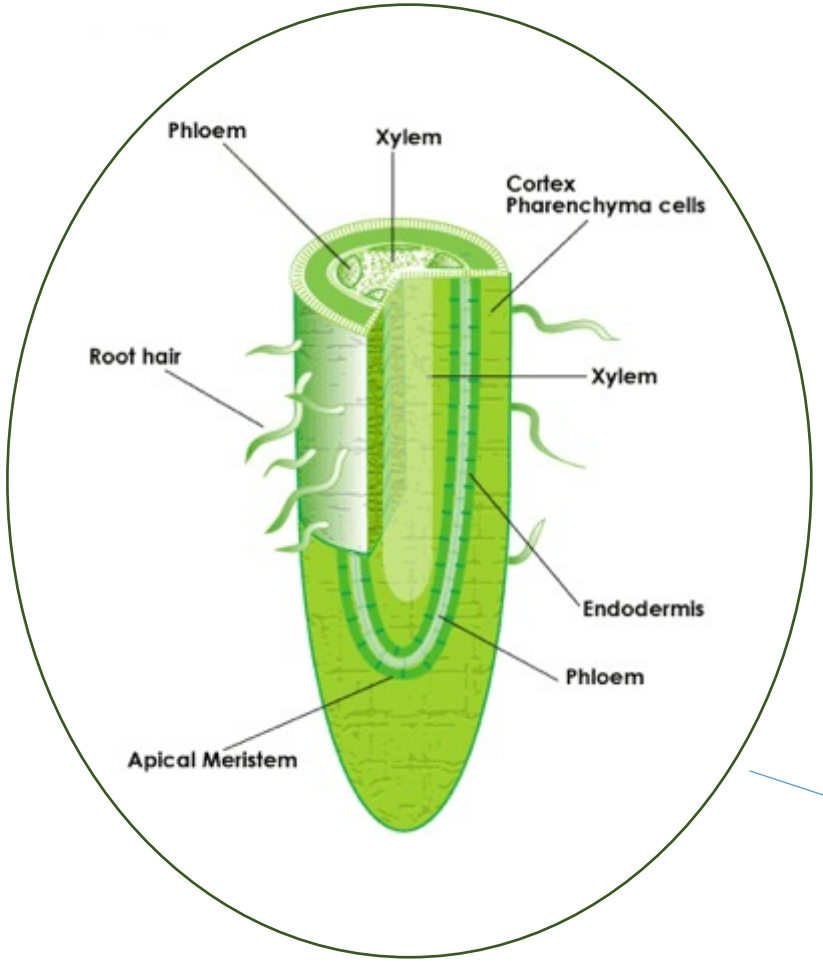


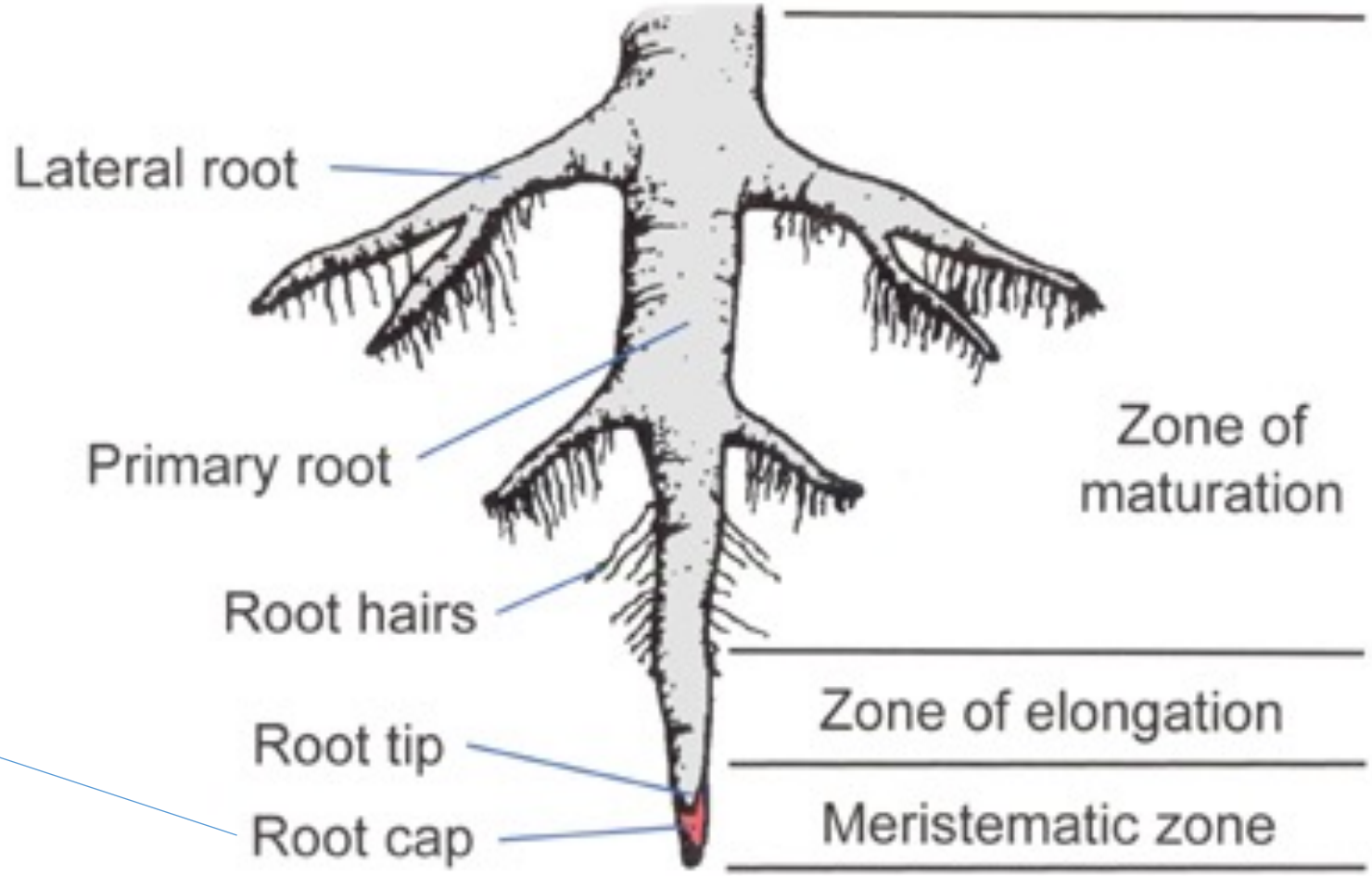
ROOTS

Function of Roots

- Take up water and nutrients
- Store excess food
- Anchor the plant
- Synthesize essential compounds
- Reproductive organ

Root Anatomy



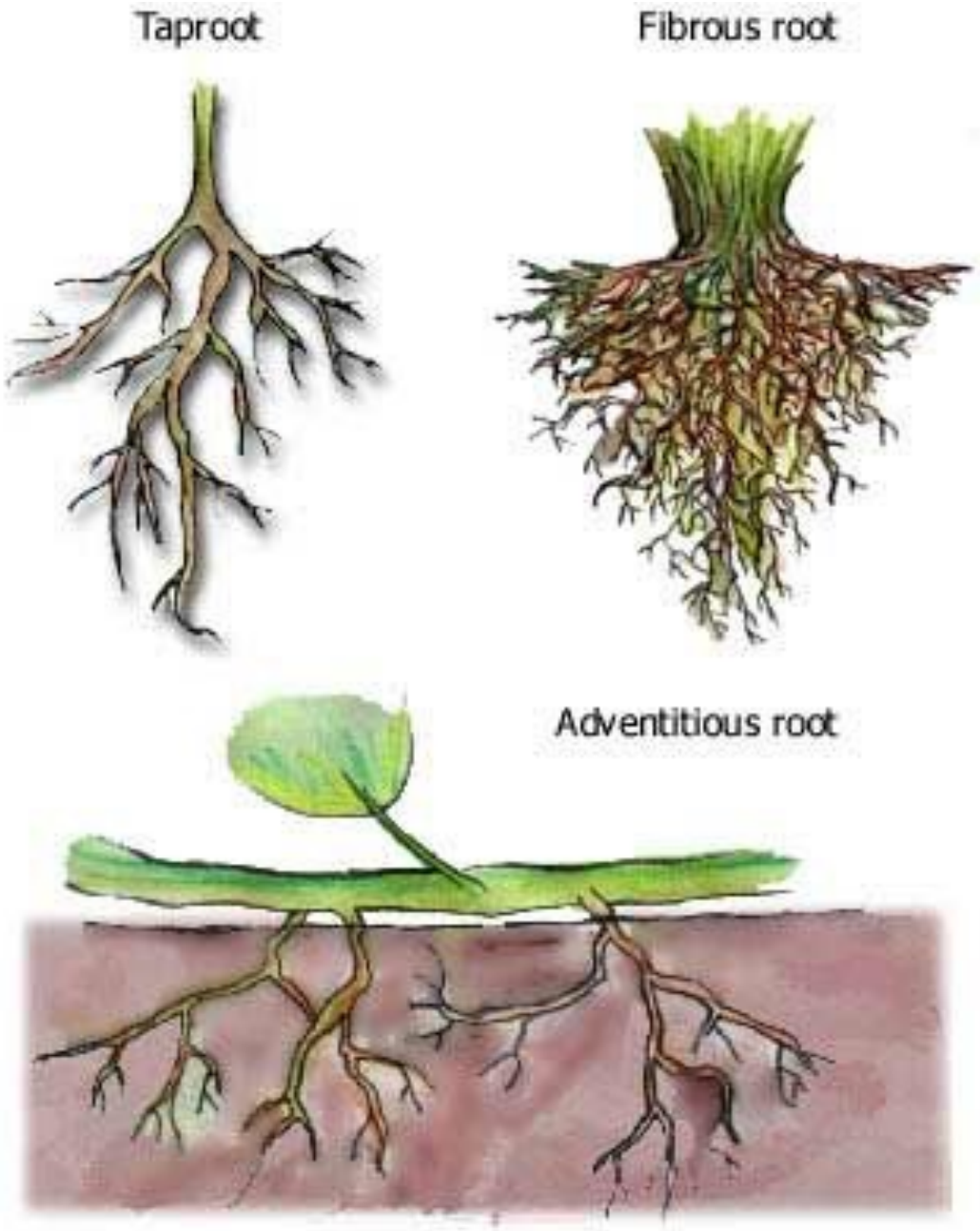


Types of Roots

Taproot –absorbs water deep in the ground (root vegetables, trees)

Fibrous roots stay close to the top of the soil (bedding plants, tomato)

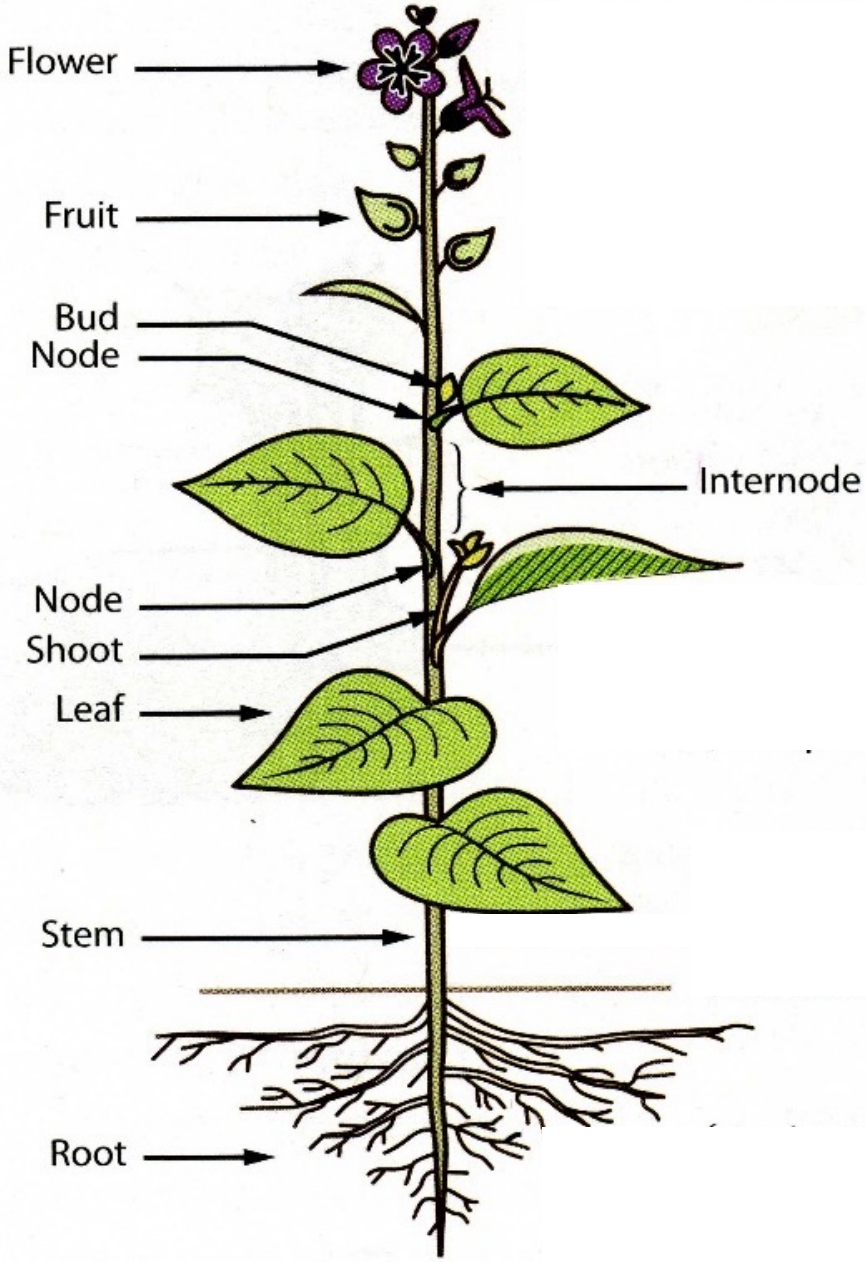
Adventitious can regenerate roots after roots are removed from the plant (ivy, some grasses & succulents)

