



PLANT MORPHOLOGY BASICS

CNPS

Keying With Natives

Presented by Dee Shea Himes

January 2022

WHAT IS PLANT MORPHOLOGY?

*A study of the
physical form
and
external structures
of plants
- wikipedia*

HAND LENS / LOUPE



TODAY'S SESSION, YOU WILL GET BASIC UNDERSTANDING OF



Plant external structures



Leaf types and features



Flowering parts



Basic fruits and seeds types

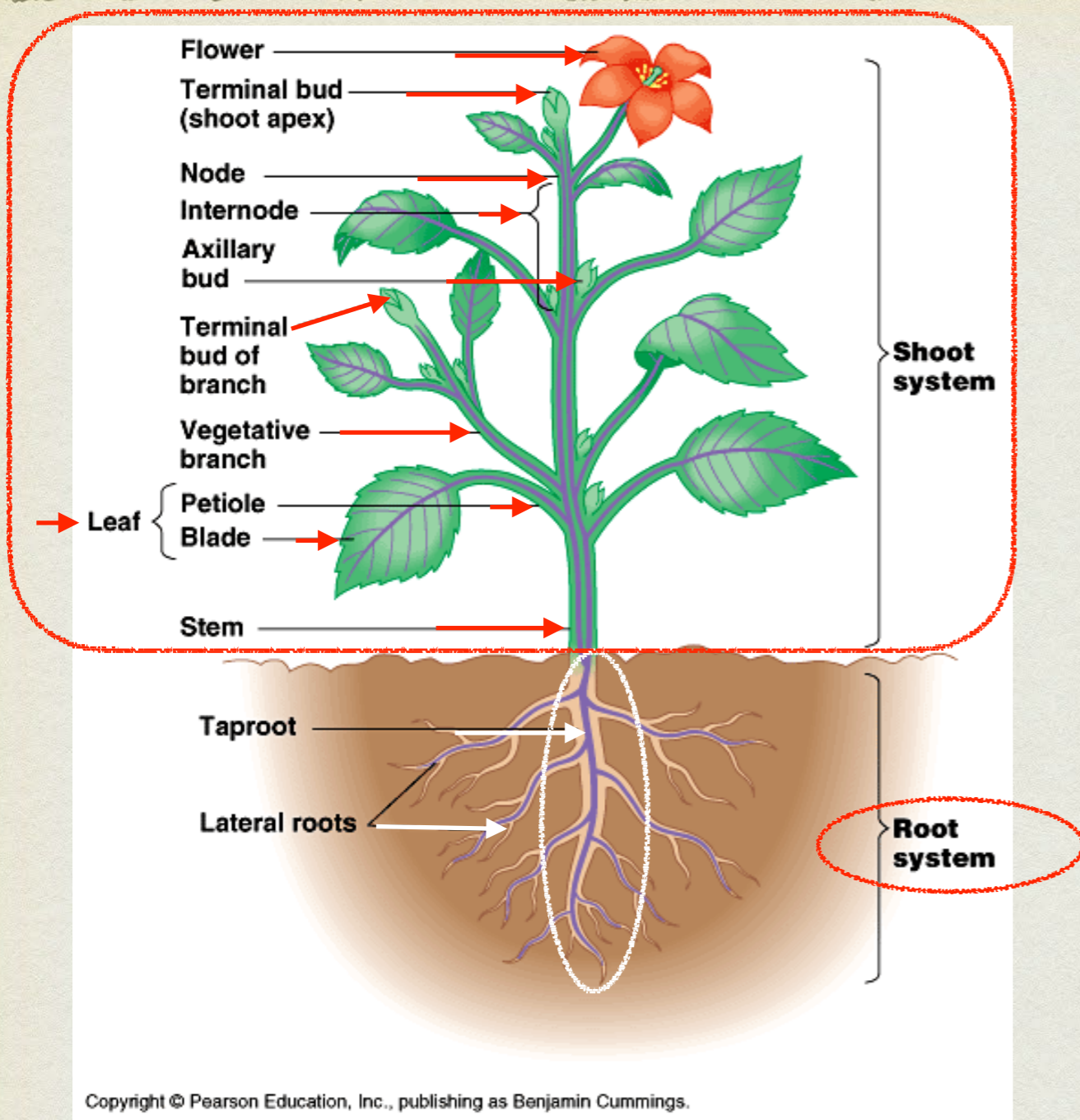


Plant glossary



Look at plant samples

THE PLANT: EXTERNAL STRUCTURE



STEMS & ROOTS...

<https://vplants.org/portal/plants/glossary/plate01.php>

rhyzomatous

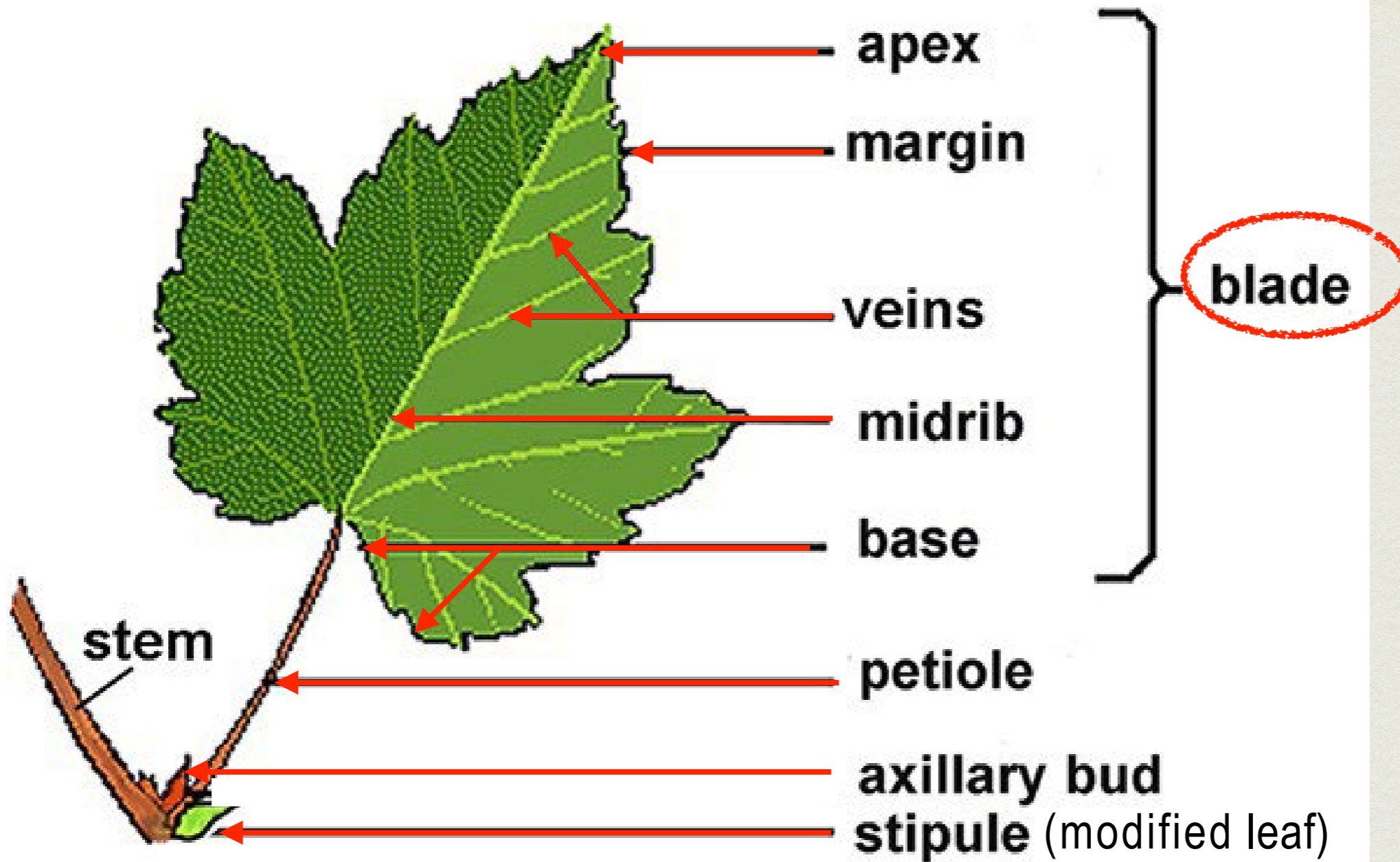


adventitious - rooting from non-root tissue



Photo by Dee Shea Himes

THE LEAF

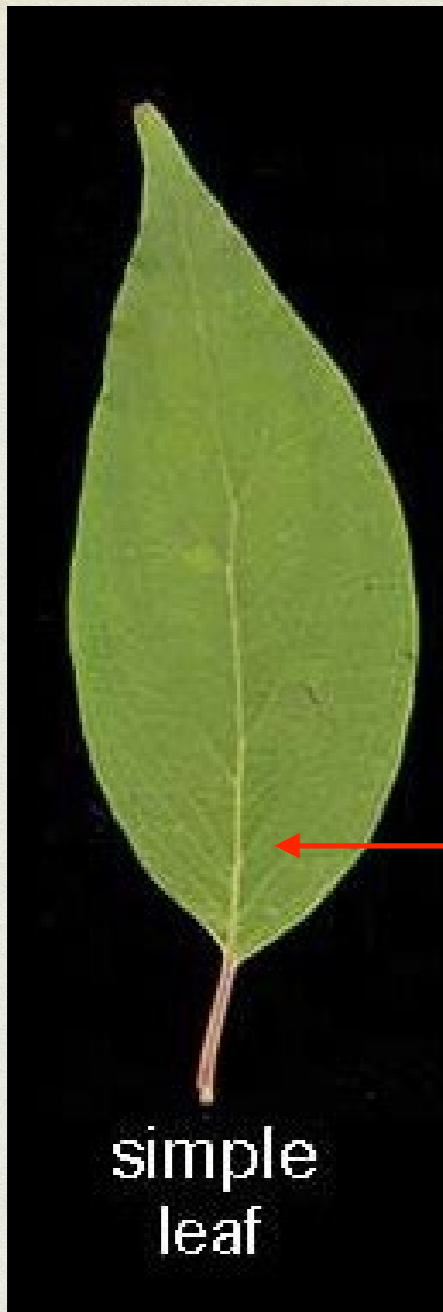


• http://www.bio.miami.edu/dana/226/226F07_8print.html



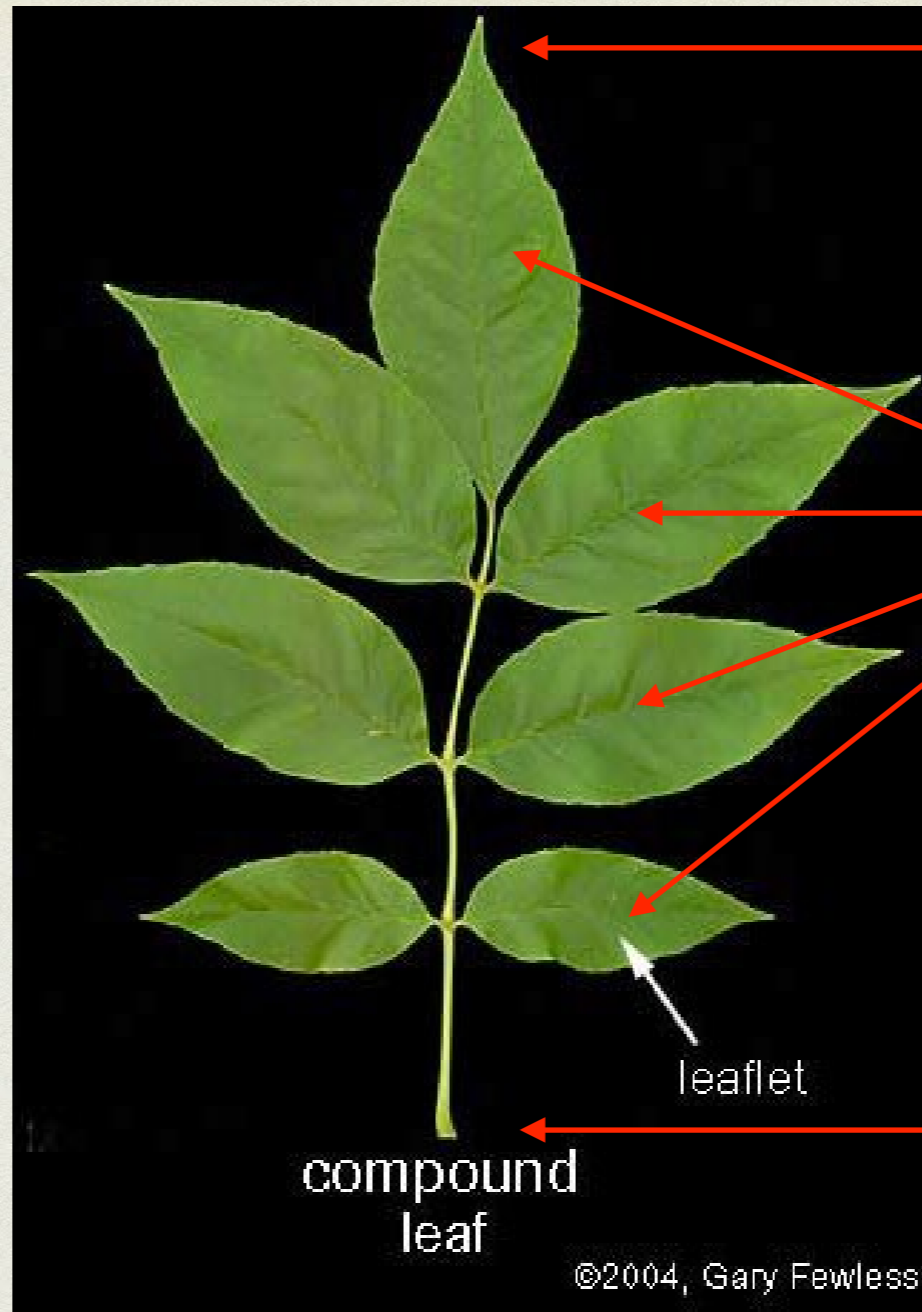
Stipule

LEAF TYPES



1 Leaf

simple
leaf



compound
leaf

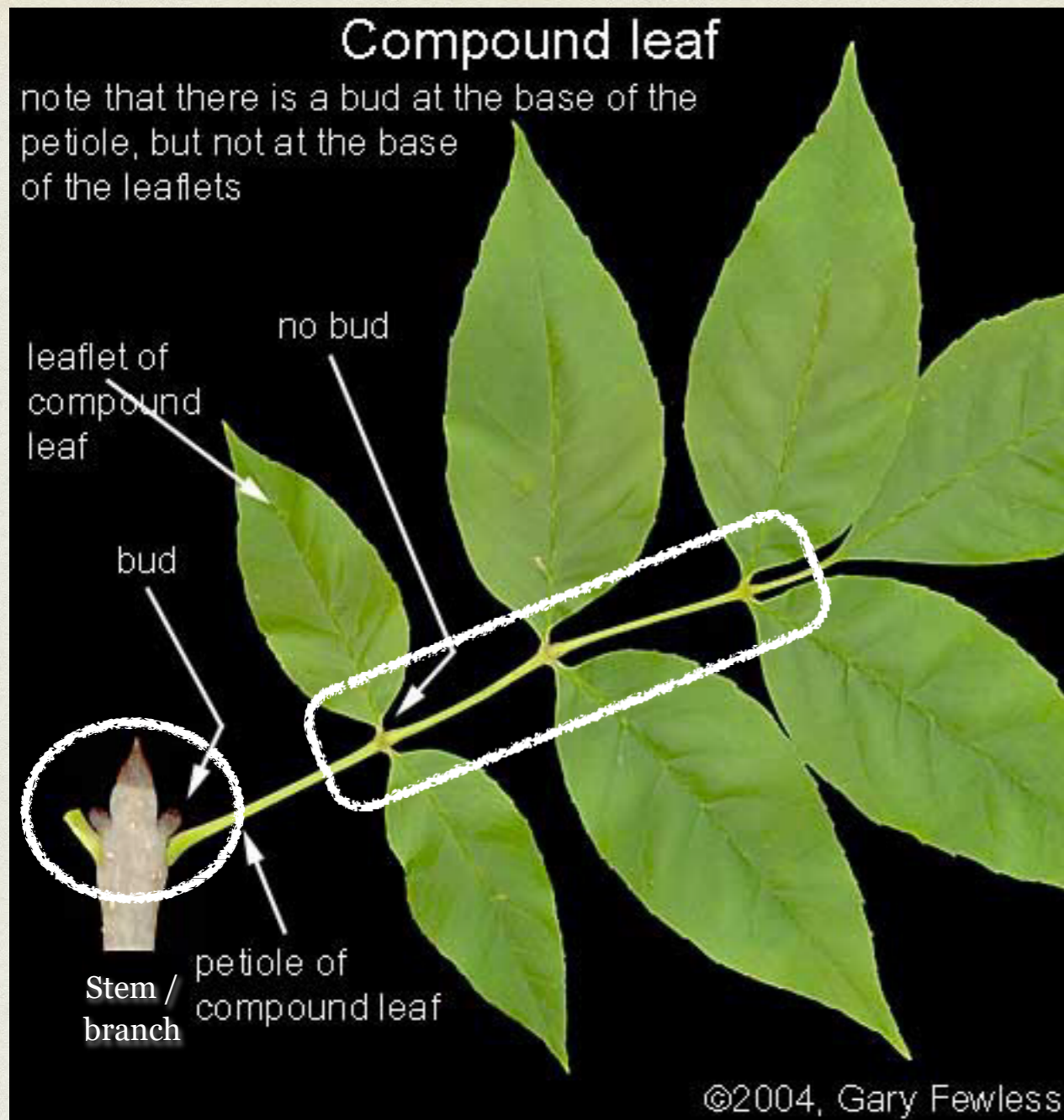
leaflet

1 Leaf

Multiple
Leaflets

©2004, Gary Fewless

THE COMPOUND LEAF



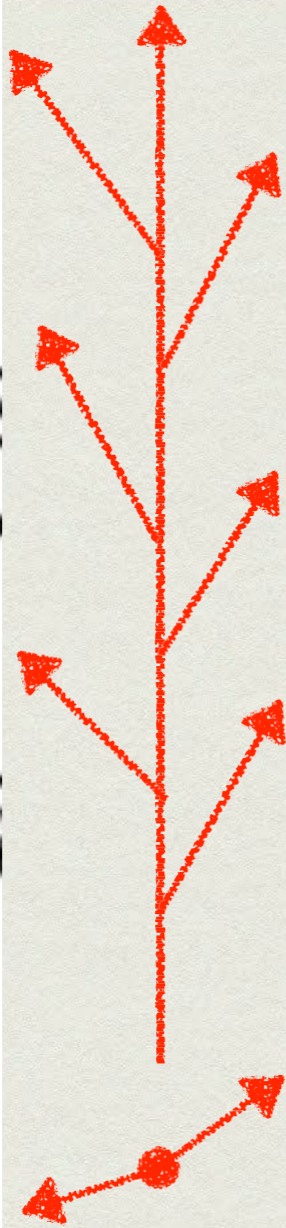
https://www.uwgb.edu/biodiversity/herbarium/trees/simple_compound_leaves01.htm

LEAF ARRANGEMENTS...

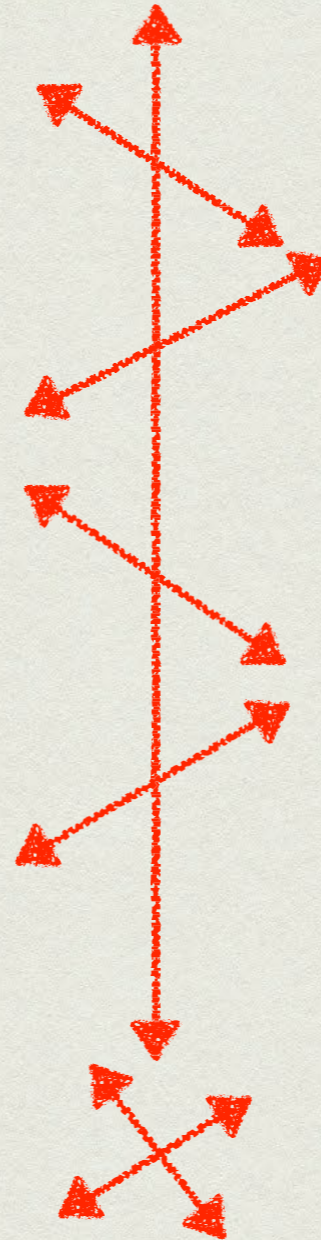
[HTTPS://VPLANTS.ORG/PORTAL/PLANTS/GLOSSARY/PLATE02.PHP](https://vplants.org/portal/plants/glossary/plate02.php)



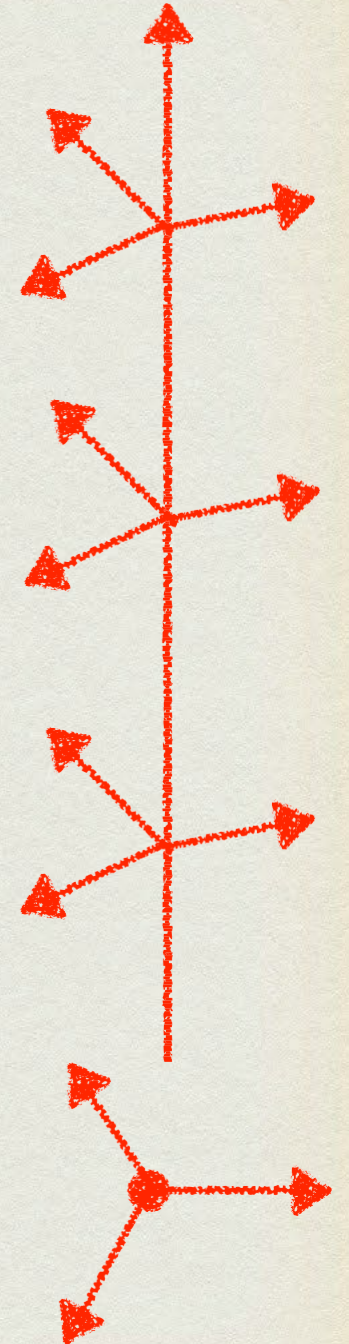
ALTERNATE



OPPOSITE



WHORLED



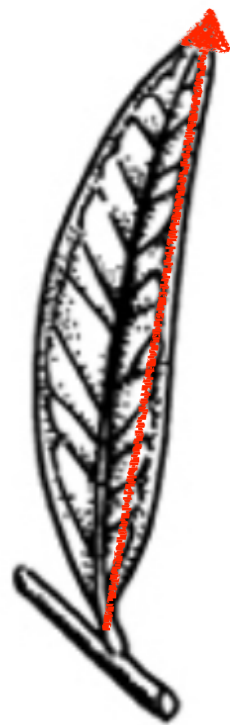
IMBRICATE

[HTTPS://VPLANTS.ORG/PORTAL/PLANTS/GLOSSARY/PLATE02.PHP](https://vplants.org/portal/plants/glossary/plate02.php)



