



Welcome to ICBO & BioCreative 2016



August 1-4, 2016, Oregon State University, Corvallis, Oregon USA

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Keynote Address

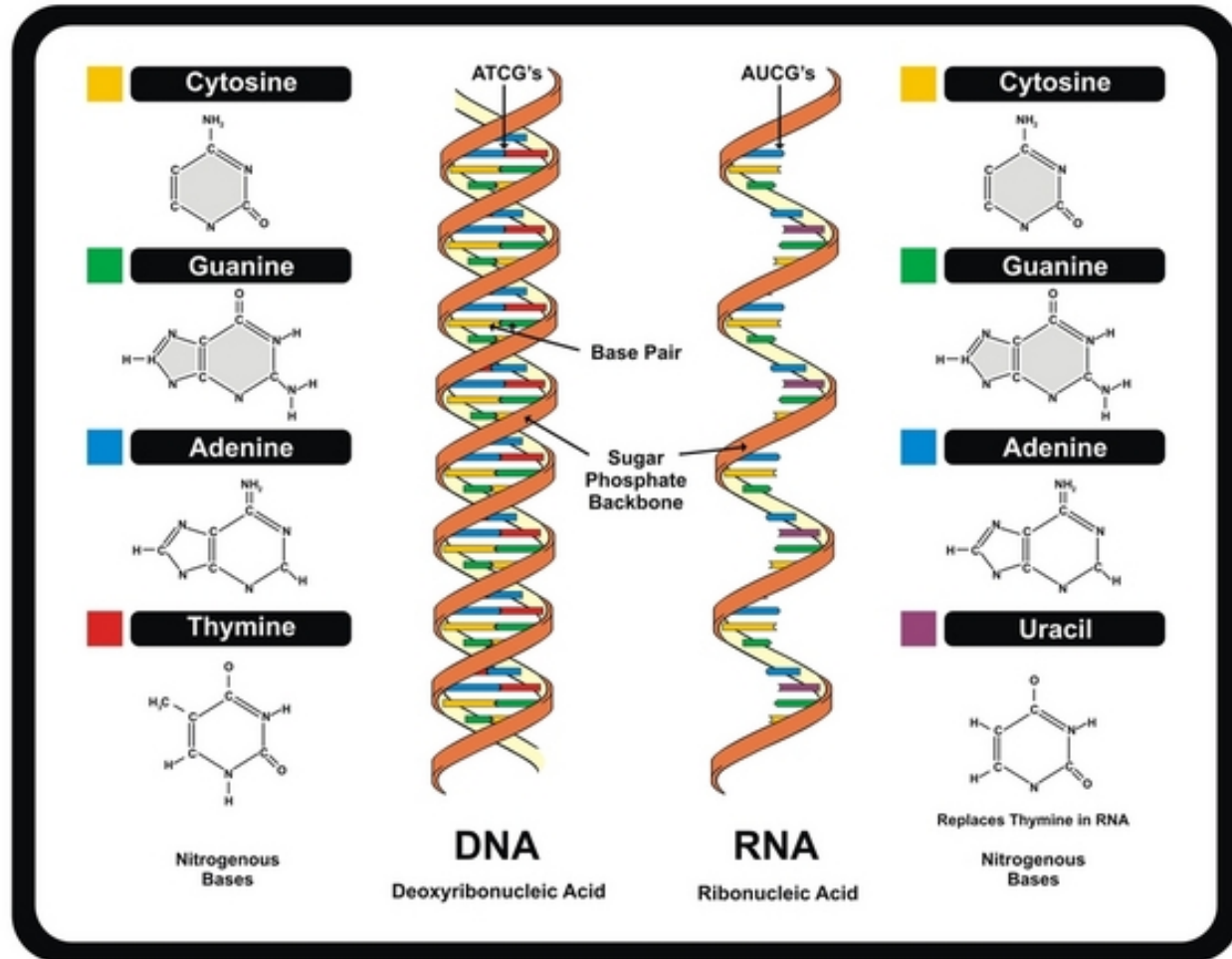
Plant Phenomes to Genomes Integrating the GO with the PO

Prof. Stevenson's research and activities span a range of topics including, evolution and classification of the Cycadales (cycads) and monocots mainly Commelinidae, their placement in seed plant phylogeny, studying developmental floral morphology, embryology, and inflorescence structure. He is actively involved in the Plant Genomics Consortium project studying the origin, development, and modification of the seed and the Planteome project on developing common reference ontologies for plant biology.