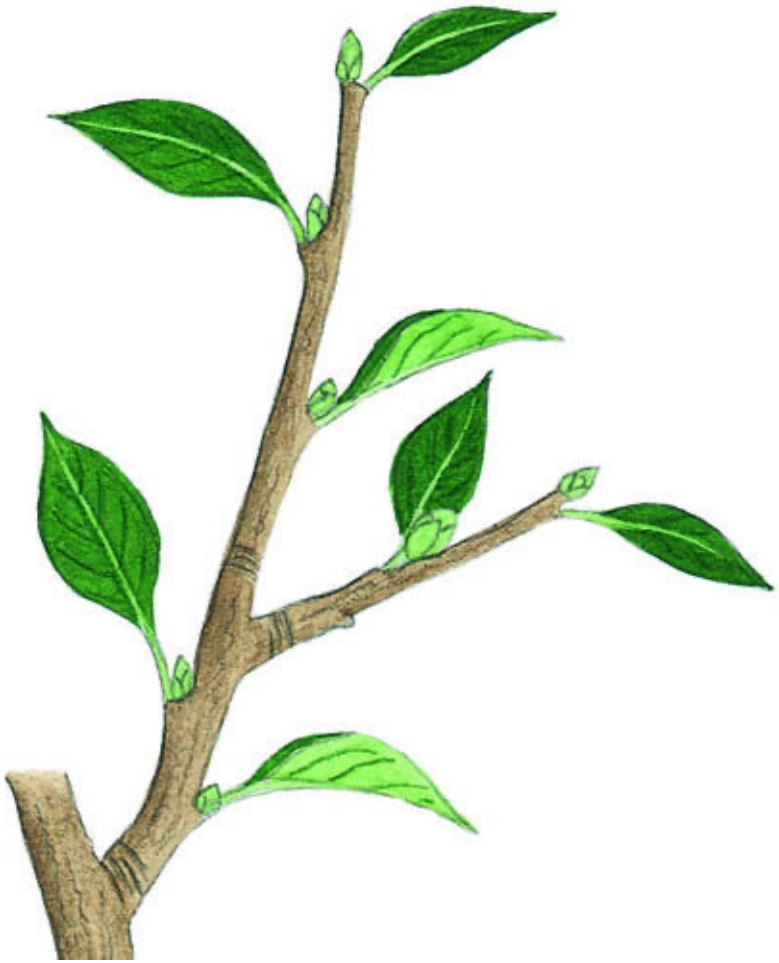



© Donna Mason-Spier

STEMS

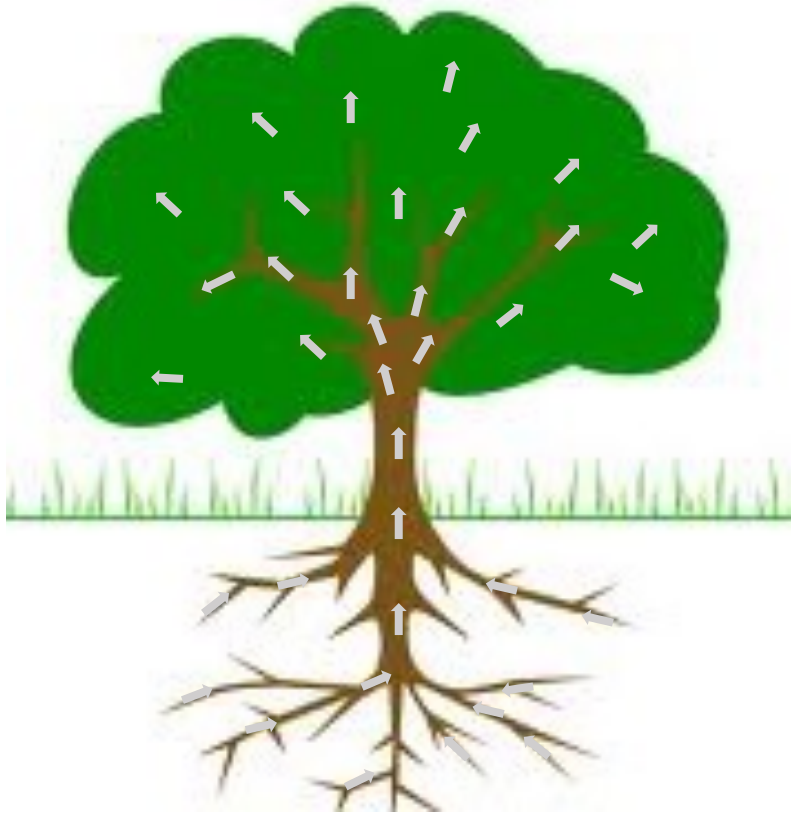
Structure of a Seed Plant



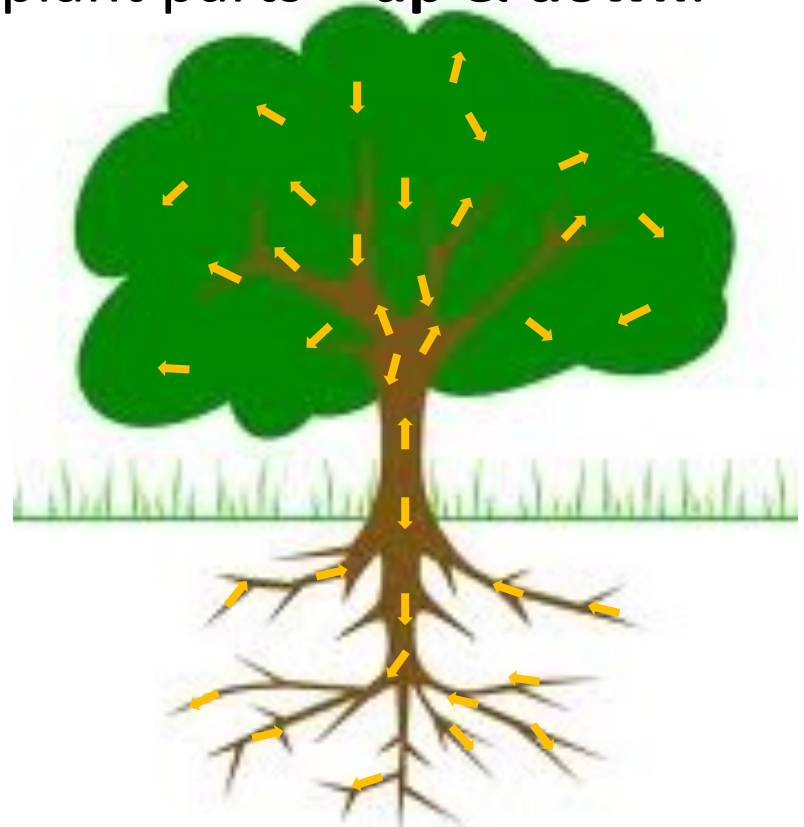


Plant Vascular Tissue

Zylem tissue conducts water & dissolved mineral nutrients from the roots **upward.**

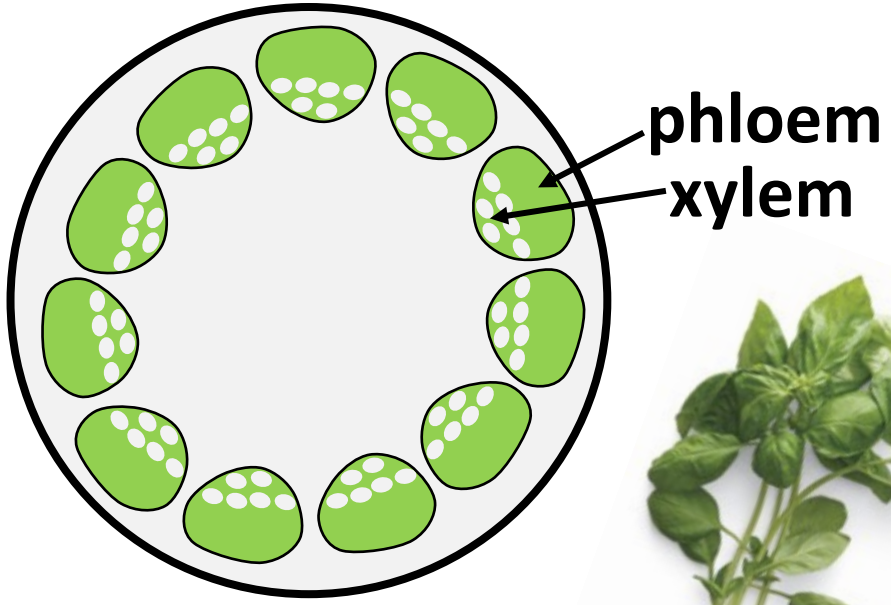


Phloem tissue conducts photo-synthetically produced food & other compounds from the leaves to other plant parts – **up & down**.

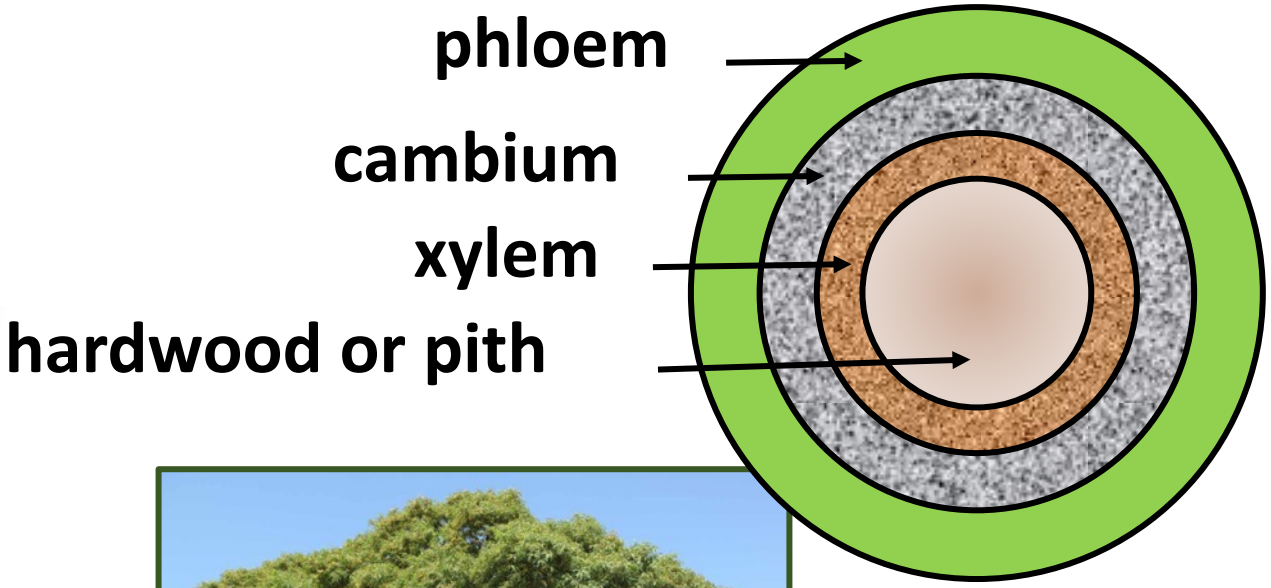


Plant Vascular Tissue – Dicot Cross Section

Herbaceous

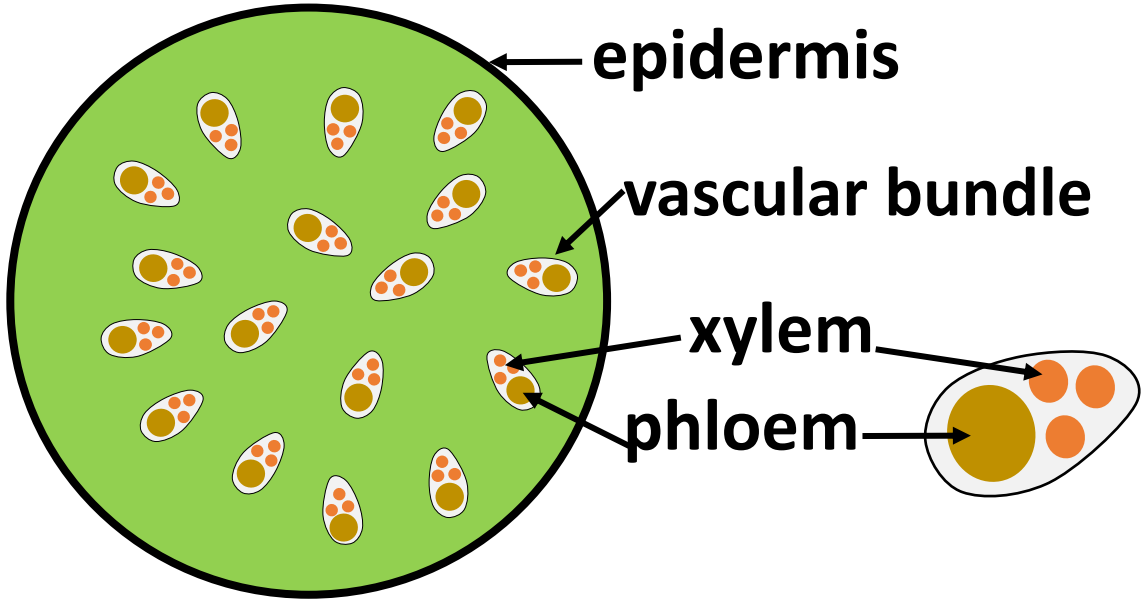


Woody



Plant Vascular Tissue – Monocot Cross Section

Monocot



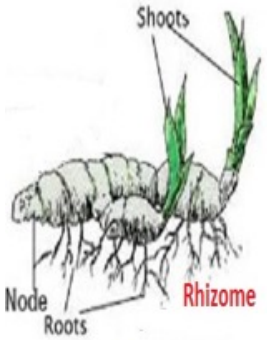
Lily's, grasses, palms, etc.