LEAF COMPOUND TYPES

[HTTPS://VPLANTS.ORG/PORTAL/PLANTS/GLOSSARY/PLATE02.PHP](https://vplants.org/portal/plants/glossary/plate02.php)



SIMPLE

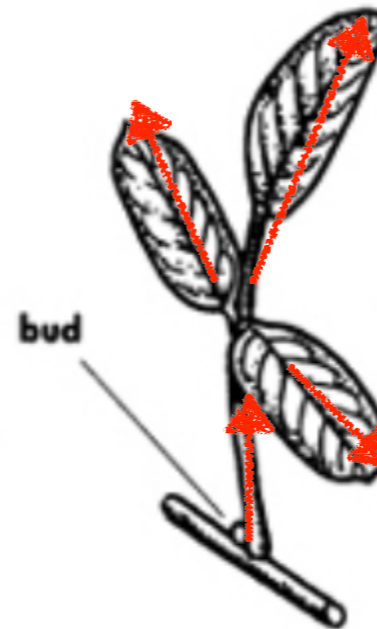


**PALMATELY
COMPOUND**



**PALMATELY
TRIFOLIOLATE
(TERNATE)**

3 leaves



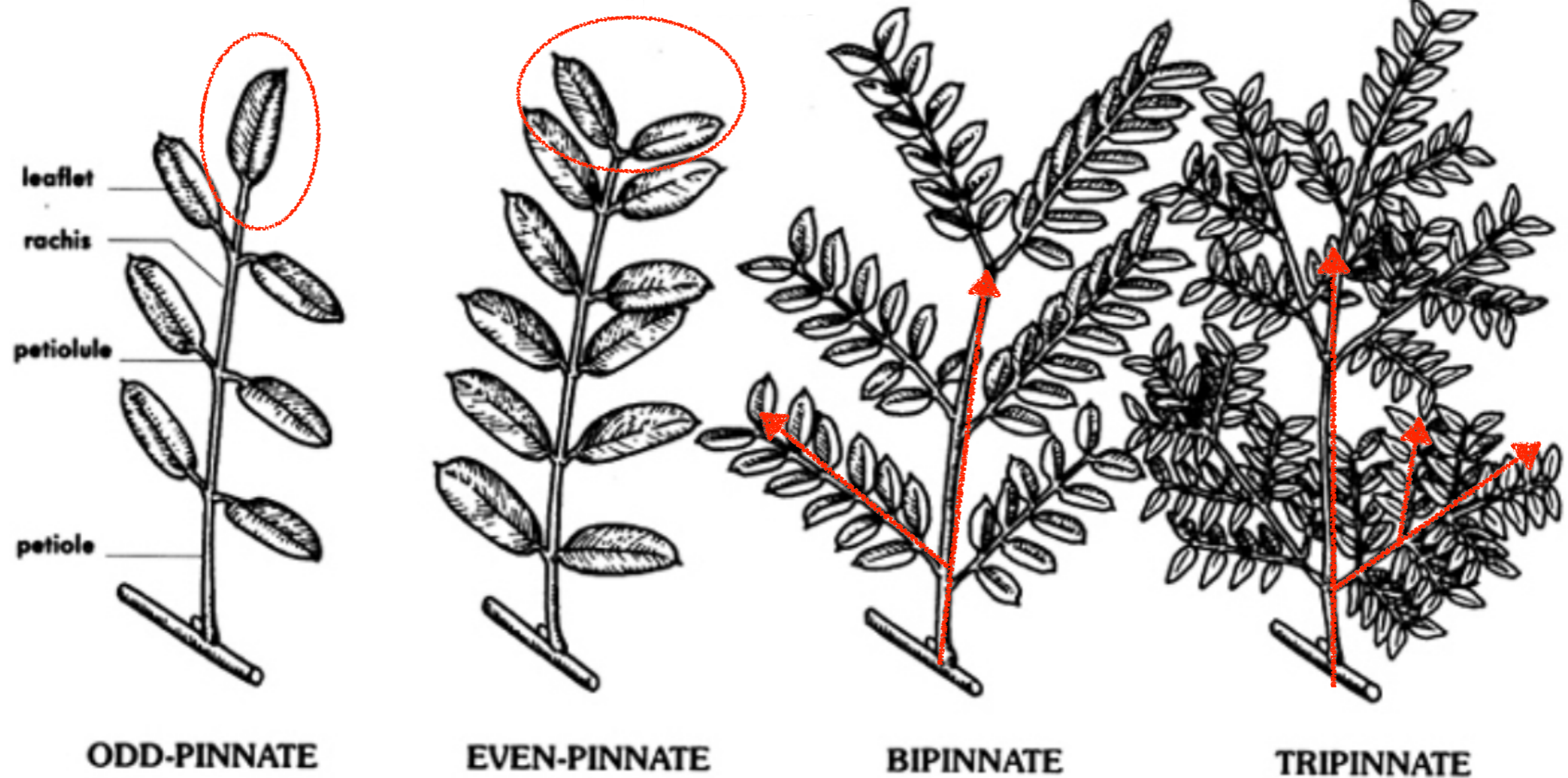
**PINNATELY
TRIFOLIOLATE**



BITERNATE

LEAF COMPOUND PINNATE TYPES

[HTTPS://VPLANTS.ORG/PORTAL/PLANTS/GLOSSARY/PLATE02.PHP](https://vplants.org/portal/plants/glossary/plate02.php)

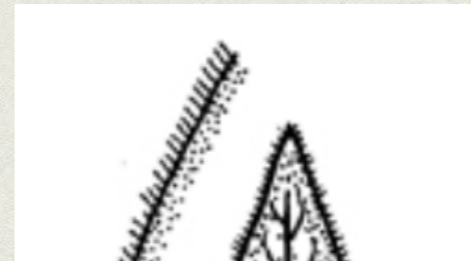


as published in Swink, F. and G. Wilhelm. 1994. *Plants of the Chicago region*. 4th ed. Indianapolis: Indiana Academy of Science.

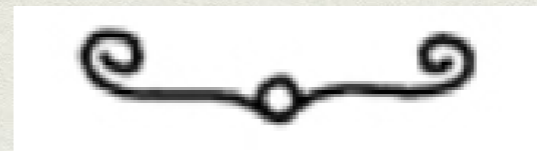
LEAF MARGINS

- Entire

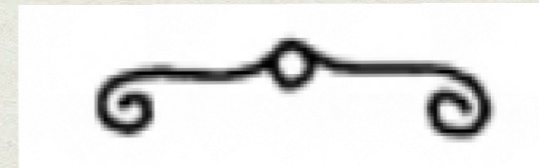
- Ciliate - fringed with fine hairs



- Involute - rolled over top



- Revolute - rolled under bottom



LEAF MARGINS...

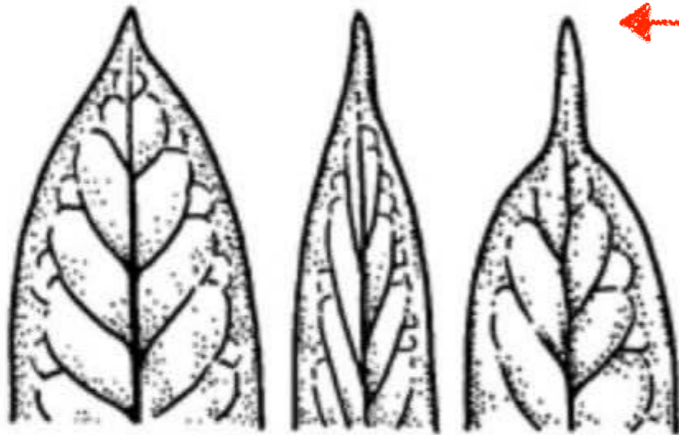
[HTTPS://VPLANTS.ORG/PORTAL/PLANTS/GLOSSARY/PLATE04.PHP](https://vplants.org/portal/plants/glossary/plate04.php)

- Crenate - crenatum, looks like a bunch of CCCCC's.
- Dentate - dentata, tum..., looks like a bunch of DDDD's
- Lobe - lobata
- Serrate - saw-like, toothed pointing forward, seratum, serata,
- Serrulate - multi serrated (finely serrated)
- Sinuate - (strongly wavy)

LEAF APICES (LEAF TIP)

<https://vplants.org/portal/plants/glossary/plate05.php>

APICES



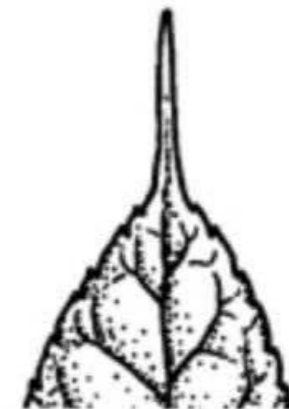
BROADLY NARROWLY ABRUPTLY
ACUMINATE



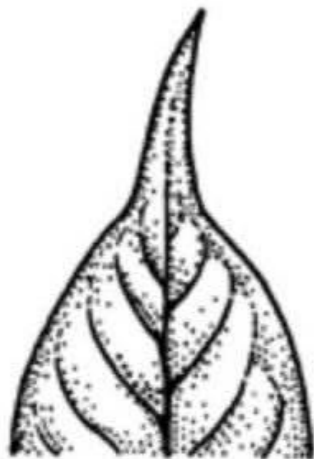
BROADLY NARROWLY
ACUTE



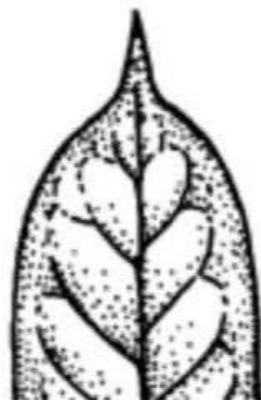
APICULATE



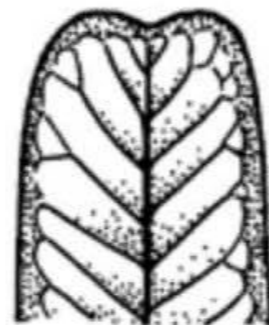
ARISTATE



CAUDATE



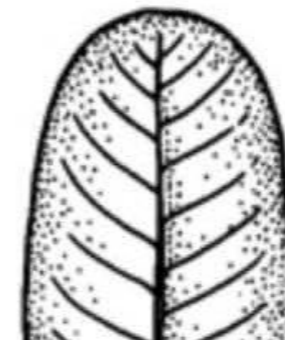
CUSPIDATE



EMARGINATE



MUCRONATE



OBTUSE



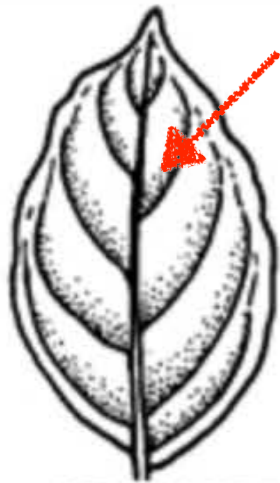
RETUSE

as published in Swink, F. and G. Wilhelm. 1994. *Plants of the Chicago region*. 4th ed. Indianapolis: Indiana Academy of Science.

LEAF VENENATION

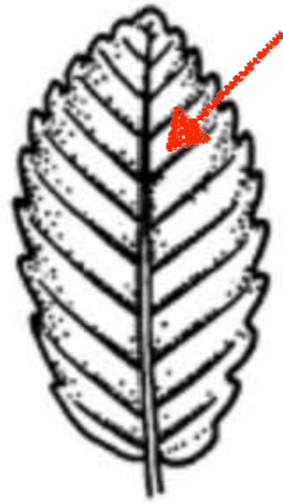
<https://vplants.org/portal/plants/glossary/plate05.php>

VENATION



ARCUATE

Alternates

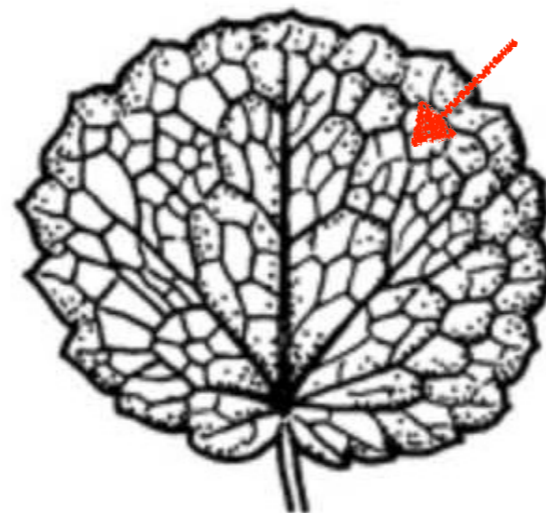


PINNATE

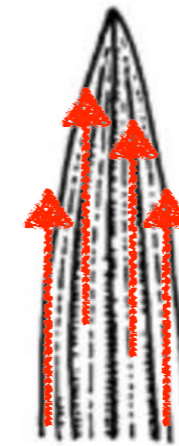
Opposite



PALMATE



RETICULATE



PARALLEL

PARALLEL VEINS - MONOCOTS

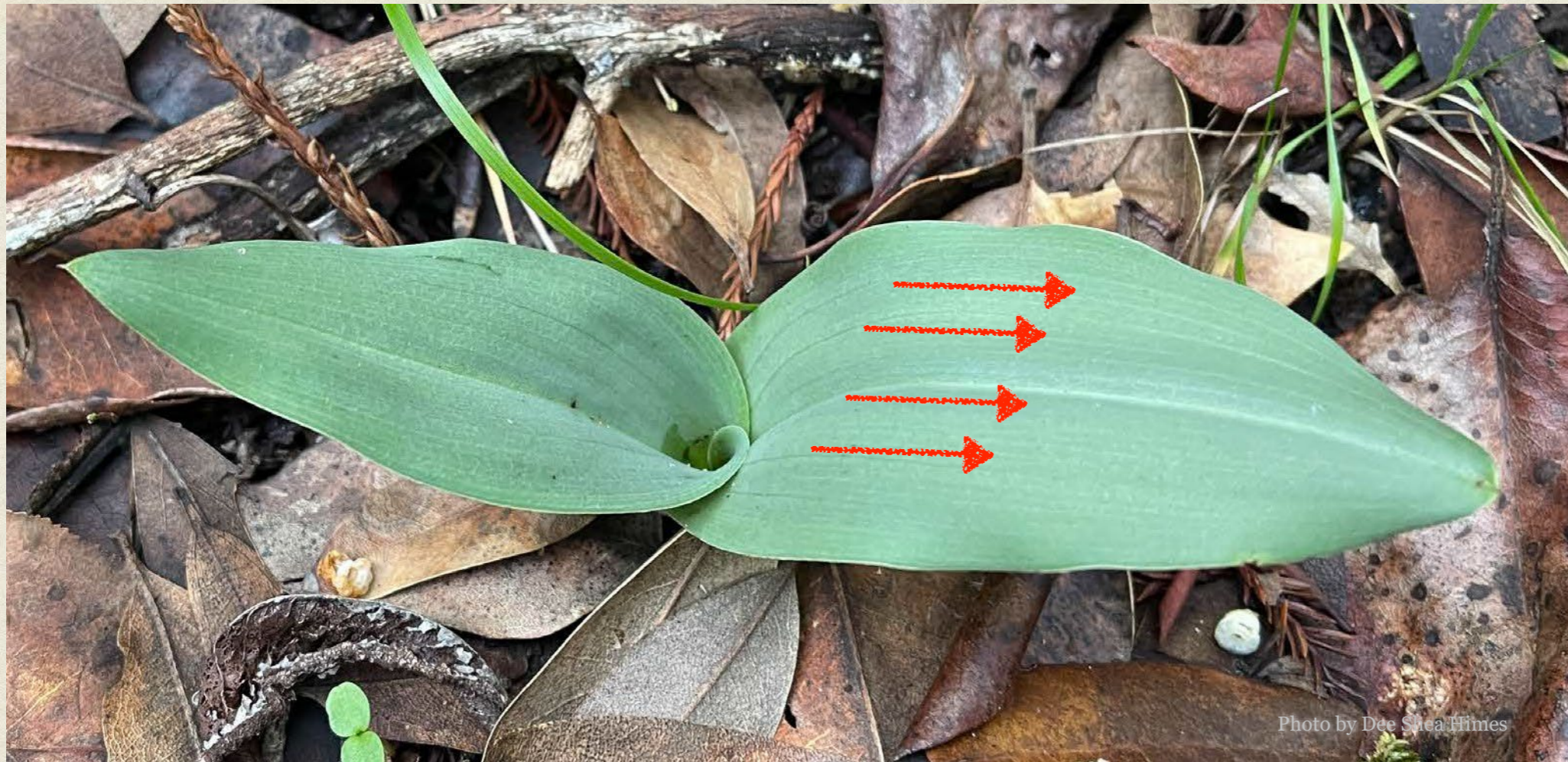
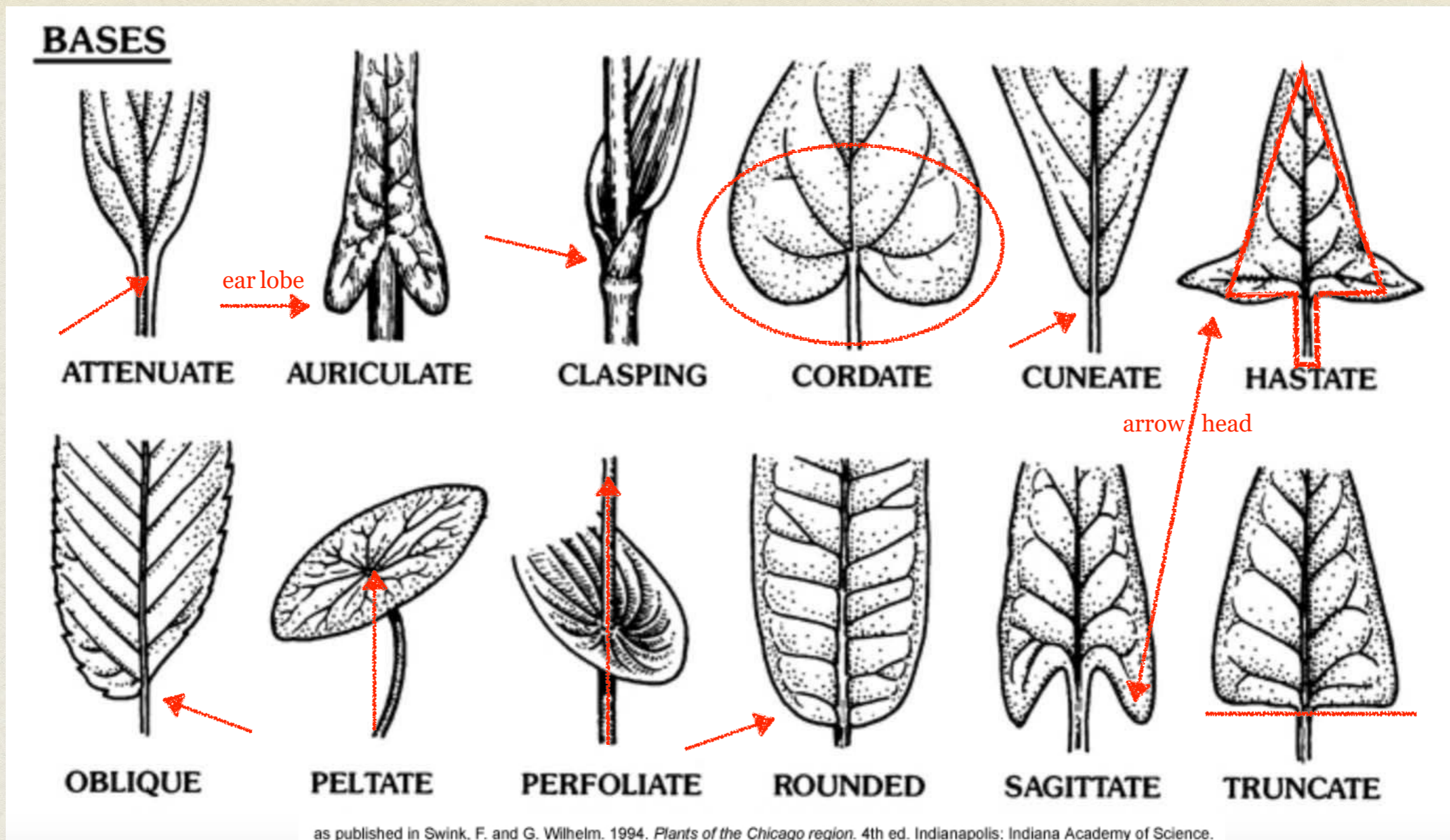


Photo by Dee Shea Himes

Piperia transversa

LEAF BASES

<https://vplants.org/portal/plants/glossary/plate05.php>



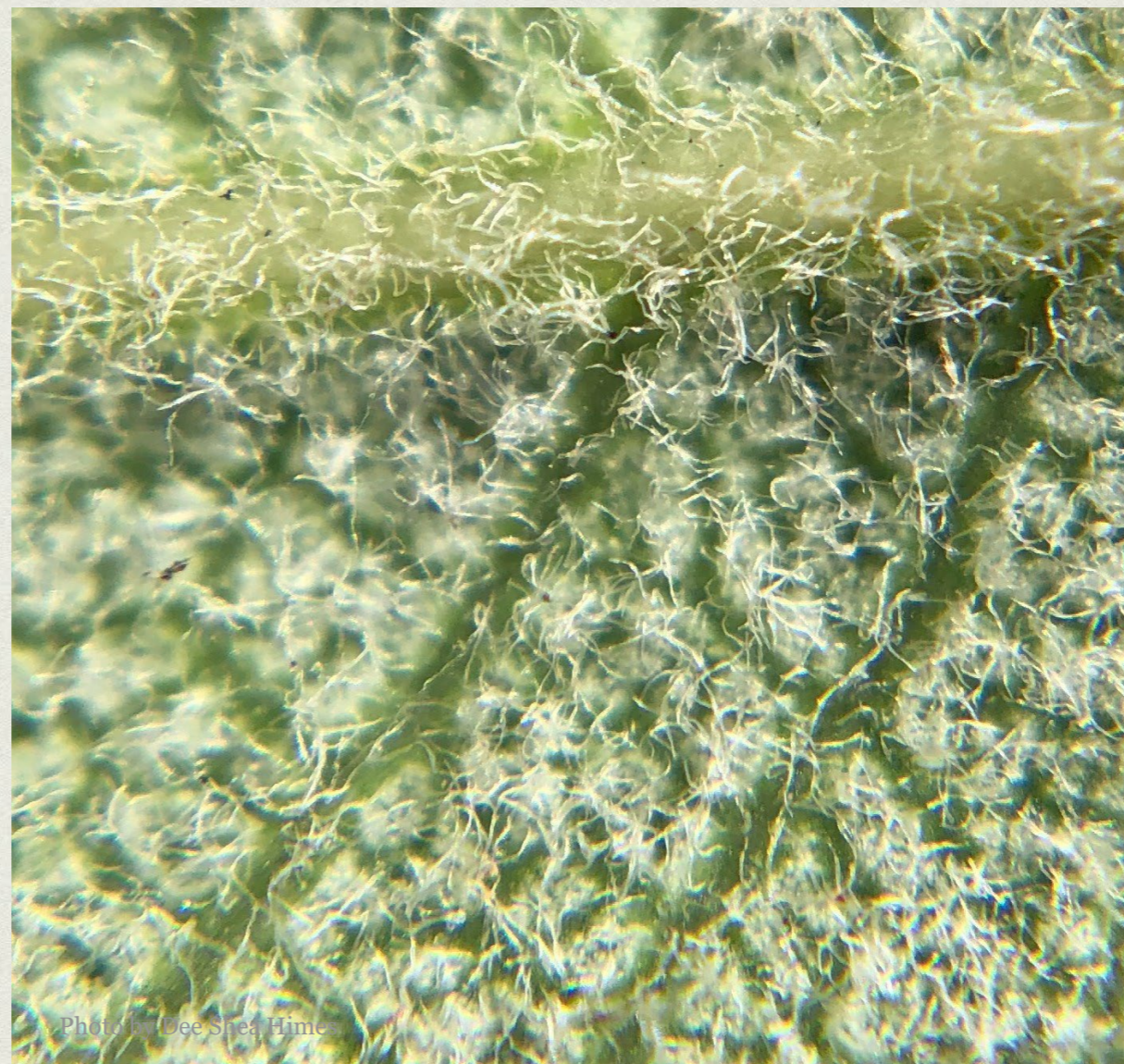
LEAF SURFACES...

