



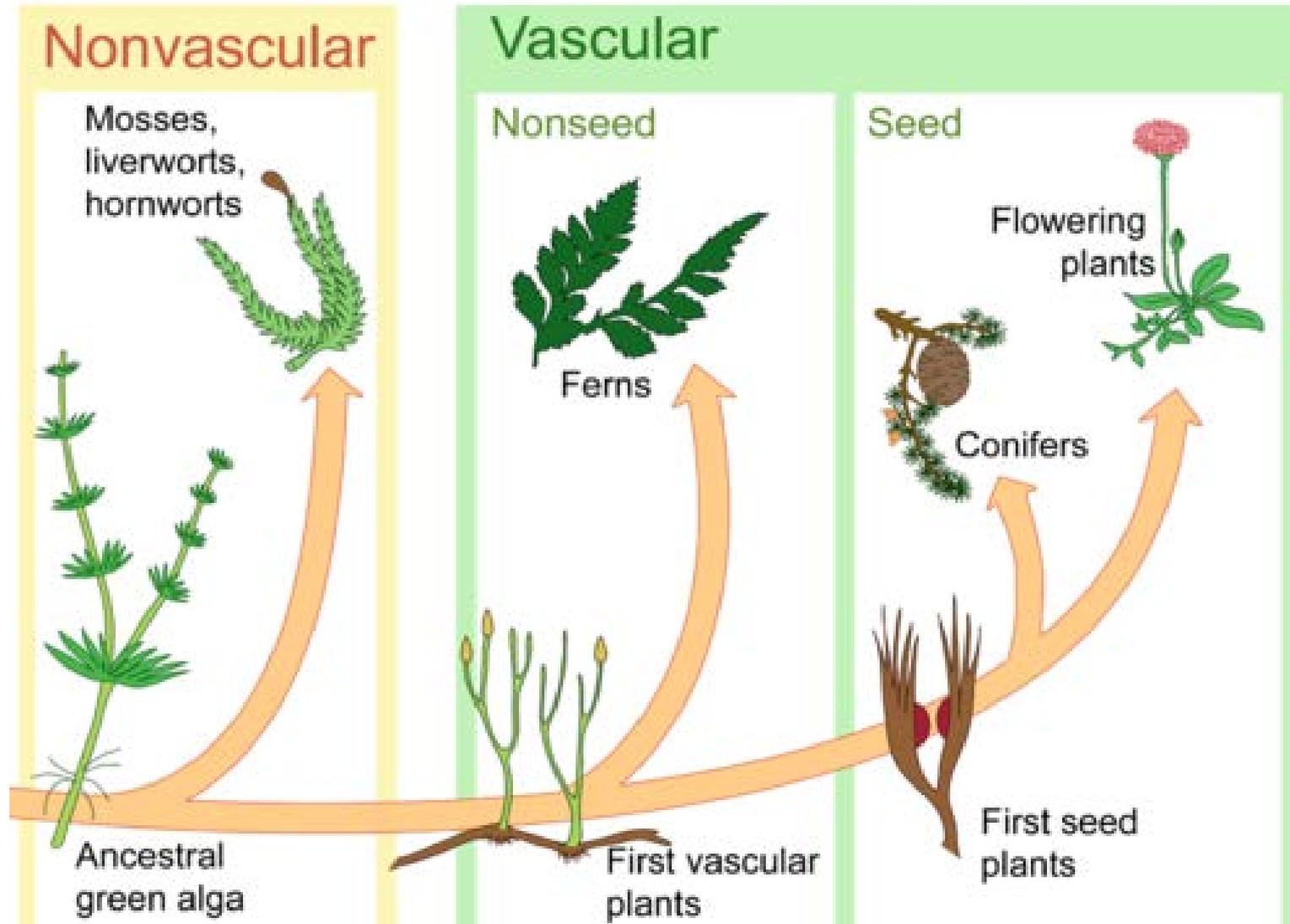
Plant Taxonomy

Janet Steven

Christopher Newport University

September 8, 2016

Major lineages of land plants





Polytrichum,
or haircap
moss





Maidenhair fern

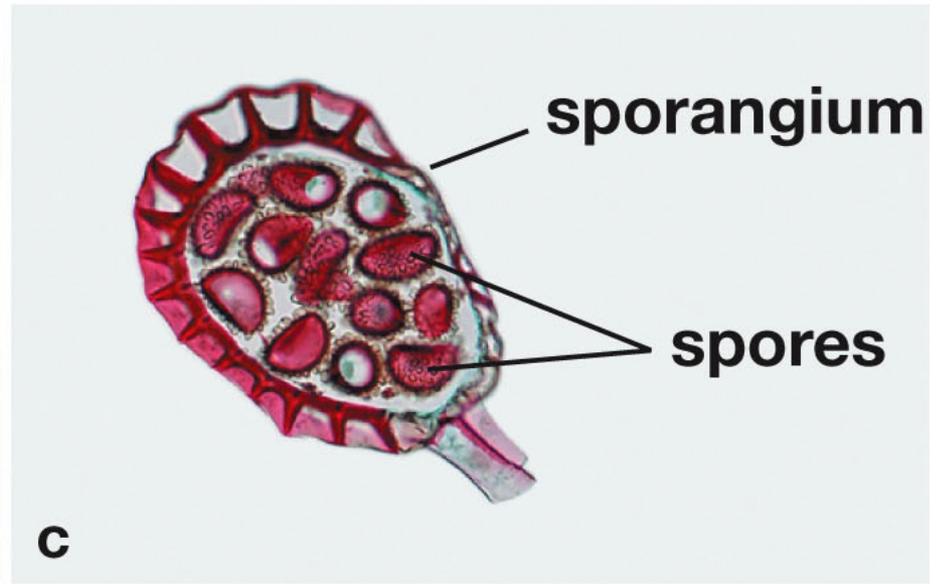
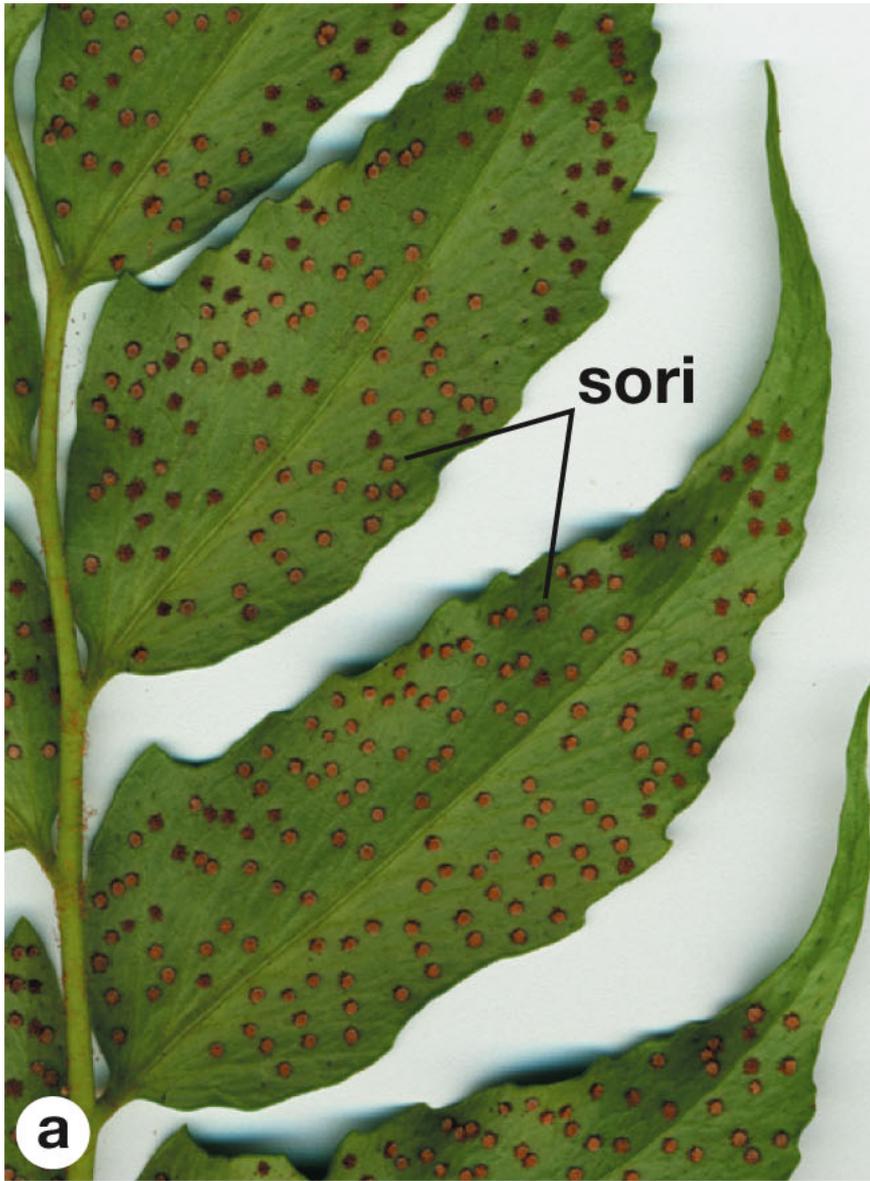
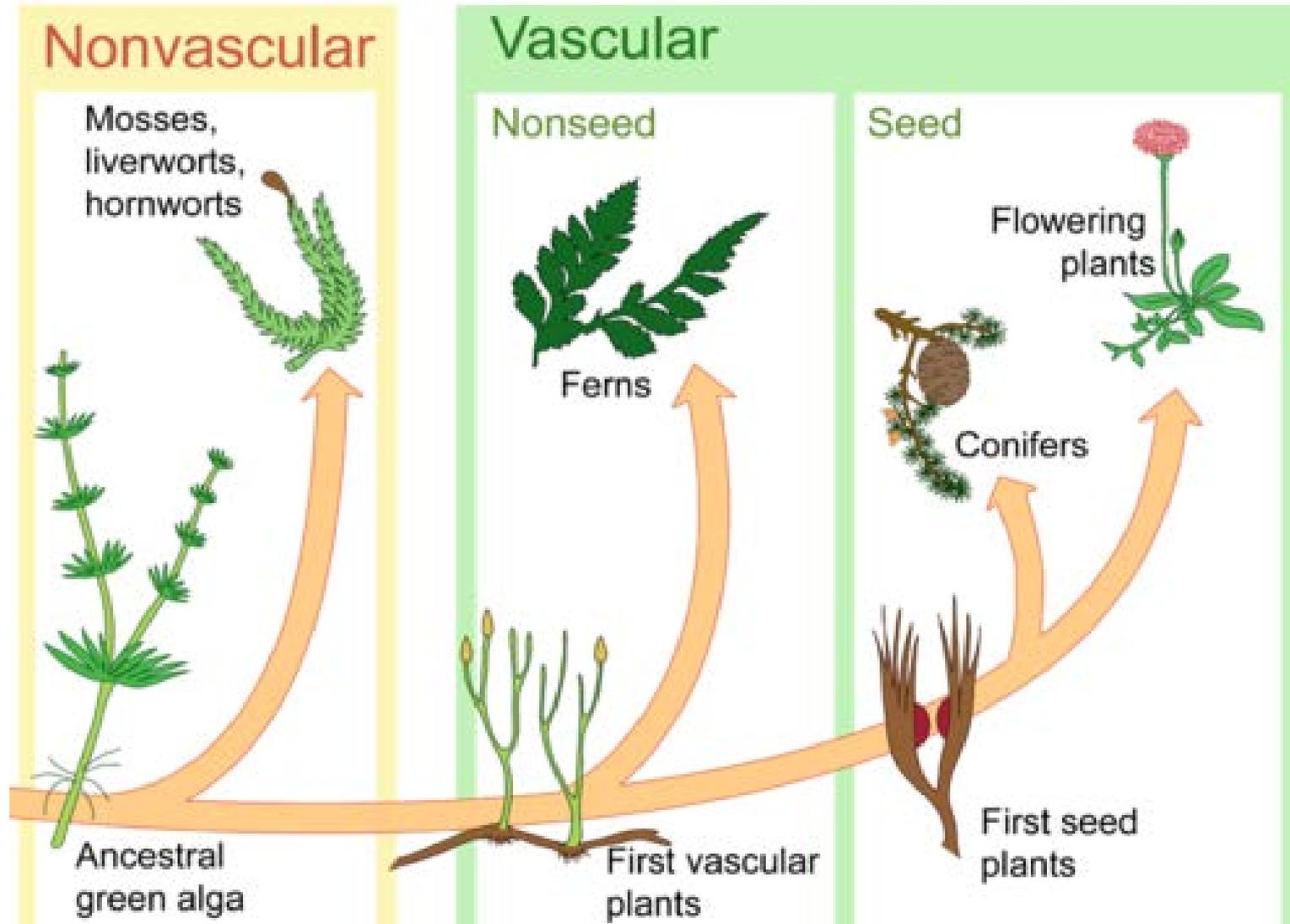