Palm Trunk

Tree Trunk

Stem Modifications

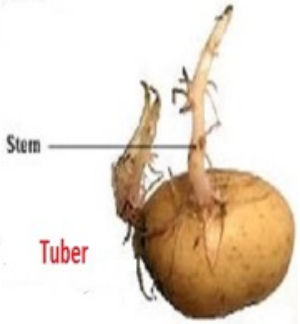
Underground modification of stem



Rhizome

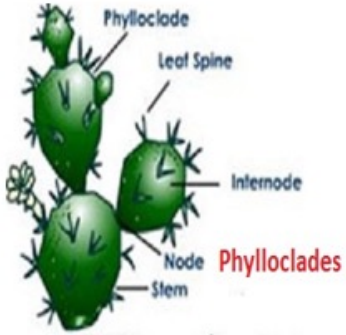
Corm

Bulb

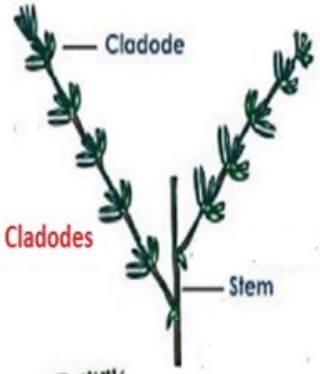


Tuber

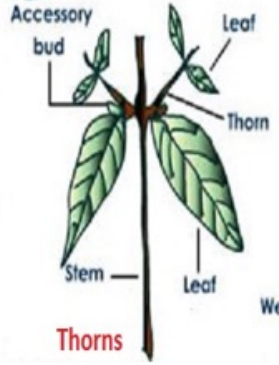
Aerial modification of stem



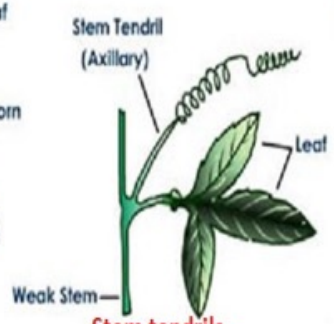
Phylloclades



Cladodes



Thorns



Stem tendrils

Sub-aerial modification of stem

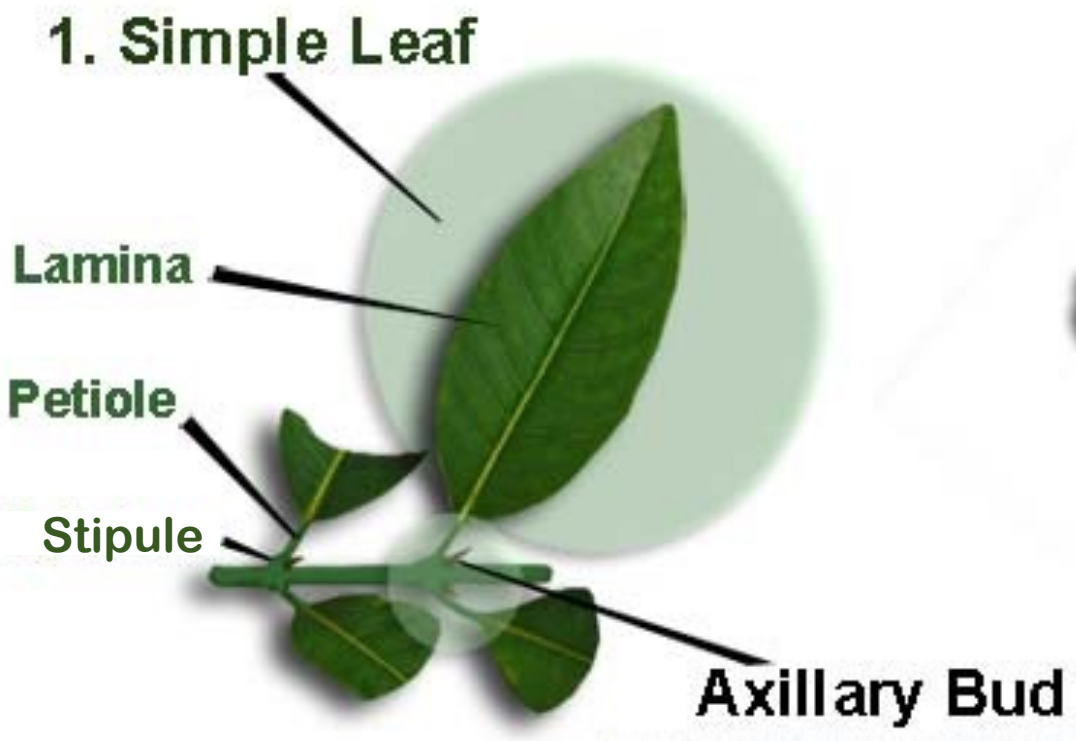
Runner

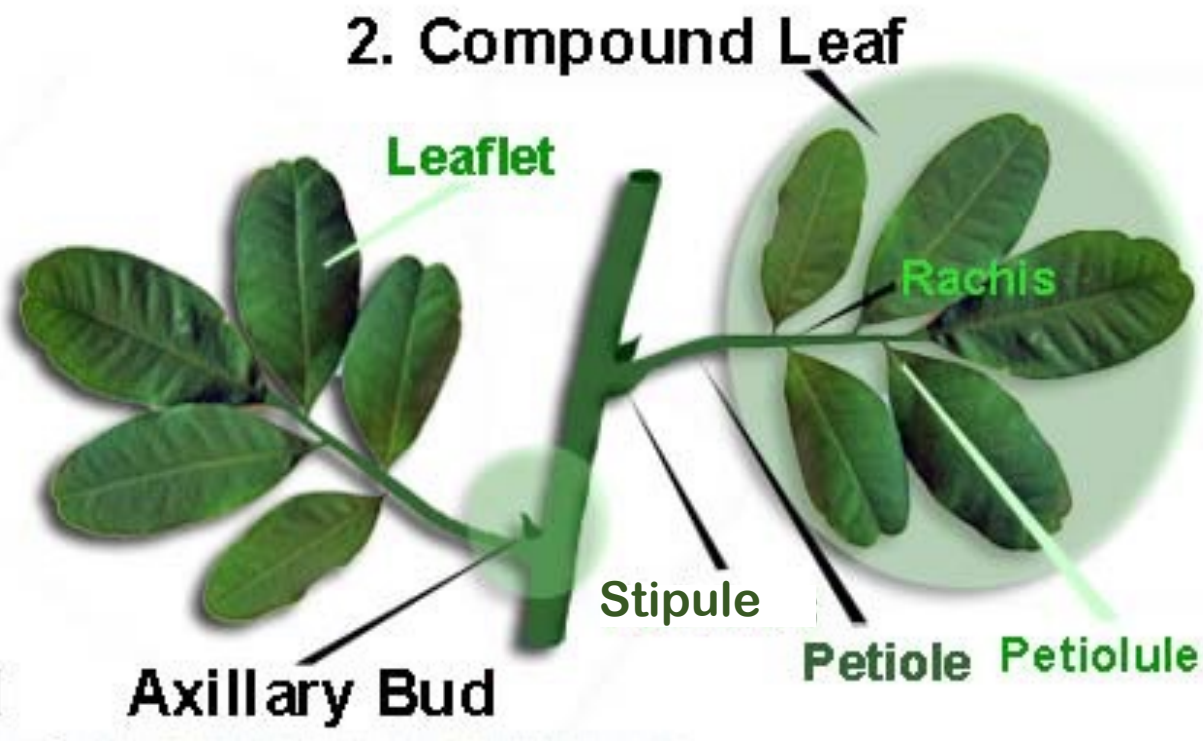
Stolon

Sucker

Offset

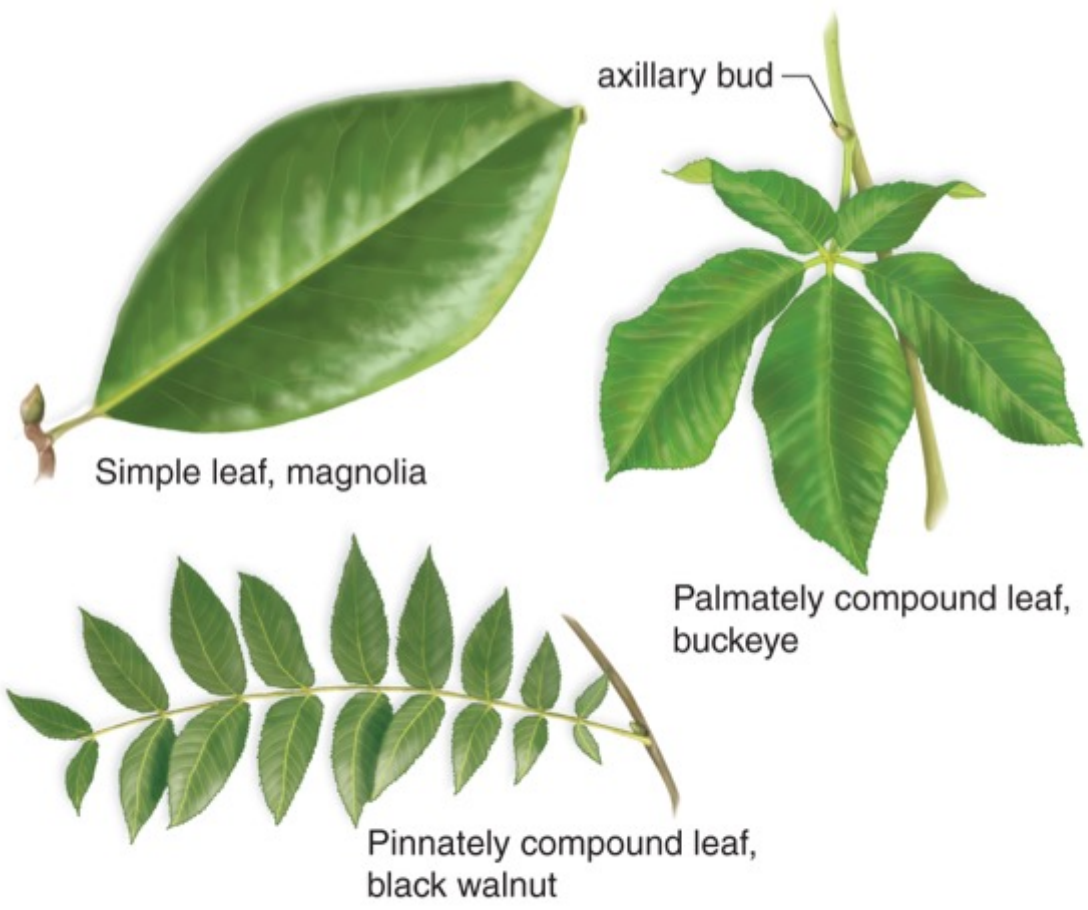
LEAVES



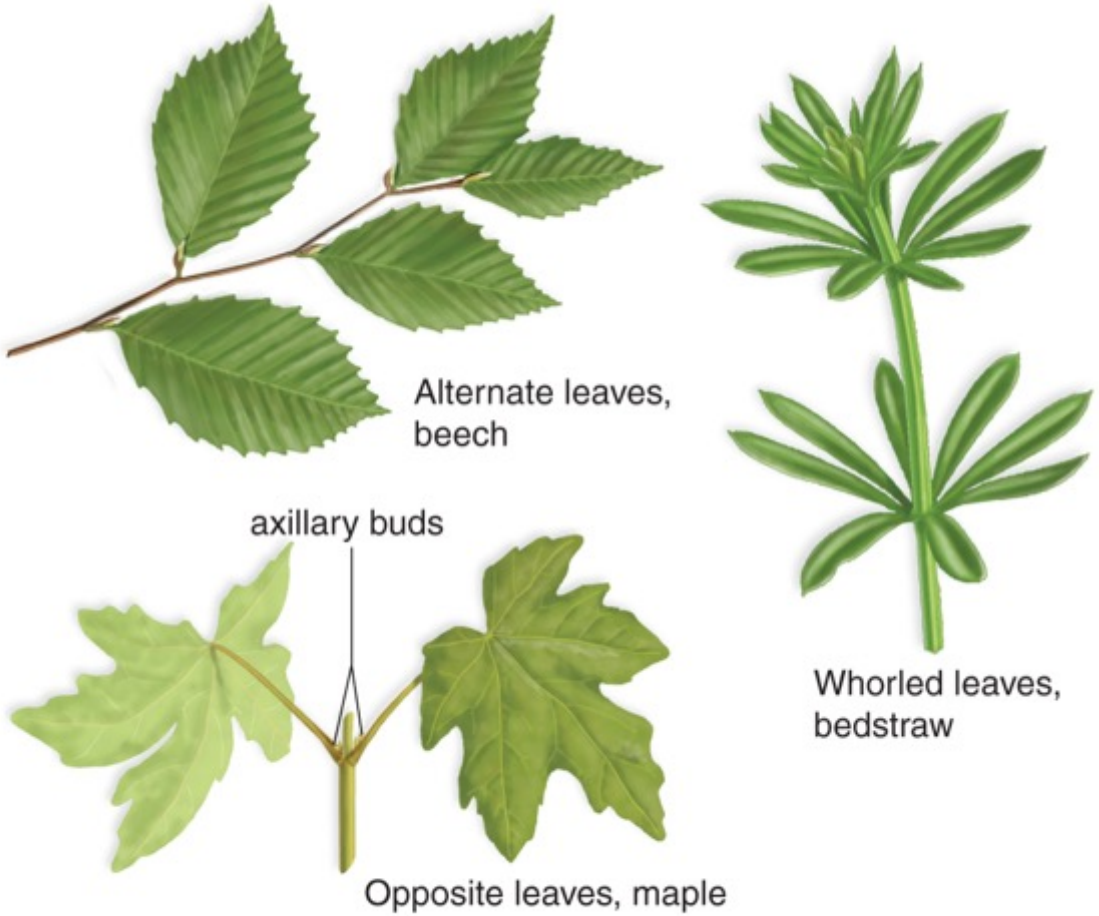


Parts of a Leaf

Leaf Arrangements

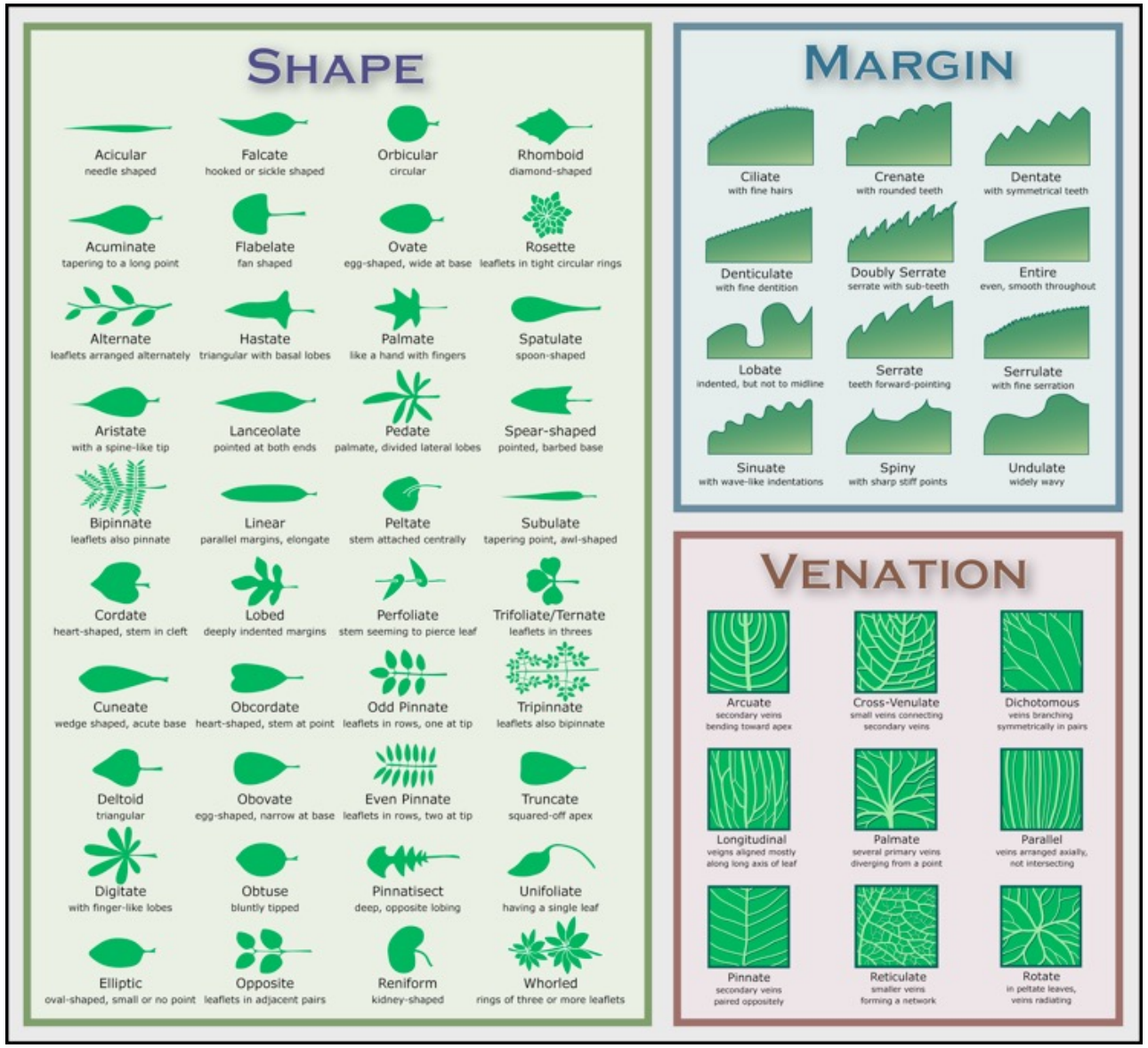


a. Simple versus compound leaves

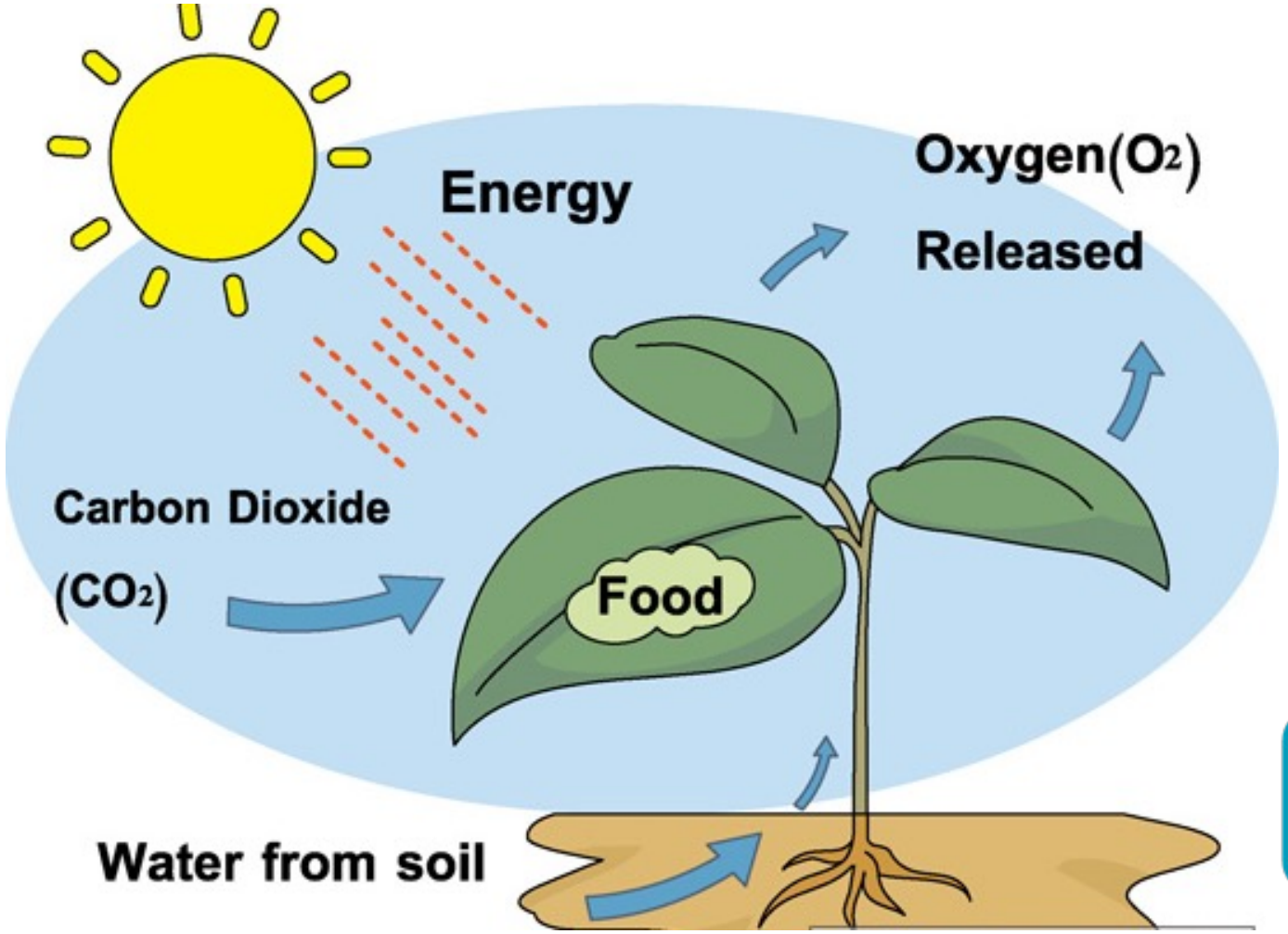


b. Arrangement of leaves on stem

Leaf Key


SHAPE
Acicular
needle shaped
Falcate
hooked or sickle shaped
Orbicular
circular
Rhomboid
diamond-shaped
Acuminate
tapering to a long point
Flabelate
fan shaped
Ovate
egg-shaped, wide at base
Rosette
leaflets in tight circular rings
Alternate
leaflets arranged alternately
Hastate
triangular with basal lobes
Palmate
like a hand with fingers
Spatulate
spoon-shaped
Aristate
with a spine-like tip
Lanceolate
pointed at both ends
Pedate
palmate, divided lateral lobes
Spear-shaped
pointed, barbed base
Bipinnate
leaflets also pinnate
Linear
parallel margins, elongate
Peltate
stem attached centrally
Subulate
tapering point, awl-shaped
Cordate
heart-shaped, stem in cleft
Lobed
deeply indented margins
Perfoliate
stem seeming to pierce leaf
Trifoliate/Ternate
leaflets in threes