[HTTPS://VPLANTS.ORG/PORTAL/PLANTS/GLOSSARY/PLATE06.PHP](https://vplants.org/portal/plants/glossary/plate06.php)

adaxial - top surface



aaxial - under (**bottom**) surface

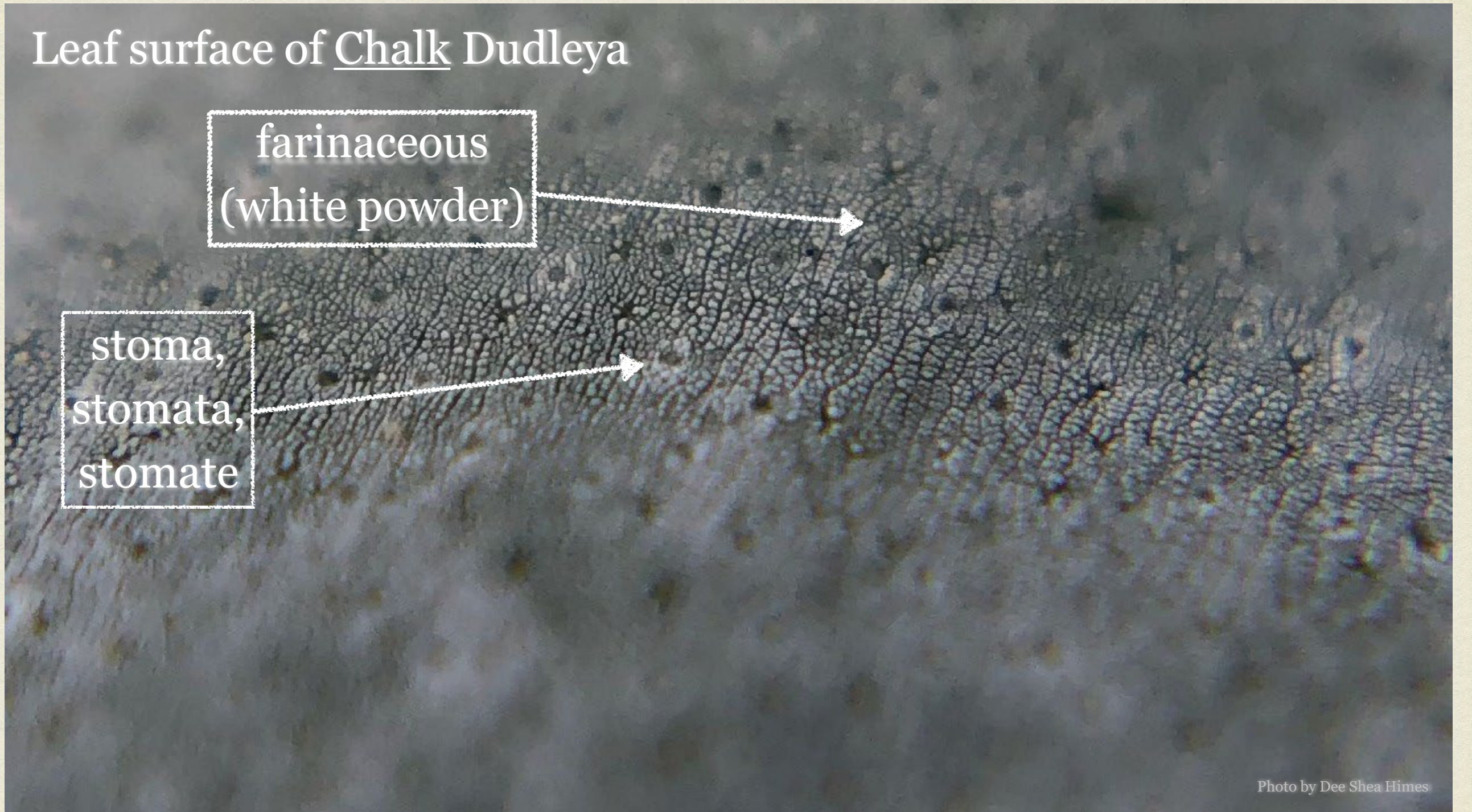


LEAF SURFACES, +30 TYPES

Leaf surface of Chalk Dudleya

farinaceous
(white powder)

stoma,
stomata,
stomate



glands,
glandular

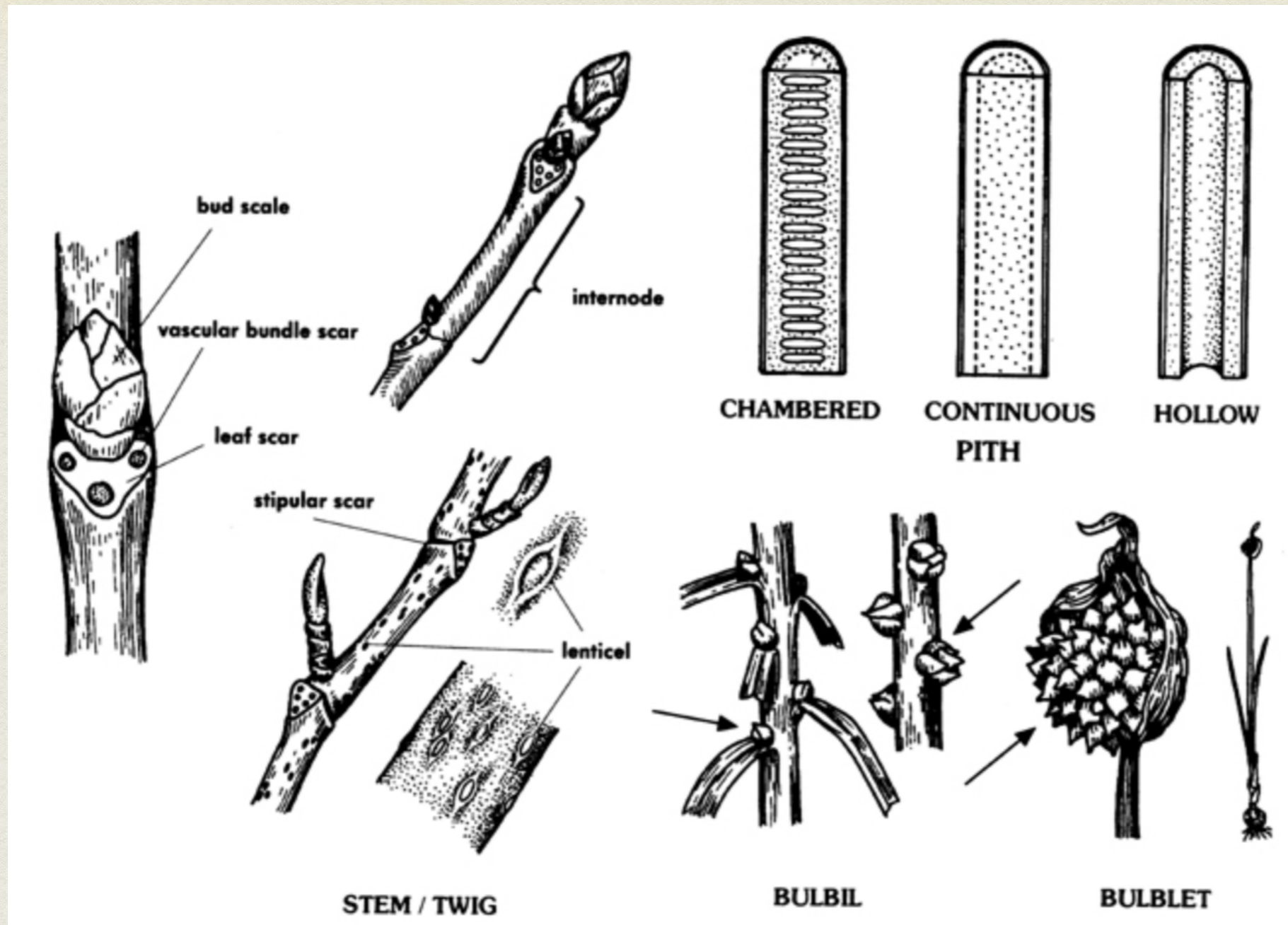


Photo by Dee Shea Himes



STEM AND LEAF PARTS, AND VARIATIONS...

<https://vplants.org/portal/plants/glossary/plate07.php>

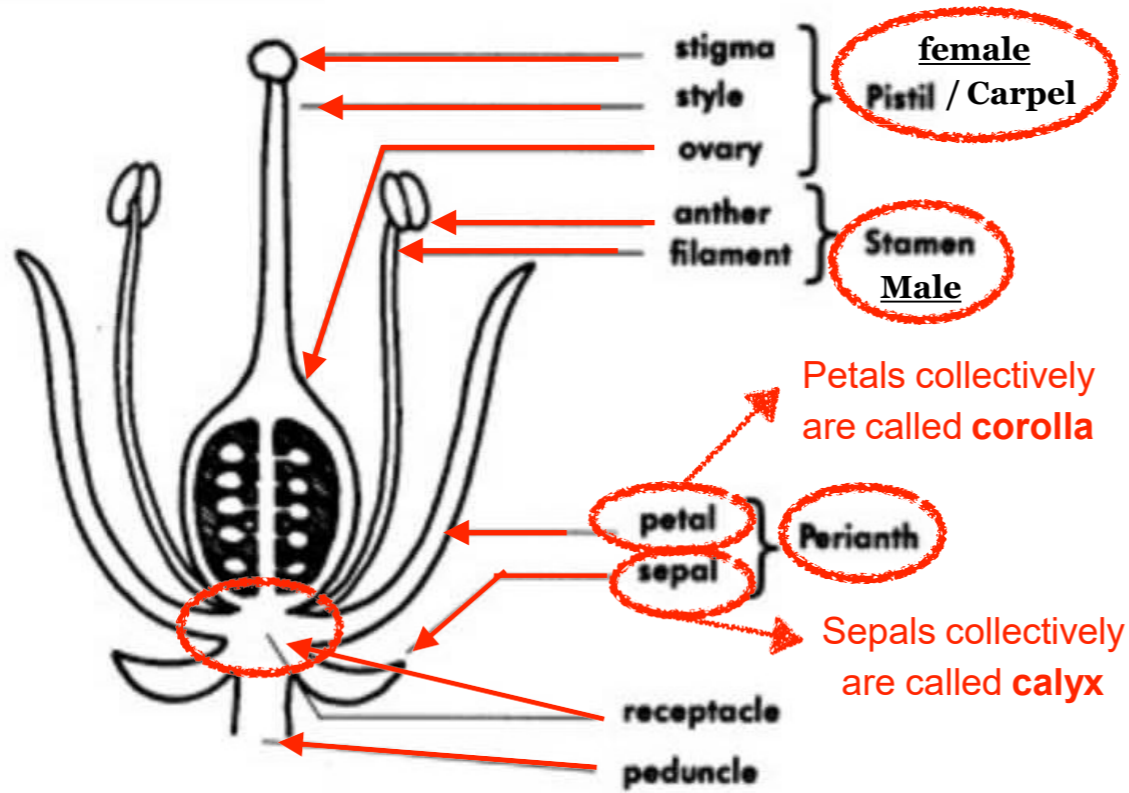


as published in Swink, F. and G. Wilhelm. 1994. *Plants of the Chicago region*. 4th ed. Indianapolis: Indiana Academy of Science.

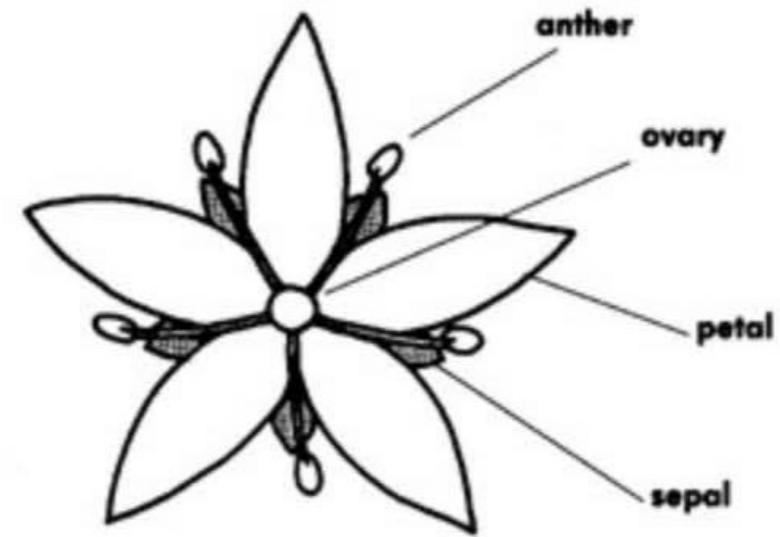
FLOWER PARTS: ANGIOSPERM - EUDICOT

[HTTPS://VPLANTS.ORG/PORTAL/PLANTS/GLOSSARY/PLATE09.PHP](https://vplants.org/portal/plants/glossary/plate09.php)

COMPONENTS



FLOWER LONGITUDINAL SECTION



FLOWER TOP VIEW

modified from Swink, F. and G. Willhelm. 1994. *Plants of the Chicago region*. 4th ed. Indianapolis: Indiana Academy of Science.