Figure 13.15 Plant Biology, 2/e



Fern gametophyte with young sporophyte

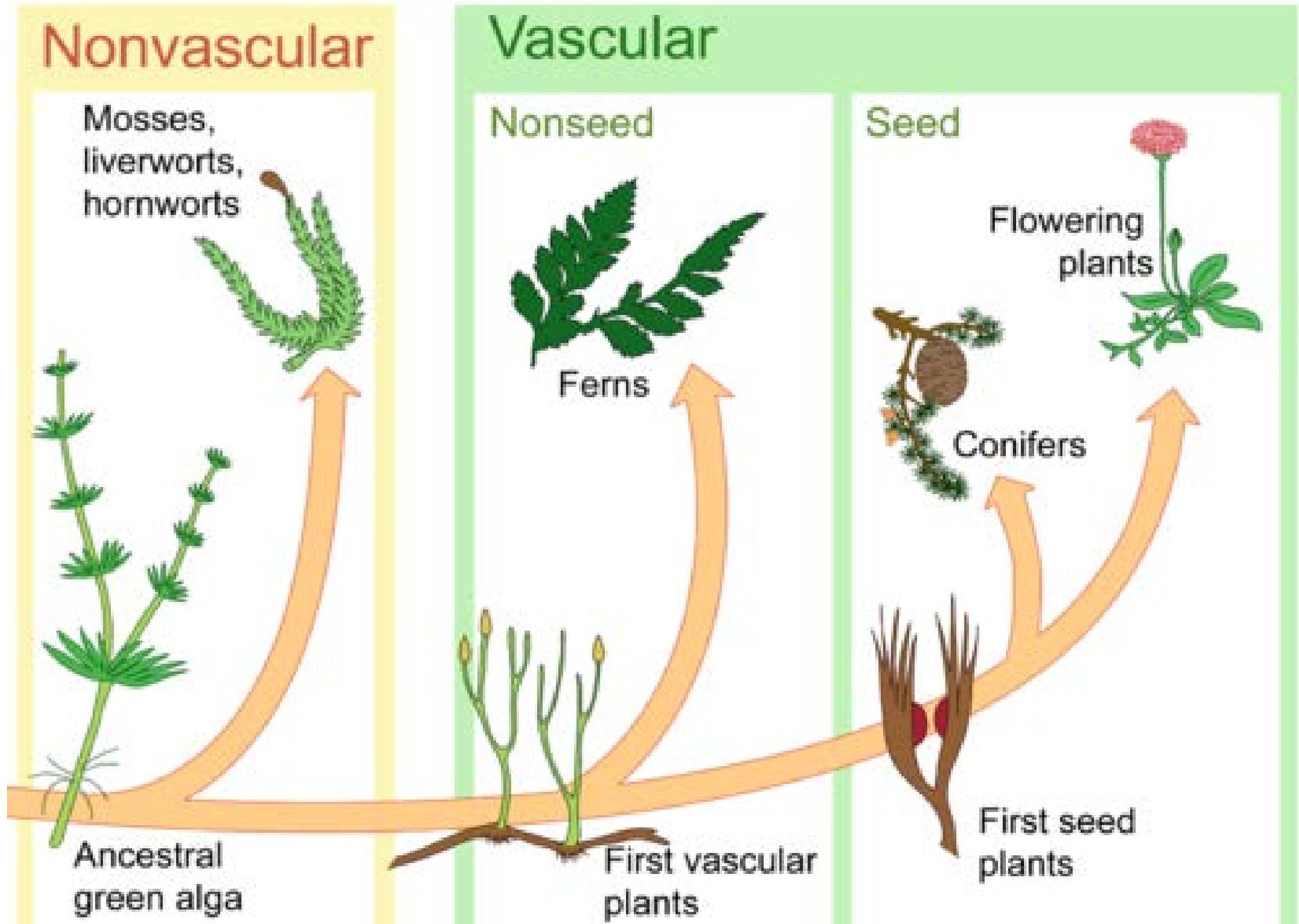
Major lineages of land plants



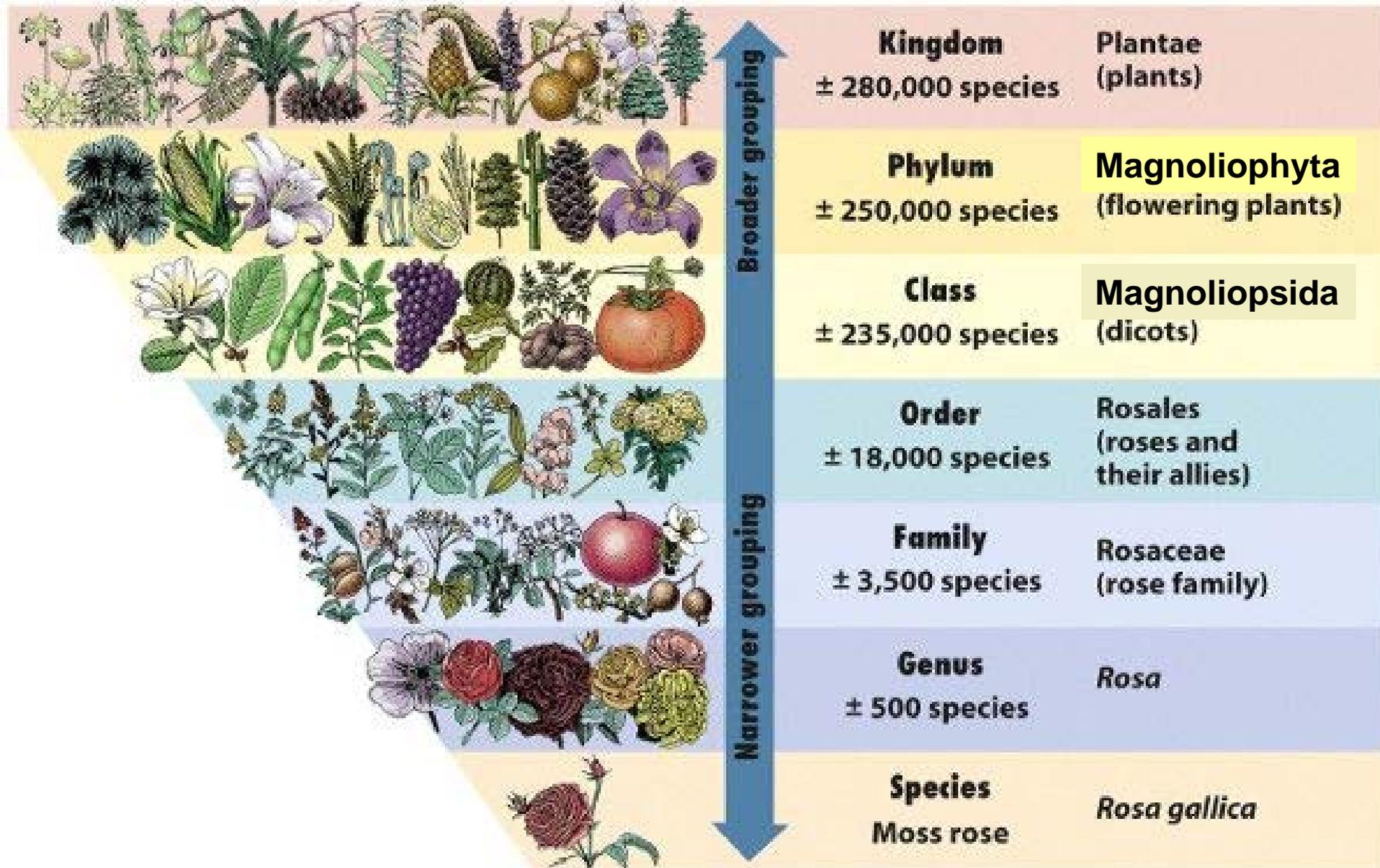
Conifers



Evolution of land plants



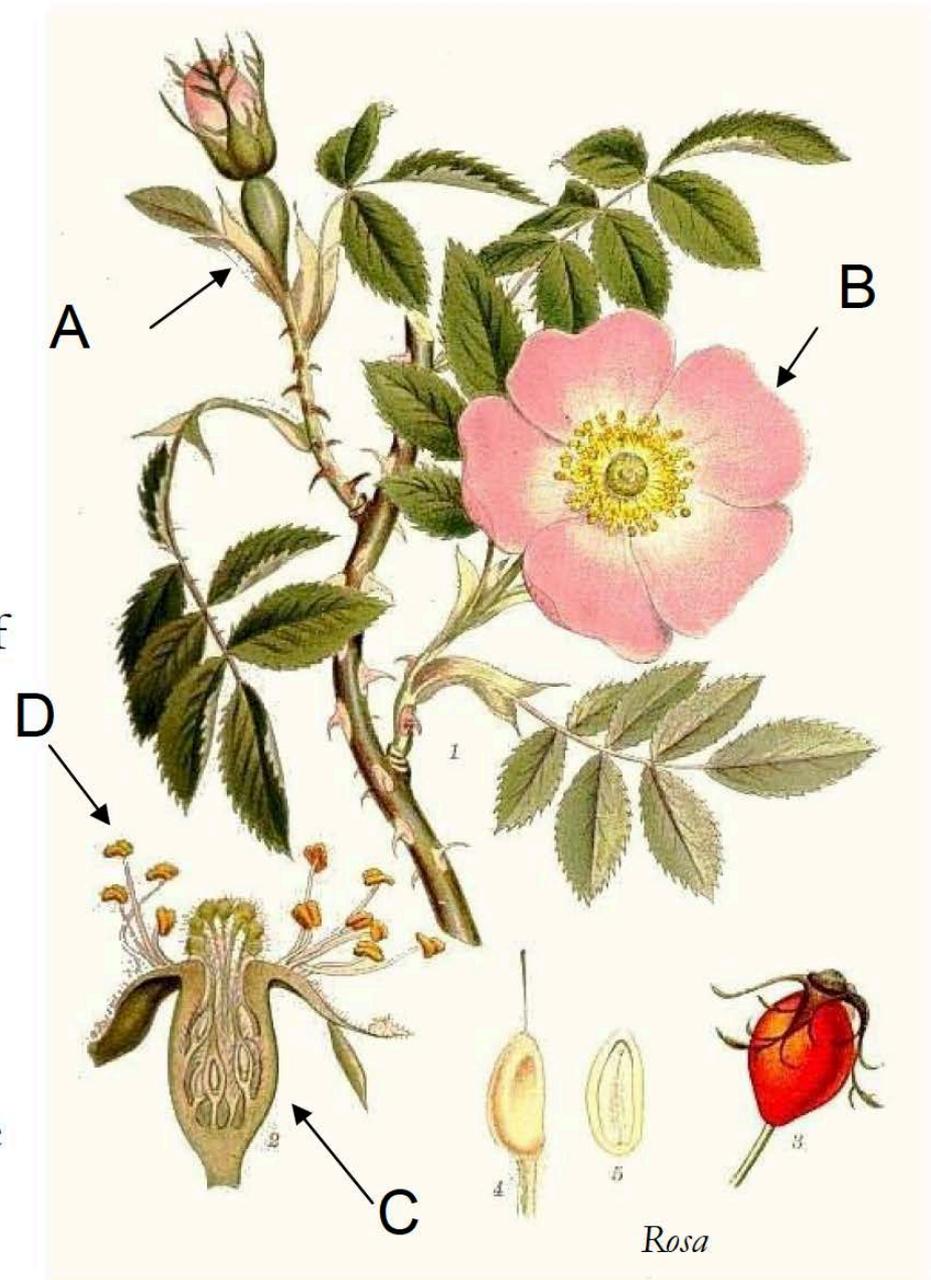
Classification



Rosaceae

ROSE & APPLE FAMILY

- Herbaceous or woody, often shrubs or trees
- Stipules (**A**) at base of each leaf
- Sepals 5, petals 5 (**B**), free
- Hypanthium (**C**, cup-like structure composed from the fused petal, sepal, and stamen bases)
- Stamens usually numerous (**D**)
- Fruit type variable, often pome (apple-like), drupelets (blackberry-like), drupe (stone fruit), dry capsules, or dry nutlets



Human uses of plants



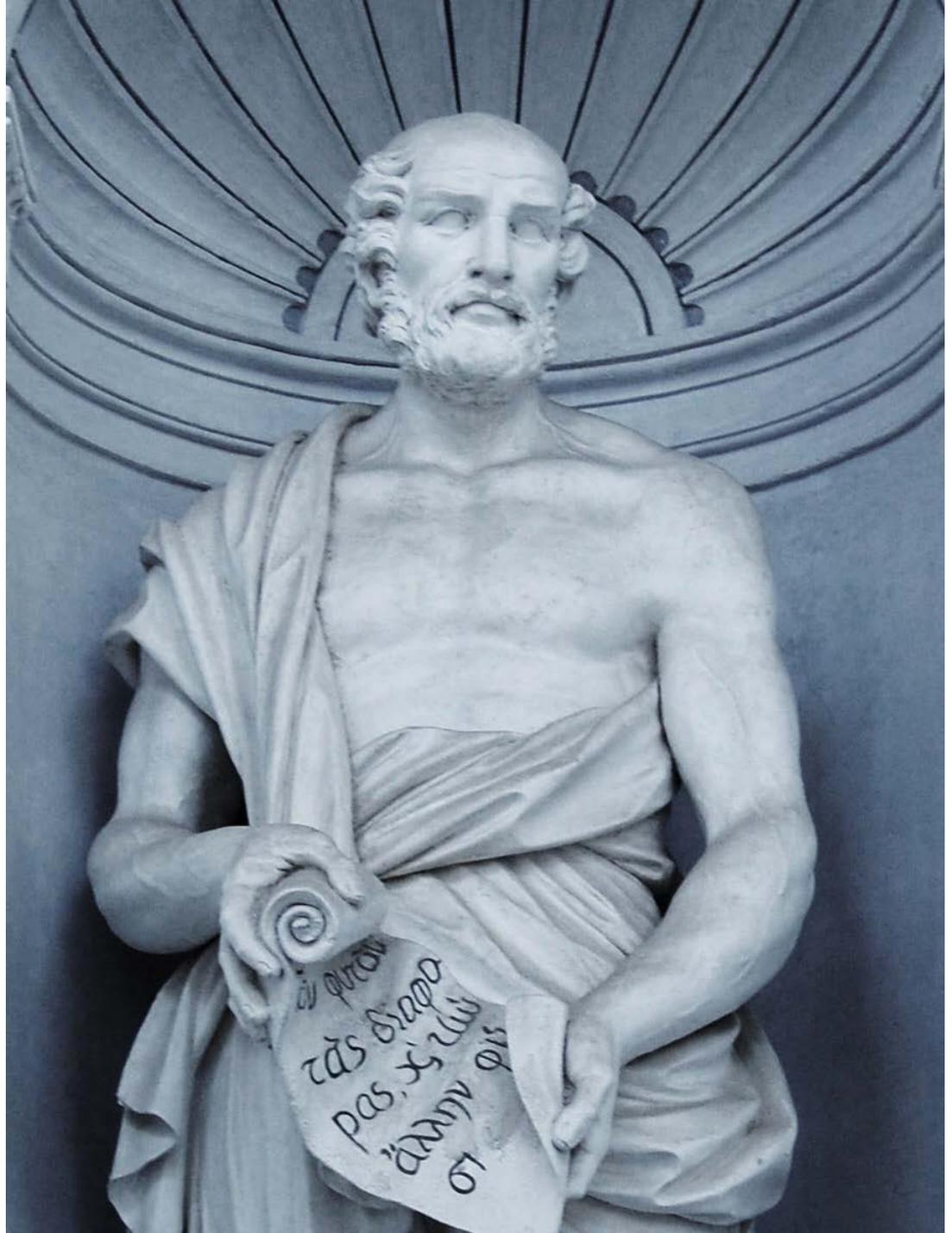
 NATIONALGEOGRAPHIC.COM

Photograph by Wilbur E. Garrett
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*Historia
Plantarum*

written around
325 BC by
Theophrastus



De Materia Medica

written around
60 AD by
Dioscorides

In use for 1500
years



Hemlock



Carolus
Linnaeus

1707-1778





CAROLUS LINNÆUS

S. R. M. Sveciæ Archiater.

Med. et Botan. Professor Upsal.

Equ. aur. de Stell. pol.

*Hic ille est, cui regna volens Natura reclusit
Quamque ulli dederat plura videnda dedit.*

Actus 1707. Maj 29

C. Aurvillius

CAROLI LINNÆI

Equitis aur. de Stella polari,

ARCHIATRI REGII, MED. & BOTAN. PROFESS. UPSAL.
ACAD. UPSAL. HOLMENS. PETROPOL. IMPERIAL.
LONDIN. MONSPEL. TOLOS. FLORENT. SOC.

SPECIES
PLANTARUM.

EXHIBENTES

PLANTAS RITE COGNITAS,

AD

GENERA RELATAS,

CUM

DIFFERENTIIS SPECIFICIS,

NOMINIBUS TRIVIALIBUS,

SYNONYMIS SELECTIS,

LOCIS NATALIBUS,

SECUNDUM

SYSTEMA SEXUALE

DIGESTAS.

TOMUS I.

Editio Secunda, aucta.

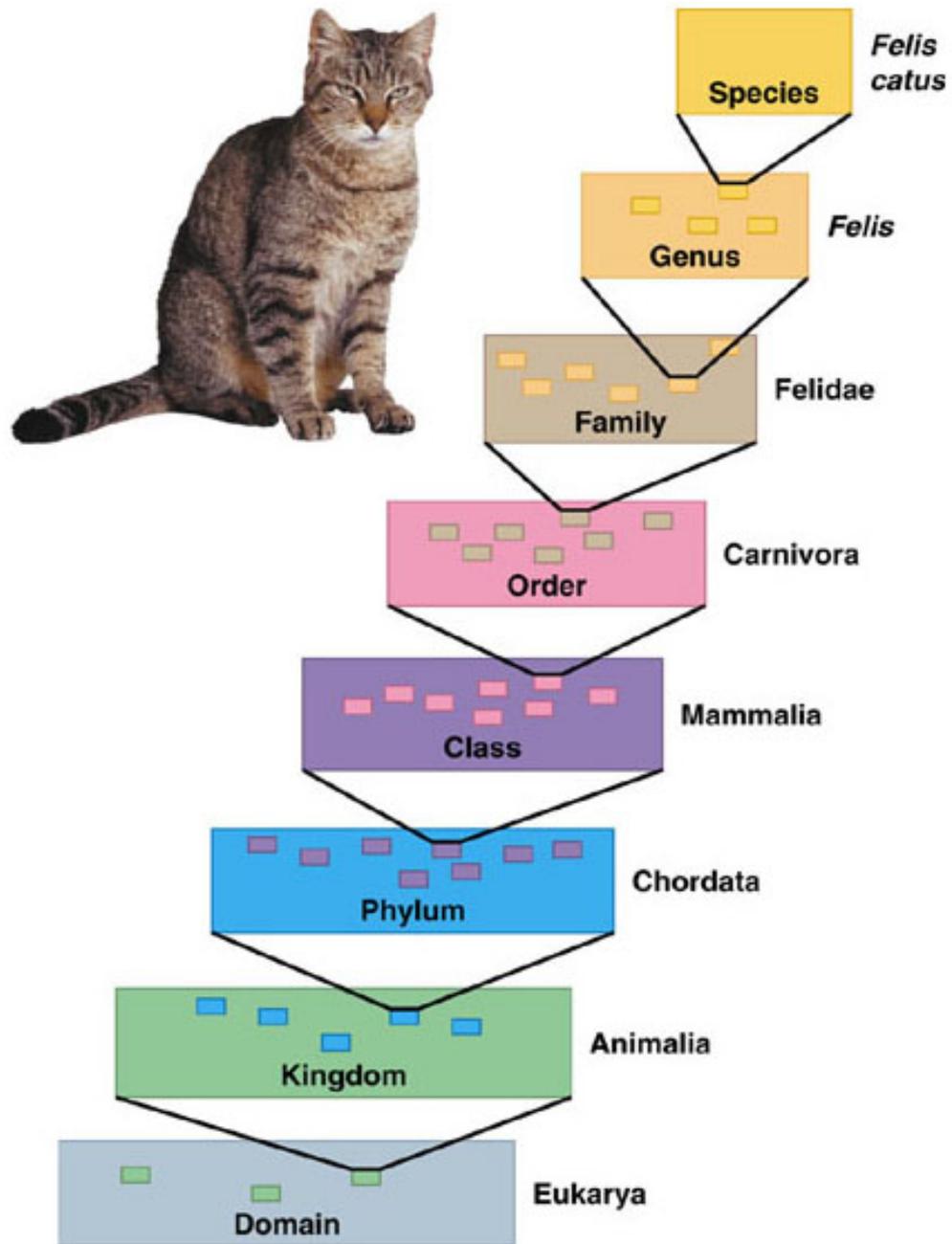
C. W. Hörsing

Cum Privilegio S. R. M^{tis} Sveciæ & S. R. M^{tis} Poloniæ ac Elektoris Saxon.