Cuneate
wedge shaped, acute base
Obcordate
heart-shaped, stem at point
Odd Pinnate
leaflets in rows, one at tip
Tripinnate
leaflets also bipinnate
Deltoid
triangular
Obovate
egg-shaped, narrow at base
Even Pinnate
leaflets in rows, two at tip
Truncate
squared-off apex
Digitate
with finger-like lobes
Obtuse
bluntly tipped
Pinnatisect
deep, opposite lobing
Unifoliate
having a single leaf
Elliptic
oval-shaped, small or no point
Opposite
leaflets in adjacent pairs
Reniform
kidney-shaped
Whorled
rings of three or more leaflets
MARGIN
Ciliate
with fine hairs
Crenate
with rounded teeth
Dentate
with symmetrical teeth
Denticulate
with fine dentition
Doubly Serrate
serrate with sub-teeth
Entire
even, smooth throughout
Lobate
indented, but not to midline
Serrate
teeth forward-pointing
Serrulate
with fine serration
Sinuate
with wave-like indentations
Spiny
with sharp stiff points
Undulate
widely wavy
VENATION
Arcuate
secondary veins bending toward apex
Cross-Venulate
small veins connecting secondary veins
Dichotomous
veins branching symmetrically in pairs
Longitudinal
veigns aligned mostly along long axis of leaf
Palmate
several primary veins diverging from a point
Parallel
veins arranged axially, not intersecting
Pinnate
secondary veins paired oppositely
Reticulate
smaller veins forming a network
Rotate
in peltate leaves, veins radiating

Photosynthesis

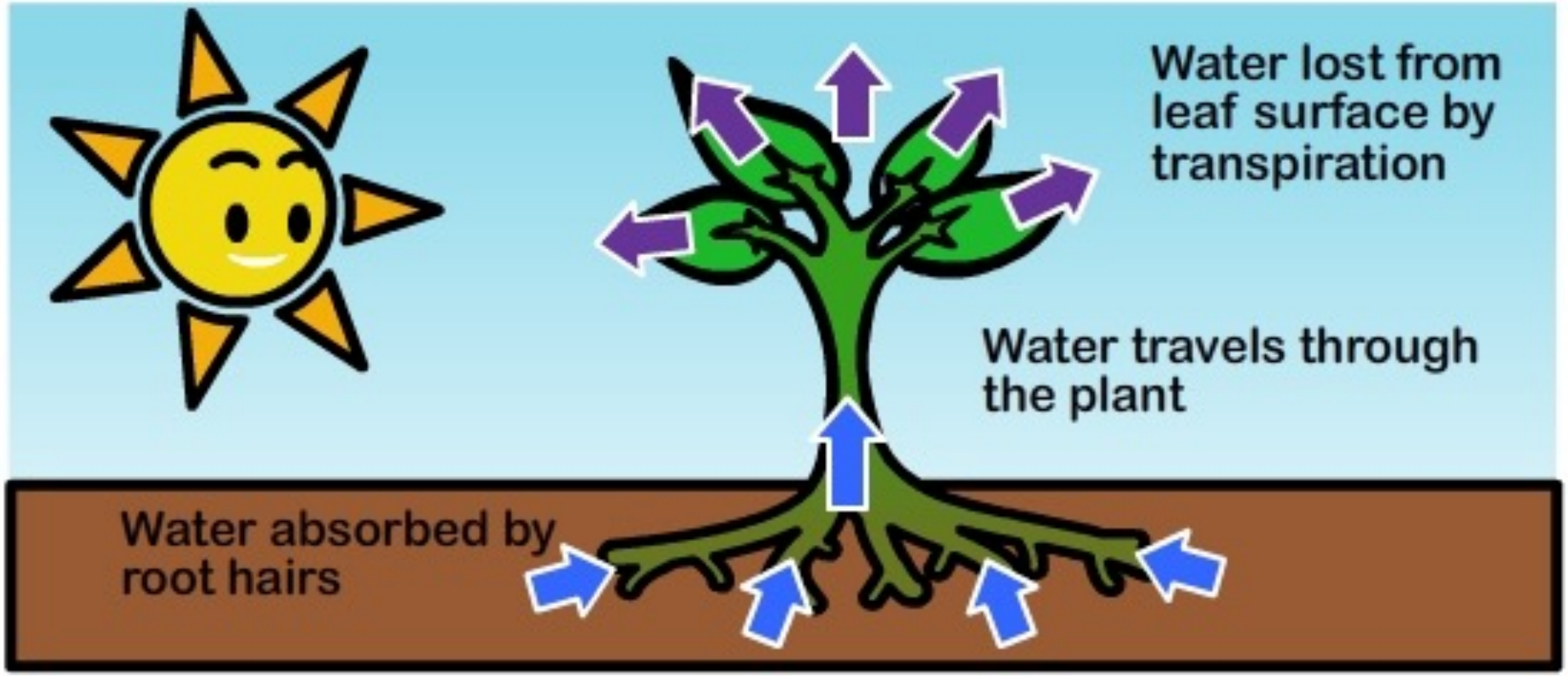


Photosynthesis

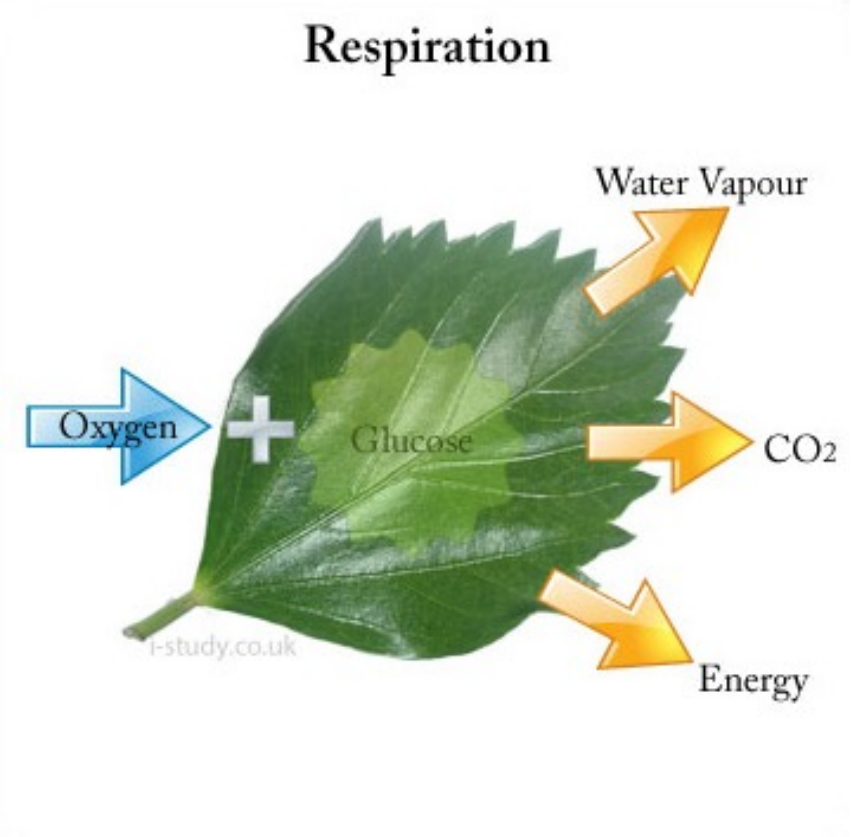
$$6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$$

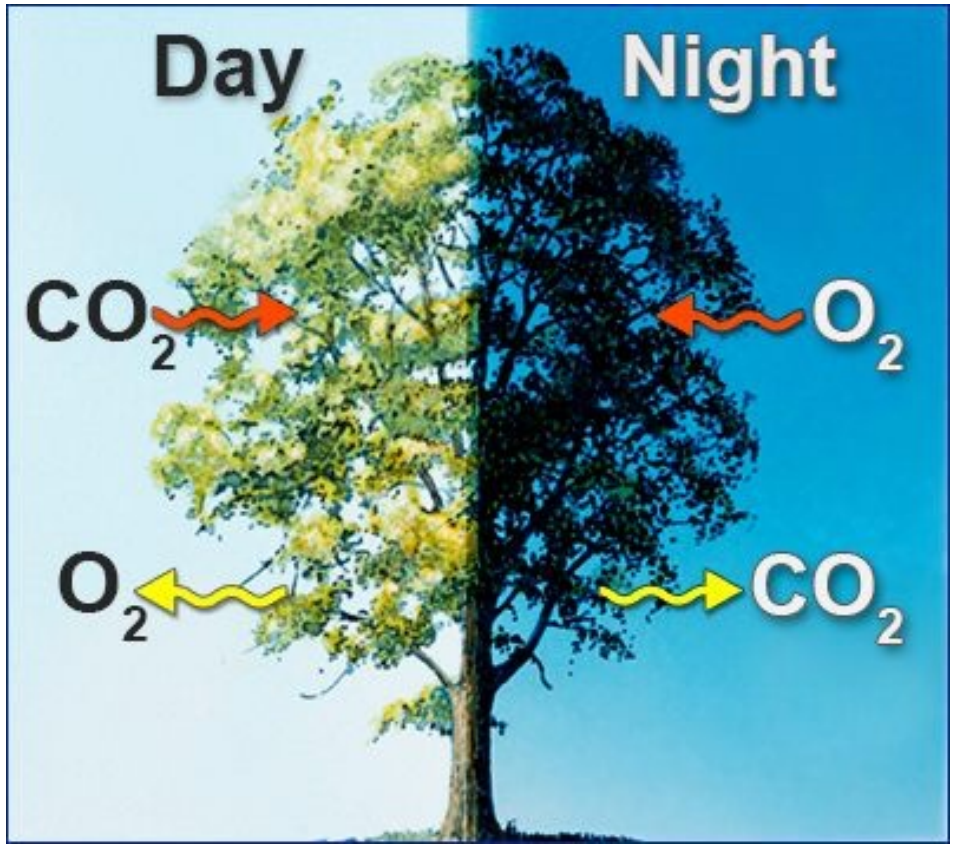
carbon dioxide + water ⟶ glucose + oxygen