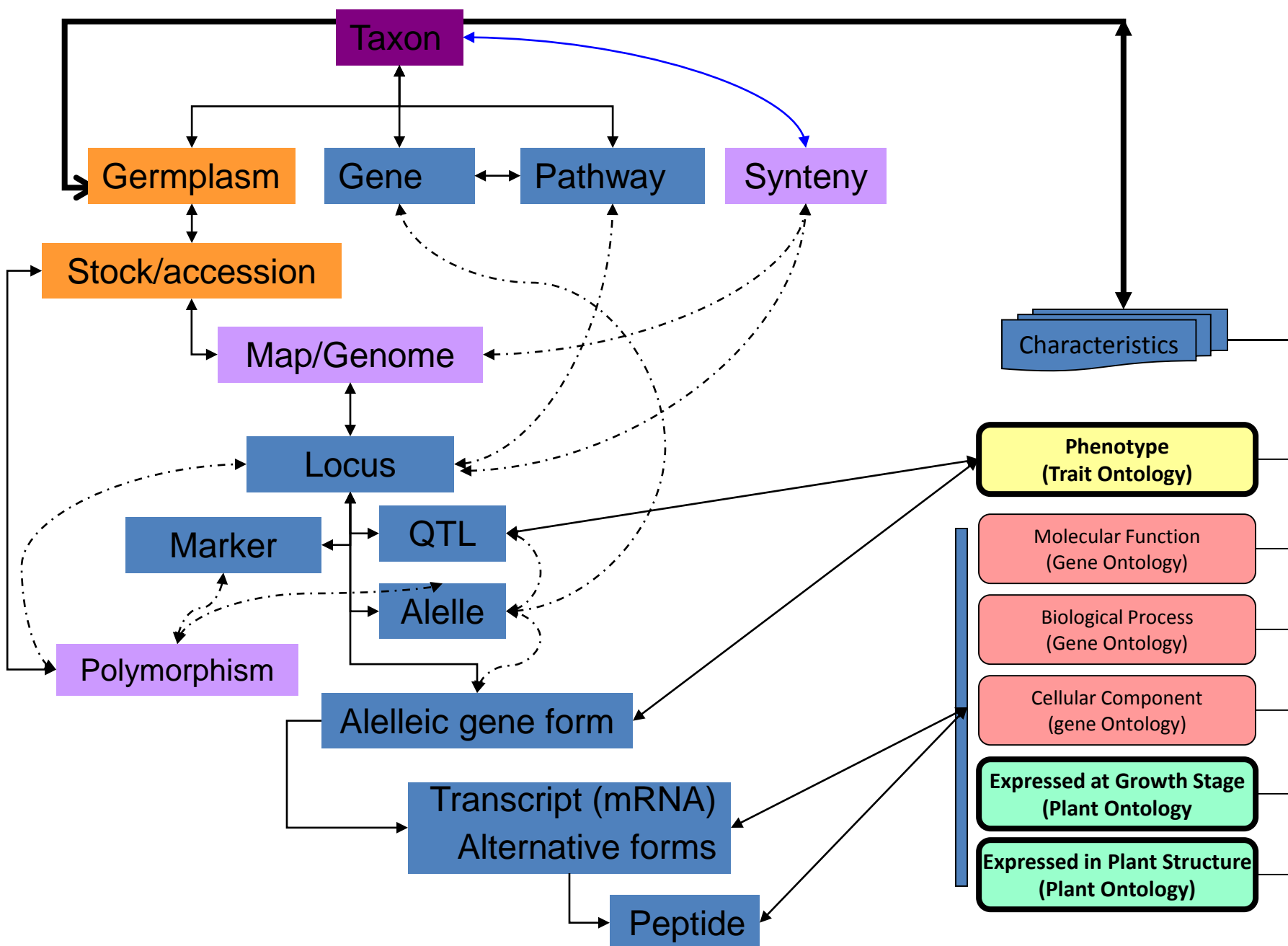


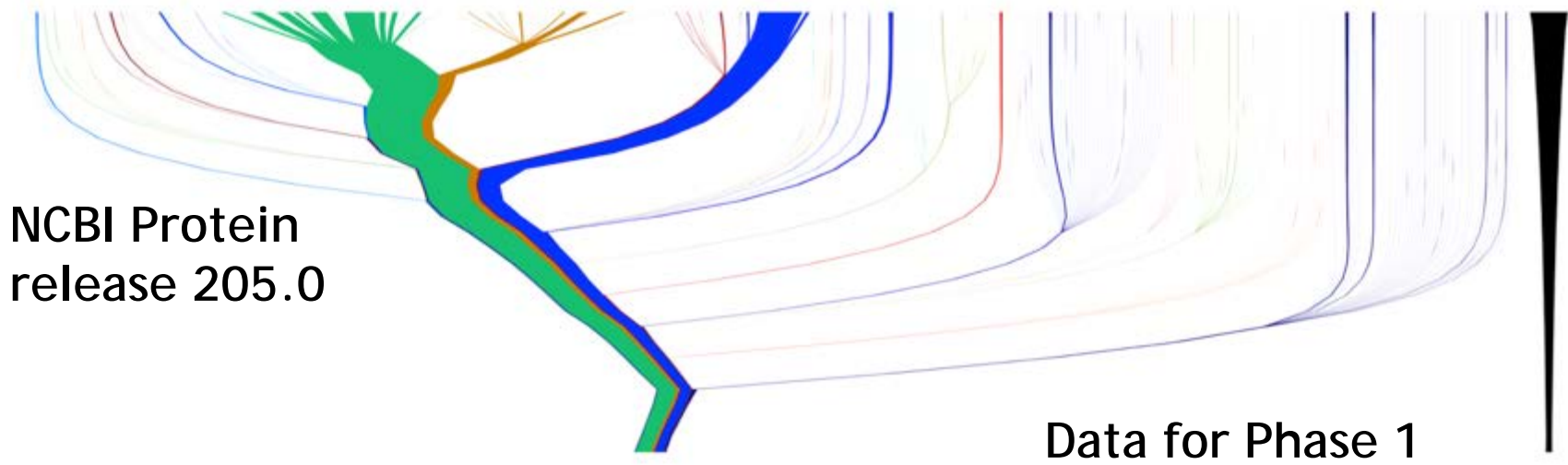
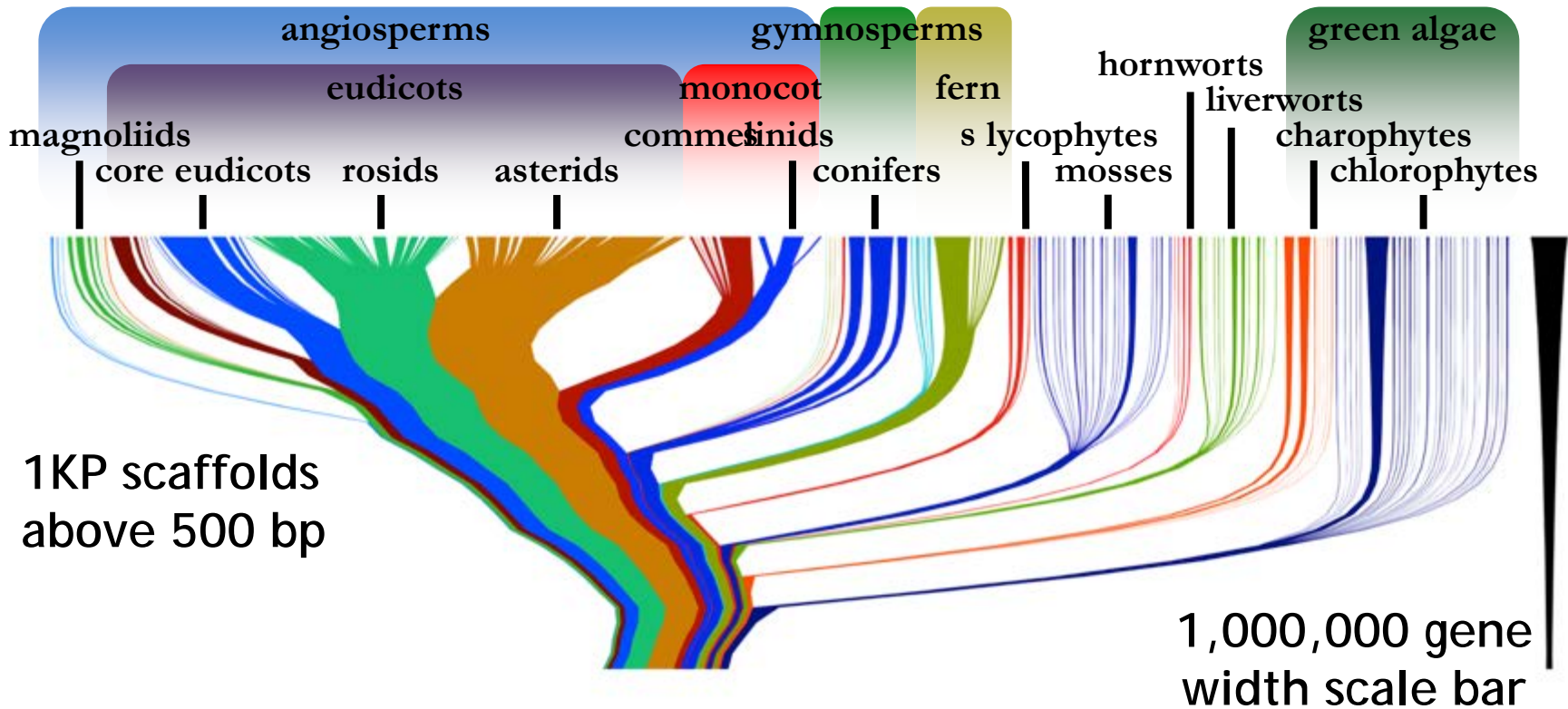
Prof. Dennis Wm. Stevenson
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New York Botanical Garden, NY, USA
Editor, Botanical Review
co-PI Planteome project