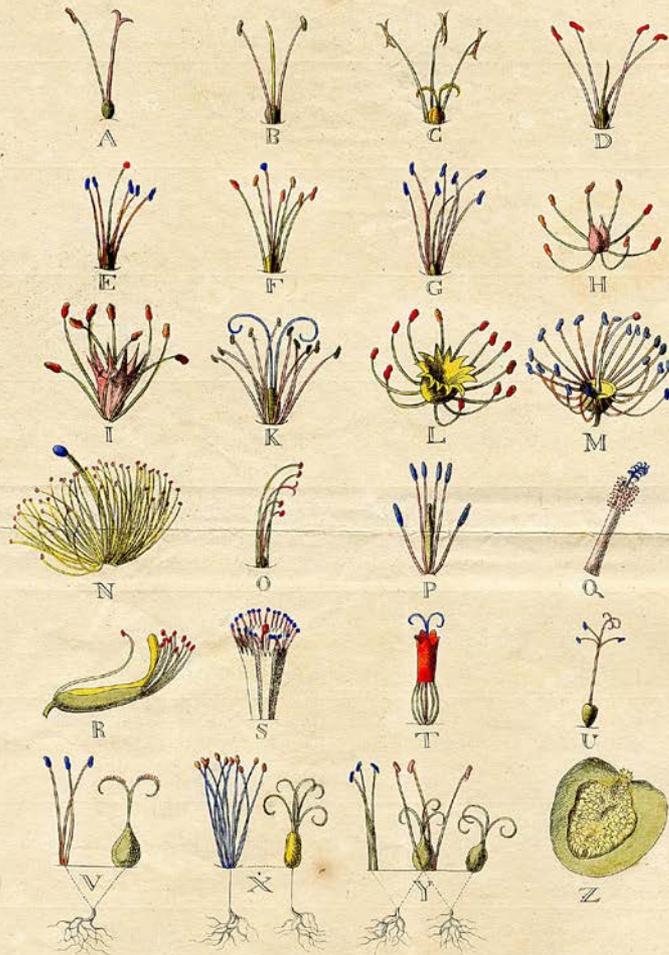
HOLMIÆ

IMPENSIS DIRECT. LAURENTII SALVII.

1762.



Clariss: LINNÆI. M. D.
 METHODUS plantarum SEXUALIS
 in SISTEMATE NATURÆ
 descripta



- Monandria.*
- Diandria.*
- Triandria.*
- Tetrandria.*
- Pentandria.*
- Hexandria.*
- Heptandria.*
- Octandria.*
- Enneandria.*
- Decandria.*
- Dodecandria.*
- Tricandria.*
- Polyandria.*
- Didynamia.*
- Tetradynamia.*
- Monadelphica.*
- Diadelphica.*
- Polyadelphia.*
- Syngenesia.*
- Gynandria.*
- Monoccia.*
- Dioccia.*
- Polygamia.*
- Cryptogamia.*

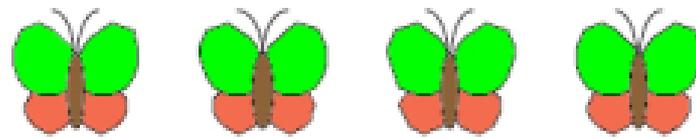
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G. D. EHRET. Palat. heidellb.
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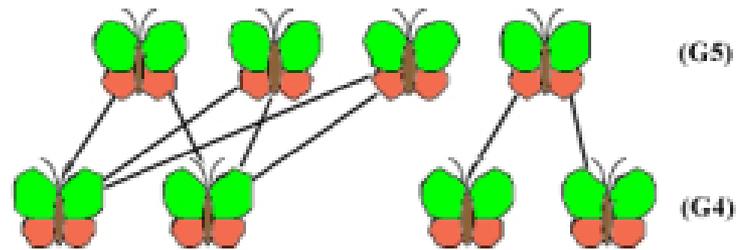
Taxonomic groupings can reflect evolutionary history.

Kingdom	<i>Plantae</i>
Phylum	<i>Magnoliophyta</i>
Class	<i>Magnoliopsida</i>
Order	<i>Ericales</i>
Family	<i>Ericaceae</i>
Genus	<i>Kalmia</i>
Species	<i>K. angustifolia</i>

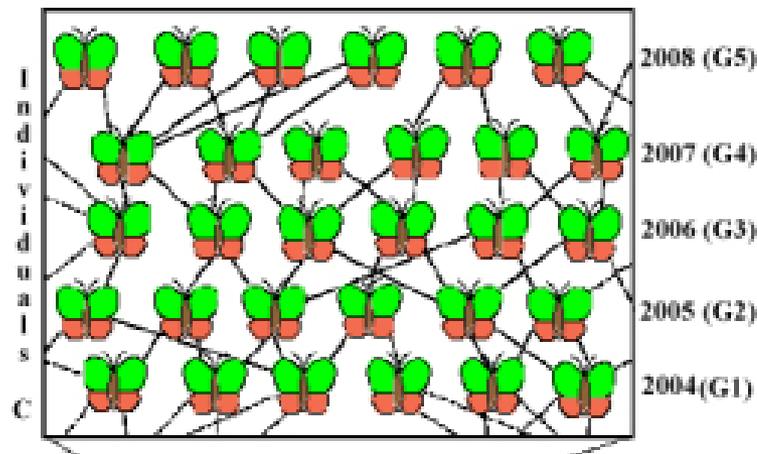


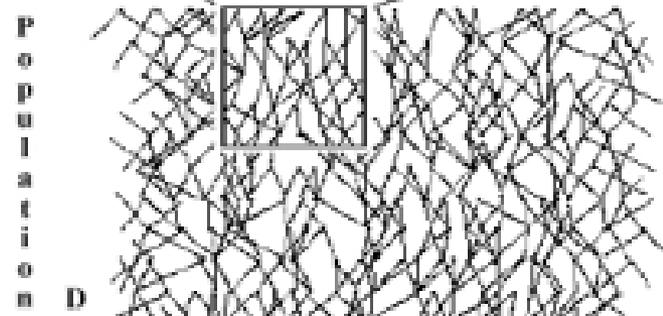
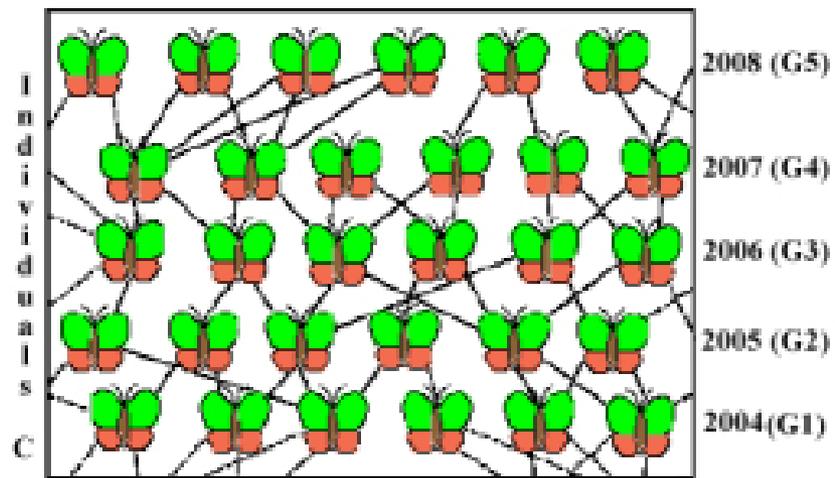


A Four butterflies

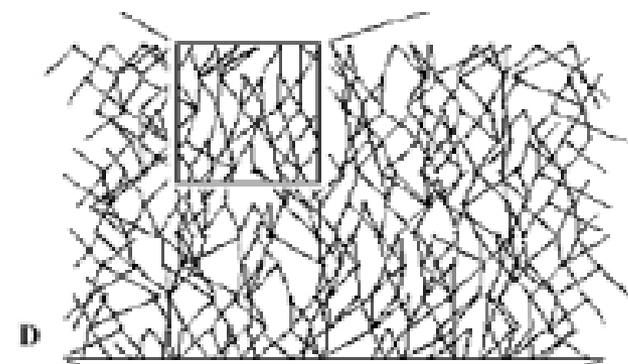


B Four butterflies (top row),
connected to their parents (bottom row)

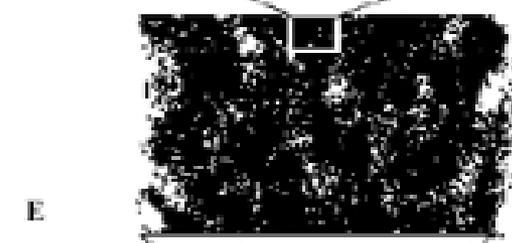




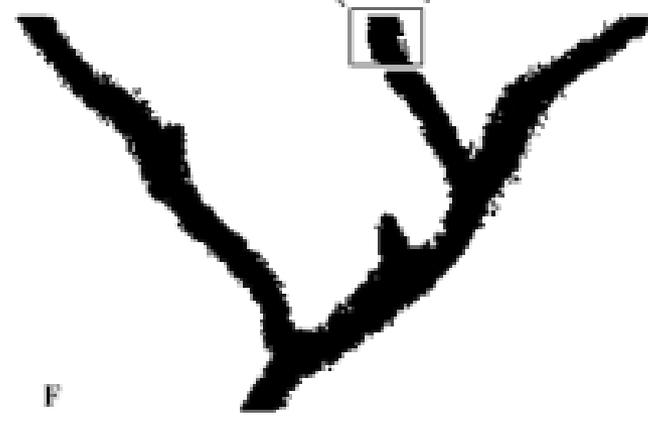
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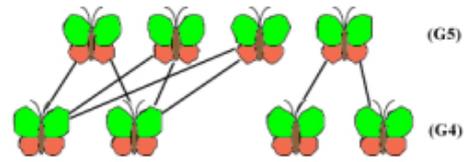


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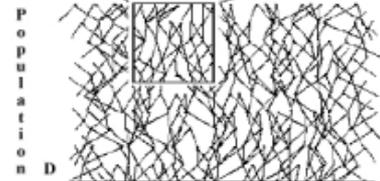
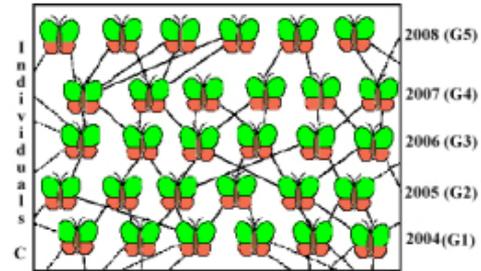


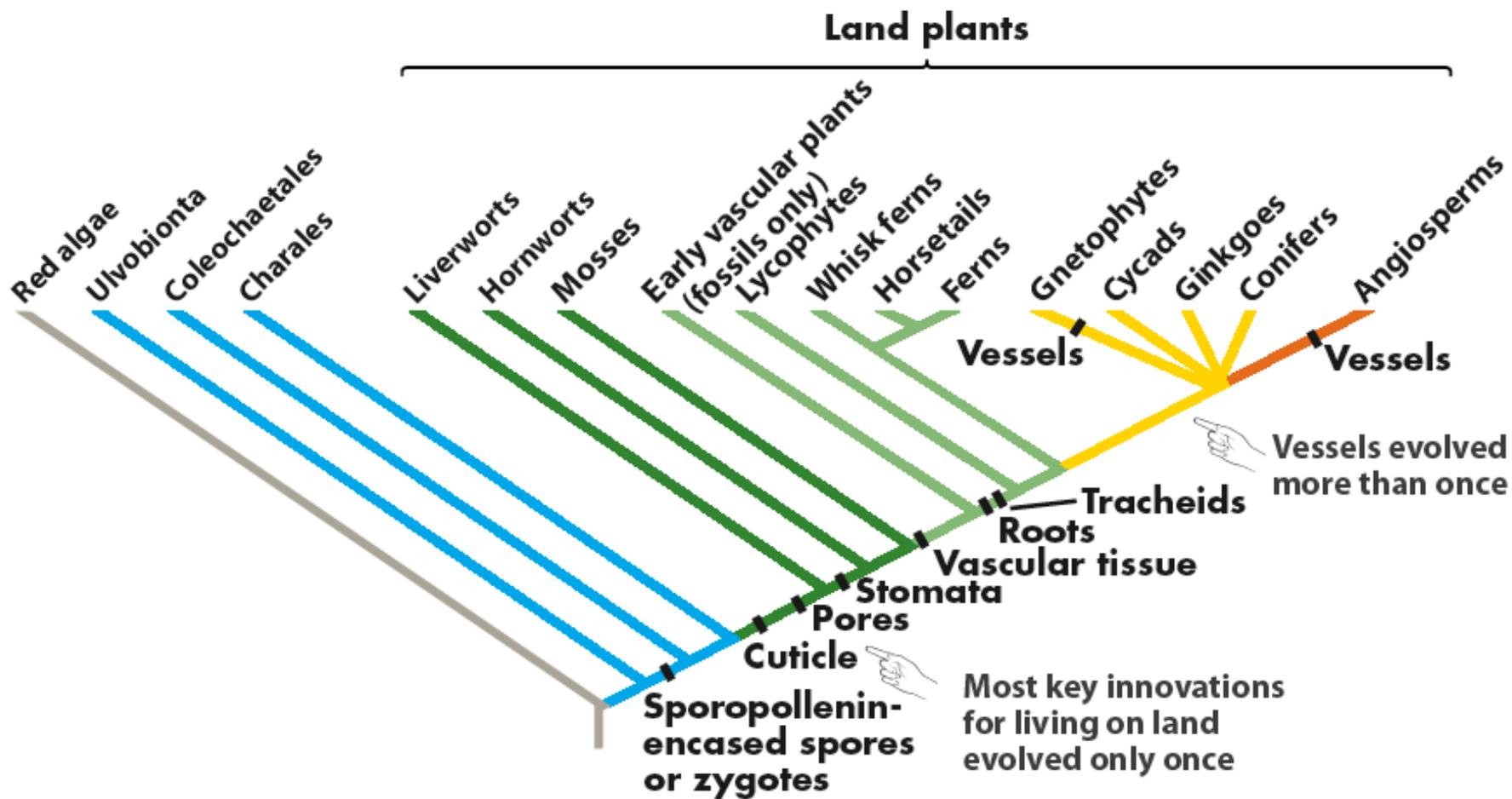
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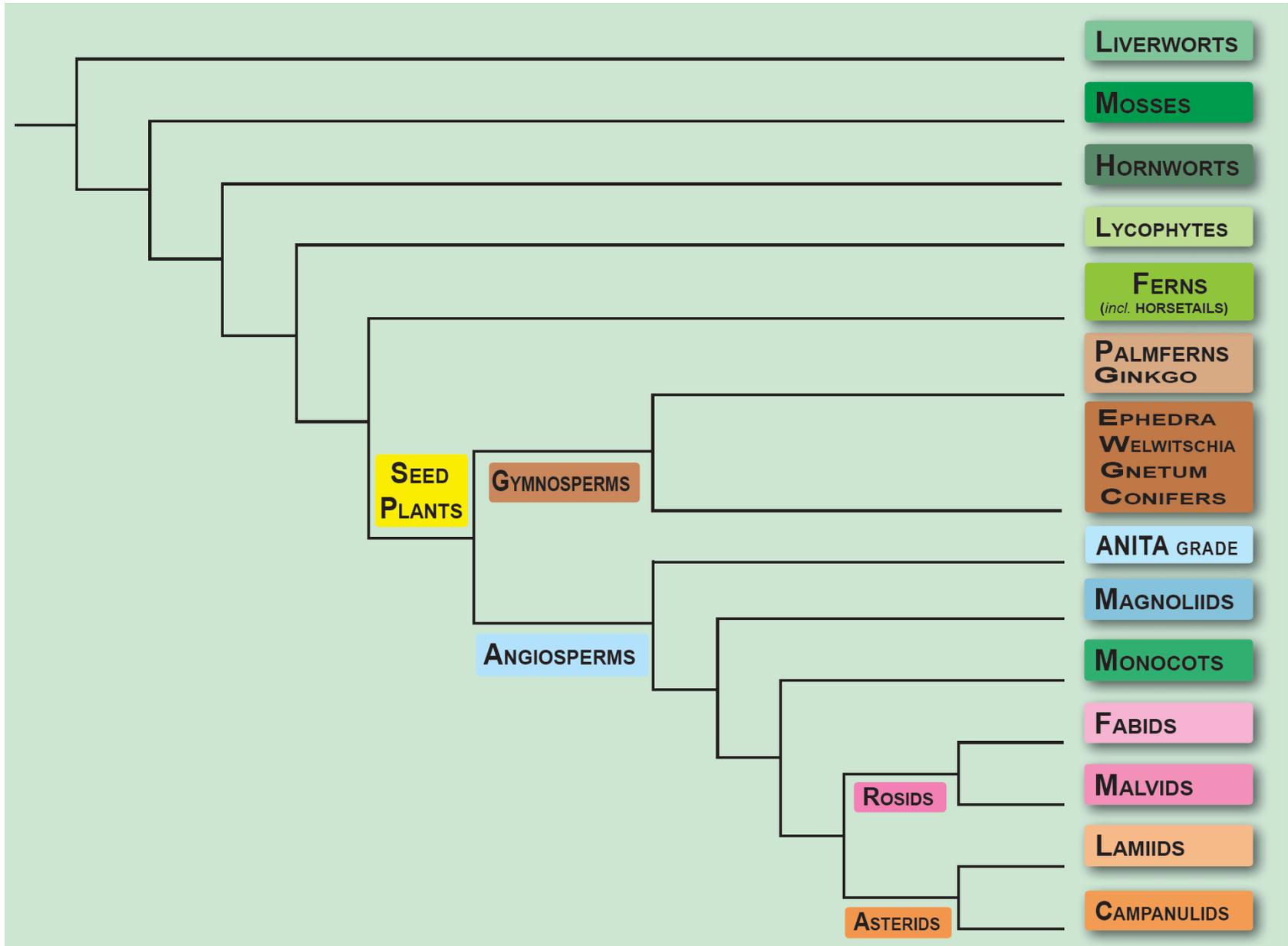