Transpiration



Respiration

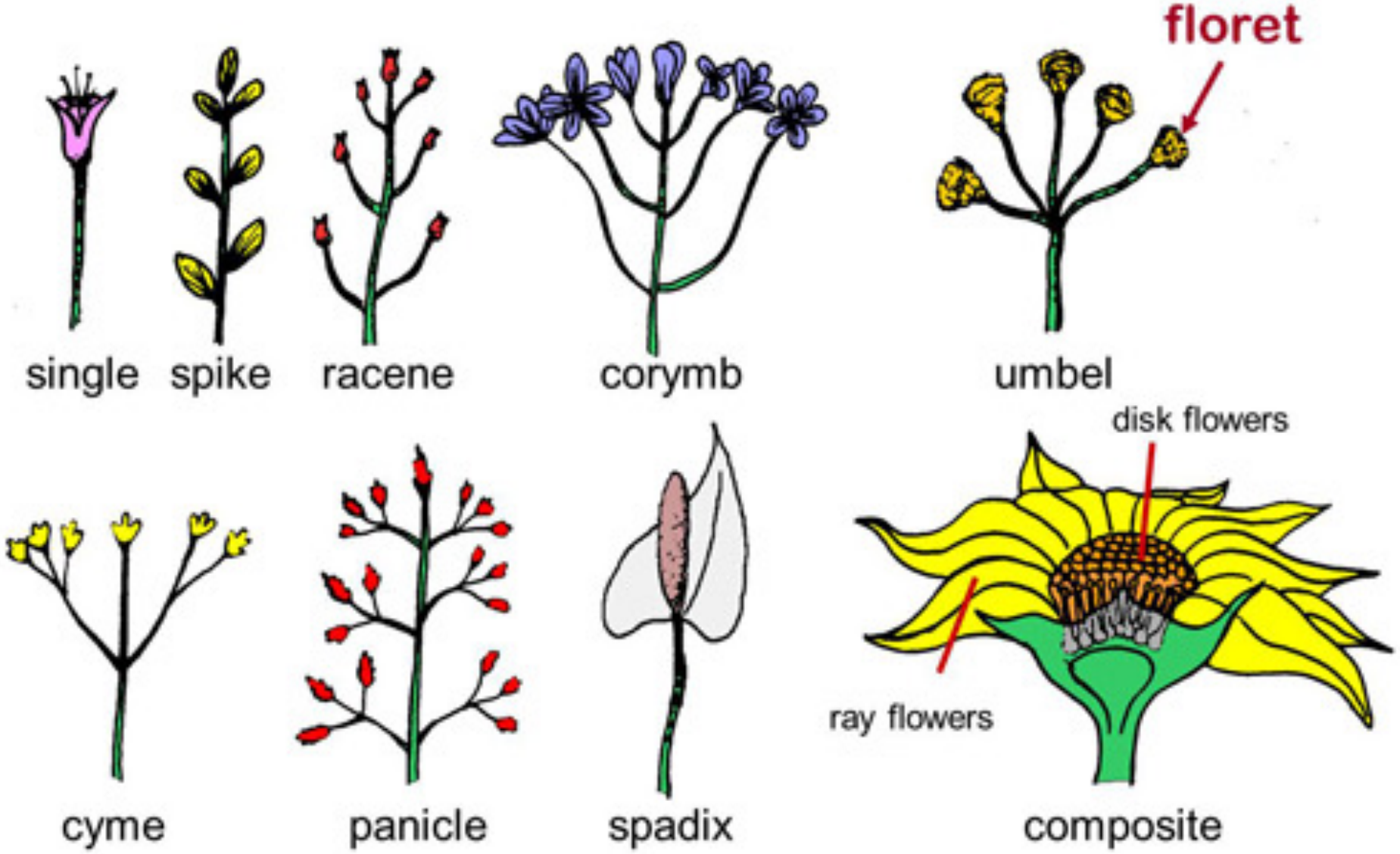




FLOWERS

Flower Shapes

Flower Forms



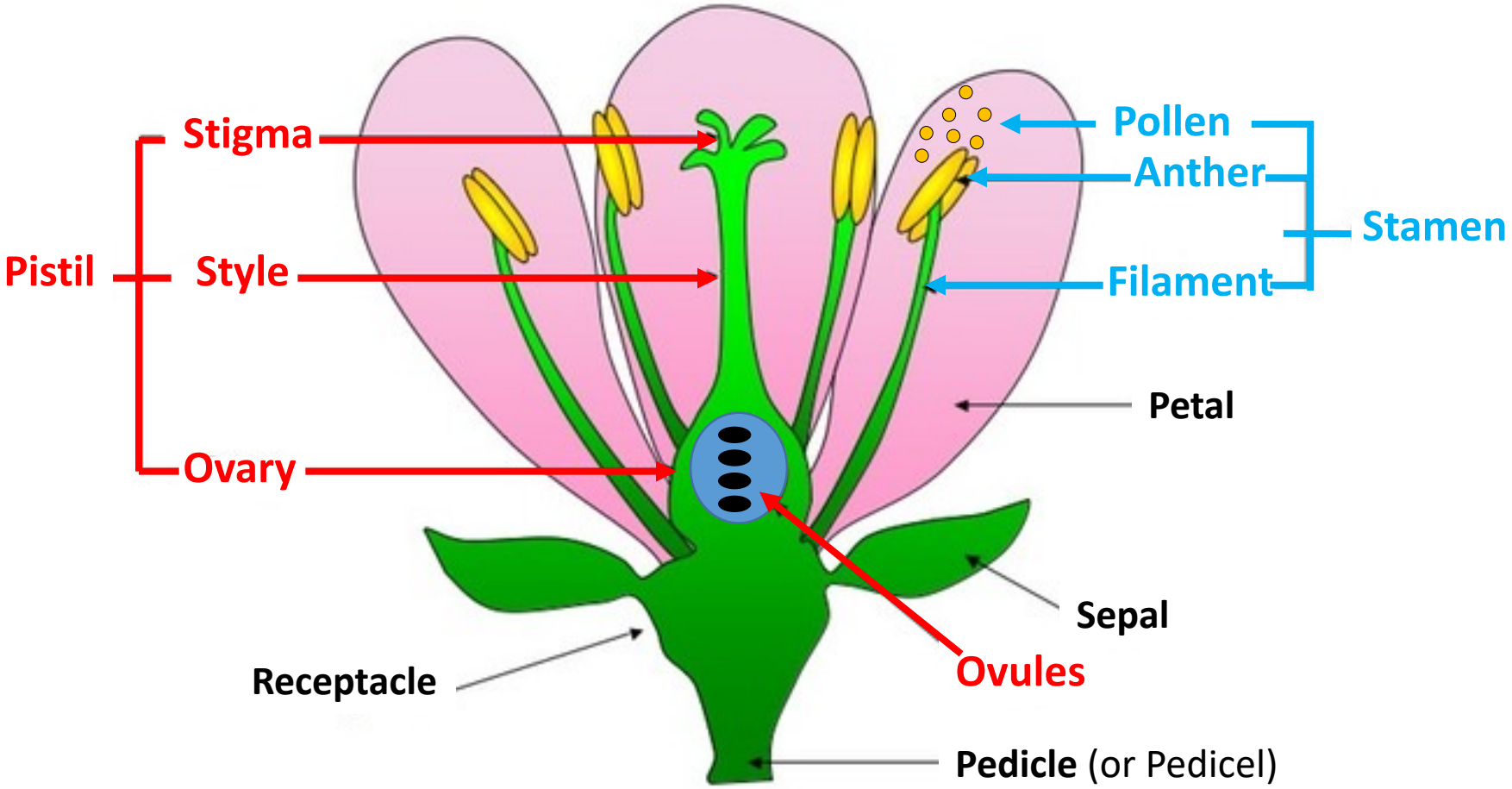
Lantana
Inflorescence

Why Do Plants Have Flowers?

Platycerium
Staghorn fern

Amorphophallus paeoniifolius 'Black Stathe‘
Elephant foot yam

Perfect Flower



A Perfect flower has the Pistil & Stamen on the same flower.

Imperfect Flower

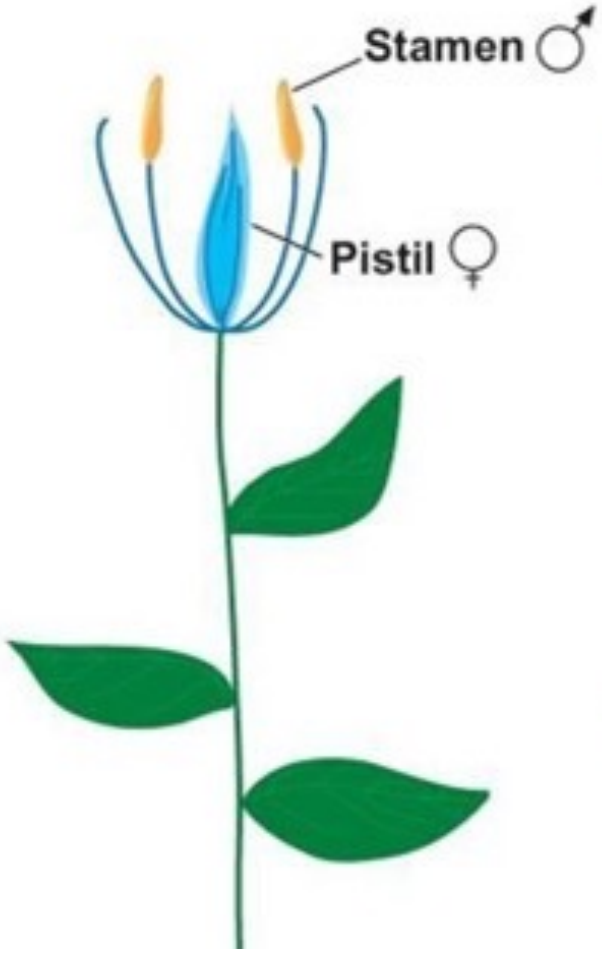
Female - Pistillate

Male - Staminate

An Imperfect flower has a Pistil or Stamen, but not on the same flower.

Sex and the Zucchini

4 Common Situations



Flower Type: **Perfect**
Plant Type: **Bisexual/ Hermaphroditic**

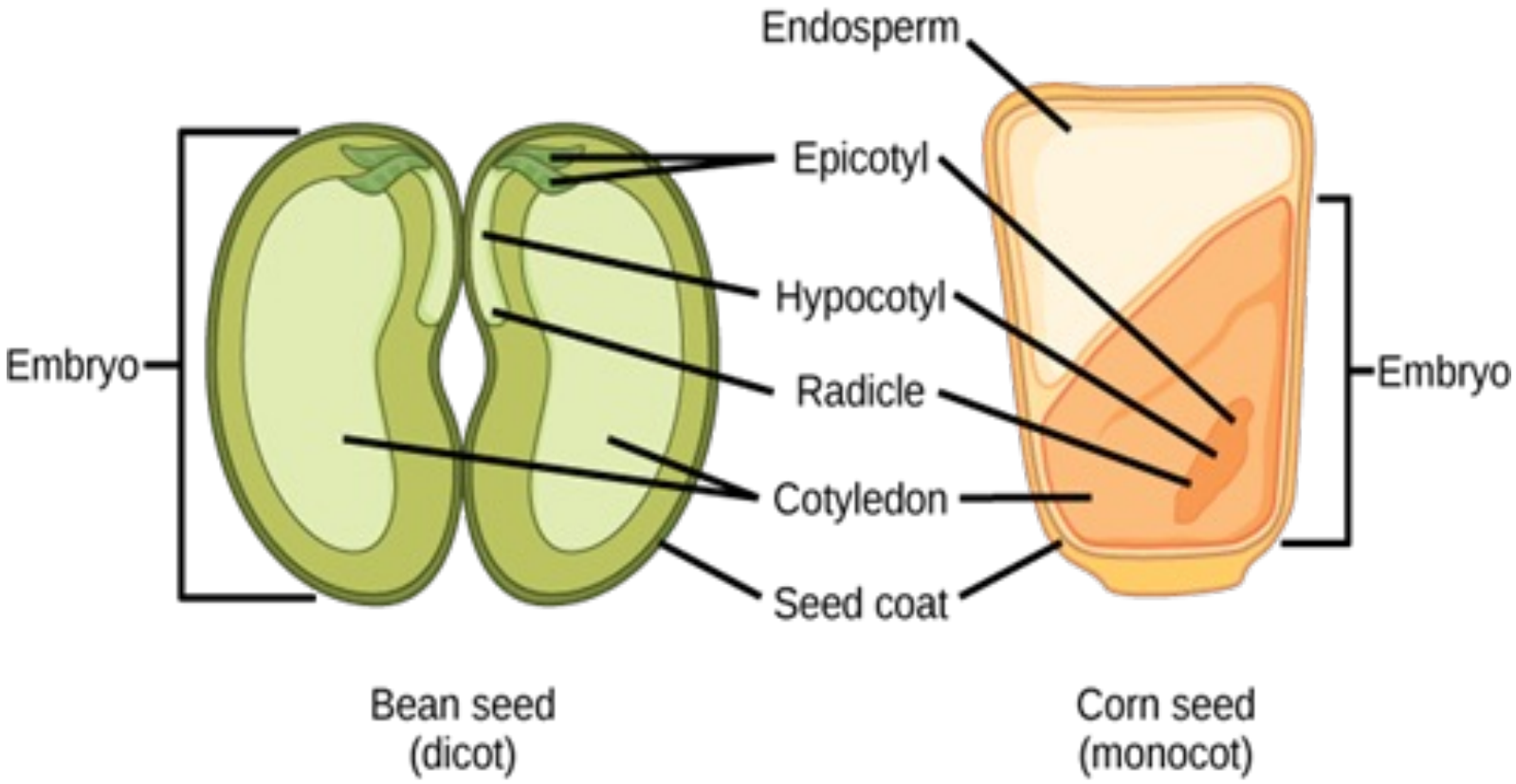
Flower Type: **Imperfect**
Plant Type: **Monoecius**