Plant Phenomes to Genomes: Integrating the GO with the PO Across Land Plants



Dennis Wm. Stevenson
New York Botanical Garden





Some Concepts to Consider

- Phenome & Genome
- Evolution and Change
- Homology vs Descriptors
- Homoplasy vs Ignorance
- Incorporating Data into Descriptors

Keys

Key to the families of the Cycadales in Colombia

1. Pinnae with a single prominent primary vein and no lateral veins; microsporophylls acuminate at apex, megasporophylls not organized into a strobilus, leaflike, bearing 2–10 marginal ovules in the proximal part; seeds flattened (platyspermic) Cycadaceae
1. Pinnae with dichotomously branched lateral veins (appearing parallel); microsporophylls acute to peltate at apex, megasporophylls organized into a strobilus, peltate, bearing two ovules under the apical part; seeds radial (radiospermic), not flattened Zamiaceae

4 Leaflet abscission present; sporophylls in spiral rows

5 Leaflet insertion on rachis midline -- *Lepidozamia*

5* Leaflet insertion on rachis sides

6 Leaflet basal callus present; sporophylls with a sharp upturned spine -- *Macrozamia*

6* Leaflet basal callus absent; sporophylls without a sharp upturned spine

7 Sporophylls with broad flattened upturned and overlapping apices -- *Dioon*

7* Sporophylls with blocky, faceted apices, not upturned & overlapping -- *Encephalartos*

Descriptions

V. Zamiaceae

ZAMIACEAE Reichenbach, Handb. nat. Pfl.-Syst. 139. 1837.

TYPE GENUS: *Zamia* L.

Stem subterranean to arborescent, when arborescent smooth or clothed in persistent leaf bases. **Ageotropic coralloid roots** containing nitrogen-fixing endophytic cyanobacteria present near the soil surface. **Leaves** with or without small **stipules**, paripinnately compound, in a crown of few (1–15) to many (30); **petiole** and lower third of **rachis** smooth or with small **prickles** or with reduced spinose pinnae; pinnae 10–120 in subopposite to opposite pairs, articulated with rachis, densely pubescent when young, glabrous when mature, **venation** dichotomous, with or without a **midrib**. Plants dioecious. **Strobili** one to several, usually emerging from center of crown; sporophylls flat to peltate. **Pollen strobili** of numerous **microsporophylls** with **sporangia** located on the abaxial surface and rarely on the adaxial surface; microsporangia many, in groups of 2–5 and dehiscing by longitudinal slits; **pollen** monosulcate, proximal sculpturing psilate to foveolate. **Ovulate strobili** of numerous ovule-bearing, stalked **megasporophylls**, each with two **ovules**. **Seed coat** when mature consisting of a red or orange/red or white outer fleshy layer and an inner stony layer; **megagametophyte** farineaceous; **embryo** with two **cotyledons** and a coiled **suspensor**.