B Four butterflies (top row),
connected to their parents (bottom row)

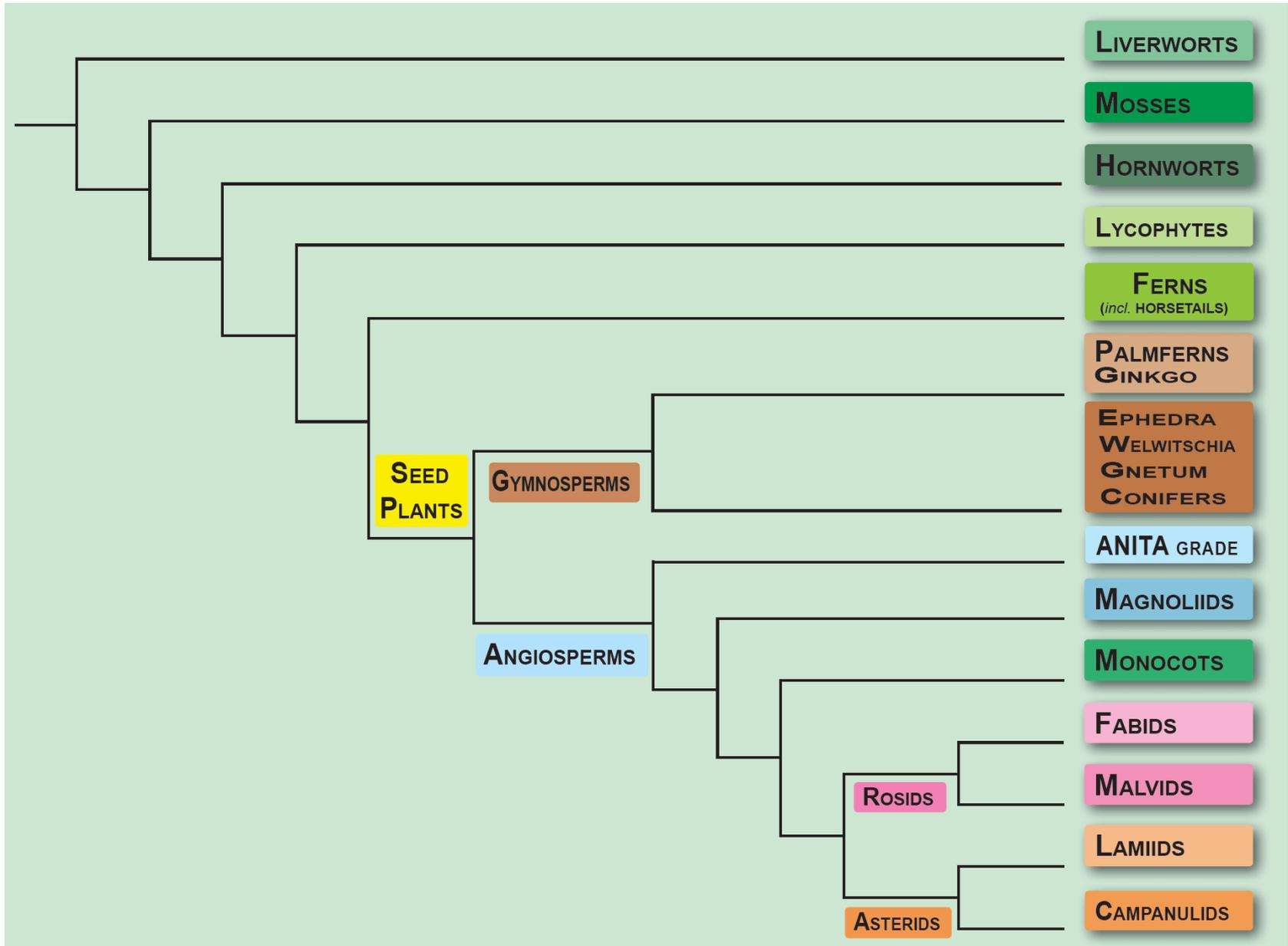




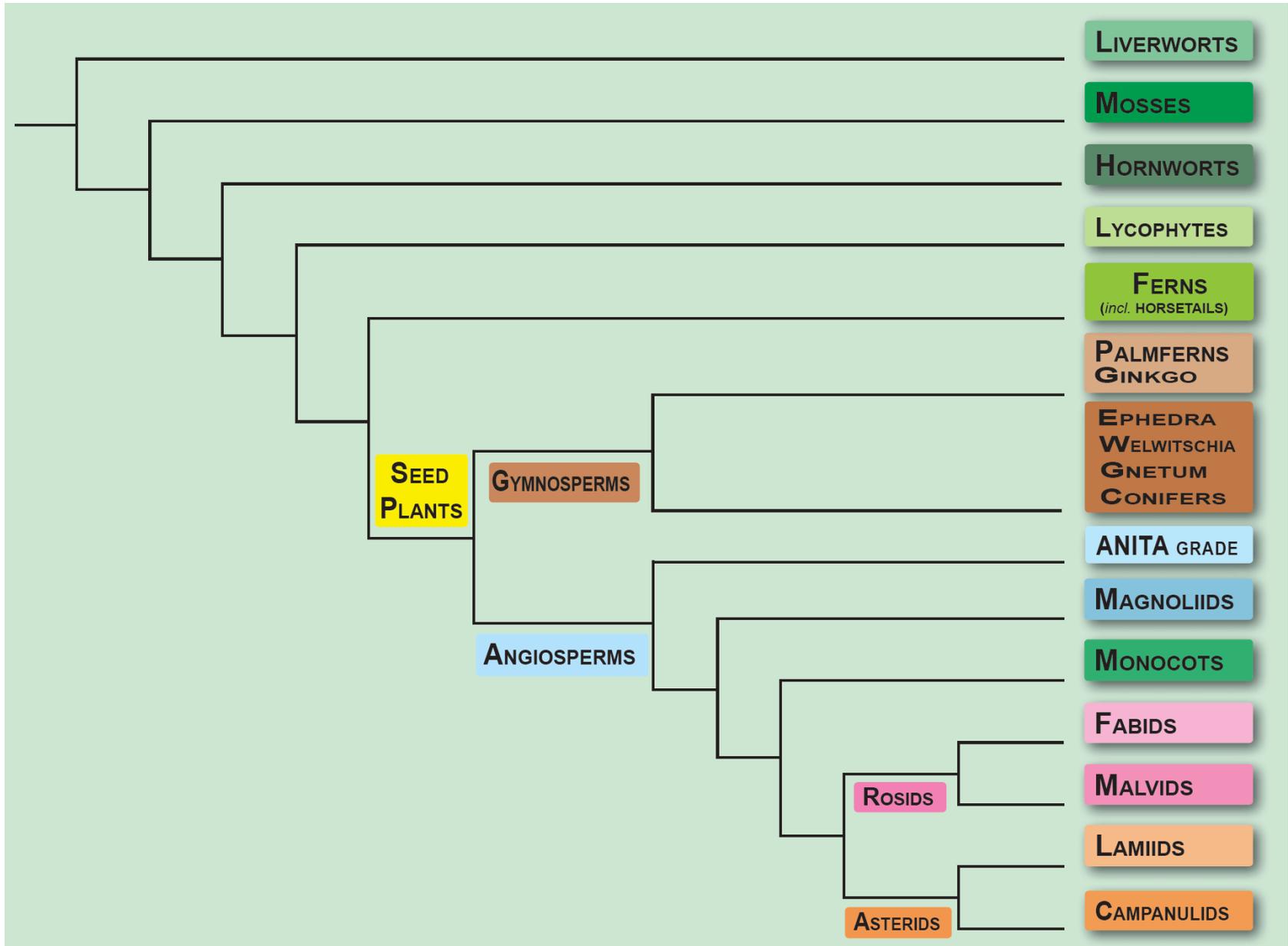
Are the fabids or the lamiids more closely related to the malvids?

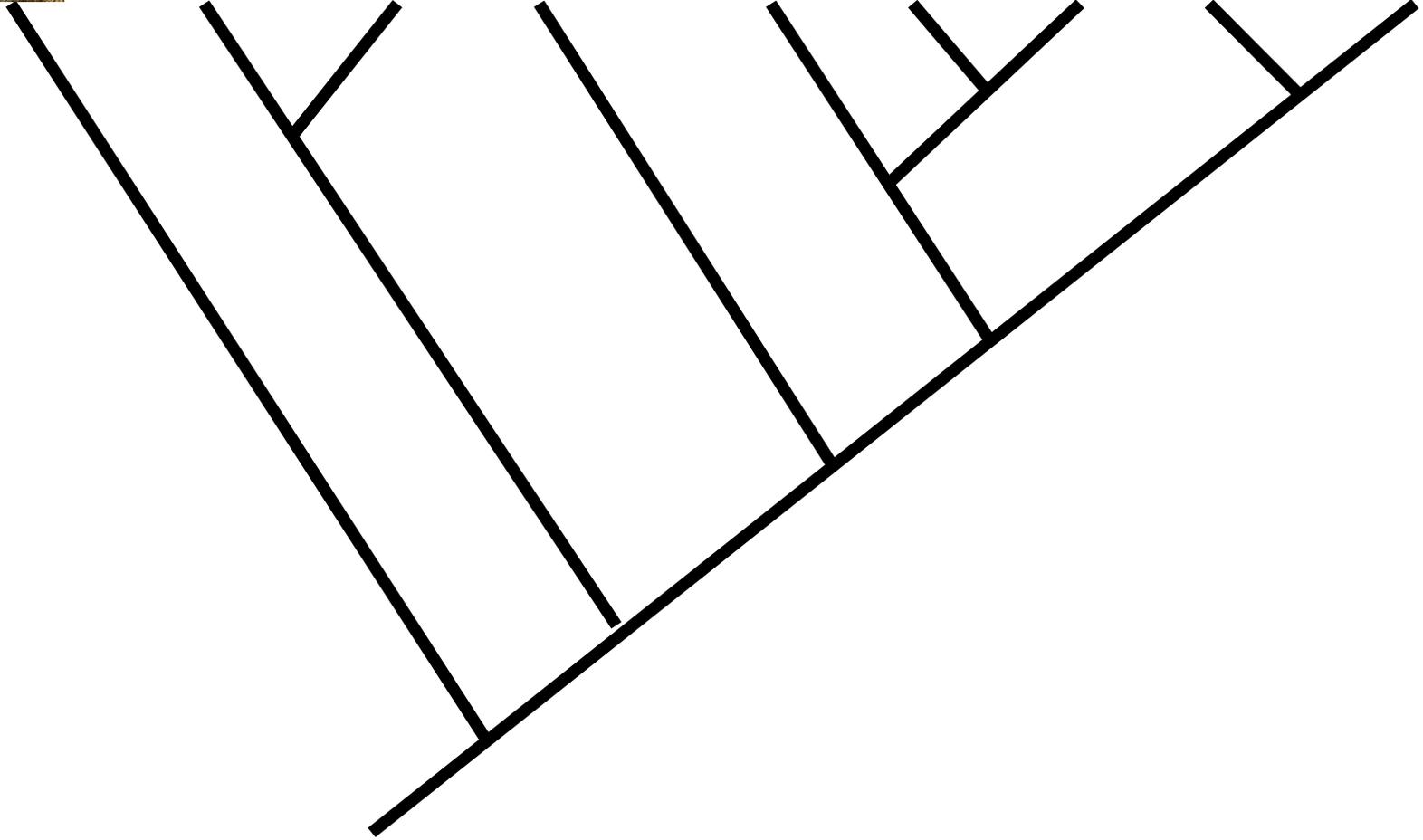


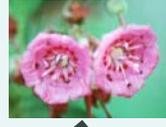
Are ferns more closely related to lycophytes or to the seed plants?



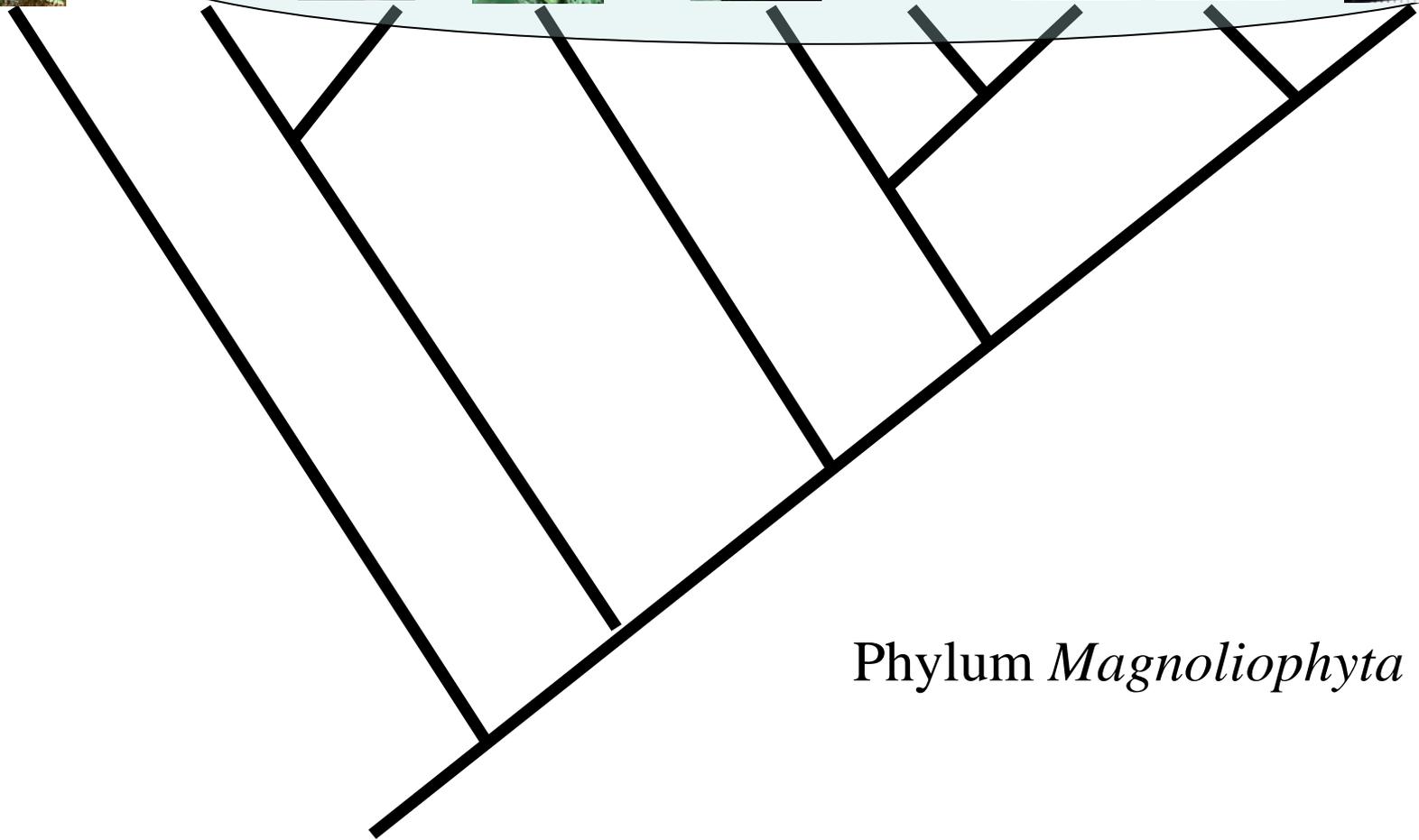
Are monocots angiosperms?