Flower Type: **Imperfect**
Plant Type: **Dioecius**
Male Plant: **Staminate**

Flower Type: **Imperfect**
Plant Type: **Dioecius**
Female Plant: **Pistillate**

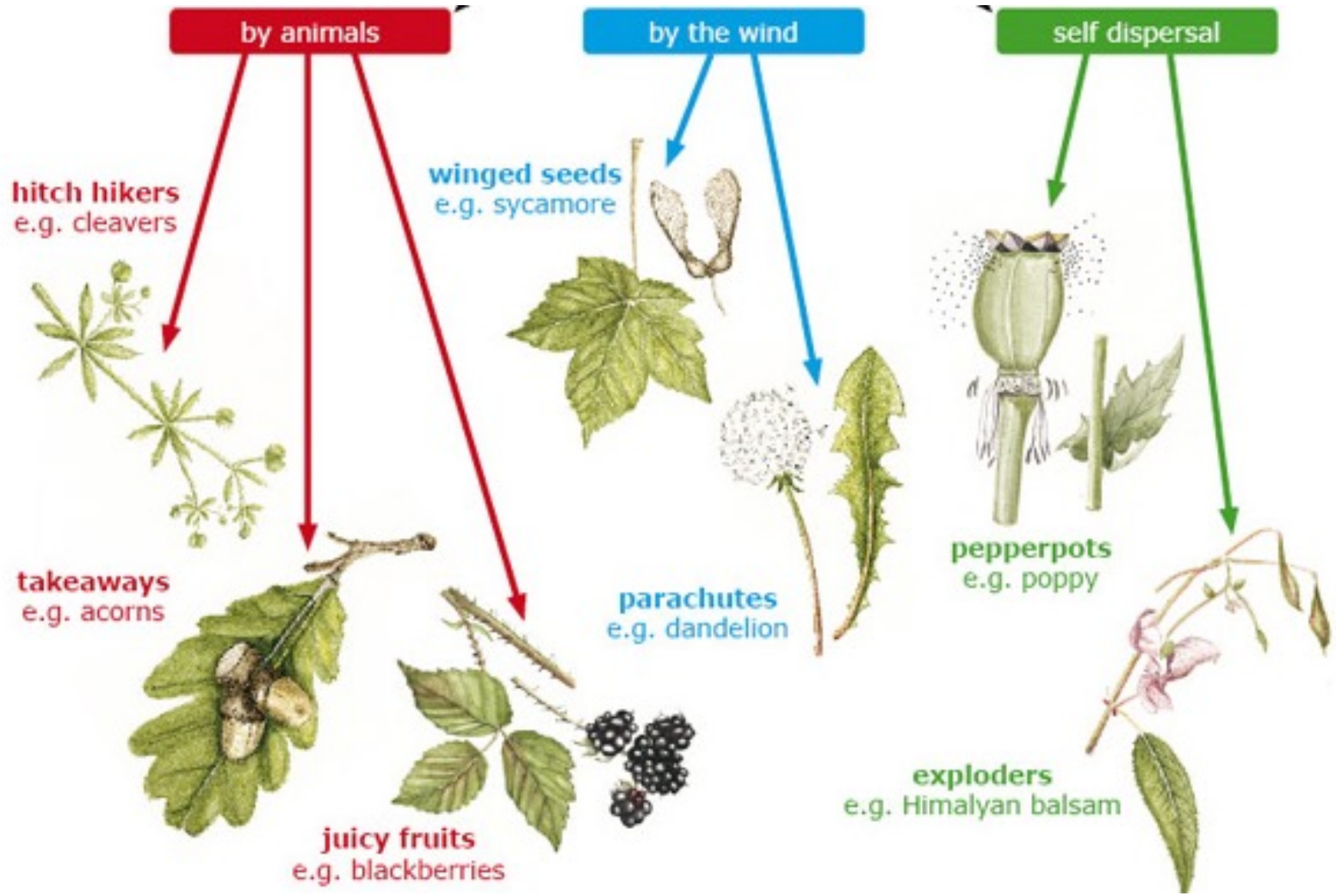
SEEDS

Anatomy of a Seed



Types of Seeds

Seed Dispersal



Classification of Plants

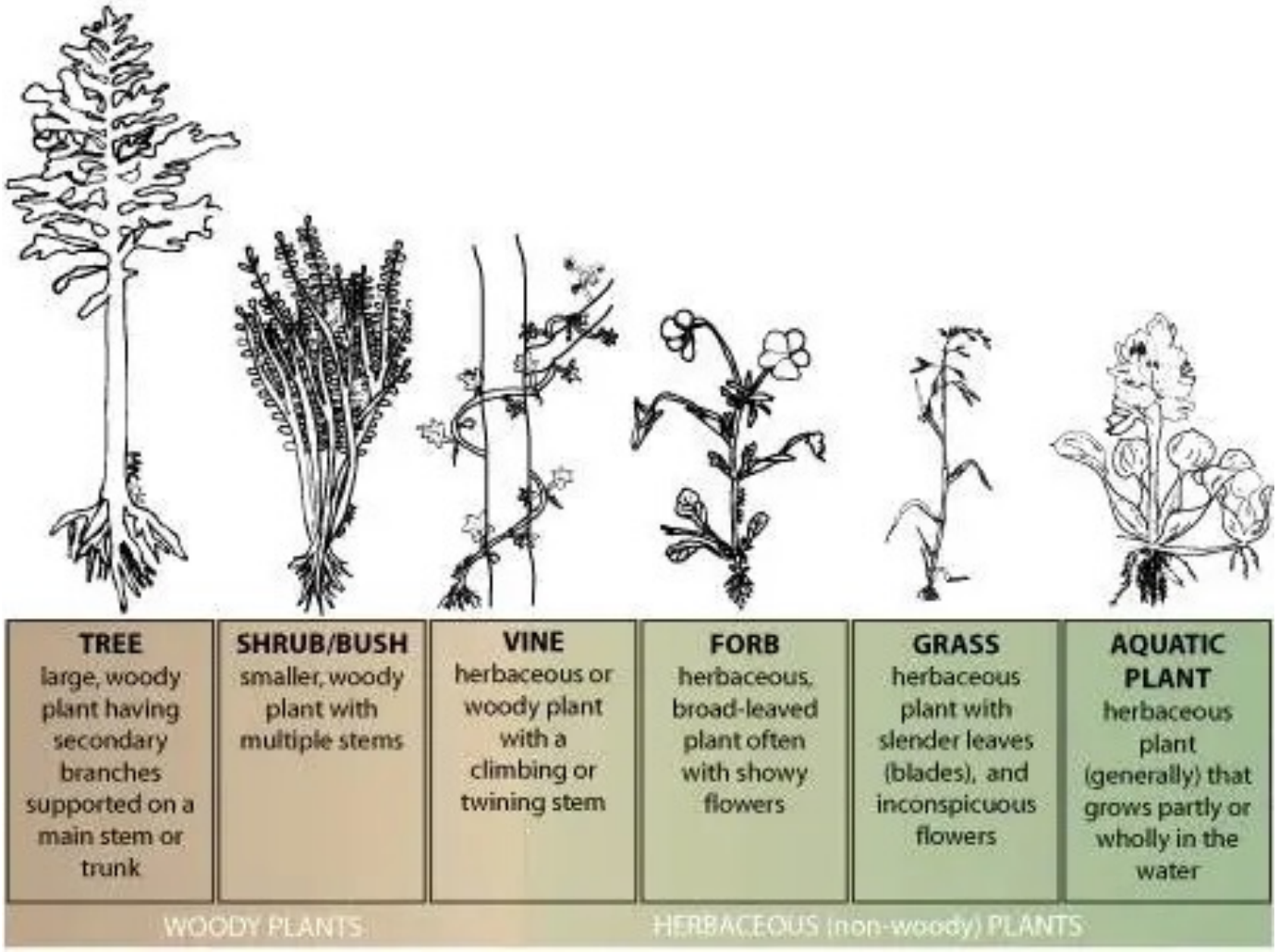
Growth Habit

Annual – plant grows and produces seen in one growing season

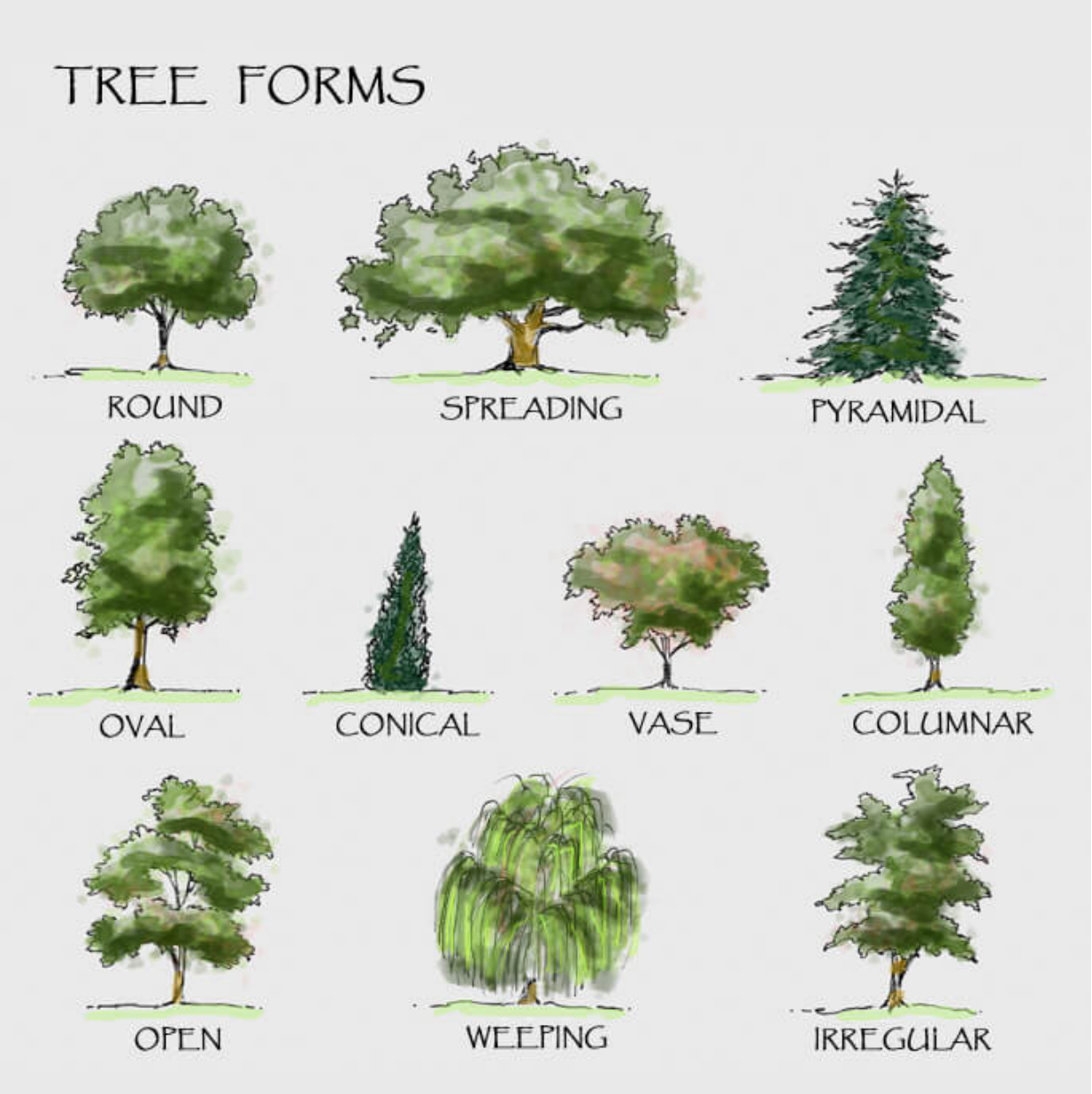
Biennial – plant completes its life cycle over two growing seasons