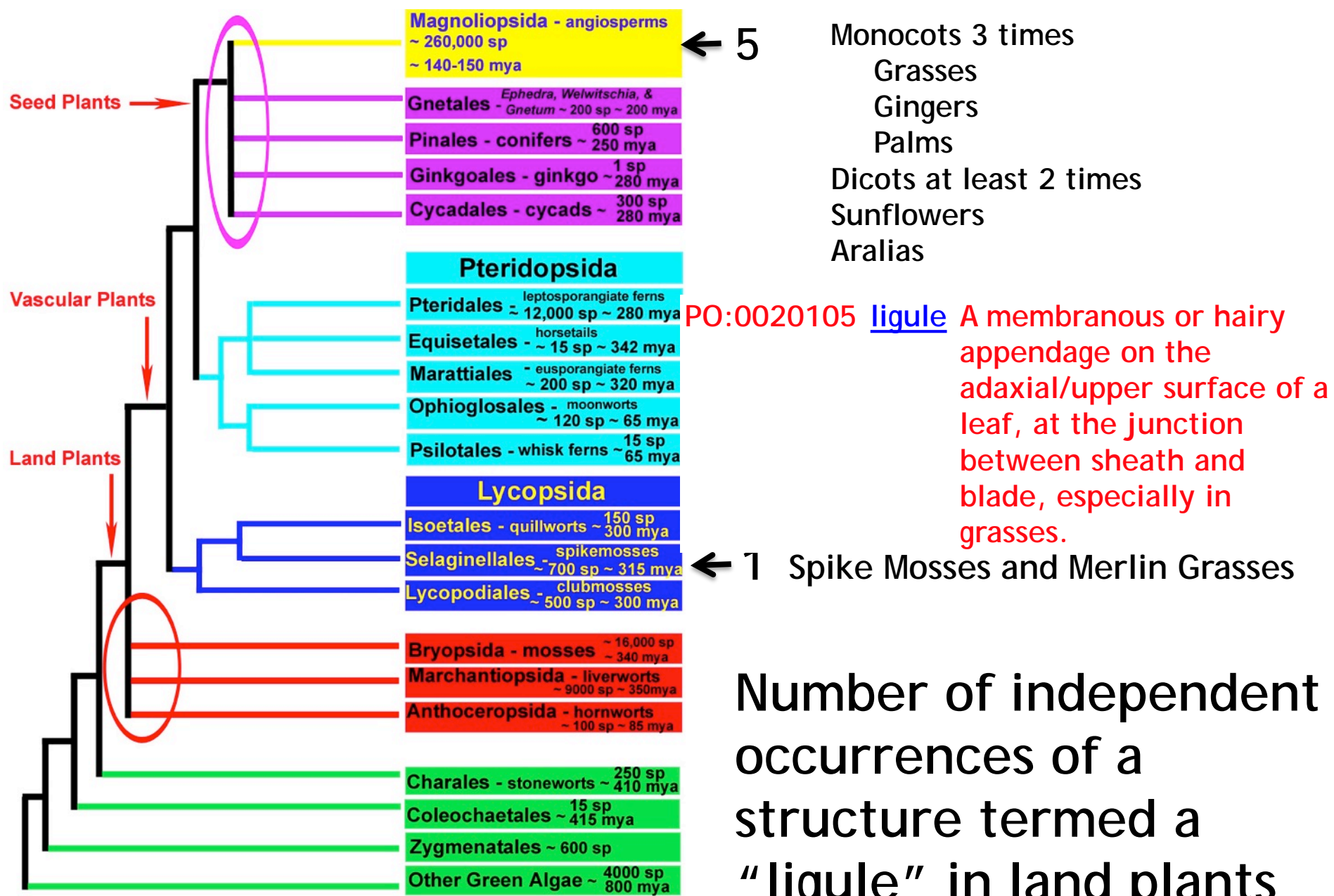
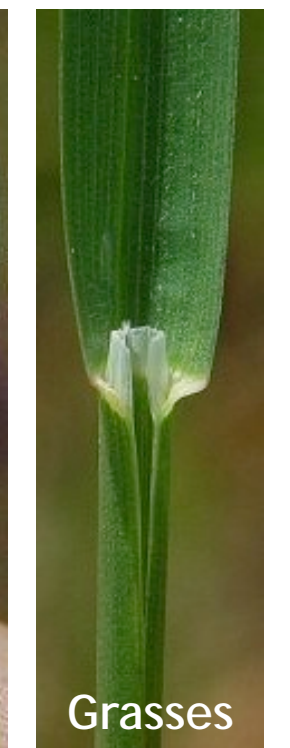