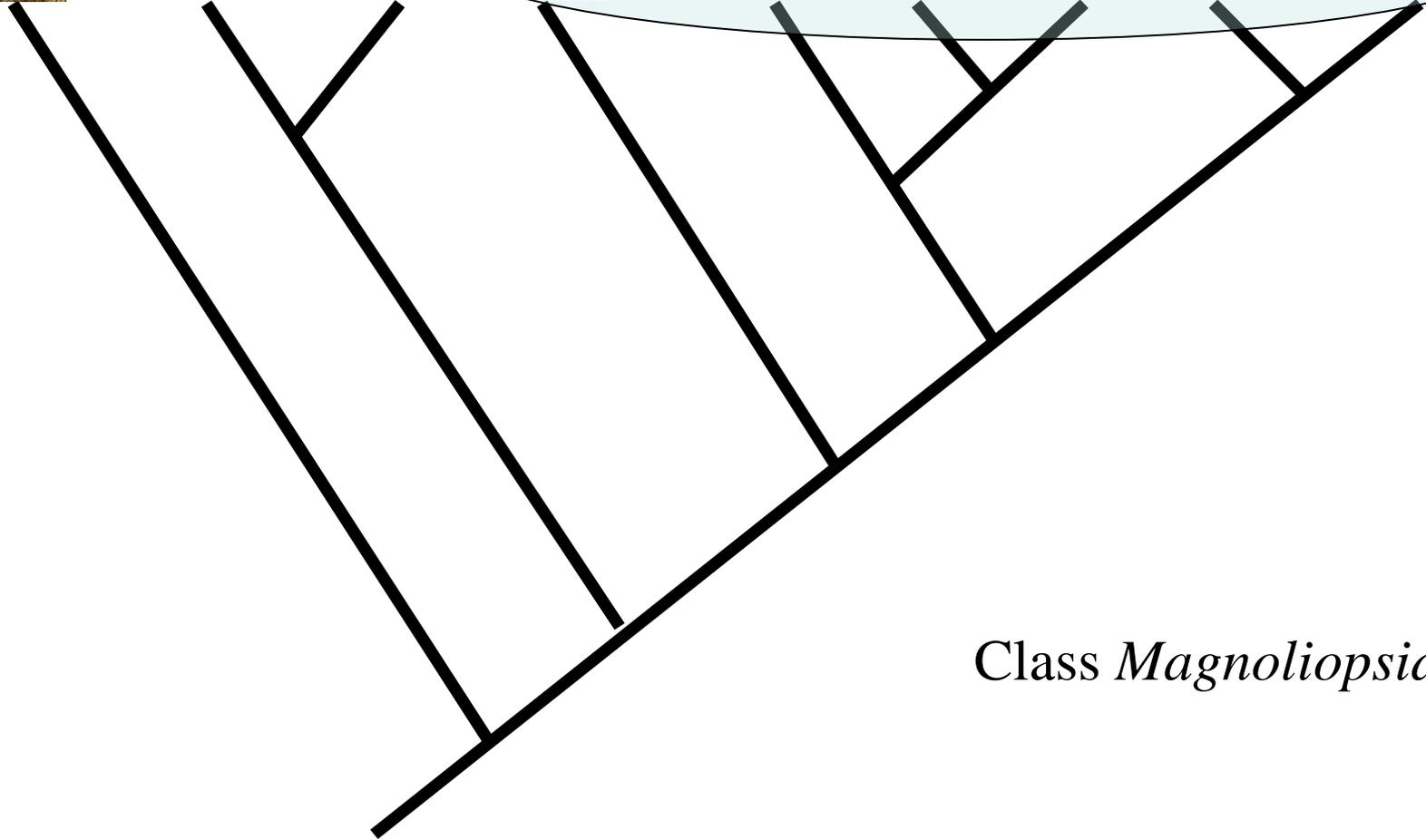
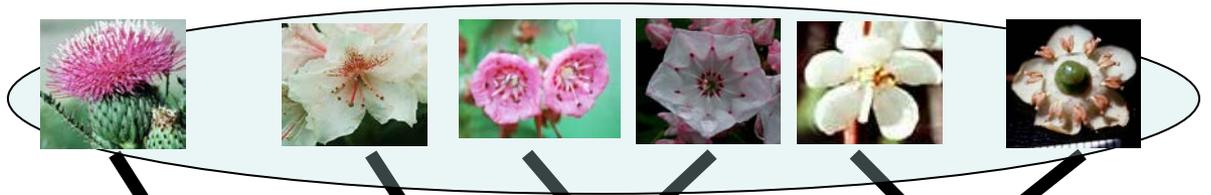