Perennial – plant continues to grow and flower for more than two years

Structure or Form



Structure or Form



Leaf Retention

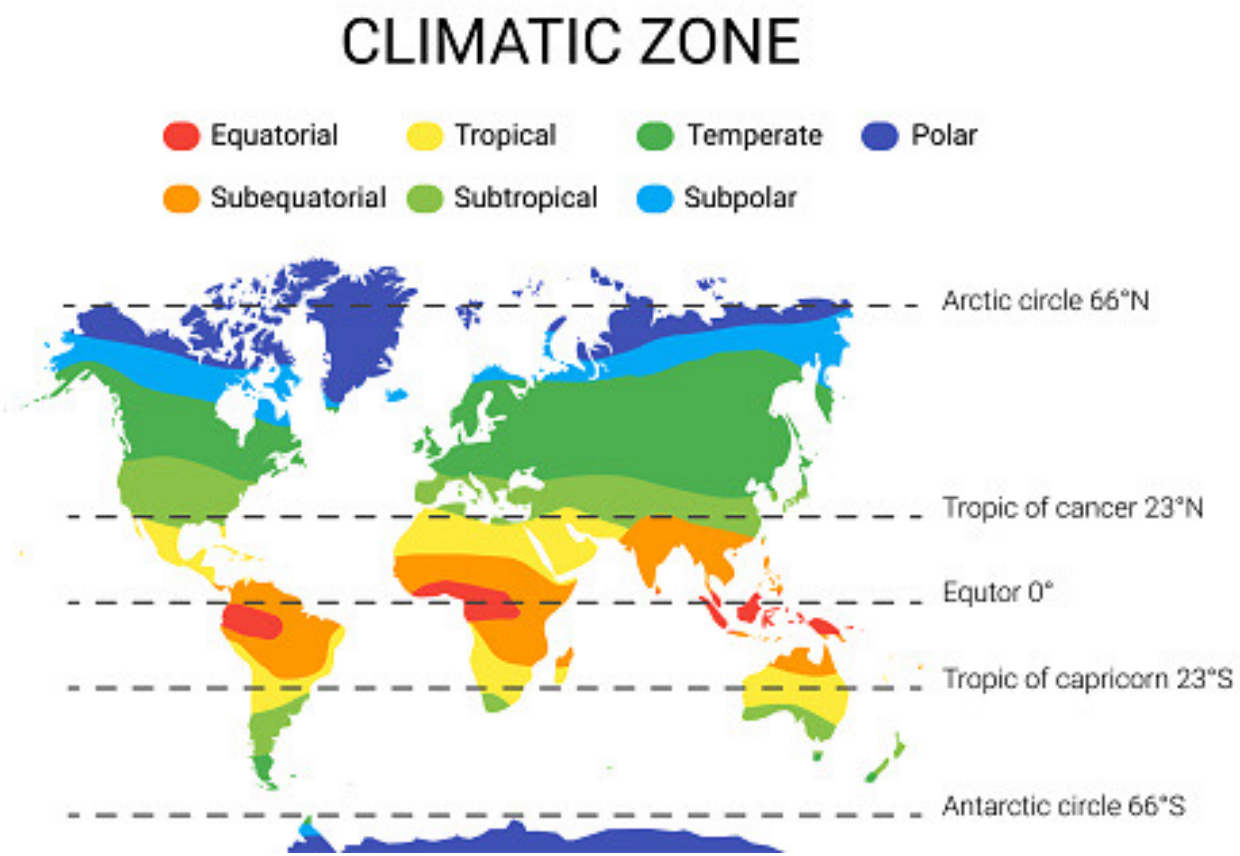
Evergreen

- Retains leaves year-round
- Needle-leaf & Broadleaf

Deciduous

- Lose leaves in fall
- Generally broadleaf

Climatic Adaptation

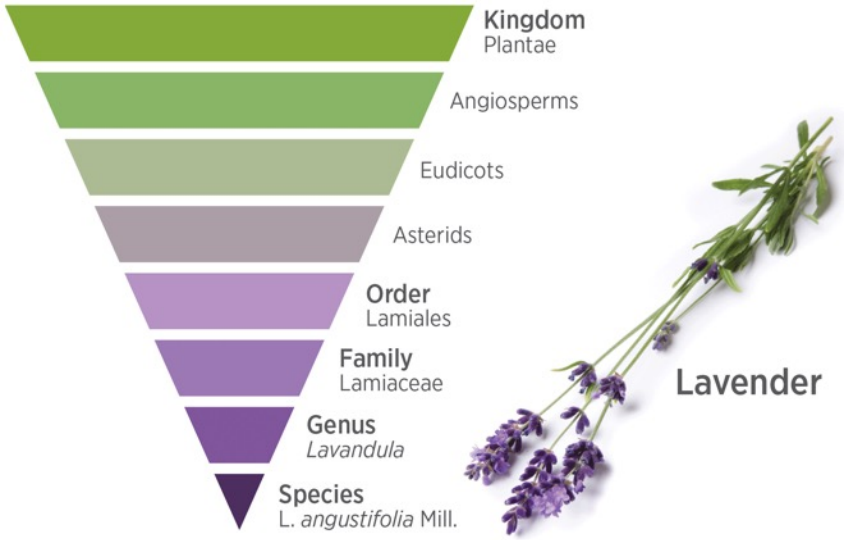


Climatic Adaptation Vegetables

Uses of Plants

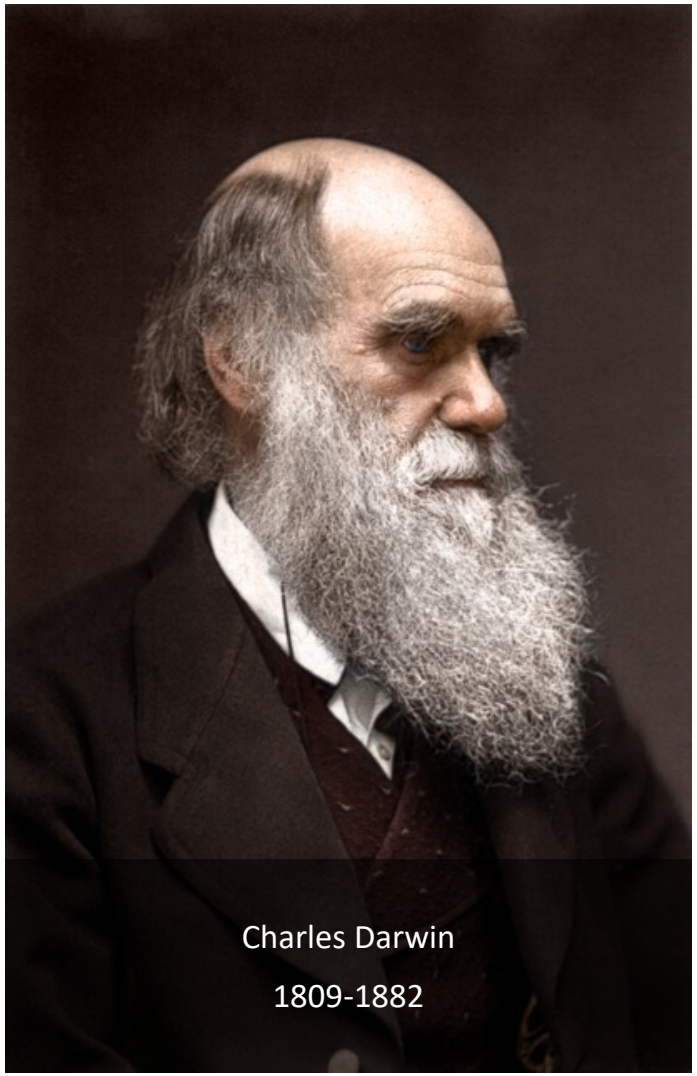
Taxonomy
Botanical Nomenclature

Purpose, Pronunciation & Format



Carl Linnaeus

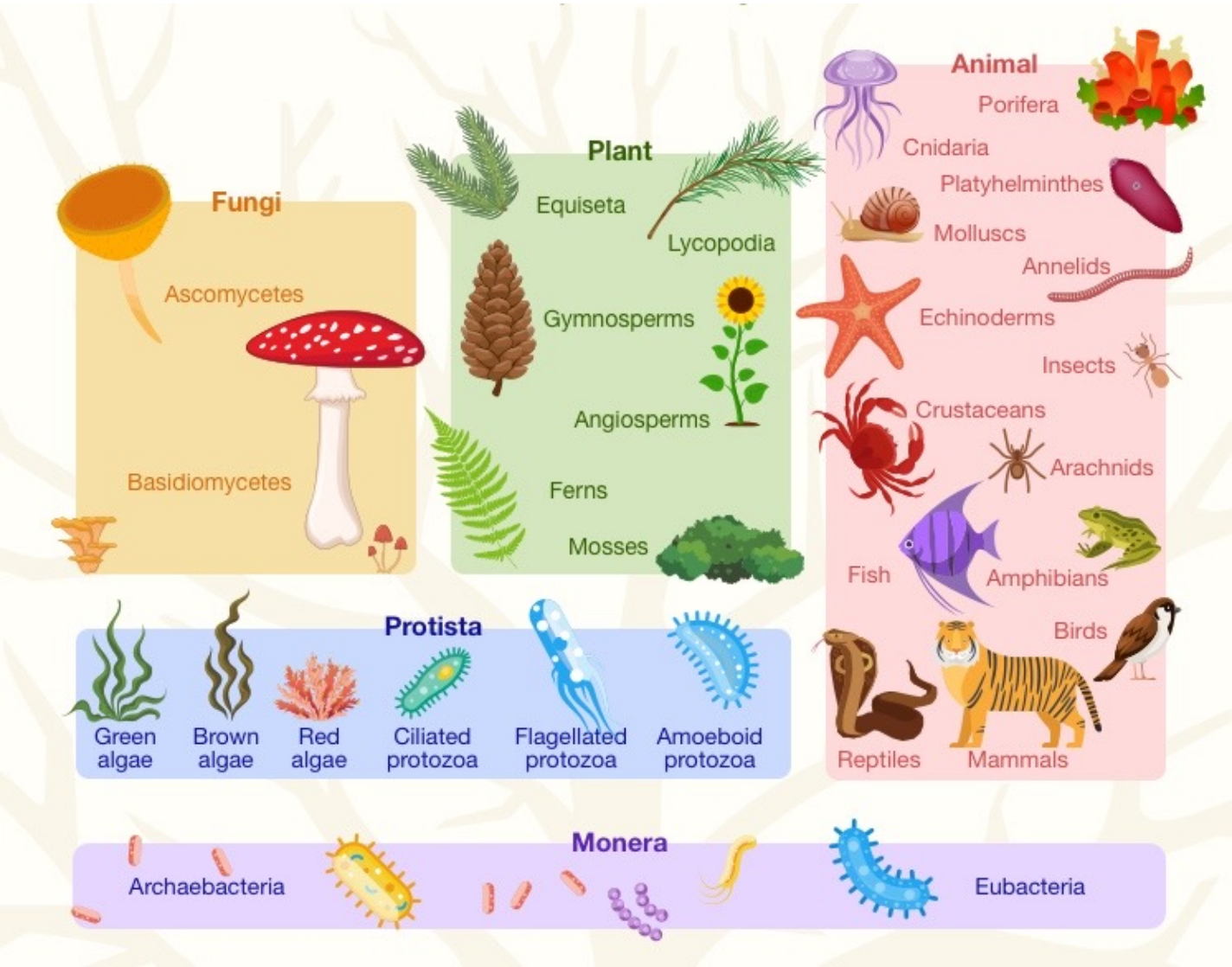
1707-1778



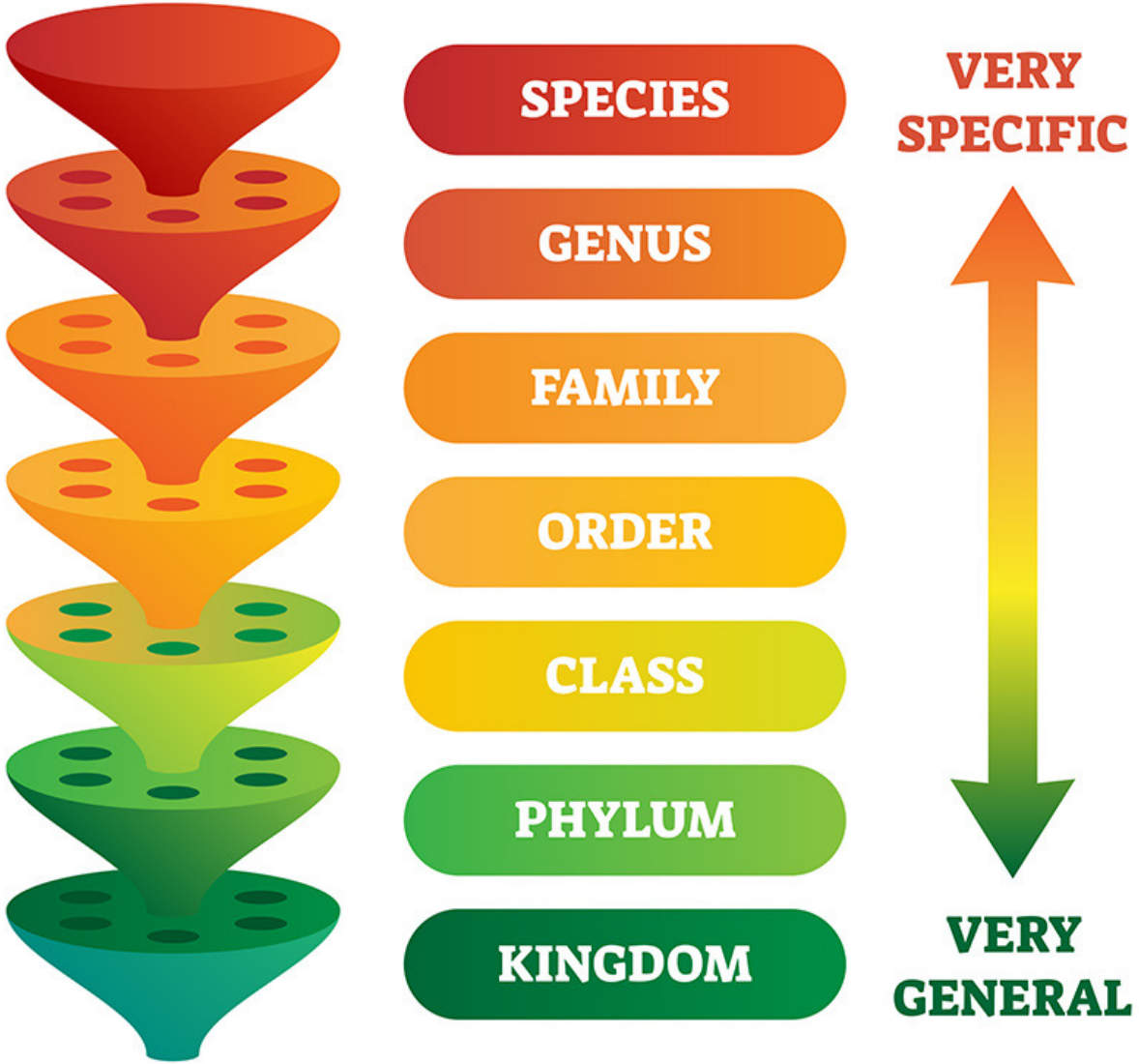
Charles Darwin

1809-1882

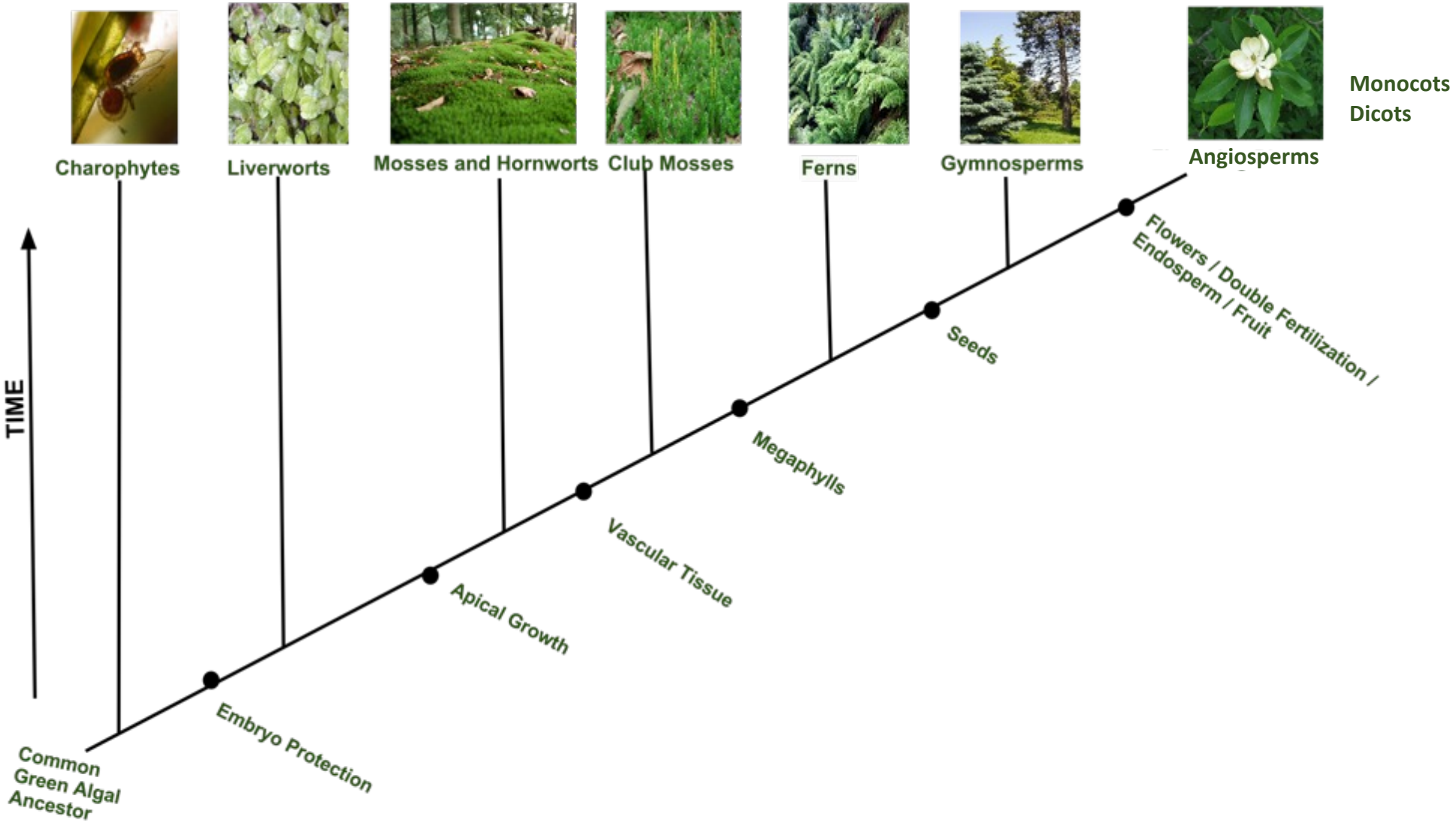
5 Kingdoms of Living Organisms

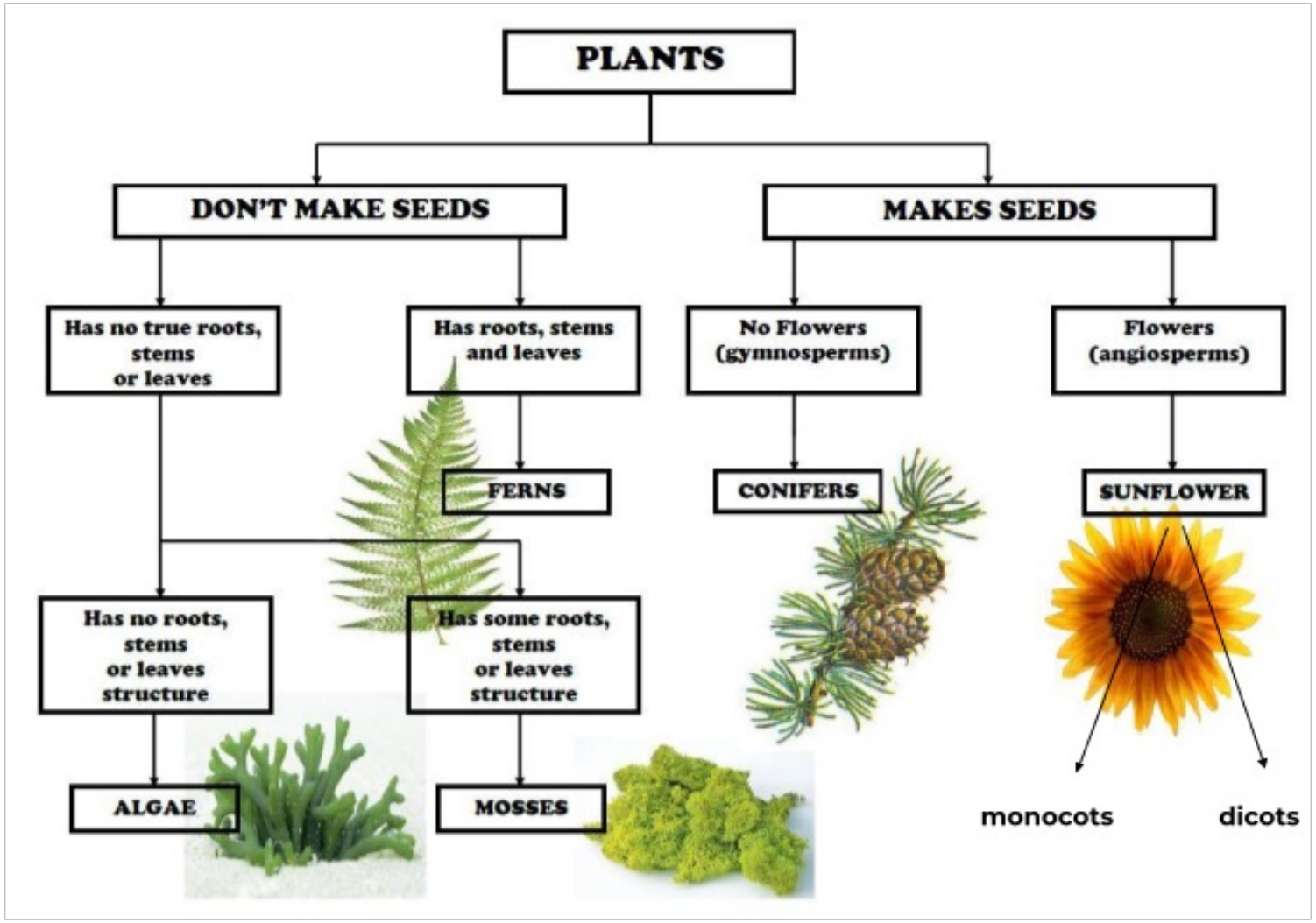


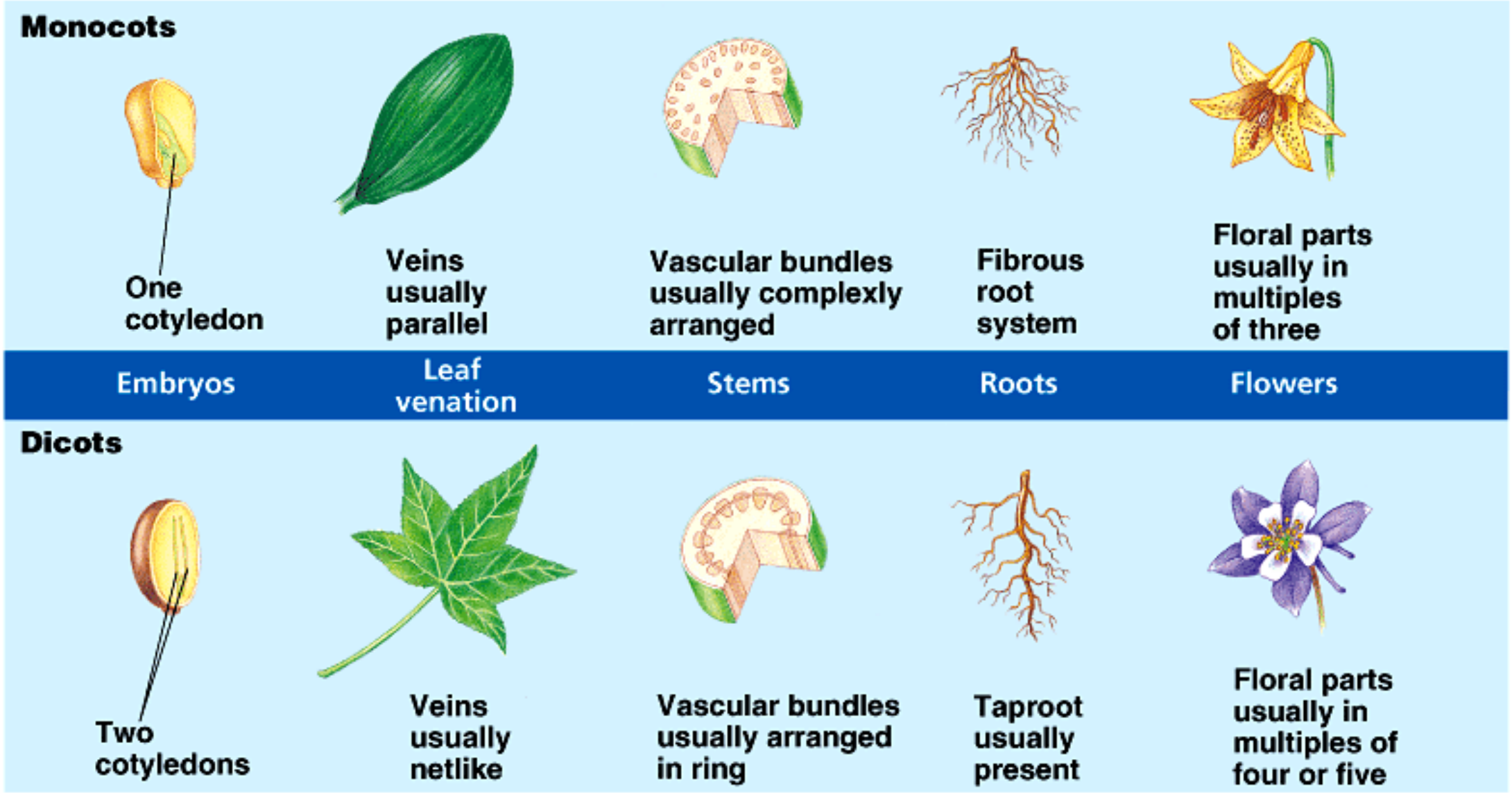
Hierarchy of Scientific Classification



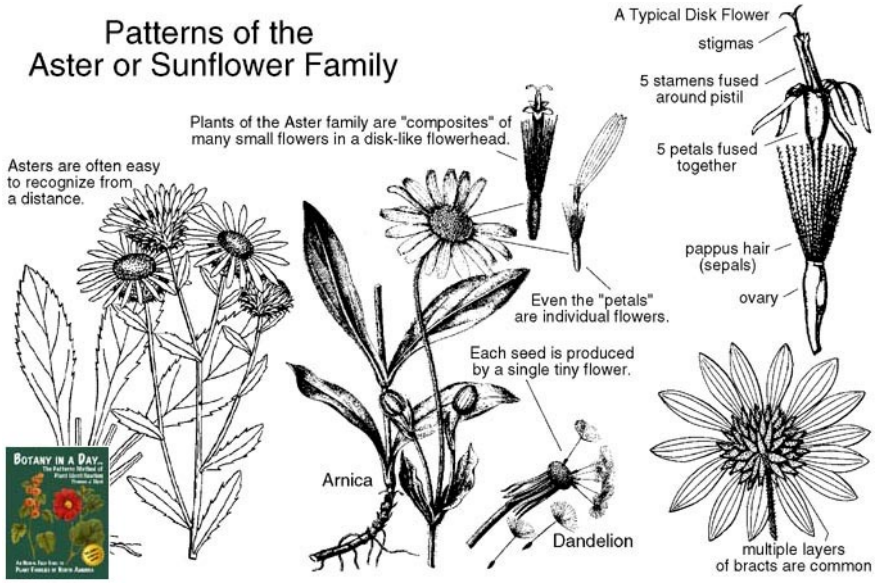
The Evolution of Plants

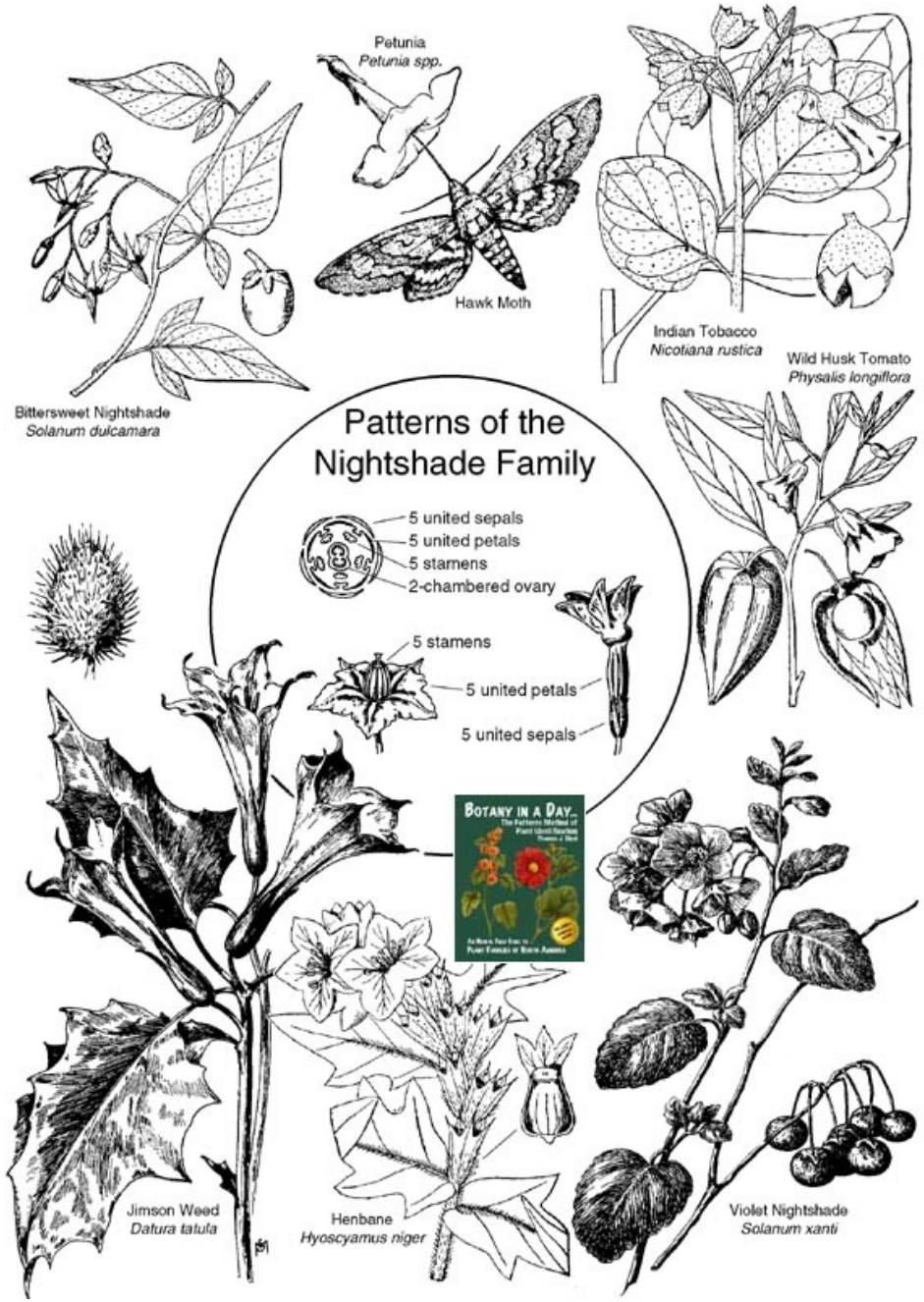



PLANTS
DON'T MAKE SEEDS
MAKES SEEDS
Has no true roots, stems or leaves
Has roots, stems and leaves
No Flowers (gymnosperms)
Flowers (angiosperms)
FERNS
CONIFERS
SUNFLOWER
Has no roots, stems or leaves structure
Has some roots, stems or leaves structure
ALGAE
MOSSES
monocots
dicots


Monocots
One cotyledon
Veins usually parallel
Vascular bundles usually complexly arranged
Fibrous root system
Floral parts usually in multiples of three
Embryos
Leaf venation
Stems
Roots
Flowers
Dicots
Two cotyledons
Veins usually netlike
Vascular bundles usually arranged in ring
Taproot usually present
Floral parts usually in multiples of four or five


Patterns of the Lily Family
And its Allies
3 sepals and 3 petals (same size and color)
parallel veins in the leaves
pistil with a 3-parted stigma
6 stamens
Philadelphia Lily
Tiger Lily


Patterns of the Aster or Sunflower Family
A Typical Disk Flower
stigmas
5 stamens fused around pistil
5 petals fused together
pappus hair (sepals)
ovary
Plants of the Aster family are "composites" of many small flowers in a disk-like flowerhead.
Asters are often easy to recognize from a distance.
Even the "petals" are individual flowers.
Each seed is produced by a single tiny flower.
Arnica
Dandelion
multiple layers of bracts are common


Petunia
Petunia spp.
Hawk Moth
Indian Tobacco
Nicotiana rustica
Wild Husk Tomato
Physalis longiflora
Bittersweet Nightshade
Solanum dulcamara
Patterns of the Nightshade Family
5 united sepals
5 united petals
5 stamens
2-chambered ovary
5 stamens
5 united petals
5 united sepals
Jimson Weed
Datura tatula
Henbane
Hyoscyamus niger
Violet Nightshade
Solanum xanti

Why use Scientific Names?

- Scientific names use the same language worldwide: Latin