FLOWER PARTS: ANGIOSPERM - EUDICOT

Parts of a Flower

Sepals collectively
are called calyx

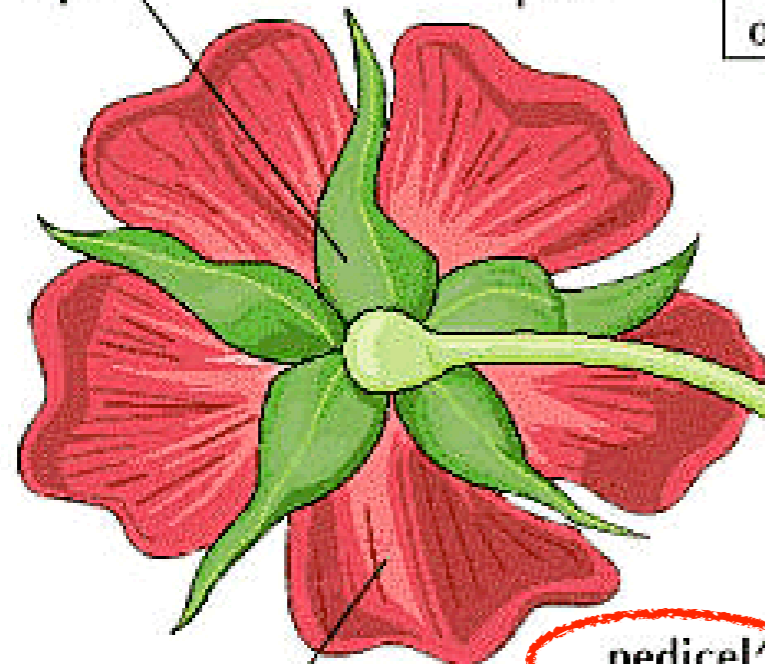
sepal

pistil

stigma

style

ovary



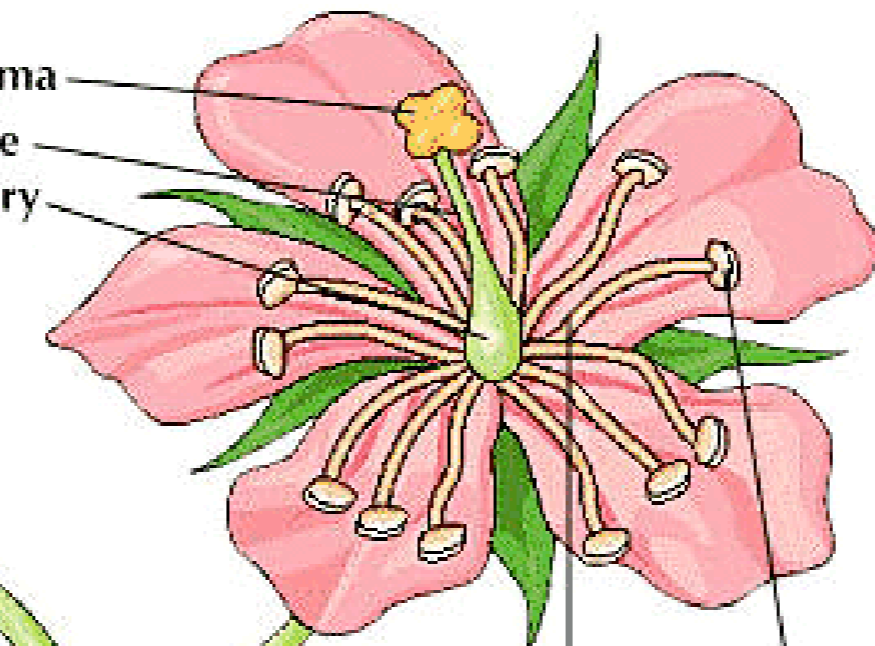
petal

Petals collectively
are called corolla

pedicel

bract

peduncle

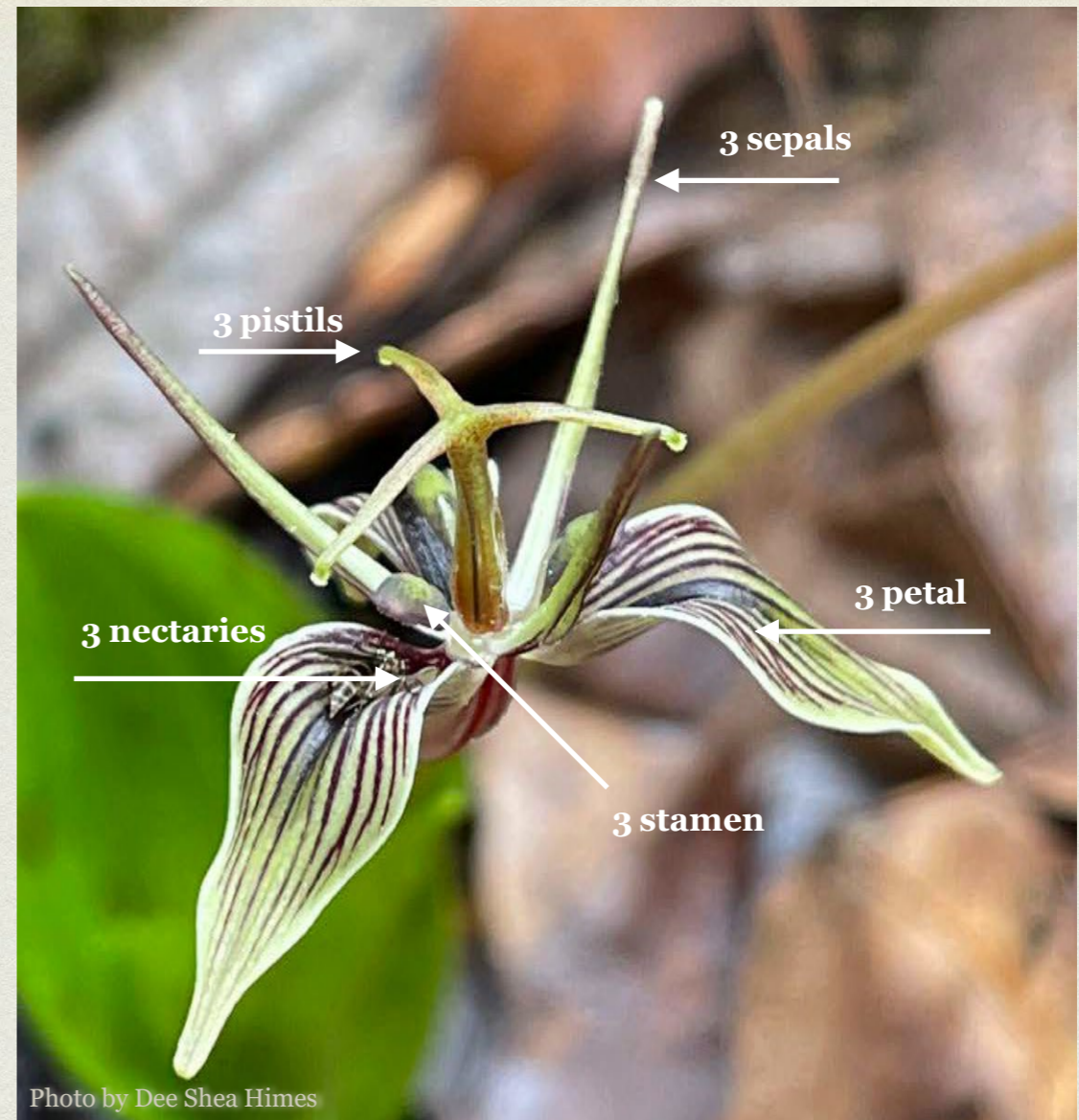
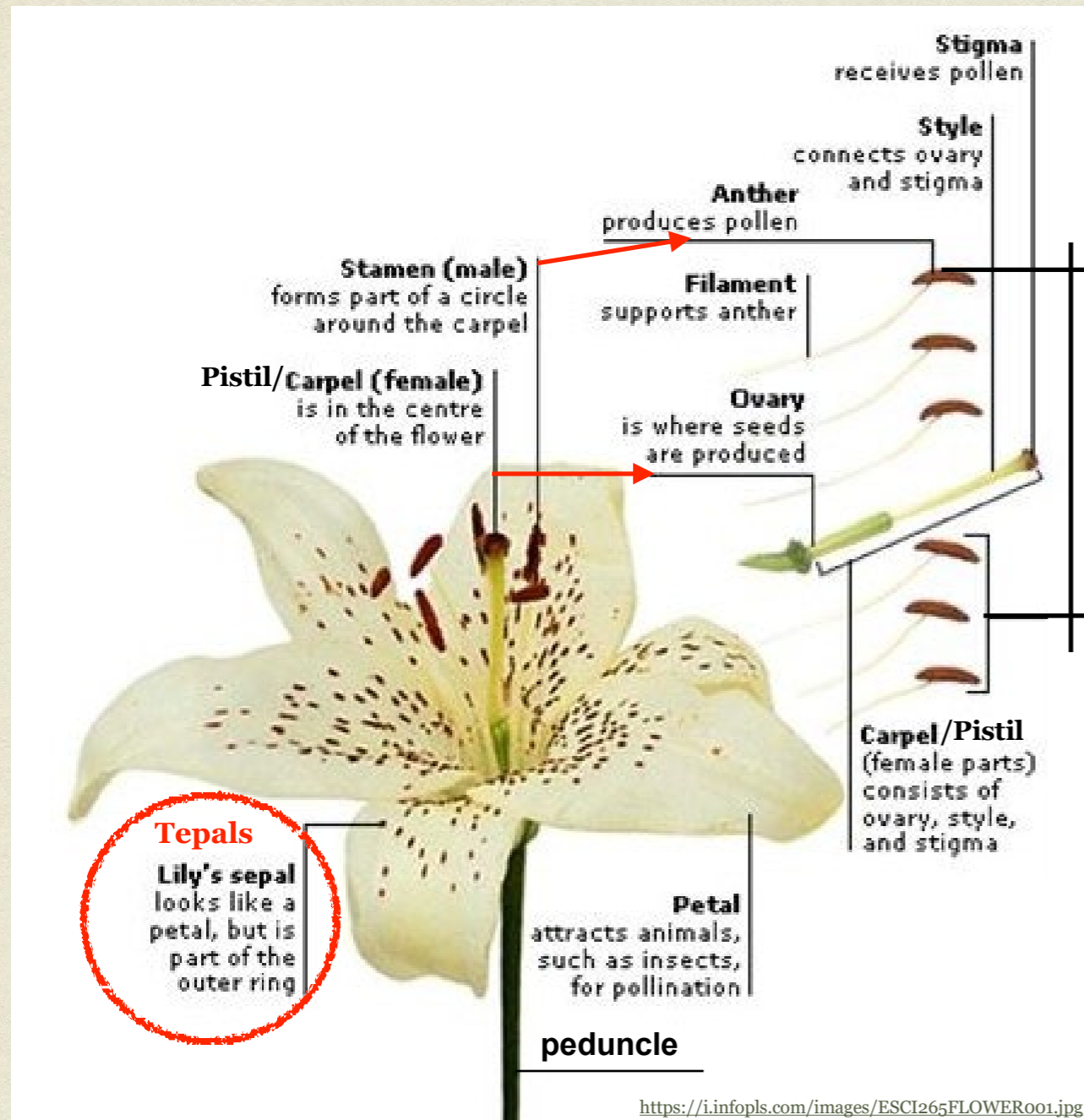


filament

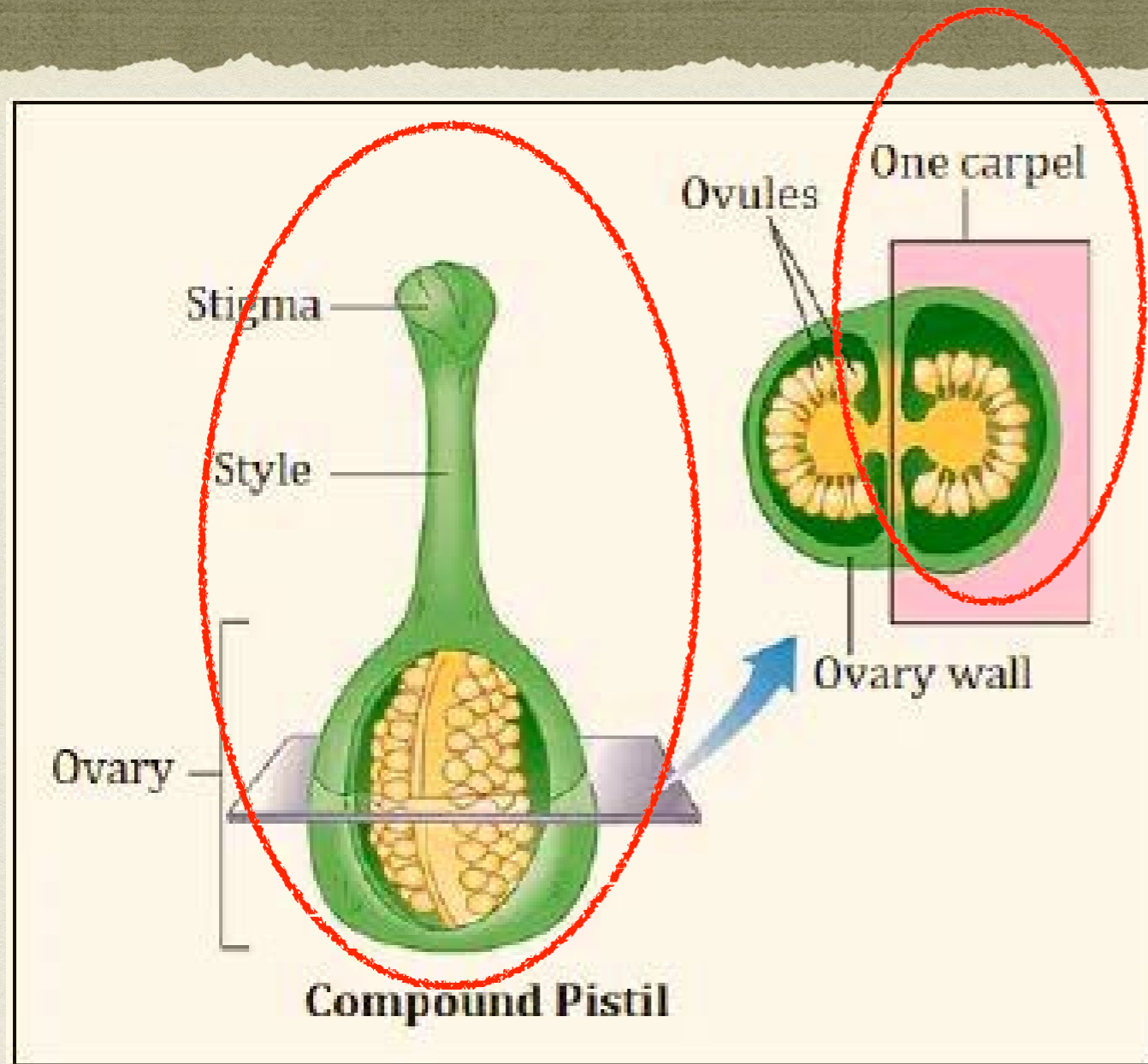
anther

stamen

FLOWER PARTS: ANGIOSPERM - MONOCOT - LILIACEAE



PISTIL AND CARPEL

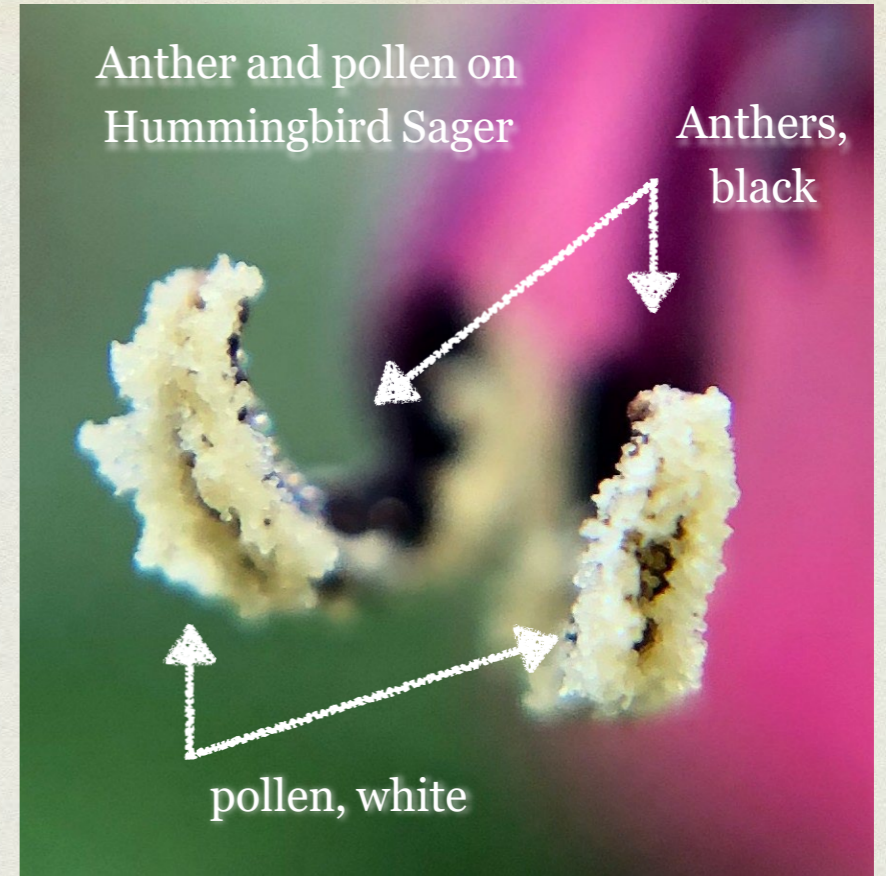
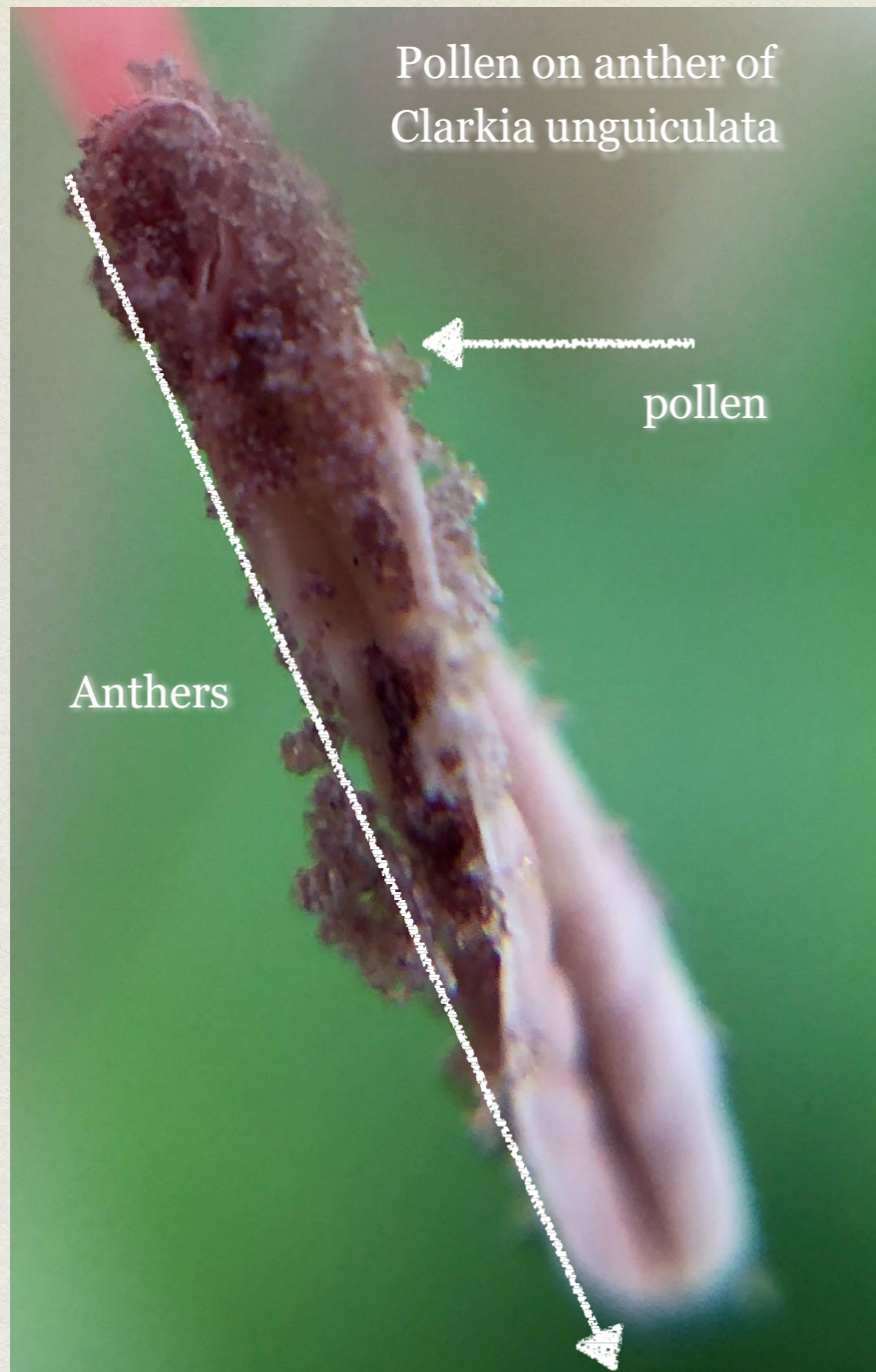


**Pistil / Carpel
(used interchangeably)
contains:
Stigma
Style
Ovary**

**A flower can have a
simple pistil / carpel or
can be compound
depending on genus/
species.**

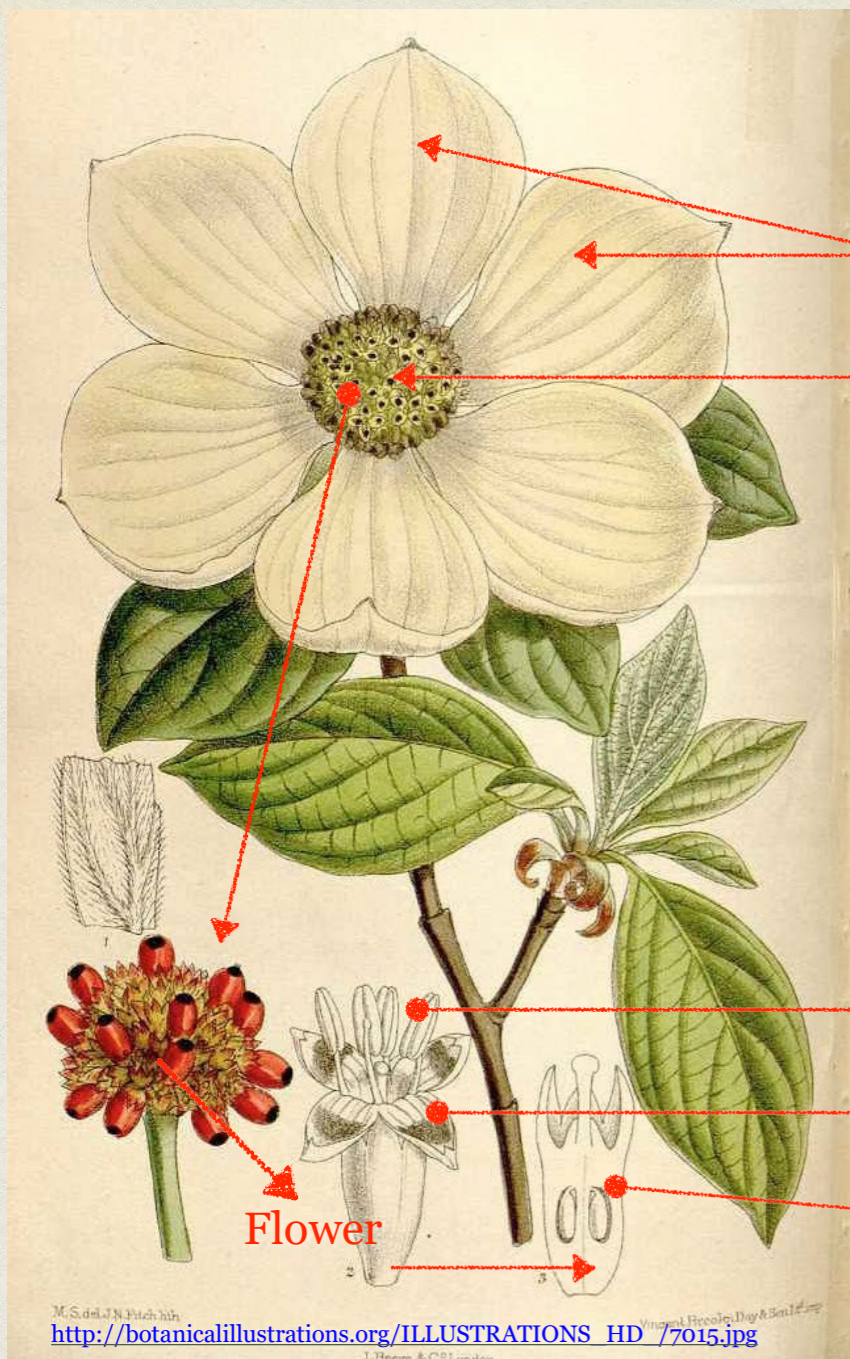
**E.g. Lilies - 3 carpels
Apiaceae - 2 carpels**

FLOWER PARTS: CLOSER LOOK AT ANTHER, POLLEN



Photos by Dee Shea Himes

FLOWER PARTS: BRACTS, LOOKING LIKE PETALS - MODIFIED LEAVES



- dogwoods

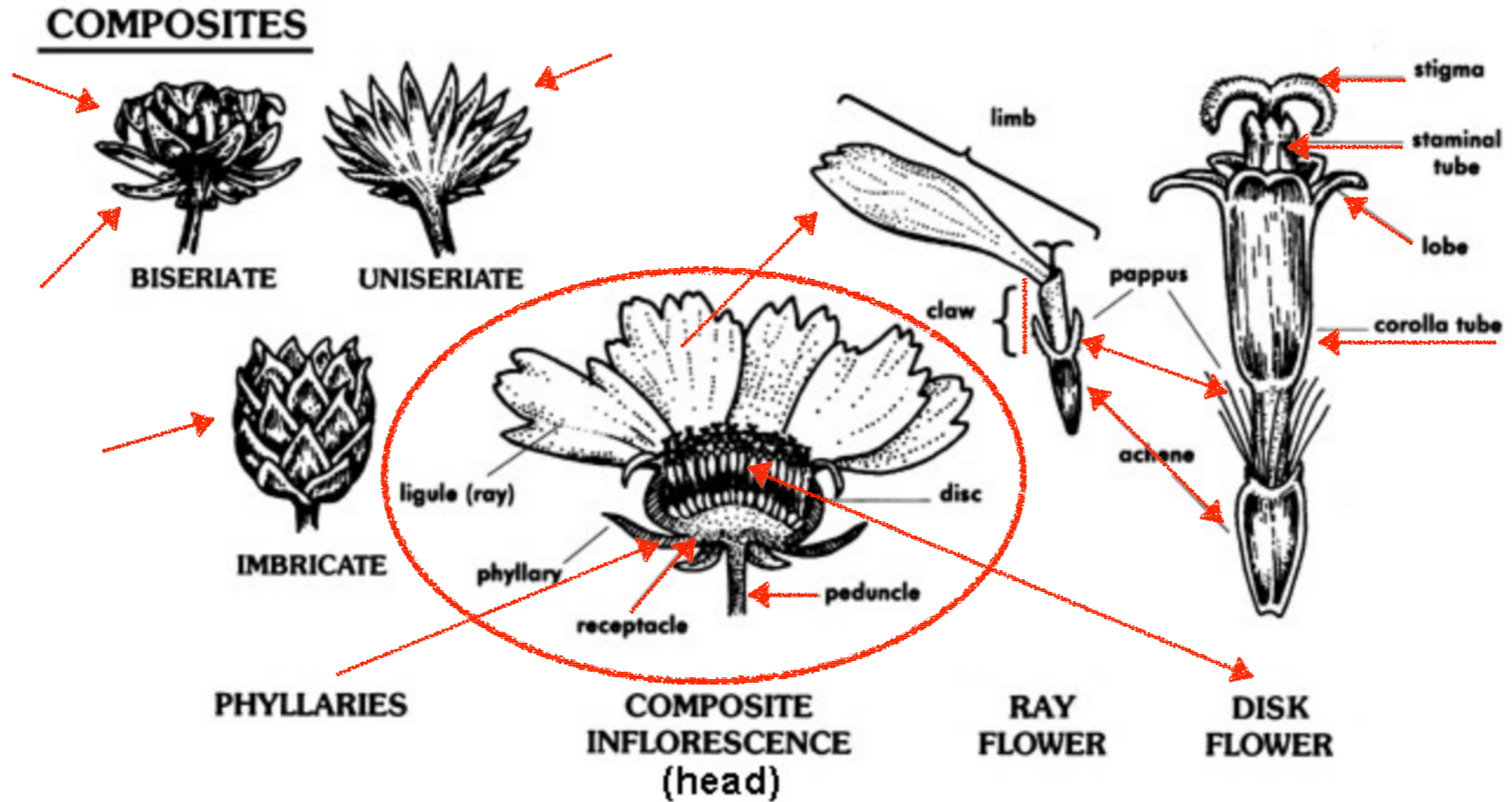
- poinsettia

- bougainvillea

<https://www.thedailygarden.us/garden-word-of-the-day/bracts>

FLORAL PARTS OF COMPOSITES

<https://vplants.org/portal/plants/glossary/plate12.php>



as published in Swink, F. and G. Wilhelm. 1994. *Plants of the Chicago region*. 4th ed. Indianapolis: Indiana Academy of Science.