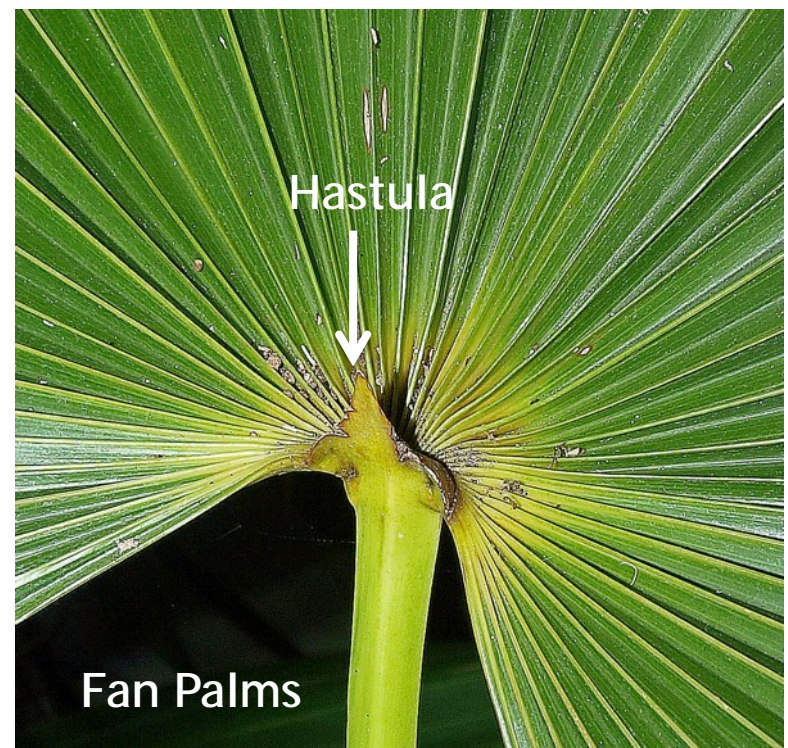
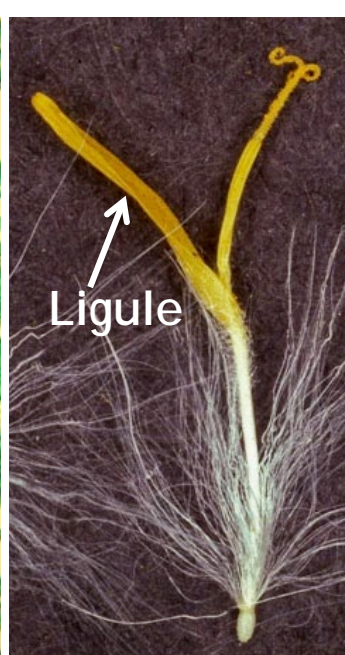
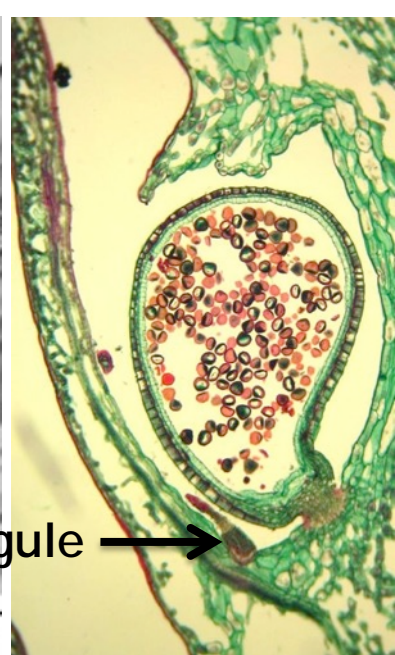