- Unique name for each plant, often multiple common names
- Many scientific names have specific meaning or descriptors

Common Name
Snow-in-Summer

Cerastium tomentosum

Melalueca linariifolia

Common Name
Naked Lady

Amaryllis belladonna

General Format

Family

- **640+ Families**
- **suffix of: aceae; pronounced Aa-Cee-Ee**

Genus

- **17,000+ Genera**
- **Genus is Capitalized & in *Italics* or <u>underlined</u>**

species

- **1,000,000+ species**
- **species is lowercase & in *italics* or <u>underlined</u>**

‘Cultivar’

- **Countless cultivars**
- **included after plant name with ‘single quotes’**

Pronunciation Facts

- Horticulturists don’t always agree on pronunciation
- Individual botanists rarely are completely consistent in pronunciation
- People tend to pronounce names the way they first learned them regardless of any subsequently encountered info
- Website to try: davesgarden.com

What’s in a Latin name?

alba – white
alpestris - alpine
bellus – beautiful
broccolo – flowering top
caerule – dark blue
candicans – hairy or wooly
cereus - waxy
coccinea – scarlet
cordata – heart shaped
crassu – fleshy, thick
dulcis – sweet
edulis – edible
ferox – very thorny
flavens – yellowish
glaber – smooth; without hairs
heli – sun
imbricata – overlapping,like scales
ingens – enormous
obesus – fat
phylla – leaves (pertaining to)
repens – crawling, creeping
ericeus - silky
serpens – creeping, snakelike
vulgaris - common

Tuscan Rosemary

KINGDOM	*Plantae* (Plant)
PHYLUM	*Magnoliophyta* (Flowering Plant)
CLASS	*Magnoliopsida* (Dicotyledon)
ORDER	*Lamiales*
FAMILY	*Lamiaceae* (Mint Family)
GENUS	*Rosmarinus* (Rosemary)
SPECIES	*officinalis* (of official/medicinal use)
CULTIVAR	‘Tuscan Blue’

Common Abbreviations

Lavandula stoechas, Lavandula canariensis, Lavandula dentate

or….. *Lavandula stoechas, L. canariensis, L. dentate*

Lavandula sp. – Used when referring to <u>one</u> unknown species of *Lavandula*

Lavandula spp. – Used when referring to <u>many</u> unknown species of *Lavandula*

More Possible Abbreviations

Lavandula stoechas L.

In journals where the initial refers to the name of the person responsible for naming the species.

Platanus x *acerifolia* or *Pisum sativum* var. *arvense*

Indicates hybrid cross or variety given a new name

Lyonothamnus floribundus ssp. *asplenifolius*

Refers to a subclassification of a species in which plants growing in the wild developed and morphological traits that is readily heritable

Another Helpful Web Site

Tropicos.org

A Web Site of Missouri Botanical Garden

Search for Botanic Names…

all Genera within a Family,

all Species within a Genus, etc.