DISCS AND RAYS



Rays and discs



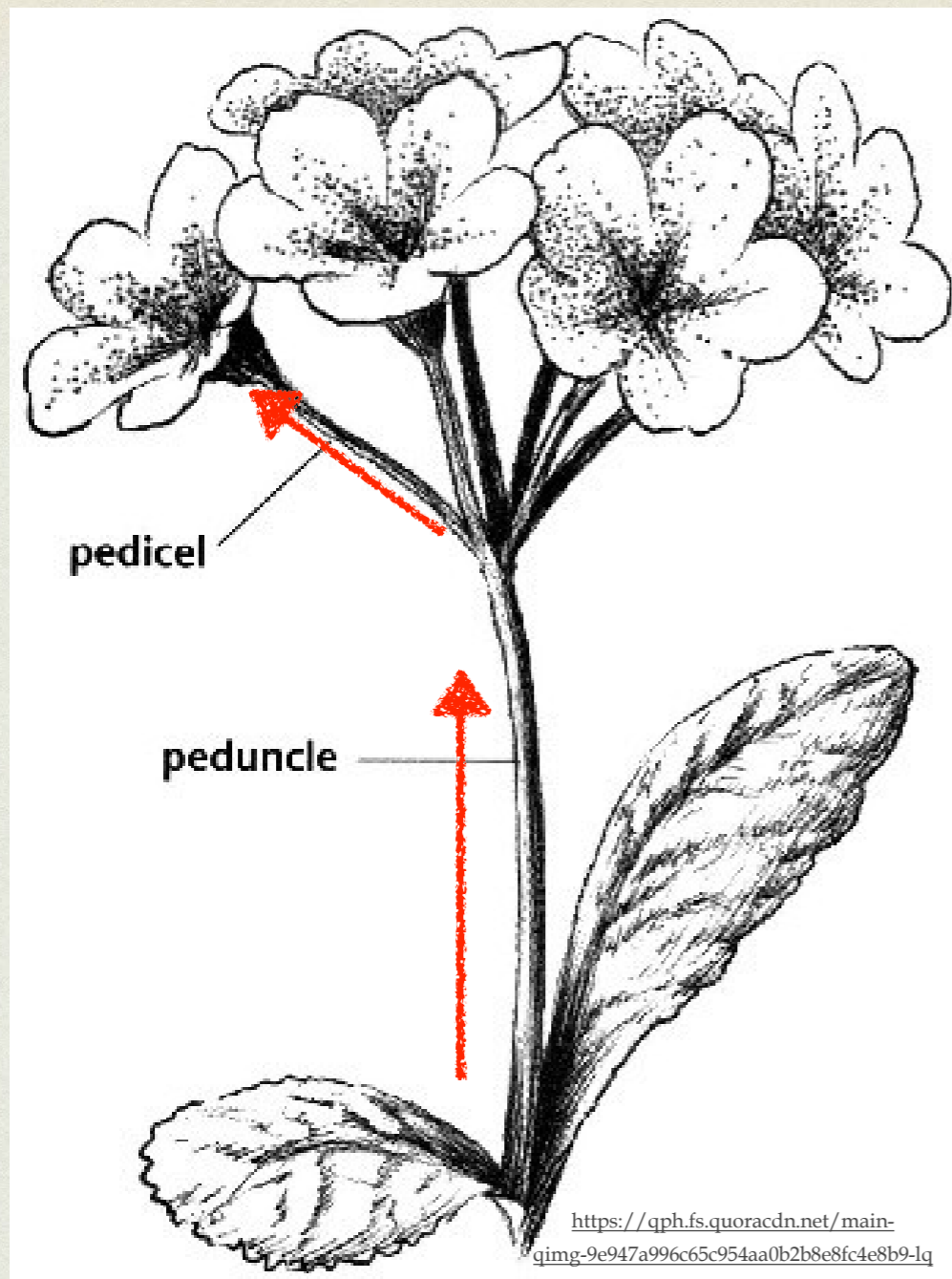
Mt. Hamilton Thistle

disc flowers only (rayless)

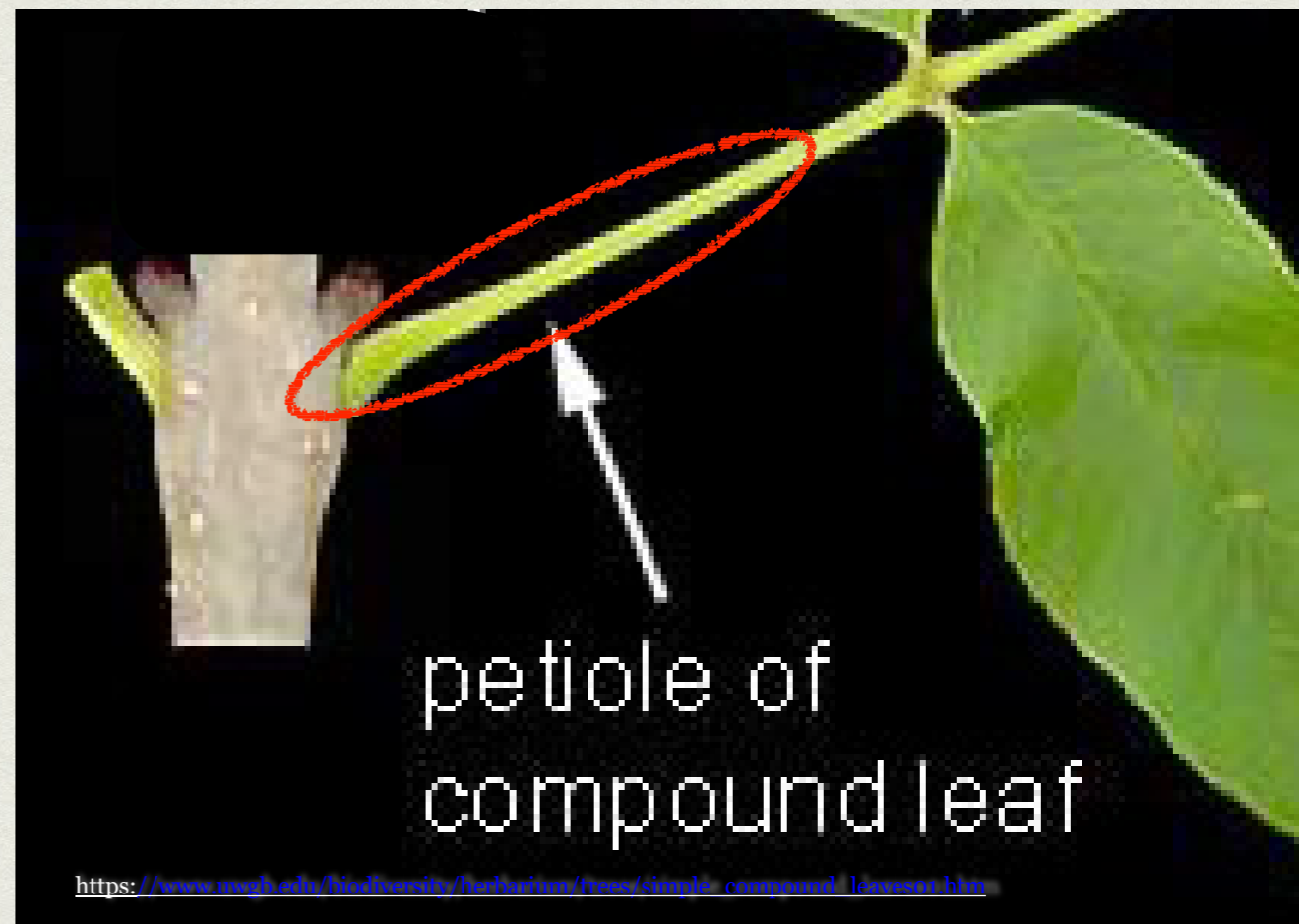


Rayless arnica

FLOWER STEMS...

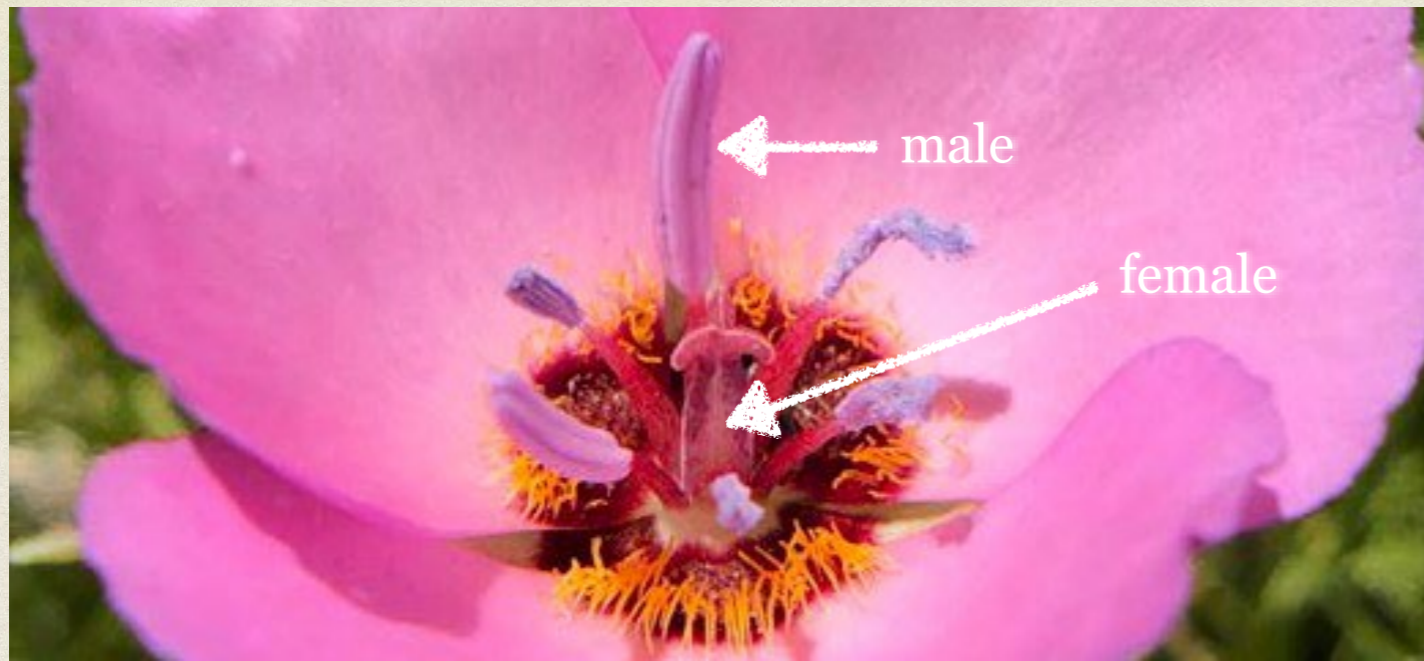


Don't forget
leaf attachment is...
Petiole



PERFECT / IMPERFECT FLOWER

COMPLETE / INCOMPLETE FLOWER



- Perfect / Complete flower
- Having both male and female reproductive parts in a flower.



- Imperfect / Incomplete flower
- Having either **male (staminate)** or **female (pistillate)** flowers.

Photos by Dee Shea Himes

MONOECIOUS / DIOECIOUS FLOWER



• **Hermaphrodite** - all flowers on the same plant are (complete flowers) bisexual, having both male and female reproductive parts on the same flower.



• **Monoecious** - one house (same plant)
• Pistillate (male) flowers and staminate (female) flowers on same plant



• **Dioecious** - two houses (two plants)
• Pistillate plant having only male flowers
• Staminate plant having only female flowers

INFLORESCENCE TYPES...

<https://vplants.org/portal/plants/glossary/plate08.php>

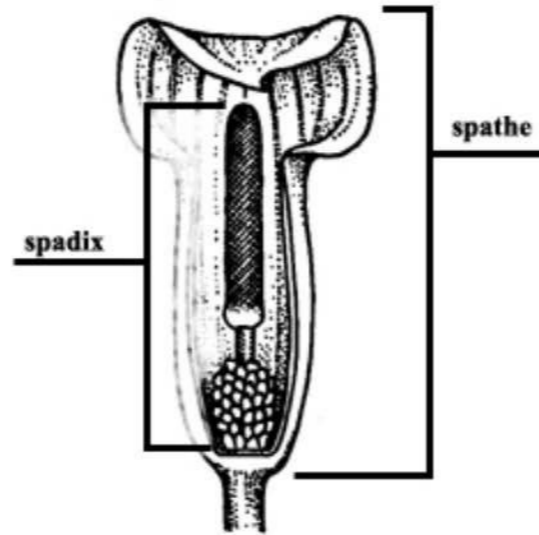
PLATE 8. INFLORESCENCE TYPES



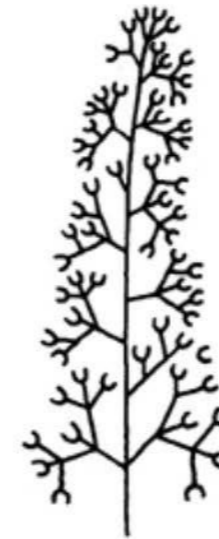
CATKIN / AMENT



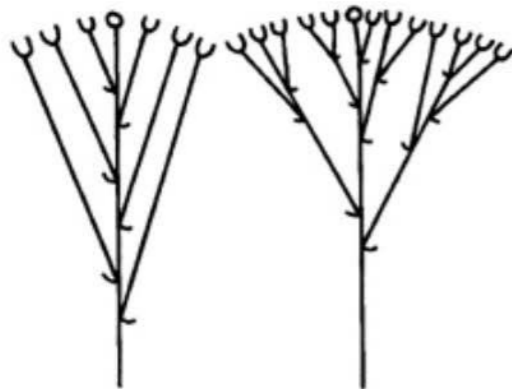
GLOMERULE



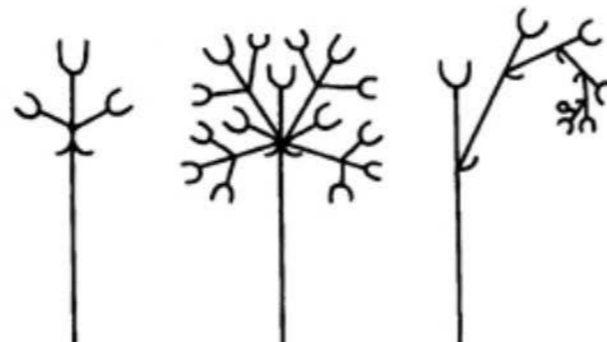
SPADIX with SPATHE



THYRSE



SIMPLE CORYMBS
COMPOUND



SIMPLE CYMES
COMPOUND HELICOID

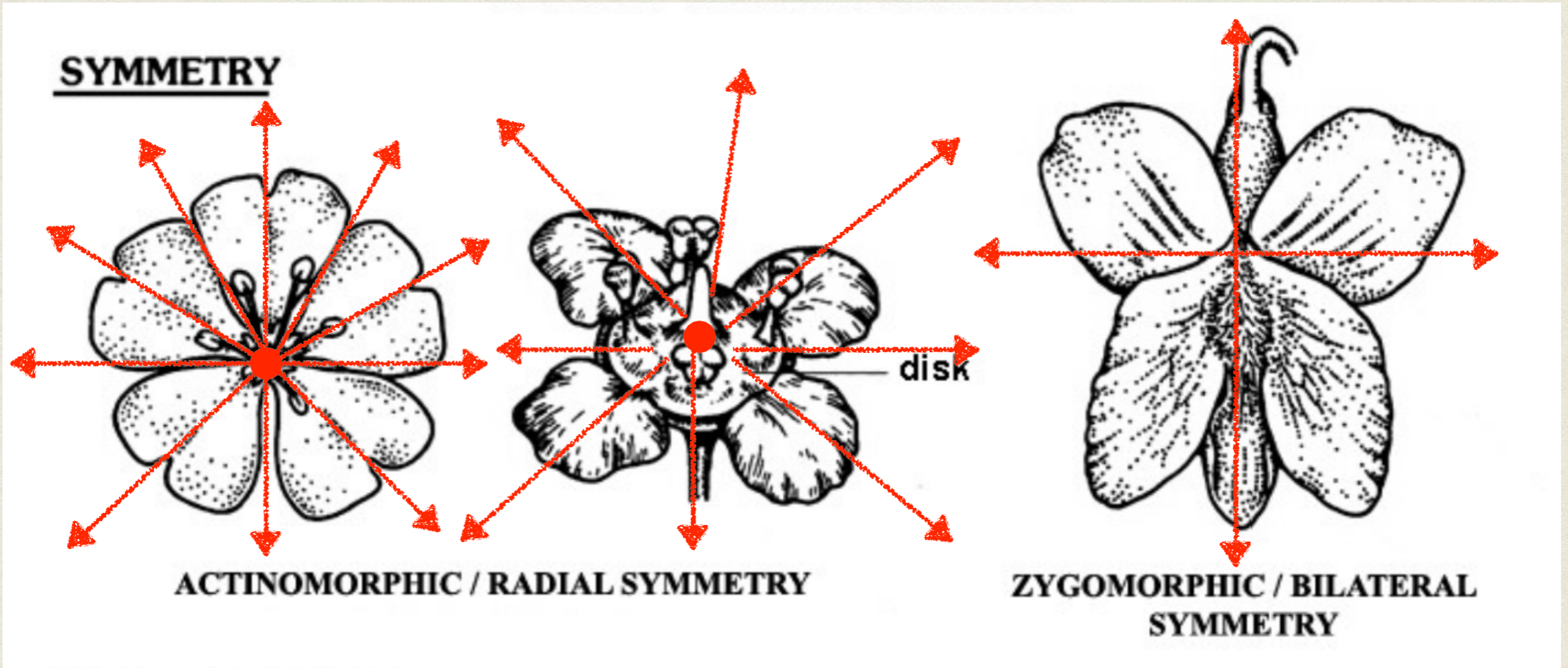


HEAD / CAPITULUM

modified from Swink, F. and G. Wilhelm. 1994. *Plants of the Chicago region*. 4th ed. Indianapolis: Indiana Academy of Science.

FLOWER SYMMETRY

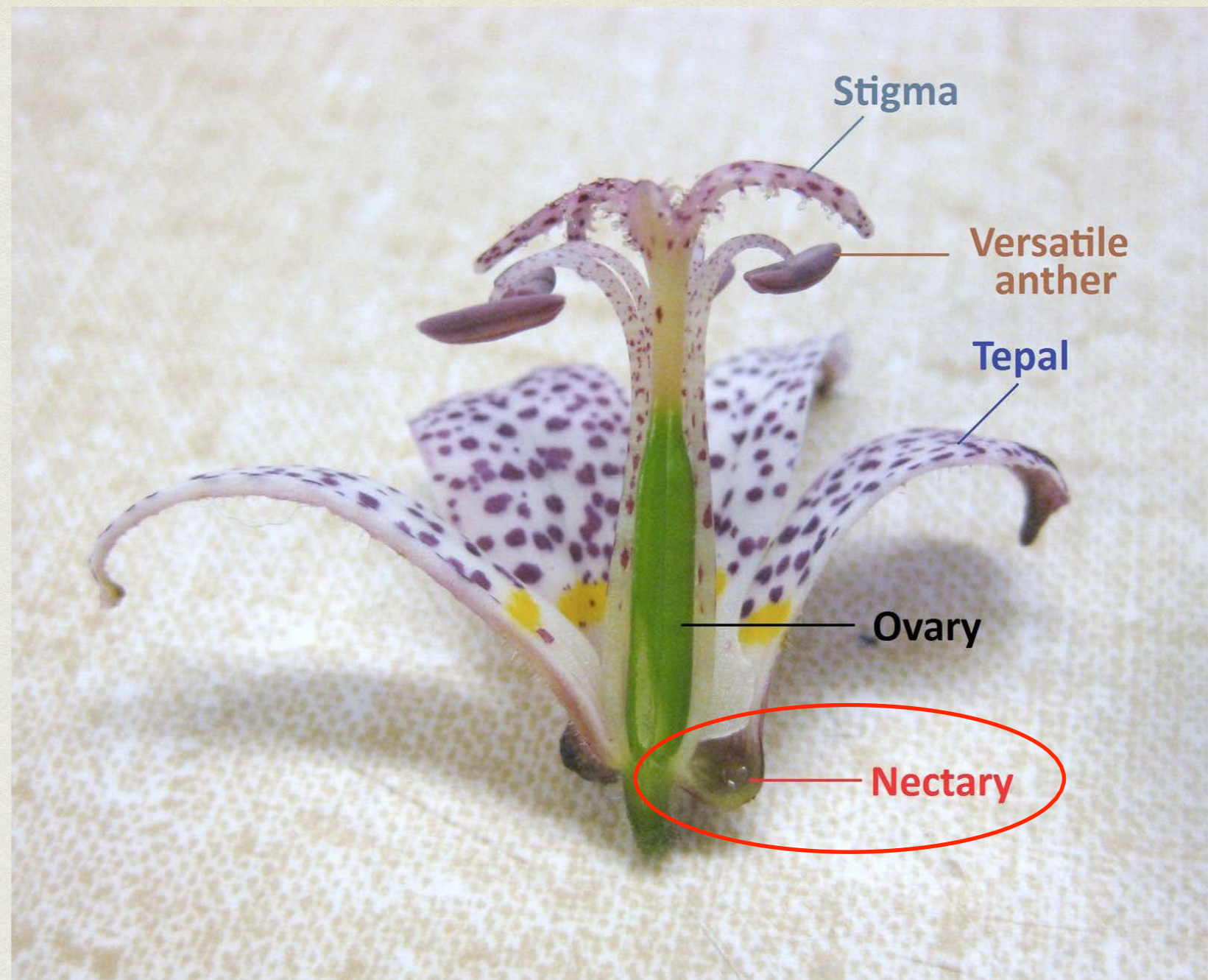
<https://vplants.org/portal/plants/glossary/plate09.php>



modified from Swink, F. and G. Wilhelm. 1994. *Plants of the Chicago region*. 4th ed. Indianapolis: Indiana Academy of Science.