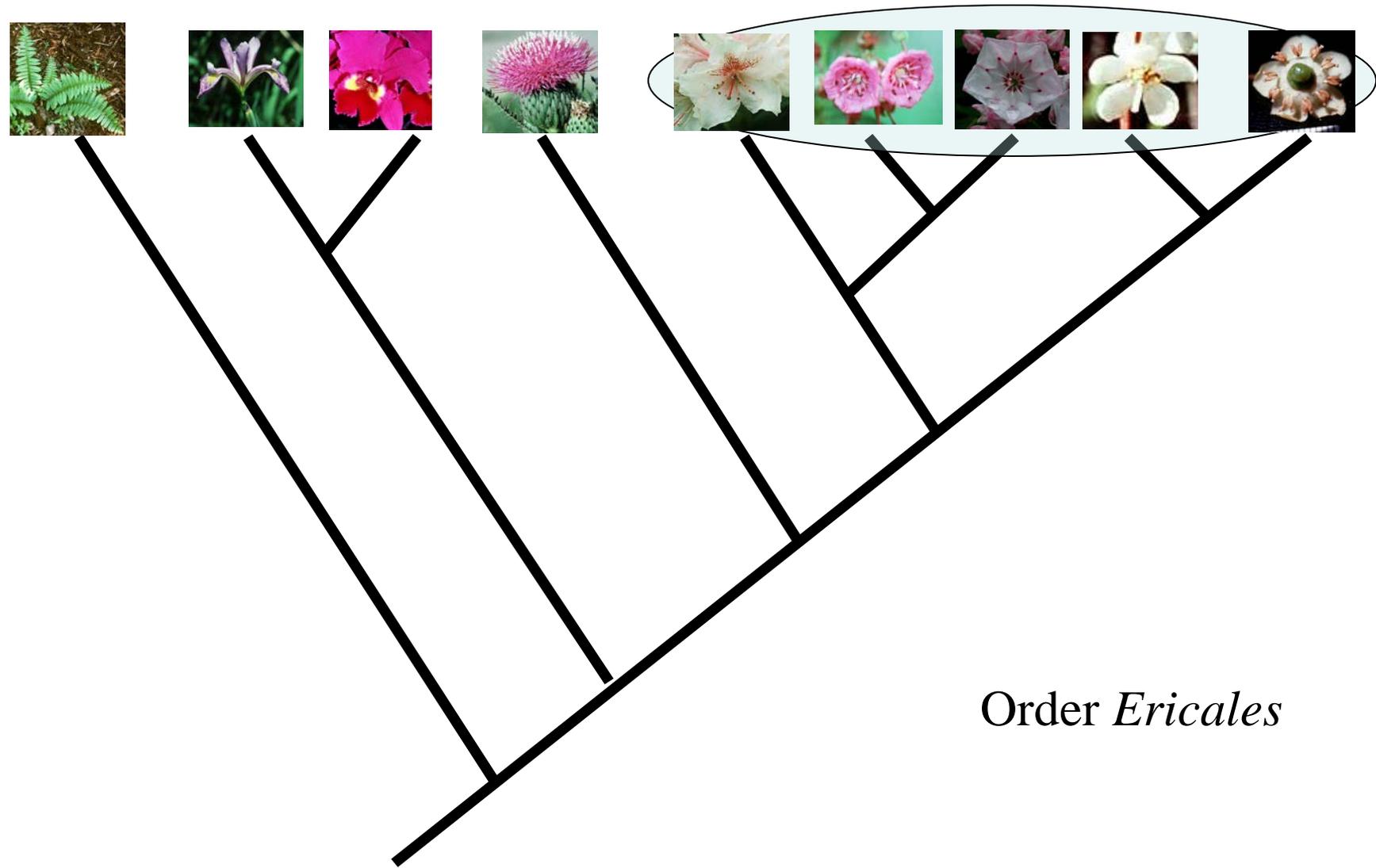
Kingdom *Plantae*



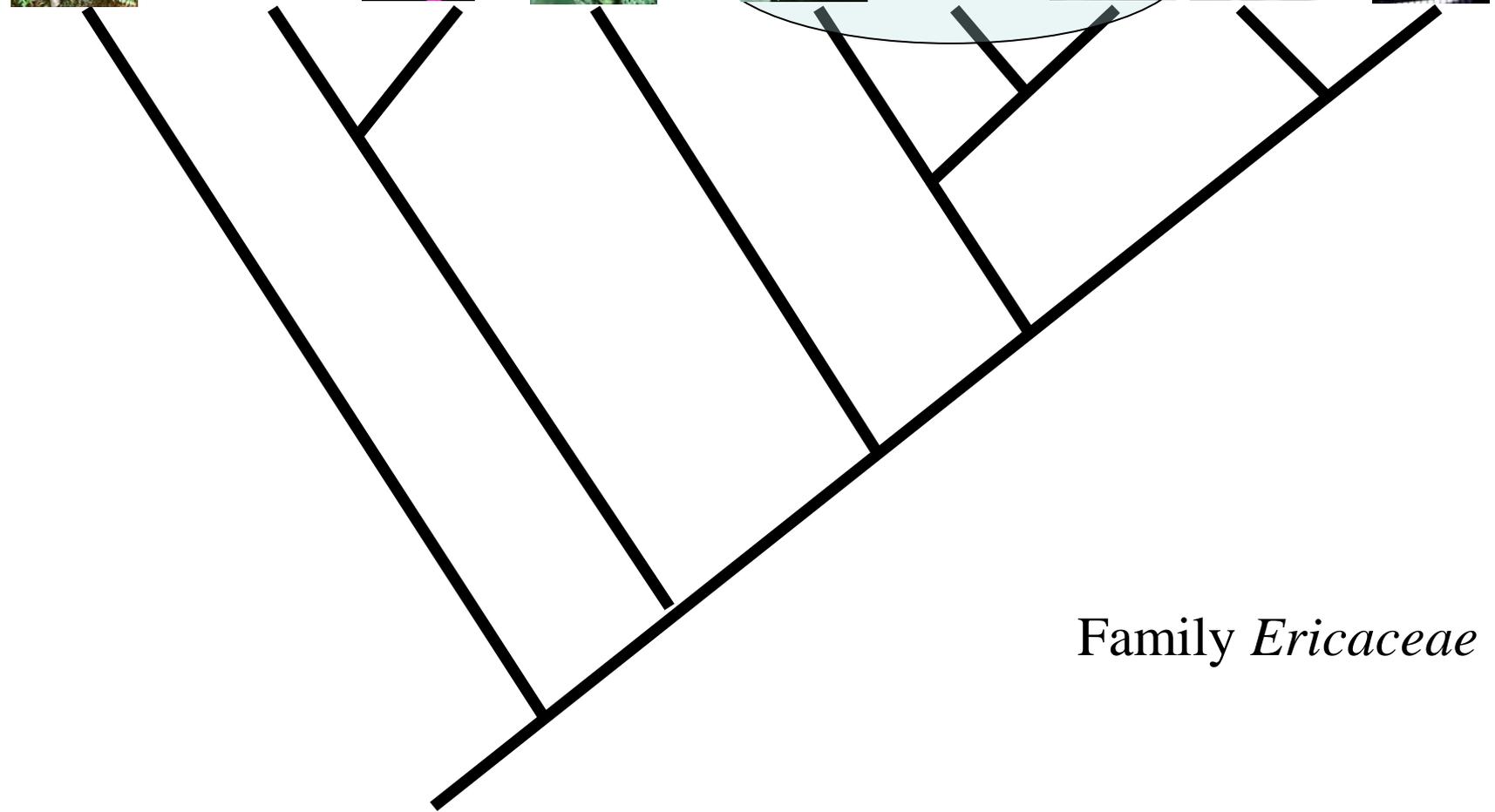
Phylum *Magnoliophyta*



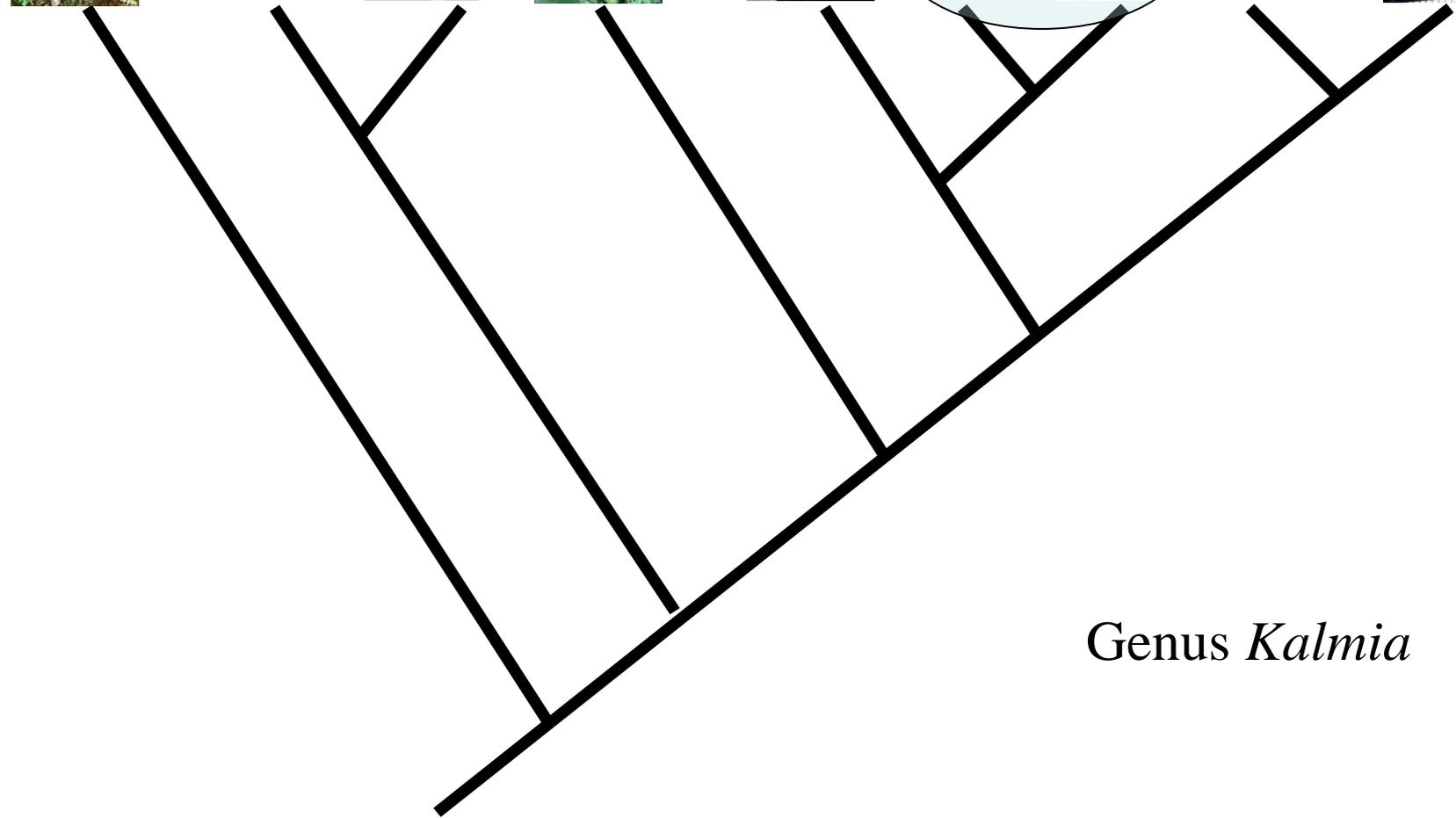
Class *Magnoliopsida*



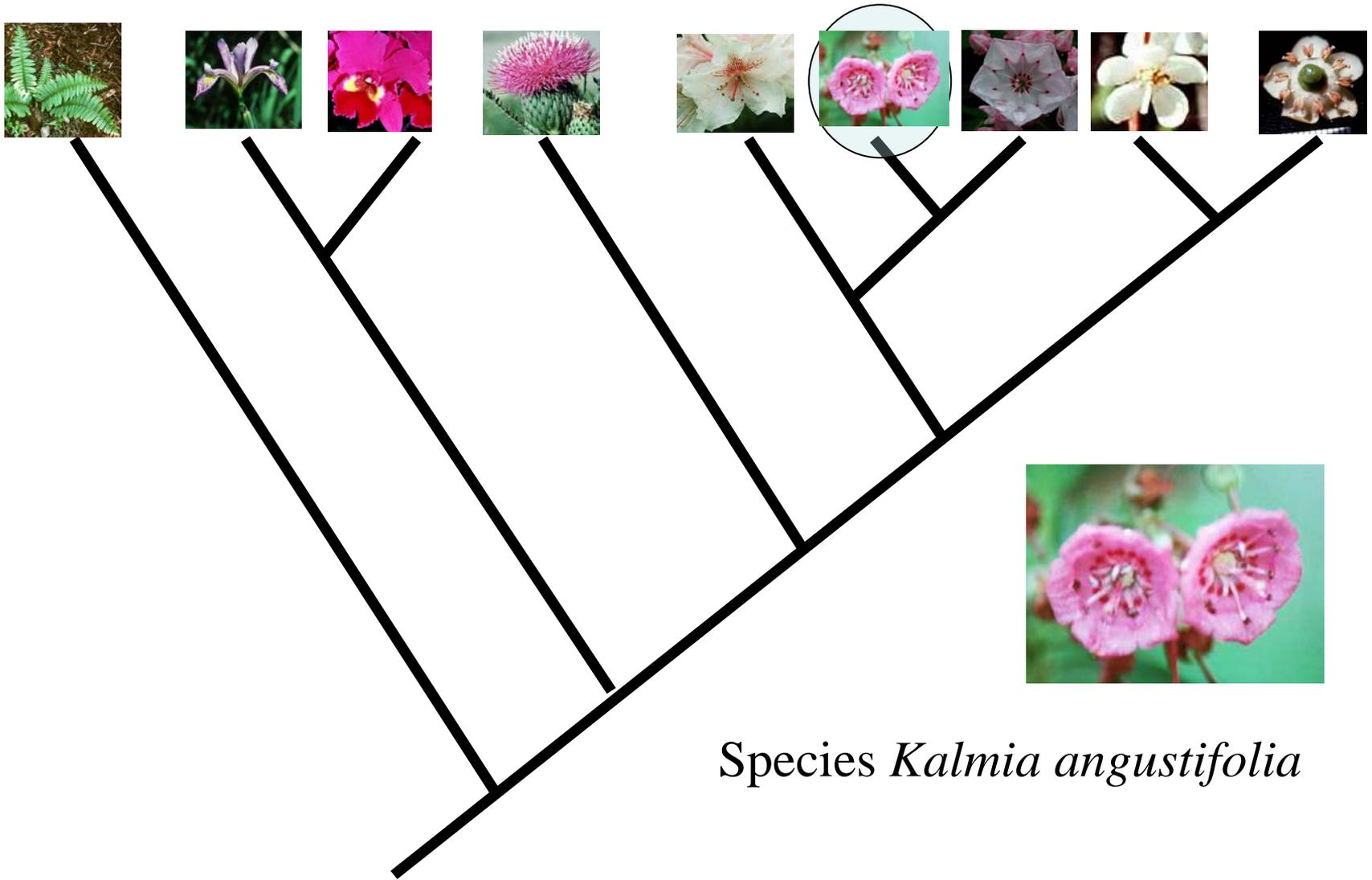
Order *Ericales*



Family *Ericaceae*



Genus *Kalmia*



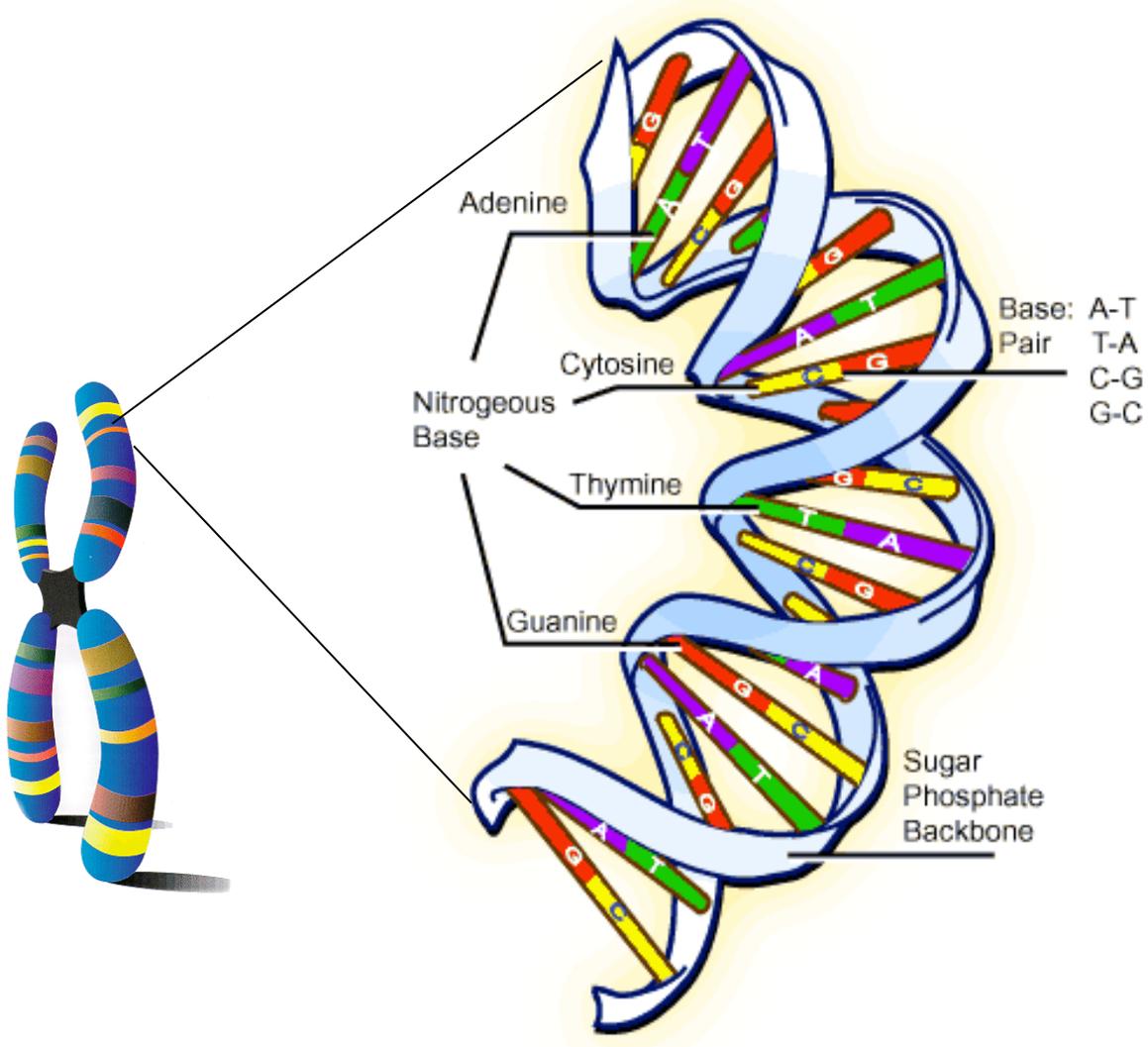
Species *Kalmia angustifolia*

Taxonomic groupings can reflect evolutionary history.

Kingdom	<i>Plantae</i>
Phylum	<i>Magnoliophyta</i>
Class	<i>Magnoliopsida</i>
Order	<i>Ericales</i>
Family	<i>Ericaceae</i>
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Species	<i>K. angustifolia</i>

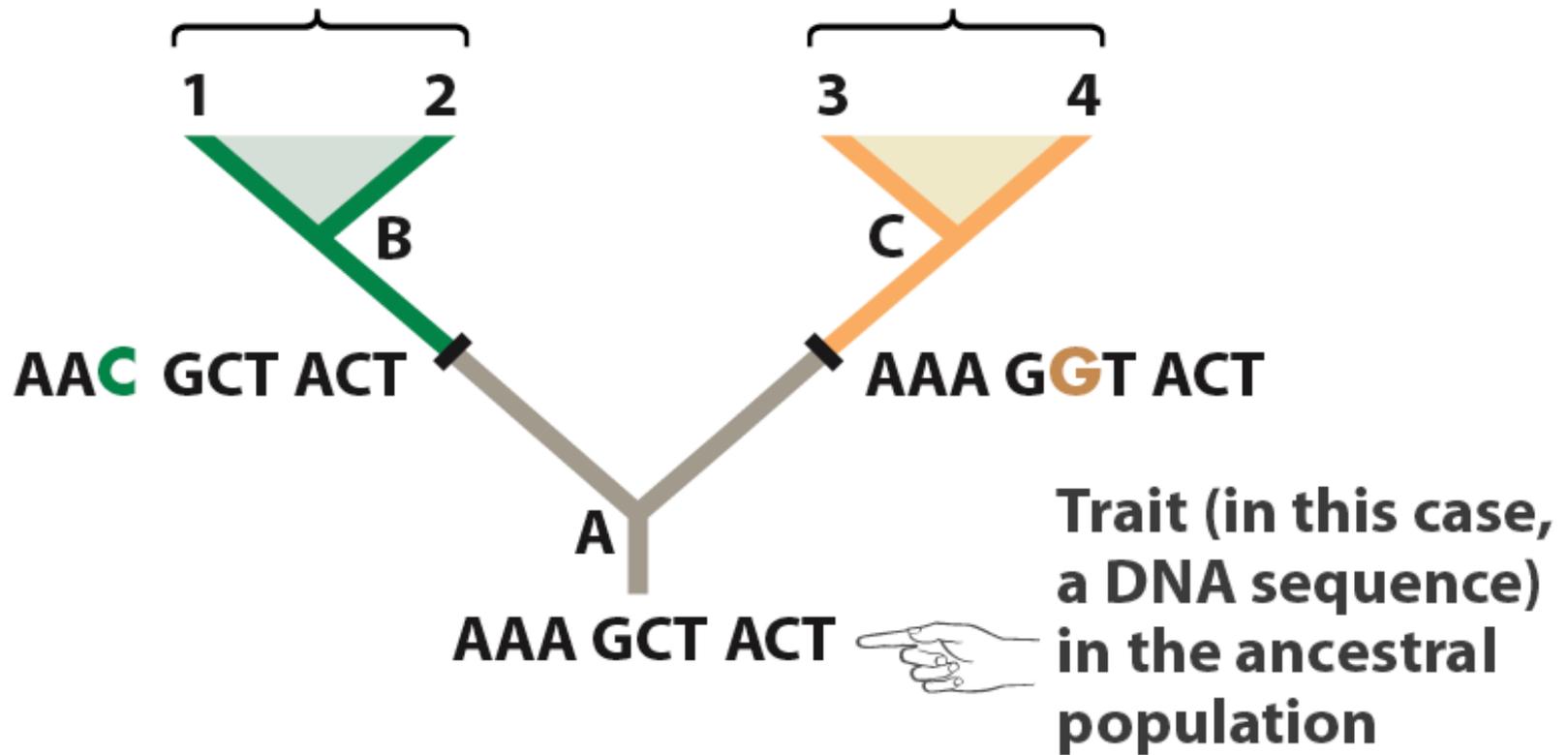


Advances in DNA technology in the 1990s introduced the use of DNA sequences in determining evolutionary relationships.



This is a monophyletic group that shares a derived trait (the "C" in the third position)

This is a monophyletic group that shares a derived trait (the "G" in the fifth position)



DNA evidence has changed our understanding of plant classification

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



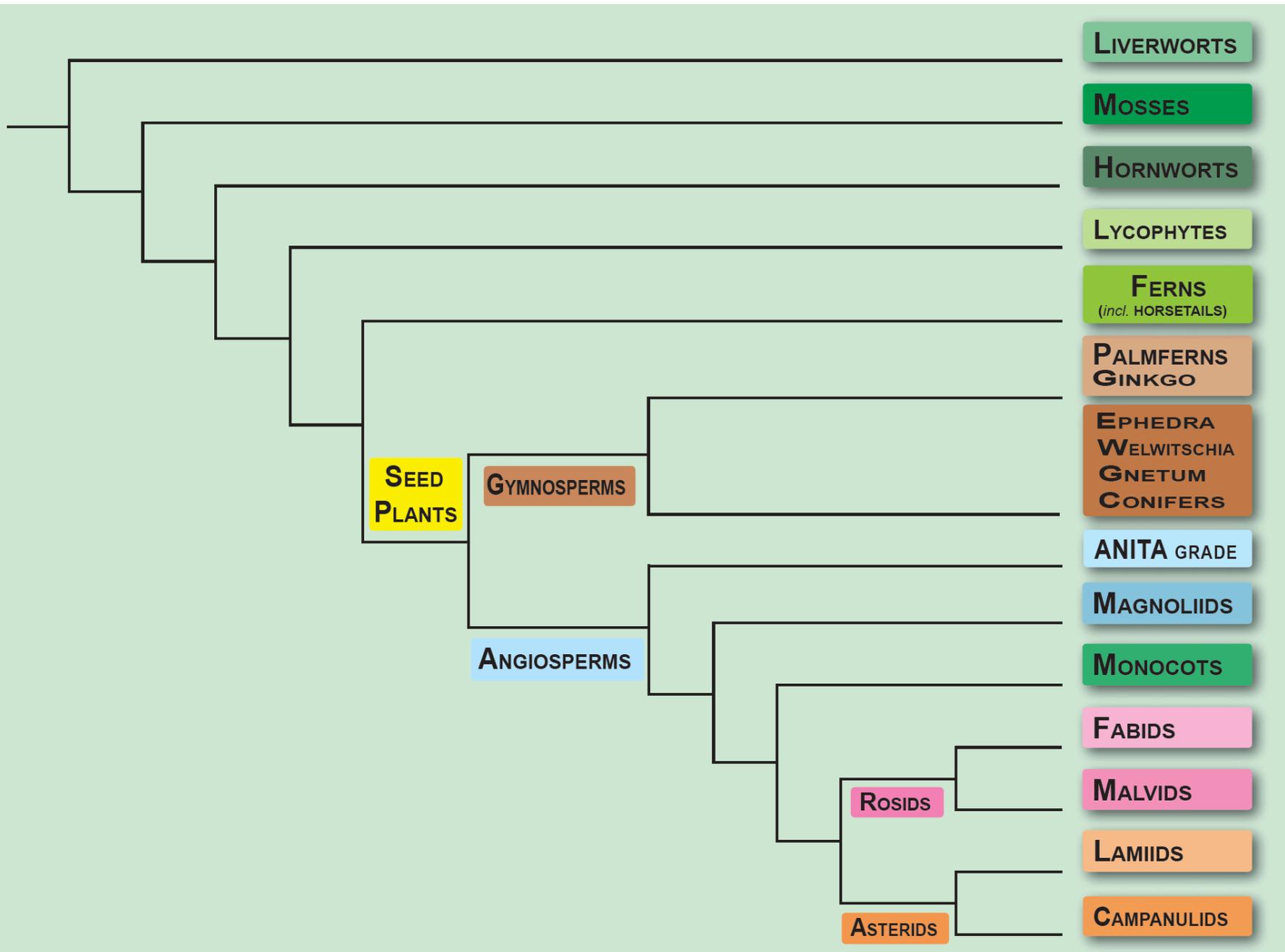
Vascular bundles usually arranged in ring