LOCATION OF NECTARY

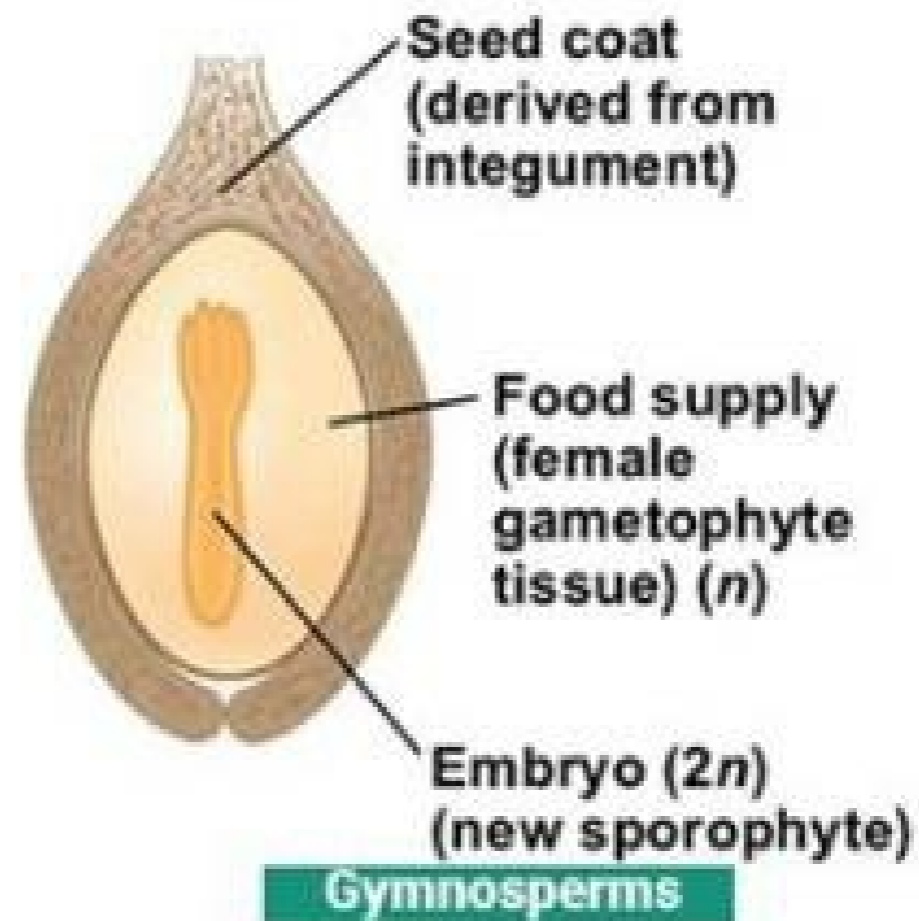
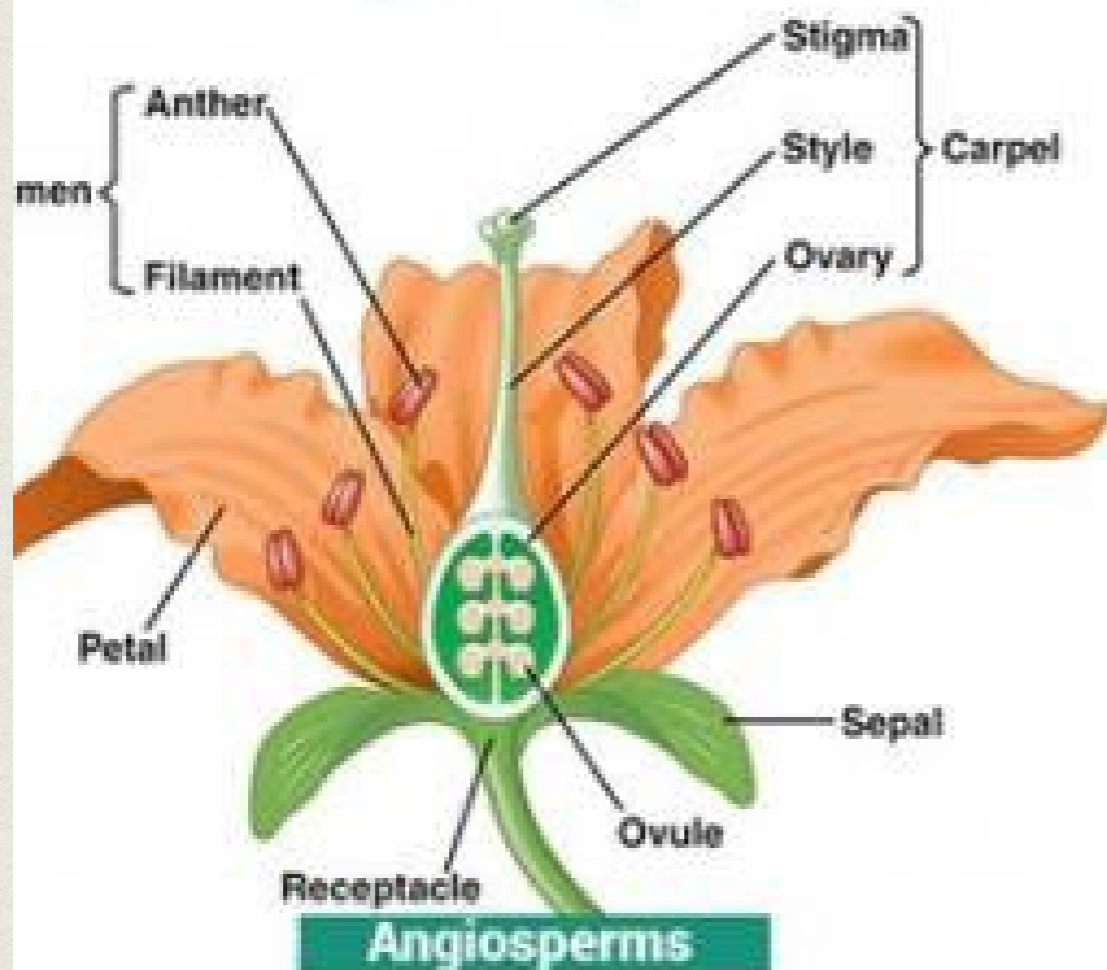
- Nectaries are glands that produce nectar to attract pollinators.
- Nectar guides are markings, lines, or patterns that guides pollinators to the nectar or to locate “landing pads”.
- Located inside base of flowers or various parts to make pollinator rub against anthers to pick up and distribute pollen to stamens.
- The reward for the hard work of pollination.



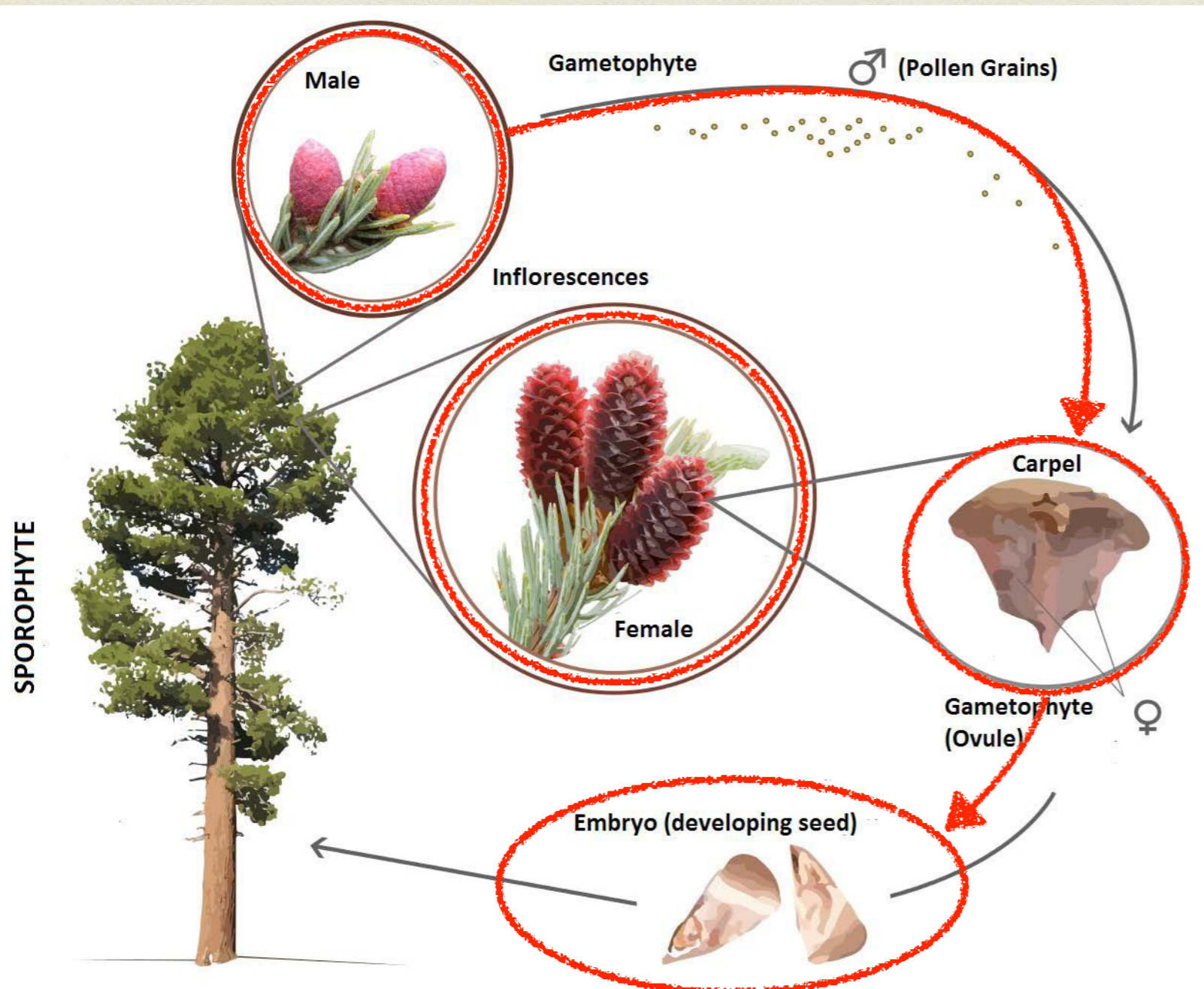
http://3.bp.blogspot.com/_Bgjbs3iJ2DE/TOGnCEz34cl/AAAAAAAAANI/boF_amE-OGM/s1600/IMG_4358+%2528labeled%2529.jpg

FLOWER PARTS: ANGIOSPERMS VS GYMNOSPERMS

Angiosperms vs Gymnosperms



FLOWER PARTS: GYMNOSPERM - CONIFERS



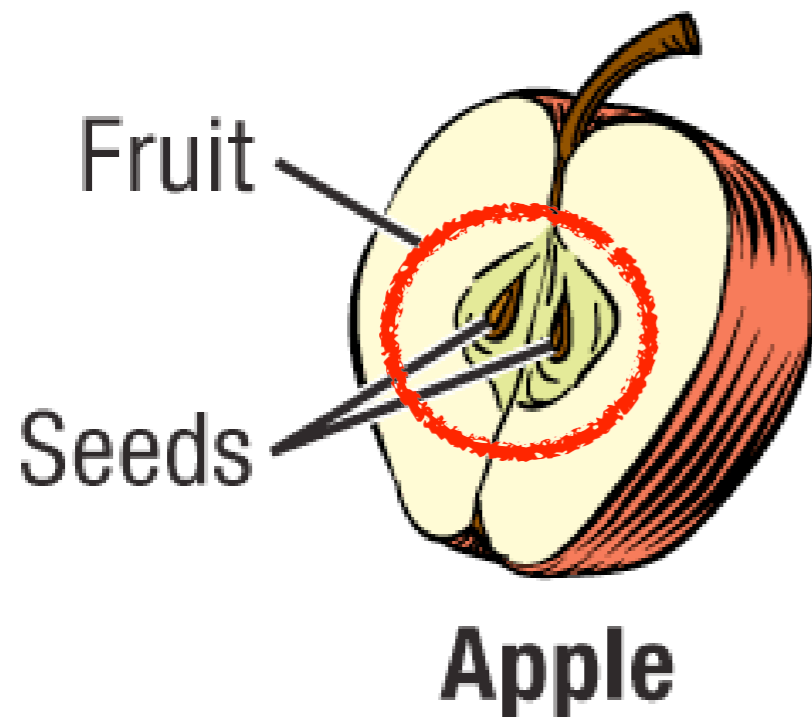
MANY TYPES OF CONES



Photo by Dee Shea Himes

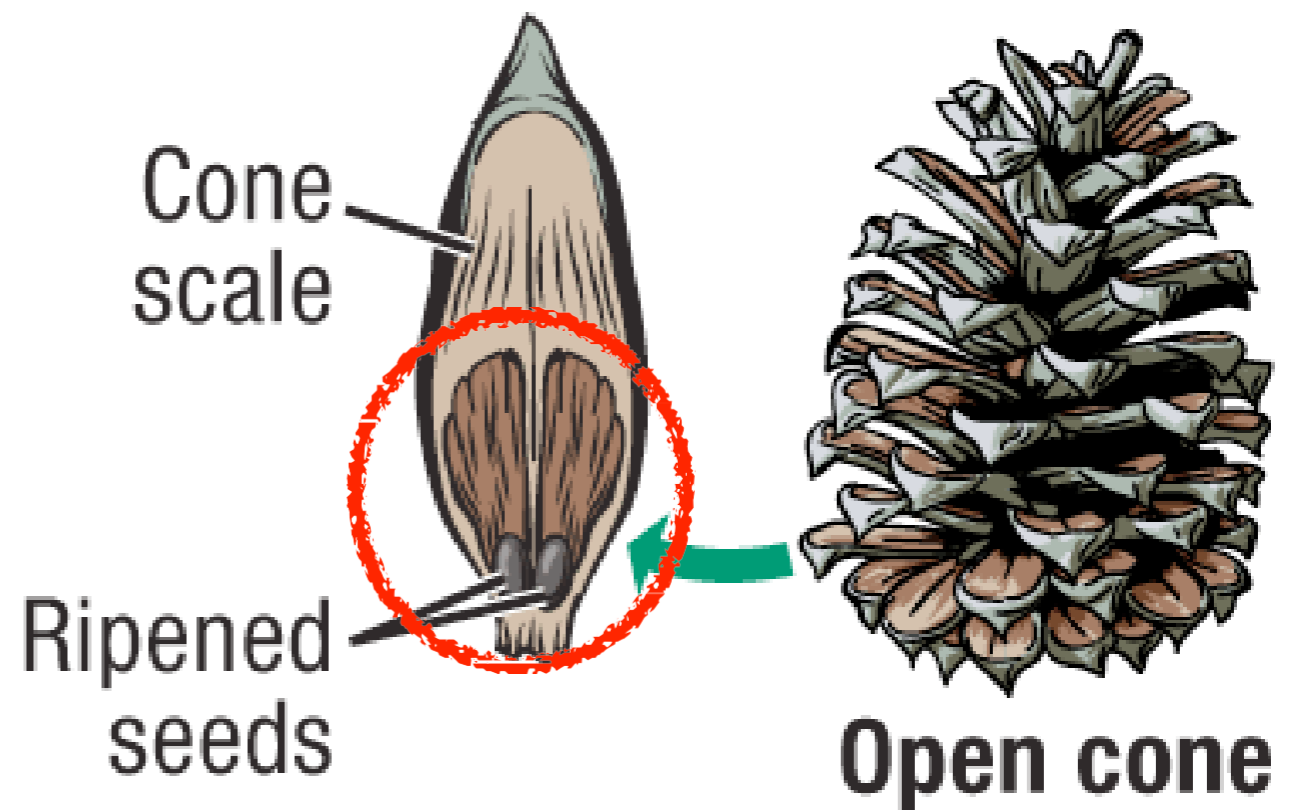
SEEDS: ANGIOSPERMS VS GYMNOSPERMS

ANGIOSPERM SEEDS AND FRUIT

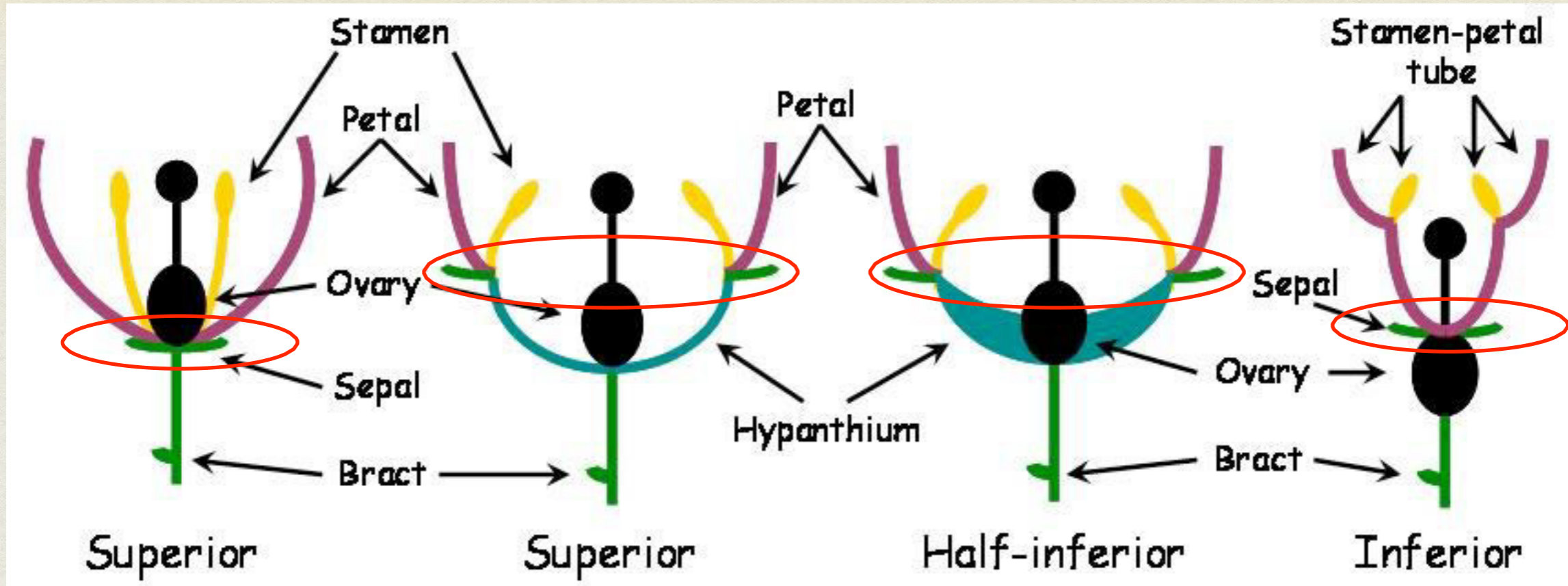


vs.

GYMNOSPERM SEEDS



OVARY POSITION SUPERIOR, INFERIOR, HALF-INFERIOR

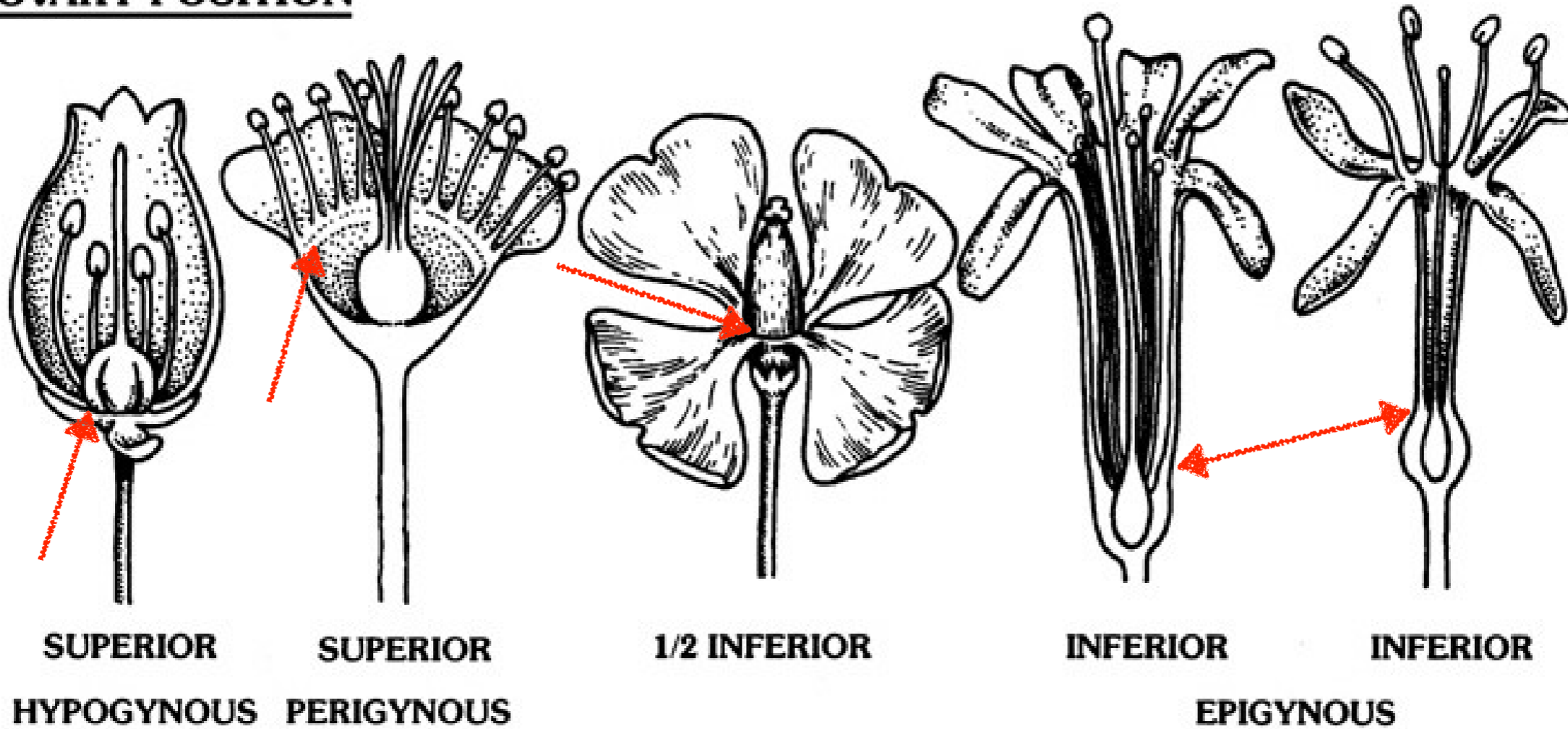


<http://1.bp.blogspot.com/-eFLRhtM7QXU/TwxXLEzlpAI/AAAAAAAAAHs/yCUtVgnCjTc/s1600/Picture6.jpg>

OVARY POSITION

<https://vplants.org/portal/plants/glossary/plate09.php>

OVARY POSITION



modified from Swink, F. and G. Wilhelm. 1994. *Plants of the Chicago region*. 4th ed. Indianapolis: Indiana Academy of Science.