Taproot usually present



Floral parts usually in multiples of four or five



DNA evidence has revealed new information about hard-to-classify species



Hesperocallis undulata
Hesperocallidaceae
© G. D. Carr

Hesperocallis undulata

DNA evidence has revealed new information about hard-to-classify species



Hesperocallis undulata



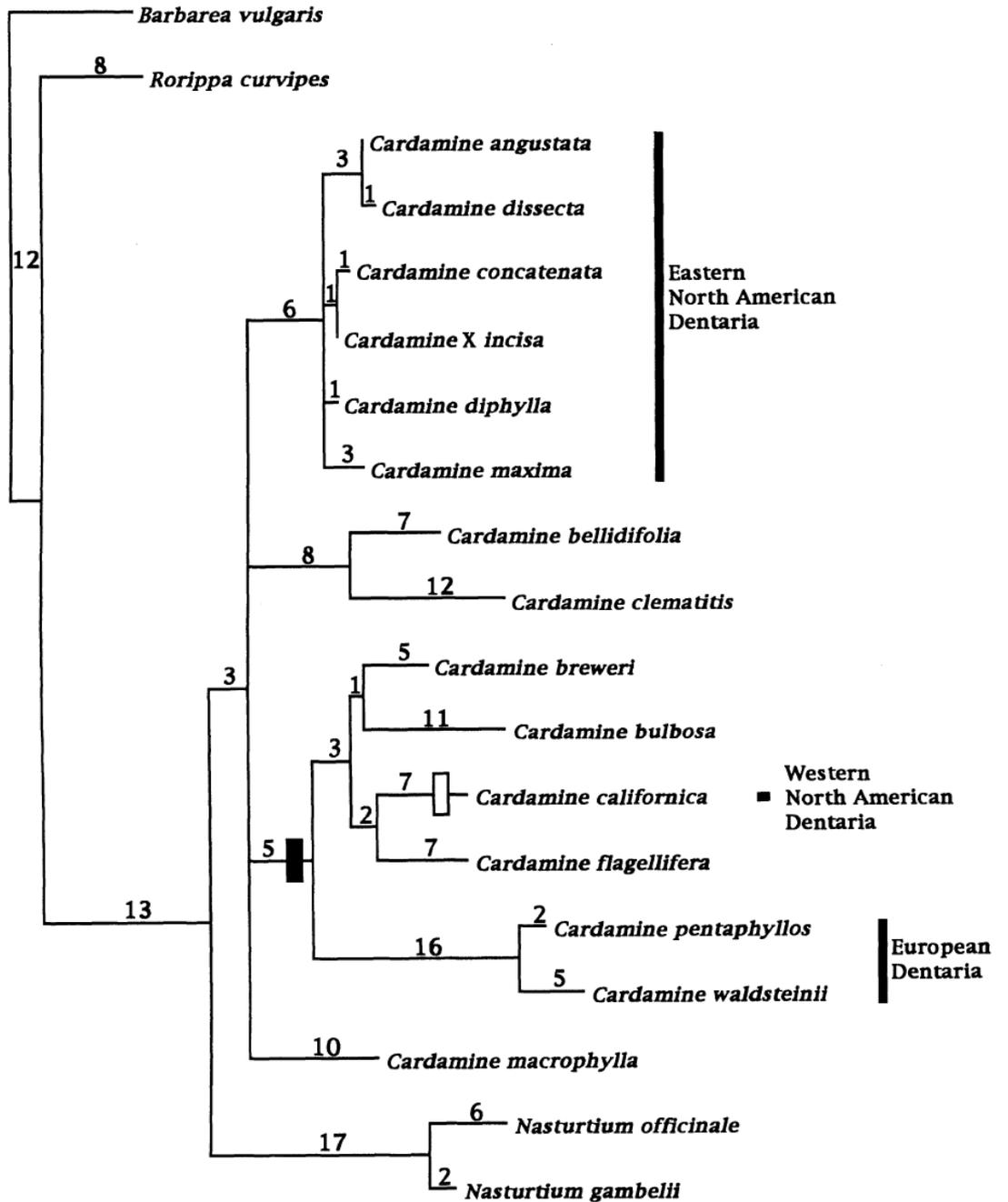
Agavaceae

New evidence means new classification



© 2001 Eleanor Saulys

Cardamine diphylla



Mohavea A. Gray



Mohavea breviflora
Coville



Mohavea confertiflora (A.
DC.) A. Heller



Asa Gray (1810-
1888)



Frederick Coville
(1867-1937)



Alphonse Louis Pierre
Pyrame de Candolle
(1806-1893)



Arthur Heller (1867-
1944)

Lecythis
pneumatophora S.A.
Mori

collected in French
Guiana in 1977

Described as a new
species in 1987





Systematic Botany (2015), 40(2): pp. 407–412
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Date of publication August 10, 2015



A New Species of *Psilochilus* (Orchidaceae) from Panama

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ulica Wita Stwosza 59, 80-308 Gdańsk, Poland.
(martakolanowska@wp.pl)

Communicating Editor: Ricarda Riina

Abstract—A new species of *Psilochilus*, *Psilochilus panamensis* is described and illustrated. The novelty is related to *P. physurifolius* but it may be easily distinguished from this species by the lip form – prominent, ovate to elliptic lip middle lobe, and lateral lobes extending to the middle part of the middle lobe.

Keywords—Biodiversity, Neotropics, taxonomy, Triphoreae.

TAXONOMIC TREATMENT

Psilochilus panamensis Kolan. sp. nov.—TYPE: PANAMA.

Veraguas: 6.4 km outside of Santa Fé on the road that passes the agriculture school. Headed toward the cordillera, 5 May 1977, *Folsom 2954* (holotype: MO-3608752!; isotypes: MO-2608327!).

The new species is similar to *Psilochilus physurifolius* (Rchb.f.) Løjtnant from which it differs in the shorter lip claw and larger, ovate to elliptic lip middle lobe.

Terrestrial herbs up to 35–45 cm tall. Leaves 4–5, distributed in the upper half of the stem, blade 5.5–7 cm × 2.5–4 cm, ovate to elliptic, obtuse to subacute, occasionally with silver stripes; petiole 0.8–1.5 cm long. Inflorescence up to 4.5 cm long in total, peduncle abbreviated, up to 8 mm long, 4–7-flowered. Flower with green sepals and pale green petals, lip purple, gynostemium white. Floral bracts 9–14 mm long, ovate, subacute. Ovary 12–20 mm long. Dorsal sepal 21–23 × 2.8–3.0 mm, oblong-lanceolate, subacute to acute, 5-veined. Lateral sepals 18–20 mm long, 2.5–4, obliquely linear-oblong-lanceolate acute, 3- or 5-veined. Petals 17.5–18 × 3–3.5 mm, elliptic-lanceolate to oblong-elliptic, obtuse, 3- or 5-veined. Lip 15.5–16 × 5–6 mm, clawed, 3-lobed, disc ornamented with 3 or 5 thickened veins; claw 4.2–4.6 mm long, with two thickenings at the base; middle lobe 6–6.5 × 3–4.5 mm, ovate to elliptic, subacute; lateral lobes up to 8 × 2.3–2.8 mm, obliquely ovate, rounded at the apices, extending to about the middle part of middle lobe. Gynostemium 16–17 mm long, slender, slightly arcuate in the upper part. Figures 2, 3.

Etymology—The name refers to the country where the type specimen was collected.

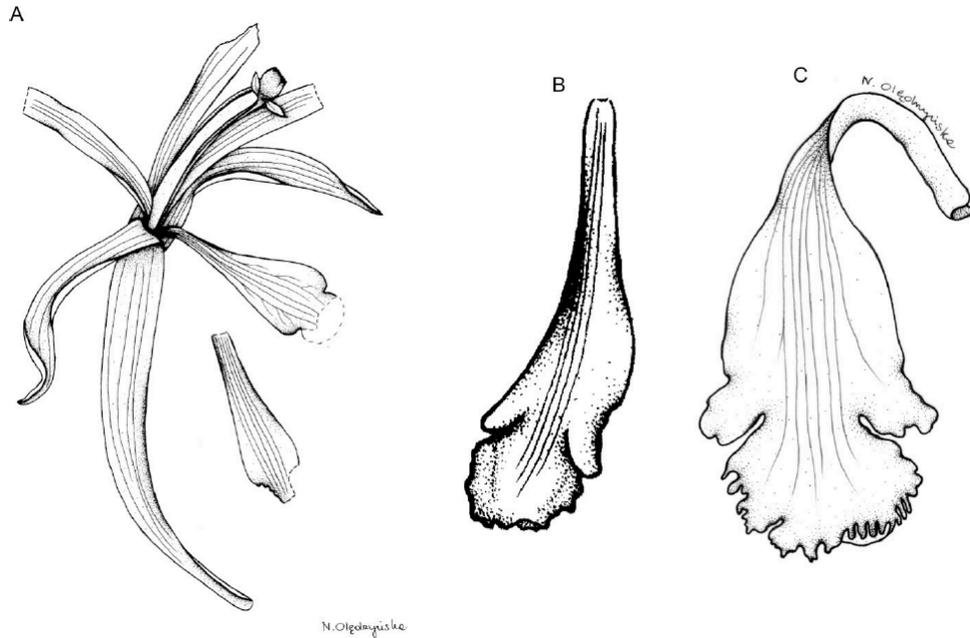


FIG. 1. *Psilochilus physurifolius*. A. Drawing of the flower from the holotype. B. Drawing of the lip presented by Rothacker (2007), redrawn by N. Oledrzyńska. C. Drawing presented by Ames (1922), redrawn by N. Oledrzyńska.

Psilochilus physurifolius

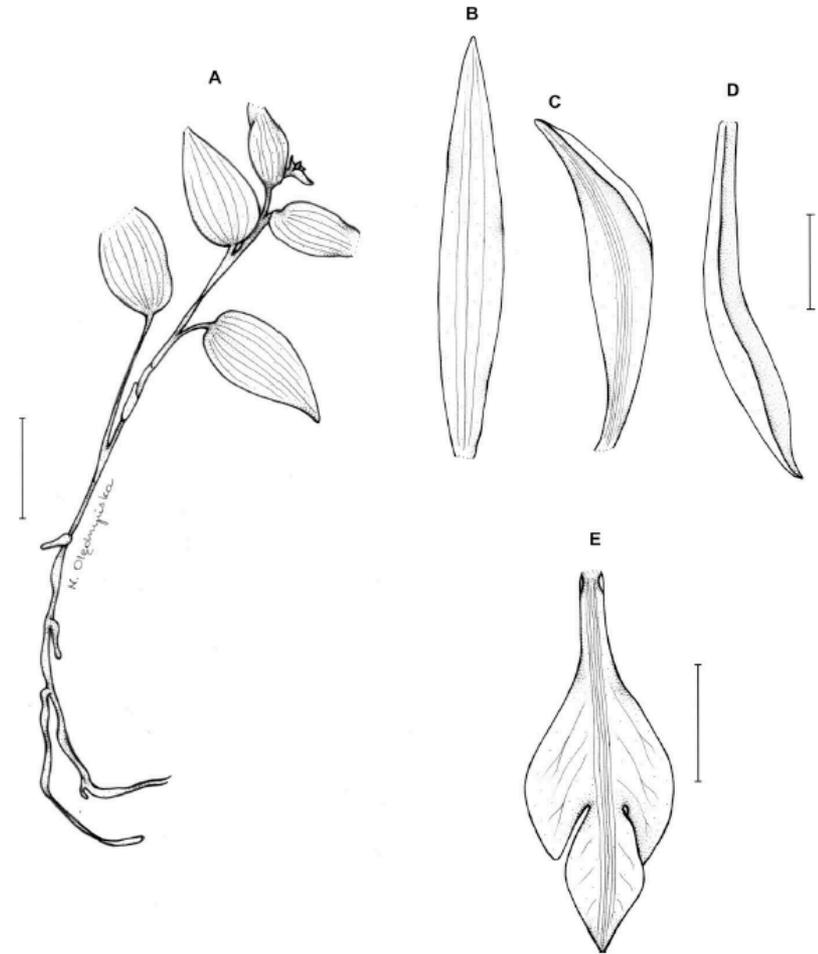


FIG. 2. *Psilochilus panamensis*. A. Habit. Drawn by N. Oledrzyńska from holotype. Scale bar = 5 cm. B. Dorsal sepal. C. Petal. D. Lateral sepal. E. Lip. Scale bars = 5 mm. Drawn by N. Oledrzyńska from isotype.

Psilochilus panamensis

A **subspecies** is a geographically isolated variant within a species.



*Trollius laxus subsp.
albiflorus*

Western subspecies



*Trollius laxus subsp.
laxus*

Eastern subspecies

A **variety** is a grouping within a species; usually not geographically isolated.



Callicarpa americana



Callicarpa americana var. *lactea*

A **cultivar** is a lineage in a species that has been selected for a particular attribute and is distinct, stable and uniform when propagated.

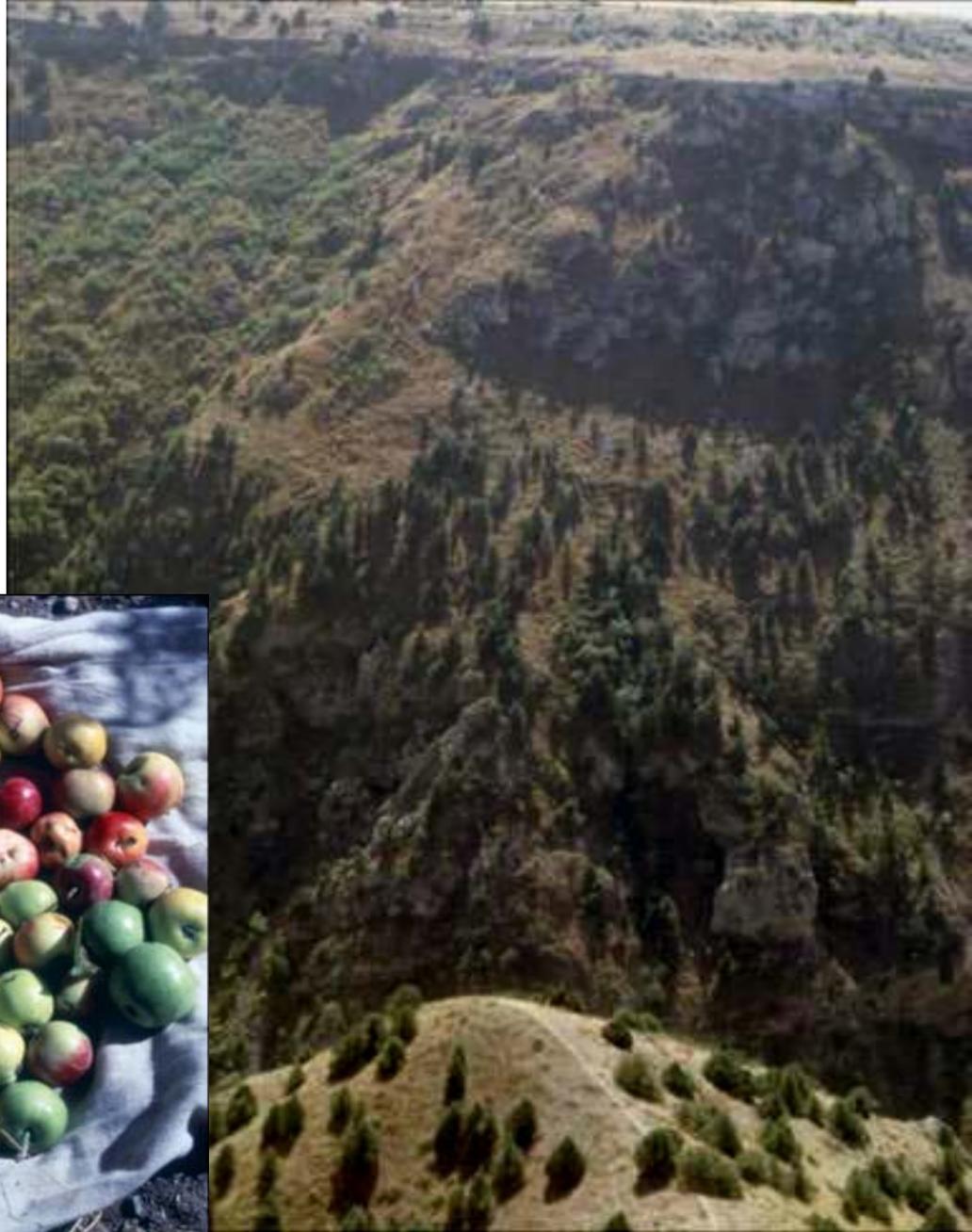


Malus pumila 'Granny Smith'

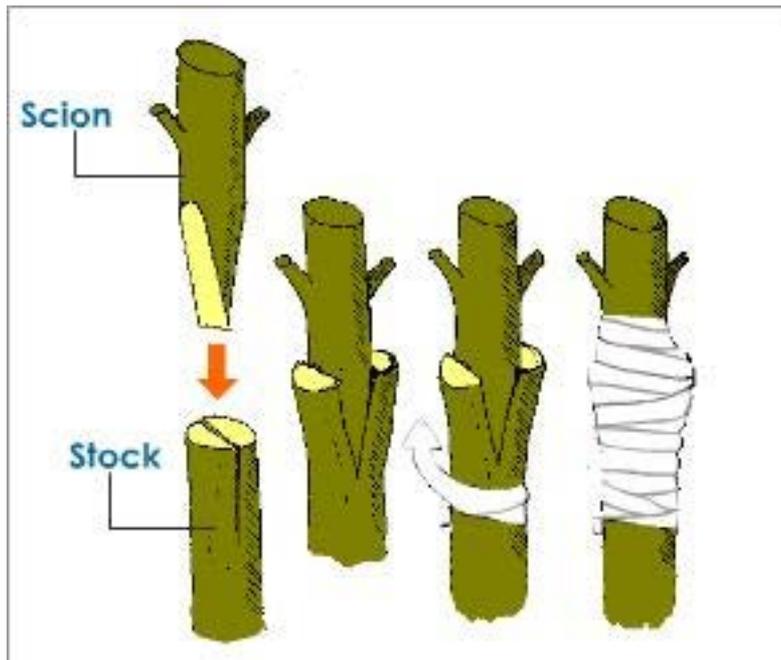
Apple
Malus pumila



Apples from the Caucasus mountains



Grafting propagates a cultivar asexually.



A **hybrid** is a cross between two species that results in a viable new plant.



Grapefruit, *Citrus x paradisi*

Pummelo, *Citrus grandis*



Citrus grandis
Rutaceae
© G. D. Carr

Sweet orange, *Citrus x sinensis*



Mandarin orange, *Citrus reticulata*



Classification

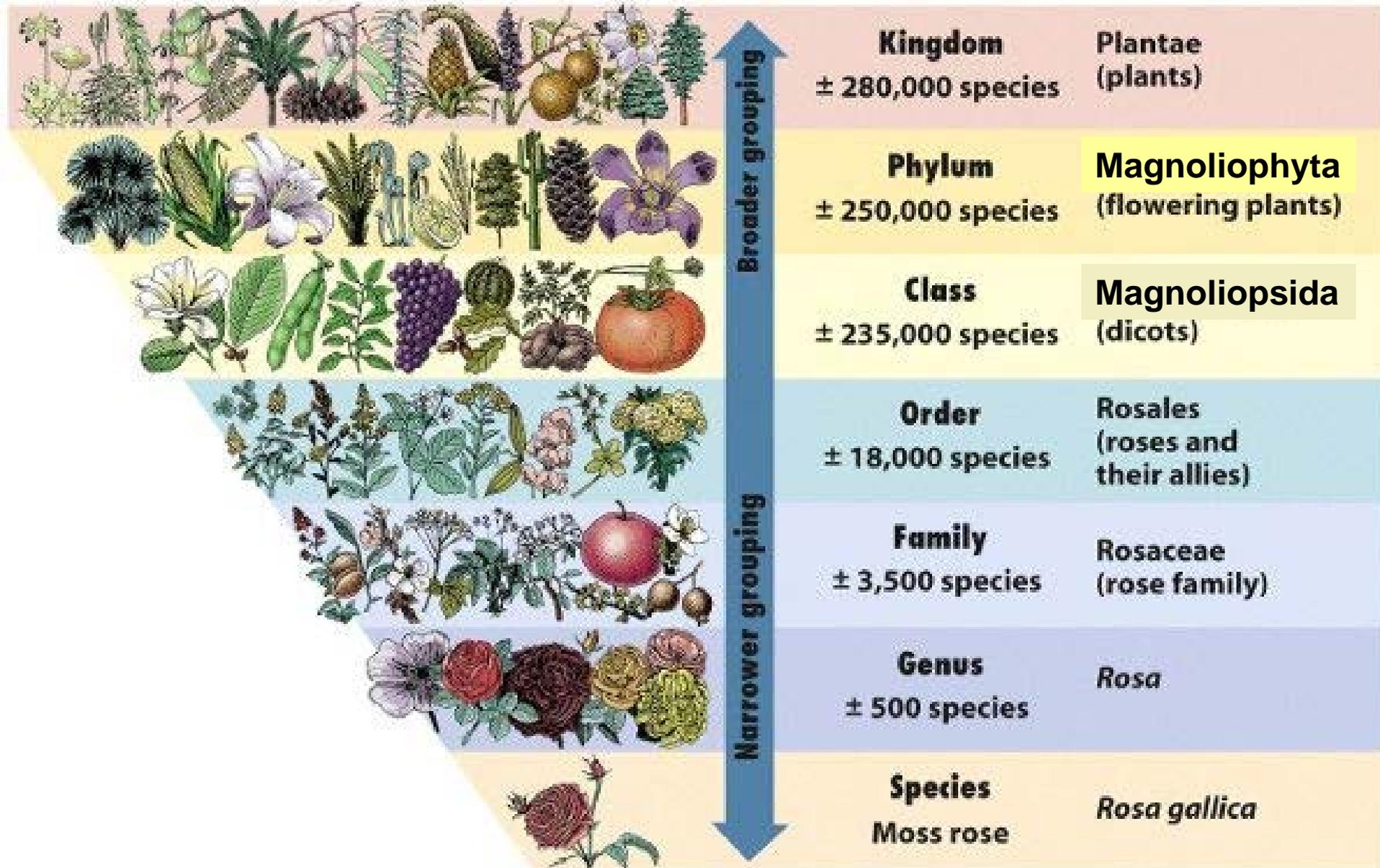


Figure 3.4 Discover Biology 3/e

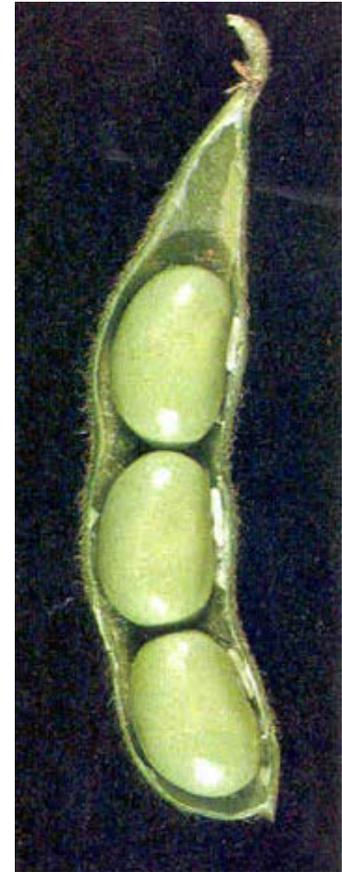
Fabaceae (Leguminosae)



Fabaceae flowers

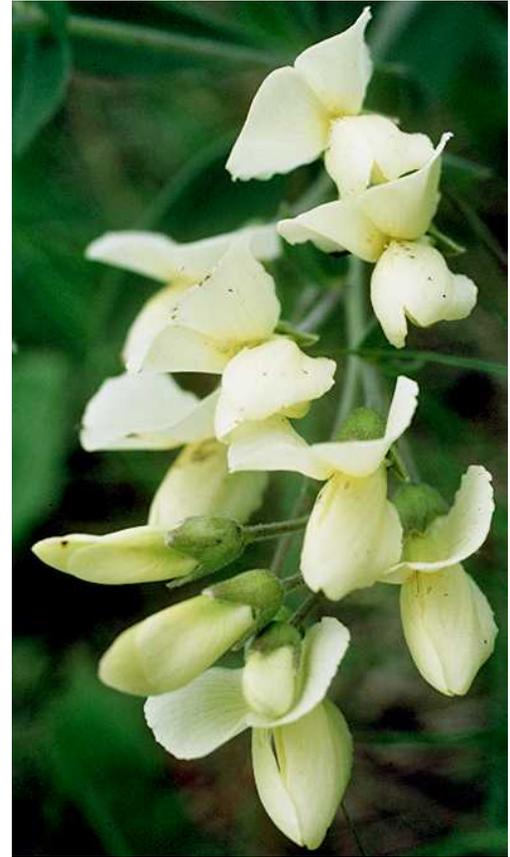


Fabaceae fruits





Cercis



Baptisia



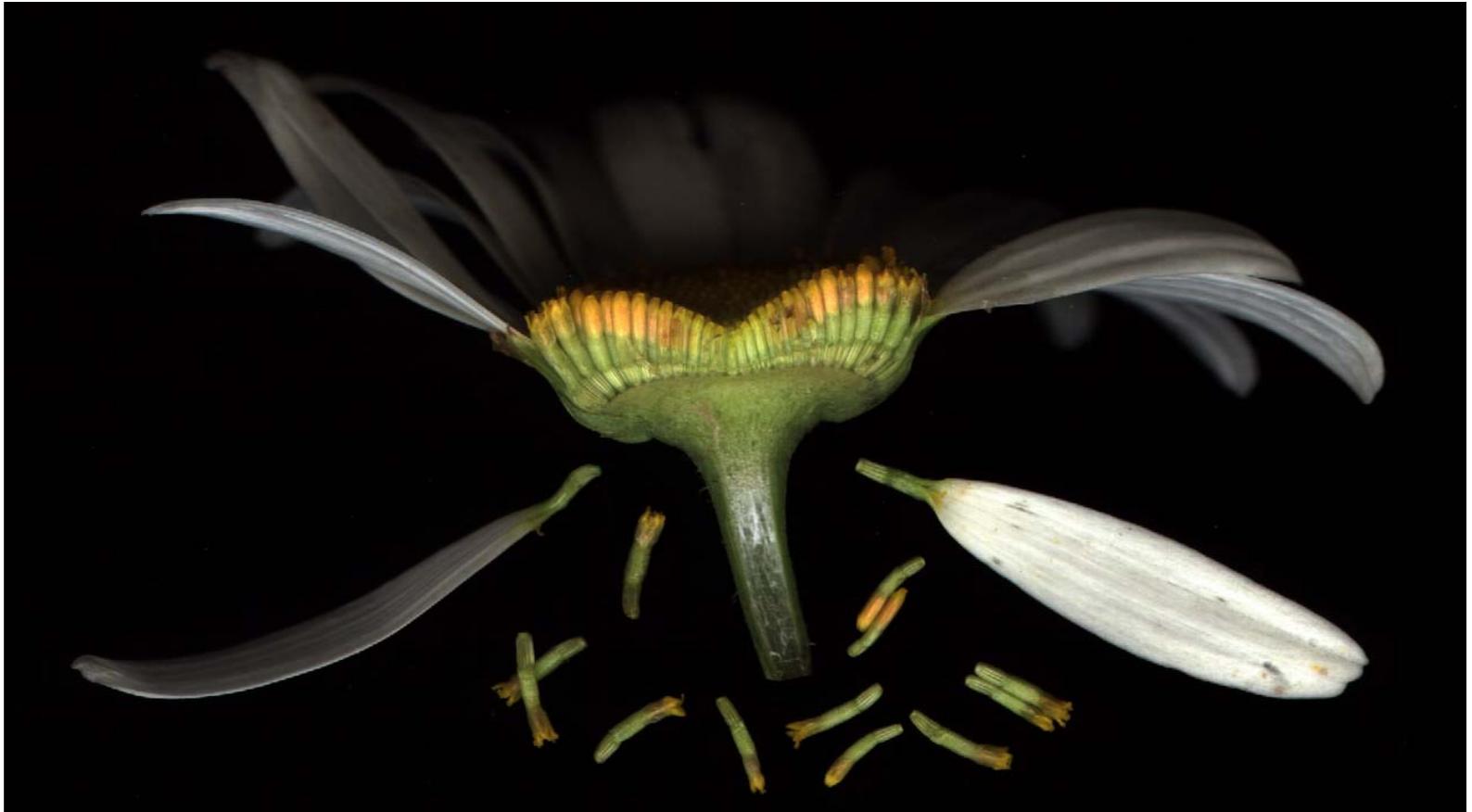
Arachis

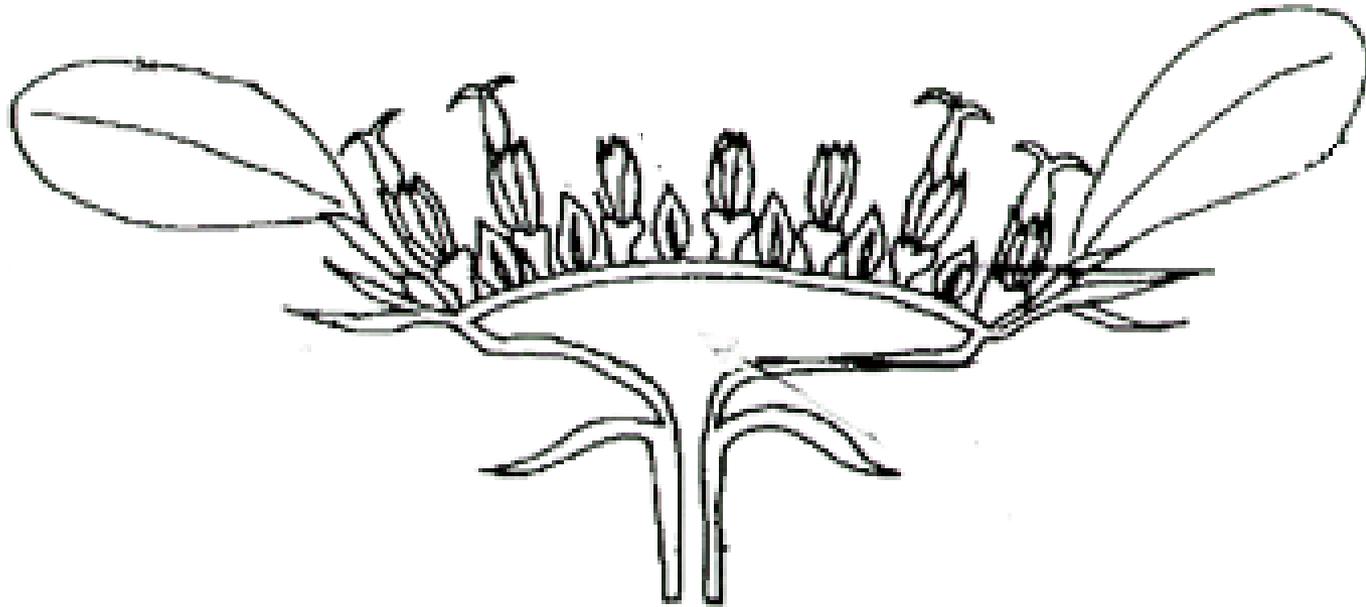
Asteraceae (Compositae)





Asteraceae have heads
with many, small flowers





Capitulum, or head, of Asteraceae



Helianthus annuus
Asteraceae - Heliantheae
© G. D. Carr





Senecio hydrophyloides
Asteraceae
© G. D. Carr



Cichorium intybus
Asteraceae
© G. D. Carr.

Many
species have
a pappus





Achillea



Liatris



Solidago

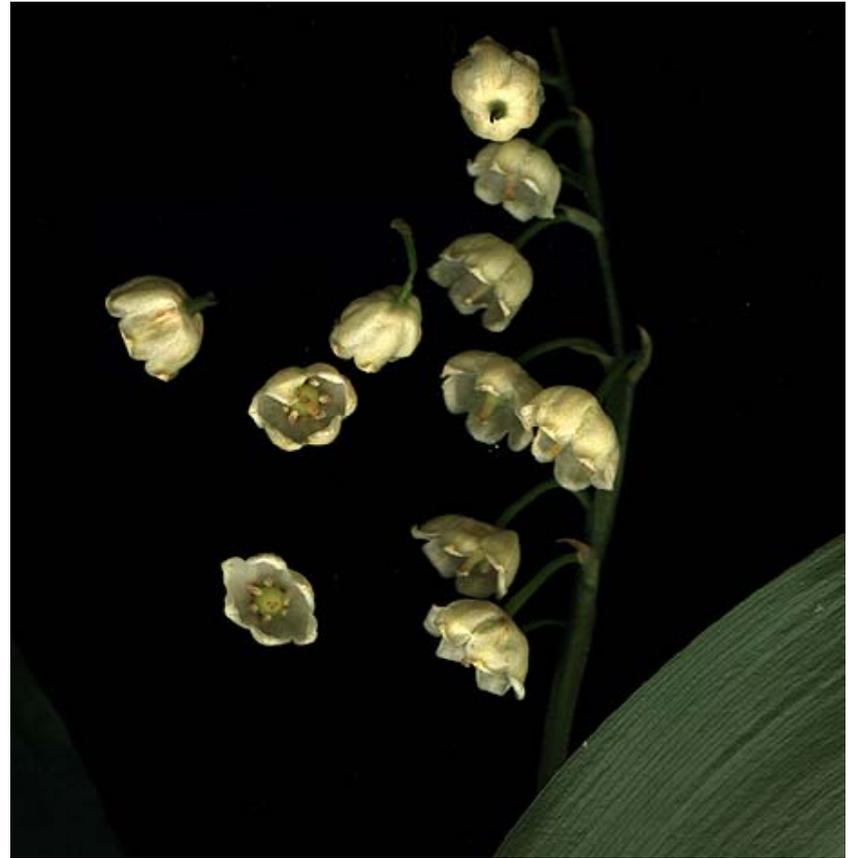


Senecio

Liliaceae



Flower parts in threes



Species in the
Liliaceae often
have bulbs or
rhizomes





Trillium



Hemerocallis



Smilacina



Erythronium

Poaceae (Gramineae)



Agropyron repens



Flowers very small



Agropyron dasystachyum



Fruit a grain



Poaceae species are the defining component of grasslands



Saccharum



Hordeum

Zea mays