below

around

above

INFERIOR OVARY



Photo by Dee Shea Himes

INFERIOR OVARY

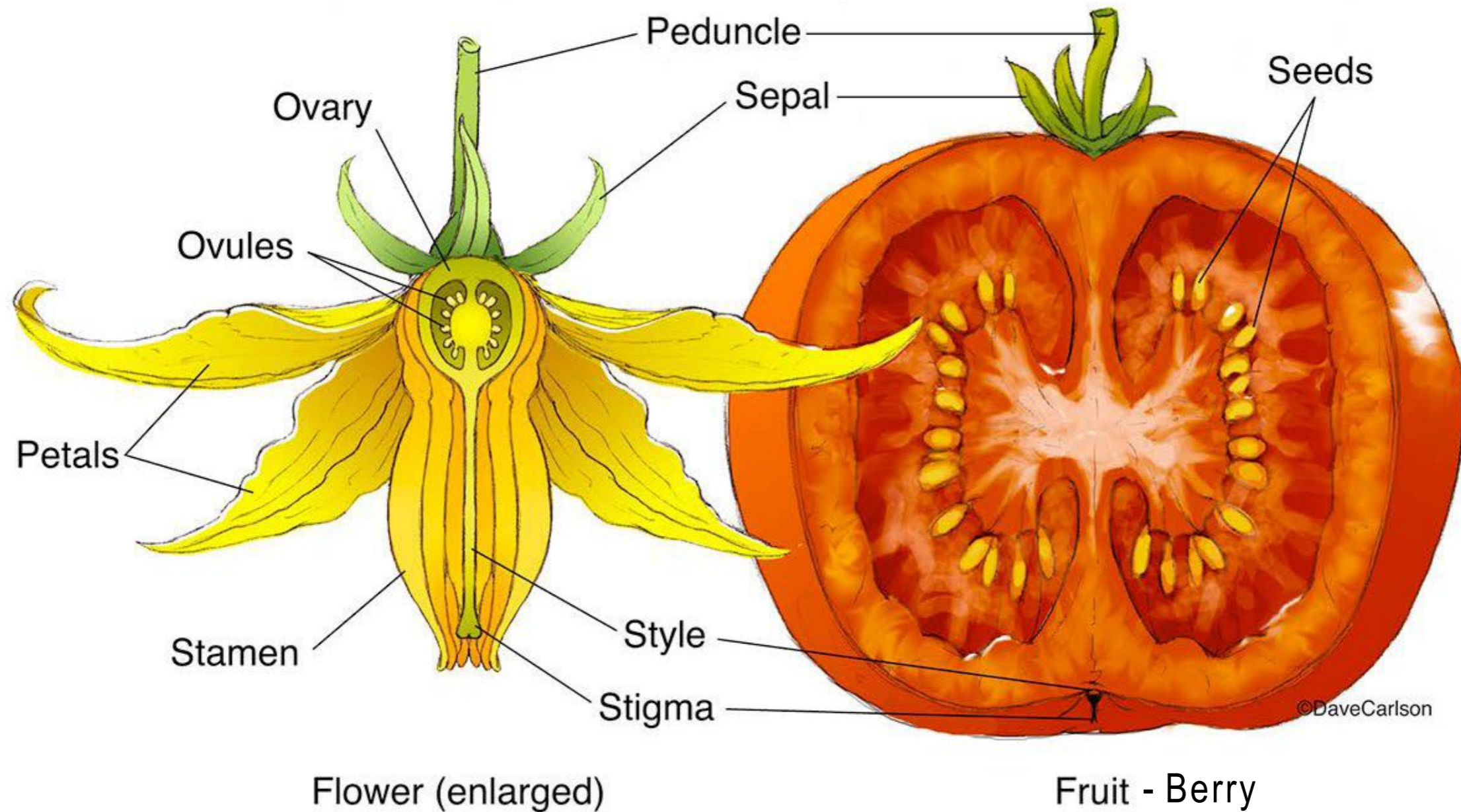


Photo by Dee Shea Himes

Sepals,
pistils,
stamens
are above the ovary

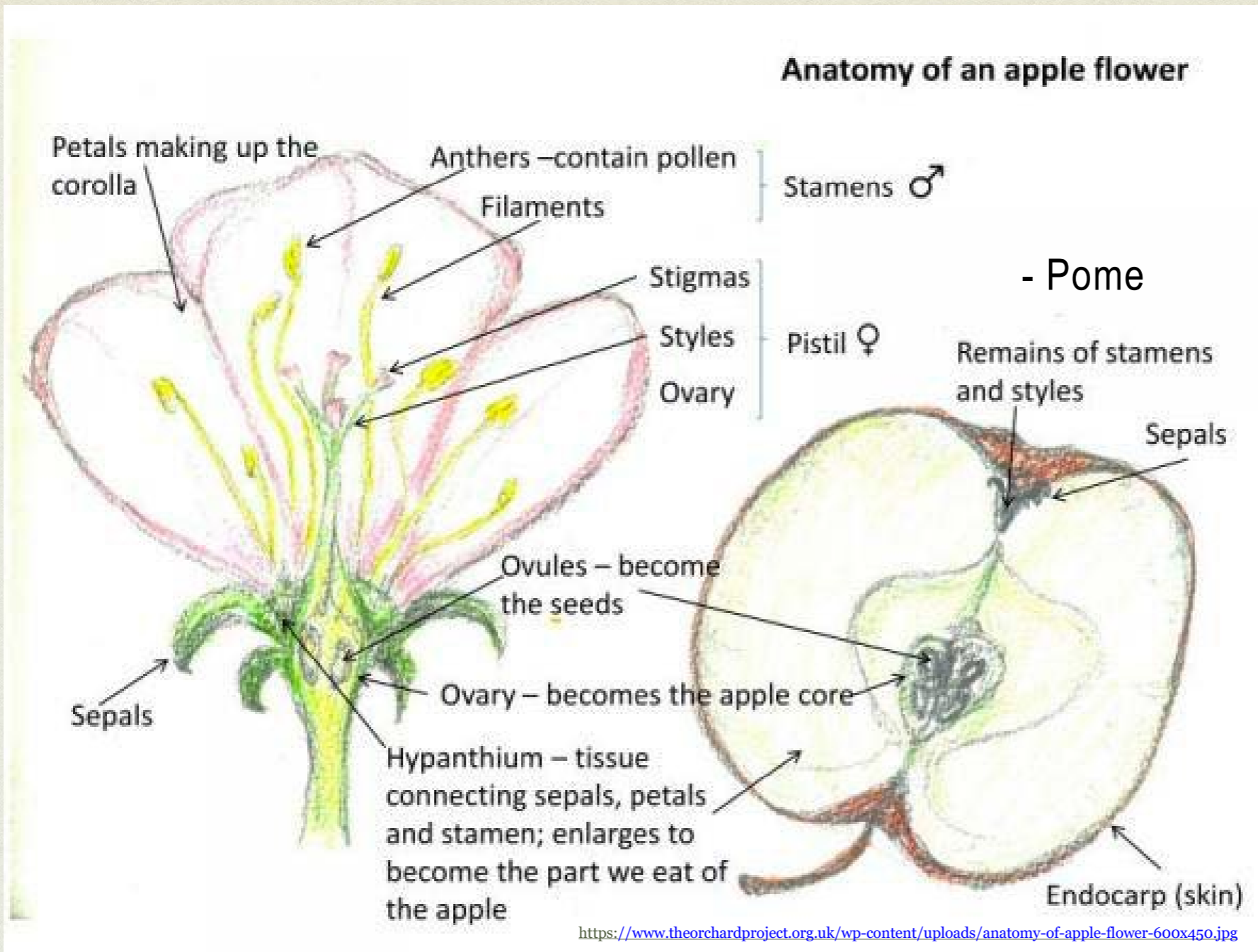
ovary that is
enclosed by the
hypanthium

FLOWER TO FRUIT SUPERIOR OVARY



<https://www.carlsonstockart.com/images/xl/ Tomato-Flower-Fruit-Anatomy.jpg>

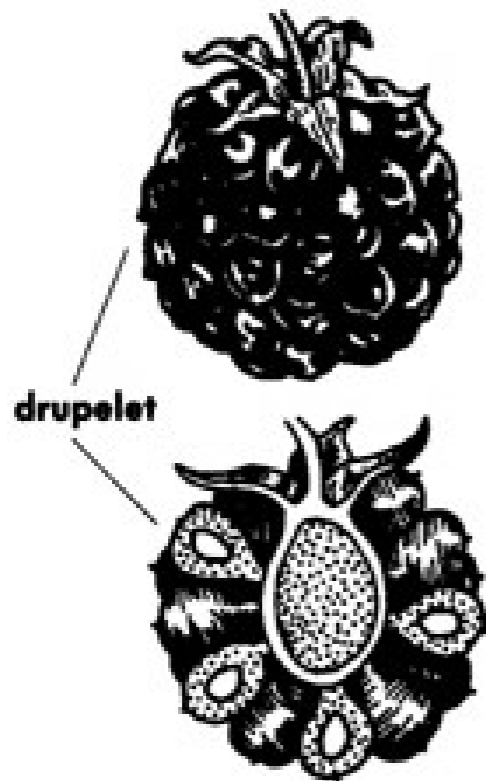
FLOWER TO FRUIT



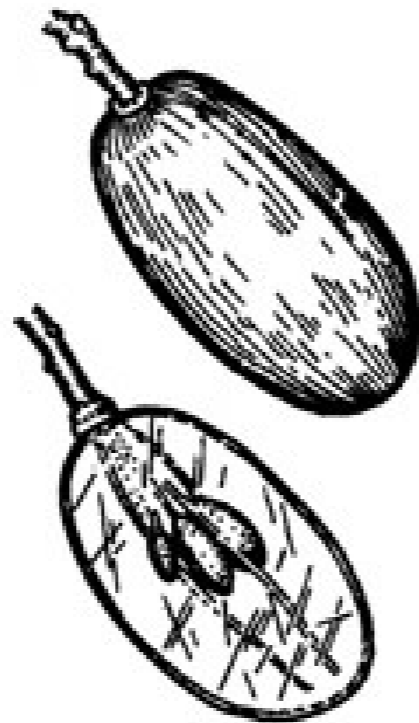
Basic Fruits and Seeds, fleshy

<https://vplants.org/portal/plants/glossary/plate11.php>

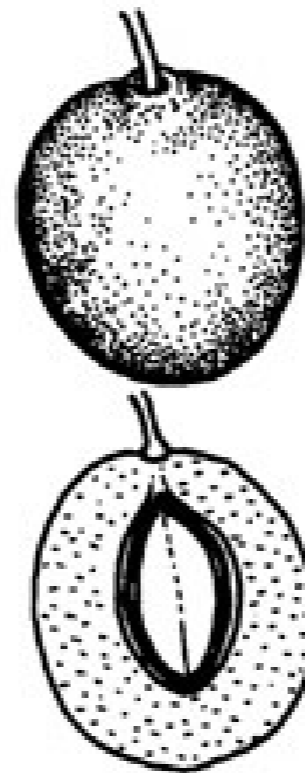
FLESHY



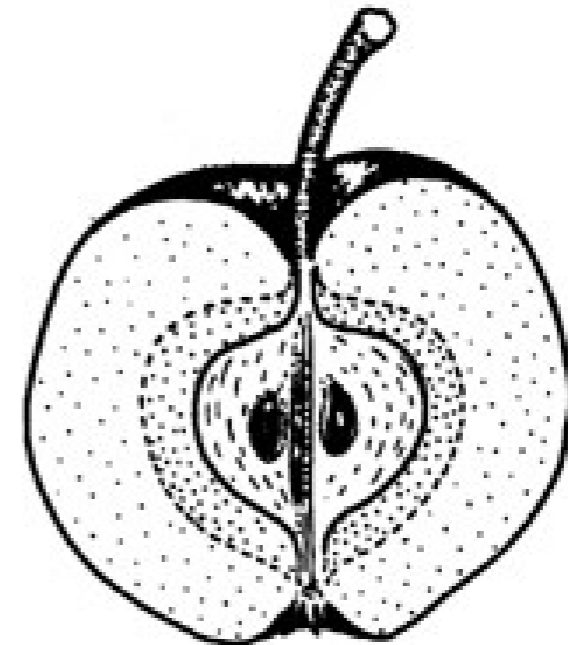
AGGREGATE



BERRY



DRUPE

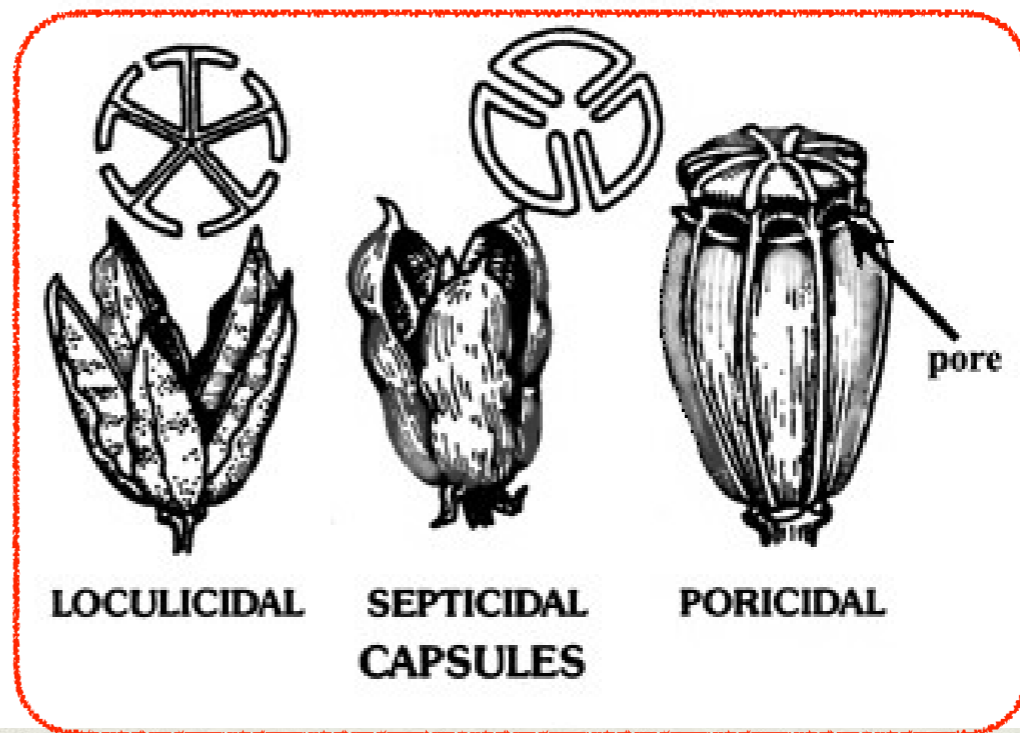
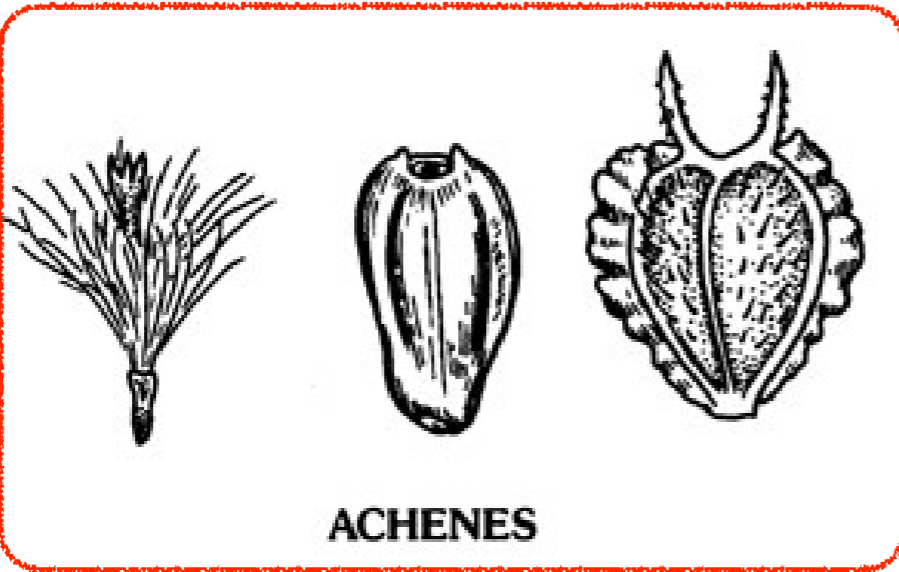


POME

Basic Fruits and Seeds, dry

<https://vplants.org/portal/plants/glossary/plate11.php>

DRY



modified from Swink, F. and G. Wilhelm. 1994. *Plants of the Chicago region*. 4th ed. Indianapolis: Indiana Academy of Science.

Basic Fruits and Seeds, dry

<https://vplants.org/portal/plants/glossary/plate11.php>



CIRCUMSCISSILE



FOLLICLE



LEGUME



LOMENT



ACORN



SAMARAS



SCHIZOCARP



SILICLE



SILIQUE

modified from Swink, F. and G. Wilhelm. 1994. *Plants of the Chicago region*. 4th ed. Indianapolis: Indiana Academy of Science.

SCREWBEAN MESQUITE

Prosopis pubescens



tightly coiled

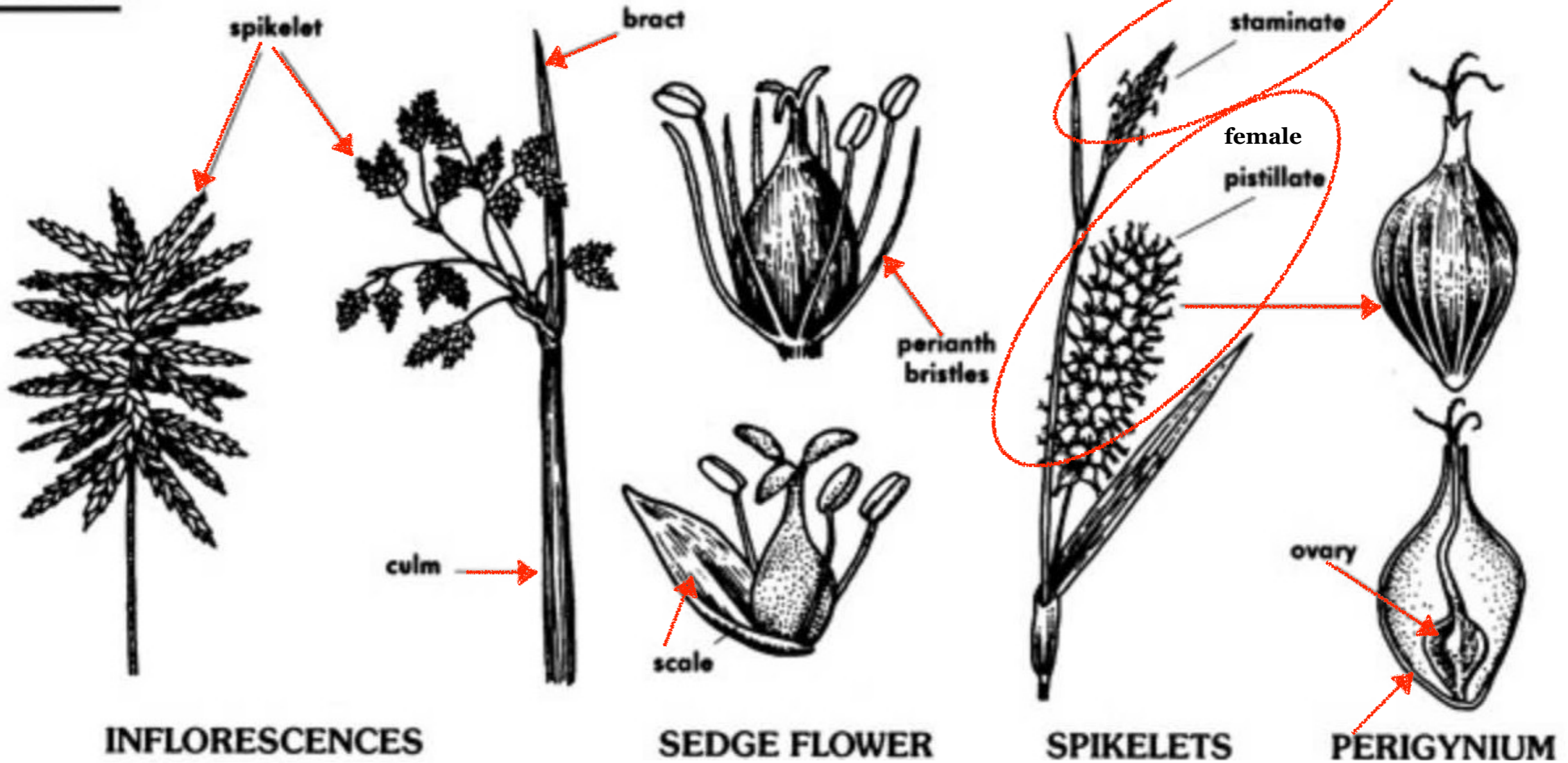


Photos by Dee Shea Himes

SEDGES

<https://vplants.org/portal/plants/glossary/plate12.php>

SEDGES

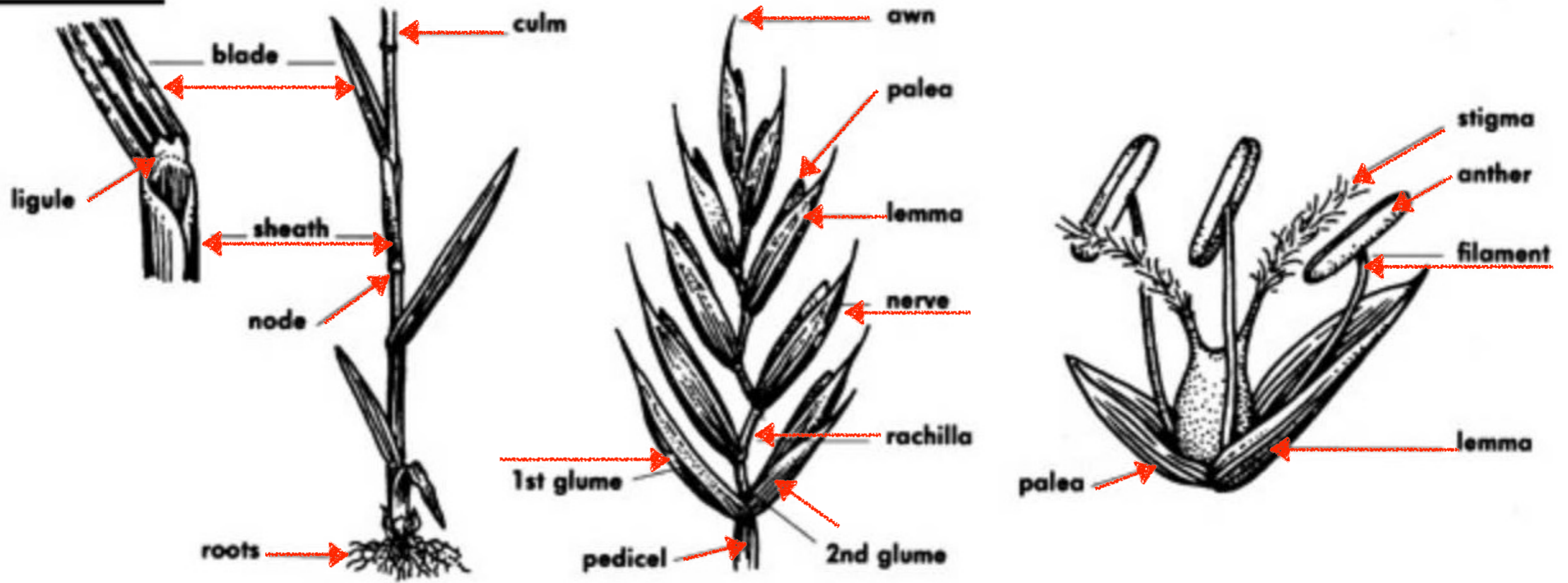


as published in Swink, F. and G. Wilhelm. 1994. *Plants of the Chicago region*. 4th ed. Indianapolis: Indiana Academy of Science.

GRASSES

<https://vplants.org/portal/plants/glossary/plate12.php>

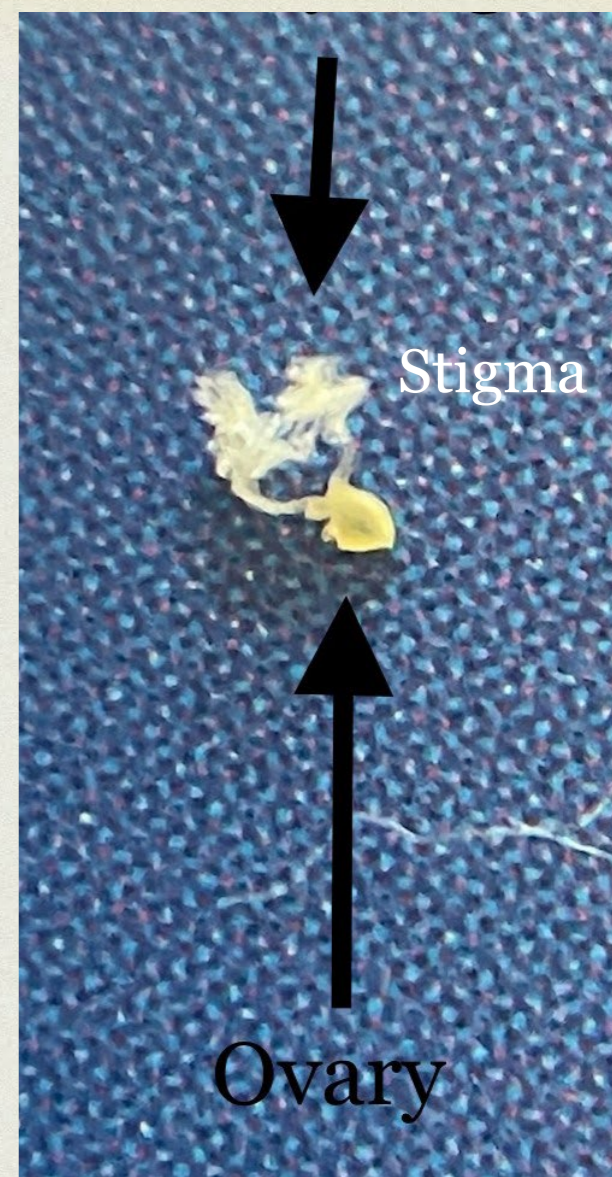
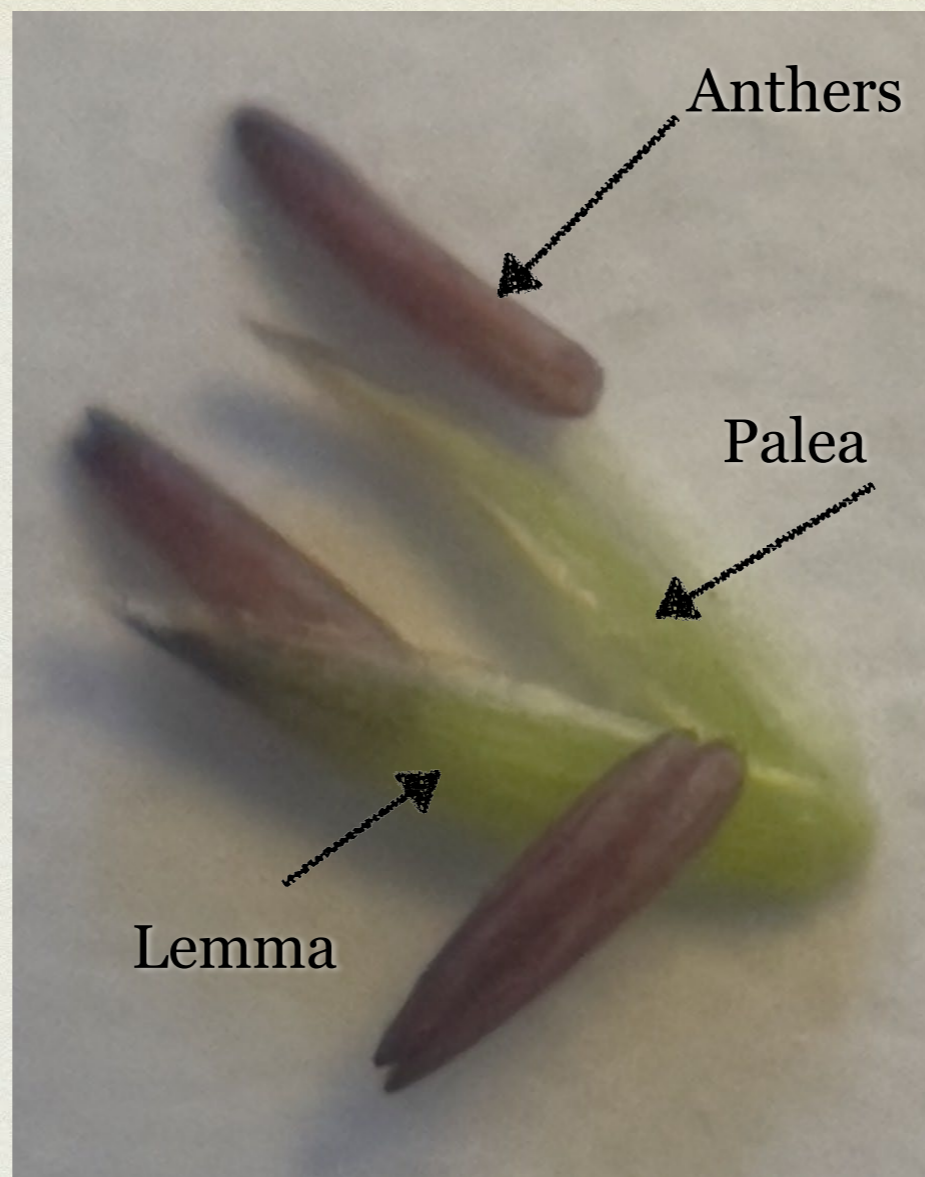
GRASSES



as published in Swink, F. and G. Wilhelm. 1994. *Plants of the Chicago region*. 4th ed. Indianapolis: Indiana Academy of Science.

FLORET

MELICA SSP.



Photos by Dee Shea Himes

VIRTUAL PLANT GLOSSARY

http://vplants.org/portal/plants/glossary/plate_all.php

Plate 1: Stem and Root Types.

Plate 2: Leaf Composition, Parts, and Types.

Plate 3: Leaf Shapes.

Plate 4: Leaf Margins.

Plate 5: Leaf Apices, Venation, and Bases.

Plate 6: Surface Features.

Plate 7: Stem and Leaf Parts, and Variations.

Plate 8: Inflorescence Types.

Plate 9: Floral Morphology.

Plate 10: Corolla Types.

Plate 11: Fruit Types.

Plate 12: Sedges, Grasses, and Composites.

PLANT IDENTIFICATION TERMINOLOGY AN ILLUSTRATED GLOSSARY

PLANT IDENTIFICATION TERMINOLOGY

An Illustrated Glossary



James G. Harris
Melinda Woolf Harris

Second Edition

PLANT IDENTIFICATION TERMINOLOGY

AN ILLUSTRATED GLOSSARY

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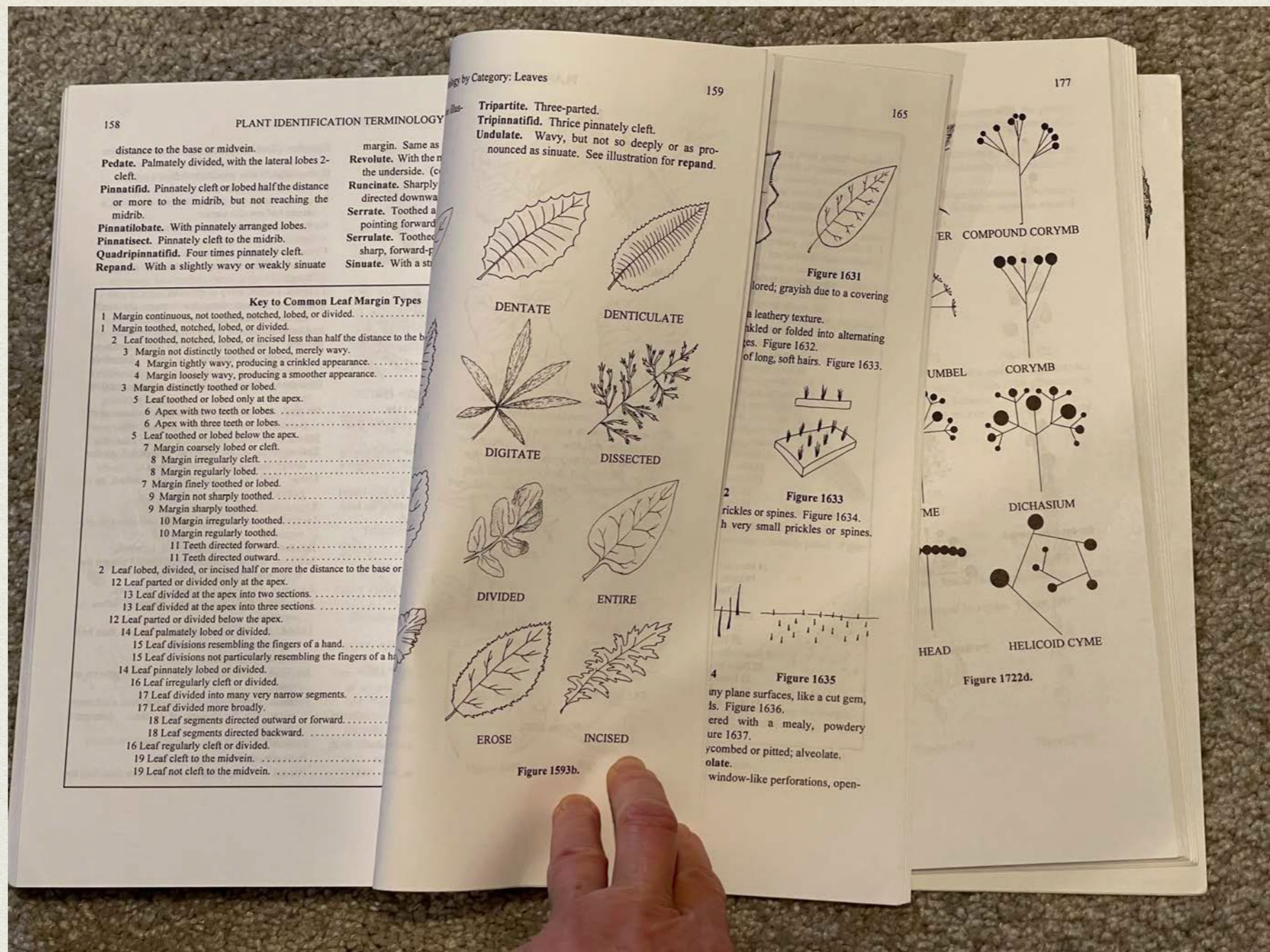
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PLANT IDENTIFICATION TERMINOLOGY

AN ILLUSTRATED GLOSSARY



distance to the base or midvein.
Pedate. Palmately divided, with the lateral lobes 2-cleft.
Pinnatifid. Pinnately cleft or lobed half the distance or more to the midrib, but not reaching the midrib.
Pinnatilobate. With pinnately arranged lobes.
Pinnatisect. Pinnately cleft to the midrib.
Quadripinnatifid. Four times pinnately cleft.
Repand. With a slightly wavy or weakly sinuate

margin. Same as **Revolute.** With the margin on the underside. (See **Revolute**.)
Runcinate. Sharply directed downward.
Serrate. Toothed and pointing forward.
Serrulate. Toothed and sharp, forward-pointing.
Sinuate. With a slight

Key to Common Leaf Margin Types

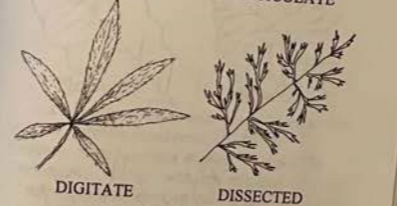
- 1 Margin continuous, not toothed, notched, lobed, or divided.
- 2 Margin toothed, notched, lobed, or incised less than half the distance to the base or apex.
- 3 Margin not distinctly toothed or lobed, merely wavy.
- 4 Margin tightly wavy, producing a crinkled appearance.
- 4 Margin loosely wavy, producing a smoother appearance.
- 3 Margin distinctly toothed or lobed.
- 5 Leaf toothed or lobed only at the apex.
- 6 Apex with two teeth or lobes.
- 6 Apex with three teeth or lobes.
- 5 Leaf toothed or lobed below the apex.
- 7 Margin coarsely lobed or cleft.
- 8 Margin irregularly cleft.
- 8 Margin regularly lobed.
- 7 Margin finely toothed or lobed.
- 9 Margin not sharply toothed.
- 9 Margin sharply toothed.
- 10 Margin irregularly toothed.
- 10 Margin regularly toothed.
- 11 Teeth directed forward.
- 11 Teeth directed outward.
- 2 Leaf lobed, divided, or incised half or more the distance to the base or apex.
- 12 Leaf parted or divided only at the apex.
- 13 Leaf divided at the apex into two sections.
- 13 Leaf divided at the apex into three sections.
- 12 Leaf parted or divided below the apex.
- 14 Leaf palmately lobed or divided.
- 15 Leaf divisions resembling the fingers of a hand.
- 15 Leaf divisions not particularly resembling the fingers of a hand.
- 14 Leaf pinnately lobed or divided.
- 16 Leaf irregularly cleft or divided.
- 17 Leaf divided into many very narrow segments.
- 17 Leaf divided more broadly.
- 18 Leaf segments directed outward or forward.
- 18 Leaf segments directed backward.
- 16 Leaf regularly cleft or divided.
- 19 Leaf cleft to the midvein.
- 19 Leaf not cleft to the midvein.

Tripartite. Three-parted.
Tripinnatifid. Thrice pinnately cleft.
Undulate. Wavy, but not so deeply or as pronounced as sinuate. See illustration for **repand**.



DENTATE

DENTICULATE



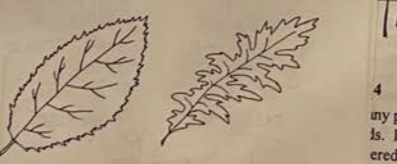
DIGITATE

DISSECTED



DIVIDED

ENTIRE



EROSE

INCISED

Figure 1593b.

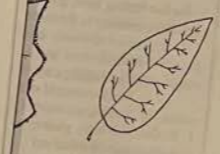


Figure 1631

colored; grayish due to a covering
 a leathery texture.
 wrinkled or folded into alternating
 ridges. Figure 1632.
 of long, soft hairs. Figure 1633.



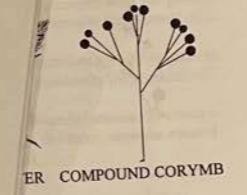
Figure 1633

2
 prickles or spines. Figure 1634.
 with very small prickles or spines.



Figure 1635

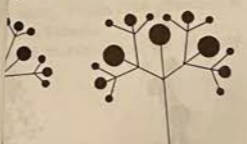
4
 on any plane surfaces, like a cut gem,
 smooth. Figure 1636.
 covered with a mealy, powdery
 substance. Figure 1637.
 pycnomerous or pitted; alveolate.
 fenestrate.
 with window-like perforations, open-



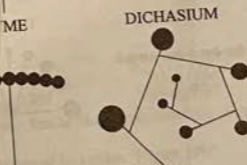
COMPOUND CORYMB



CORYMB

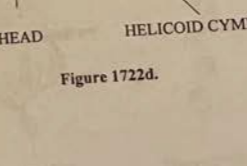


UMBEL



DICHASium

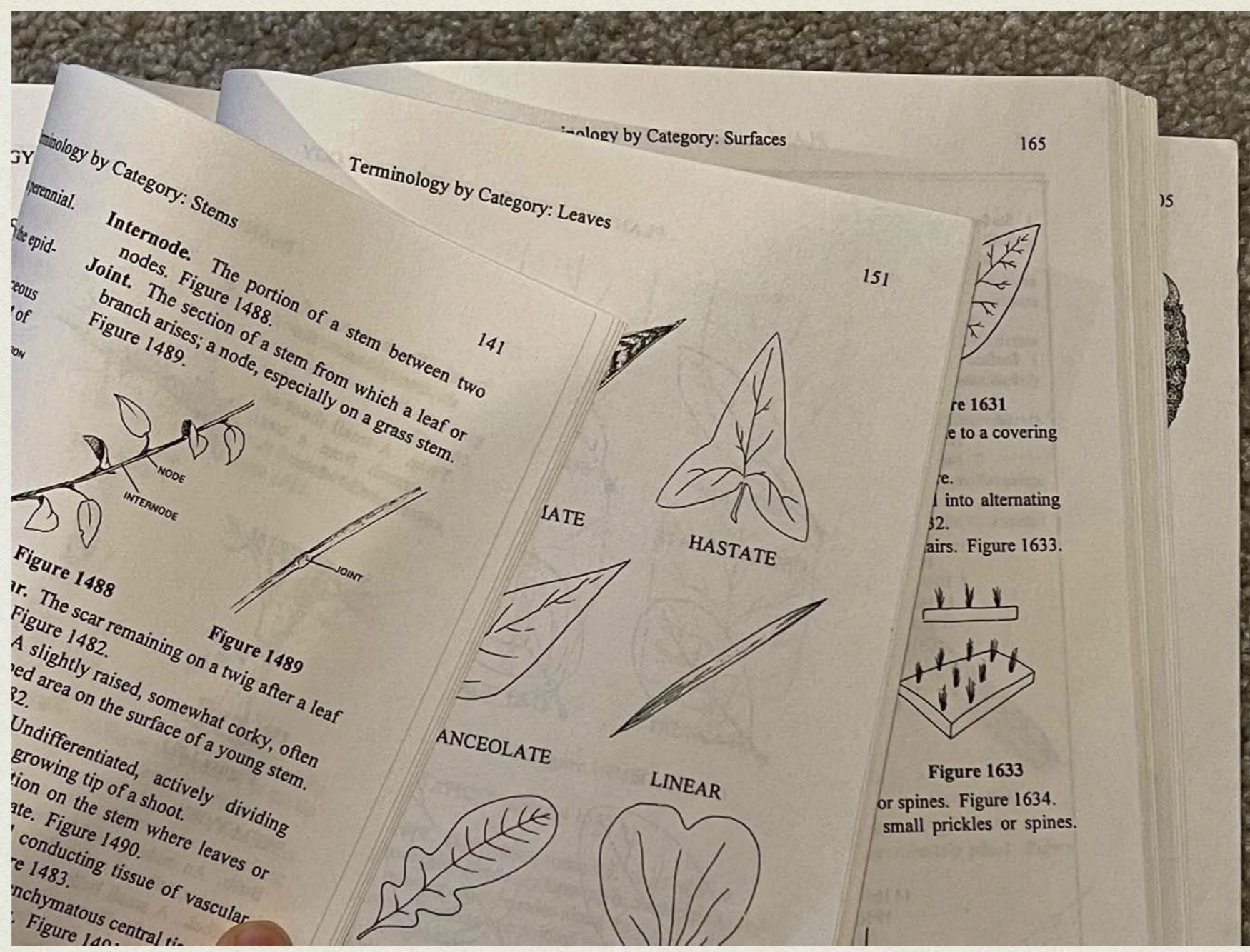
HEAD



HELICOID CYME

Figure 1722d.

PLANT IDENTIFICATION TERMINOLOGY AN ILLUSTRATED GLOSSARY



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- <https://www.vplants.org/portal/plants/glossary/index.php>
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- <https://ucjeps.berkeley.edu/eflora/glossary.html>
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- By James G. Harris & Melinda Woolf Harris, 2nd Edition

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- [Pearson Education publishing as Benjamin Cummings: The Plant diagram](#)
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- [Rose like flower anatomy](#)
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CITATIONS

- Simple/compound leaf (slides [8](#), [9](#), [28](#)): U of Wisconsin - Green Bay; Corin Center for Biodiversity
- https://www.uwgb.edu/biodiversity/herbarium/trees/simple_compound_leaves01.htm
- [Pistil and Carpel](#)
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- [Bract, dogwood illustration](#)
- http://botanicalillustrations.org/ILLUSTRATIONS_HD_/7015.jpg
- [Primrose drawing, pedicel and peduncle](#)
- <https://qph.fs.quoracdn.net/main-qimg-9e947a996c65c954aa0b2b8e8fc4e8b9-lq>
- [Nectaries](#)
- http://botanicalillustrations.org/ILLUSTRATIONS_HD_/7015.jpg

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- [https://commons.wikimedia.org/wiki/File%3AGymnosperm life cycle \(en\).png](https://commons.wikimedia.org/wiki/File%3AGymnosperm_life_cycle_(en).png)

- [Proprofs.com](#)
- https://media.proprofs.com/images/QM/user_images/1883405/1504863690.jpg

- [Angiosperm vs gymnosperm seed and fruit](#)
- <https://2.bp.blogspot.com/-QRPK8EGe4vs/UOU9uJ6o8ZI/AAAAAAAAABhI/ZKOW1uZVVZw/s1600/Angiosperms%20and%20Gymnosperms%20Differences.gif>

- [Ovary positions](#)
- <http://1.bp.blogspot.com/-eFLRhtM7QXU/TwxXLEzlpAI/AAAAAAAAAHs/yCUtVgnCjTc/s1600/Picture6.jpg>

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- [Flower to Tomato](#)
- <https://www.carlsonstockart.com/images/xl/Tomato-Flower-Fruit-Anatomy.jpg>

- [Flower to Apple](#): The Orchard Project, UK
- <https://www.theorchardproject.org.uk/wp-content/uploads/anatomy-of-apple-flower-600x450.jpg>

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