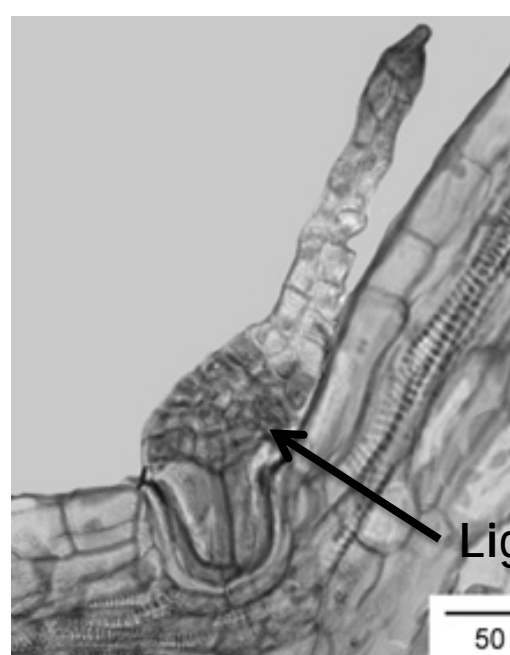
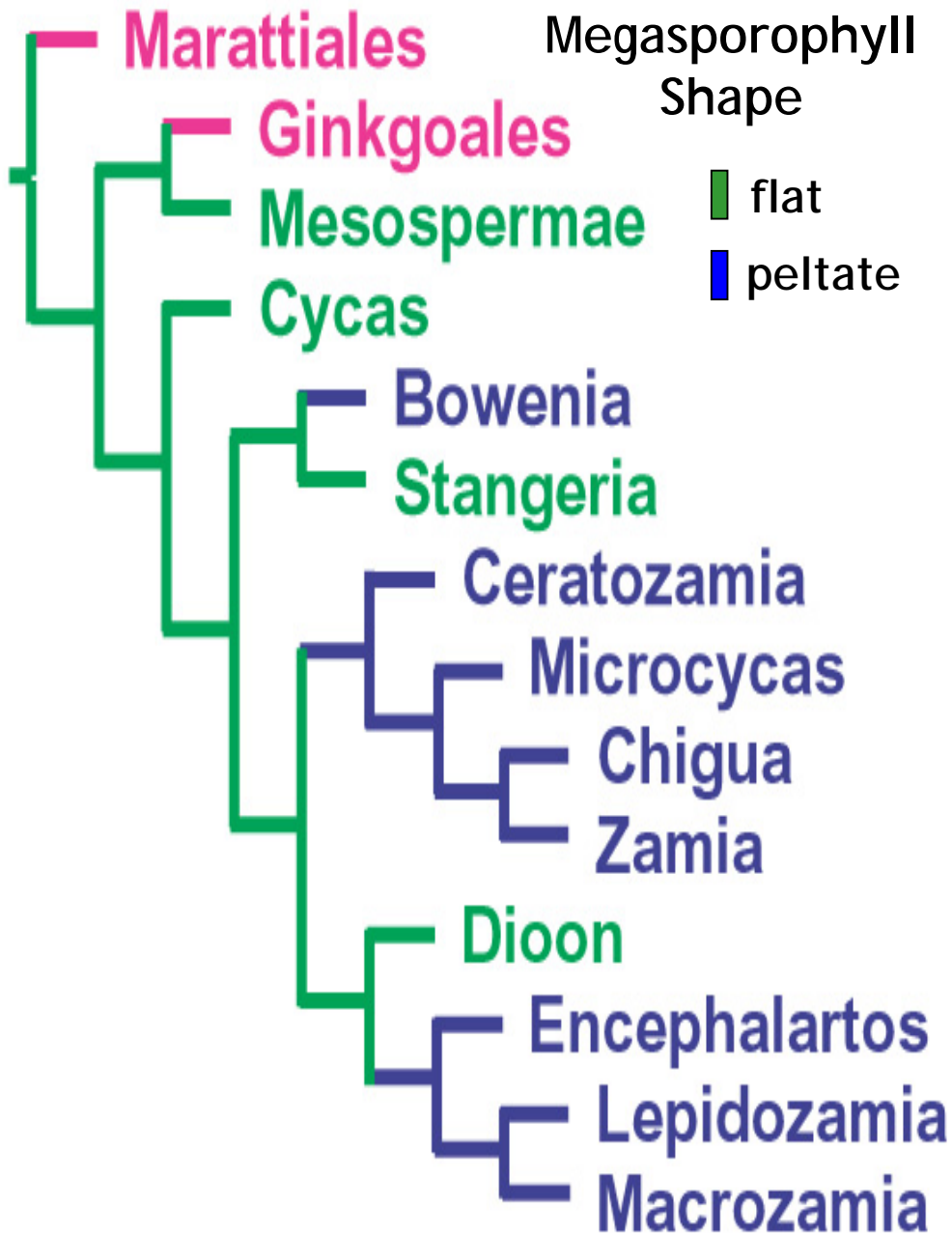


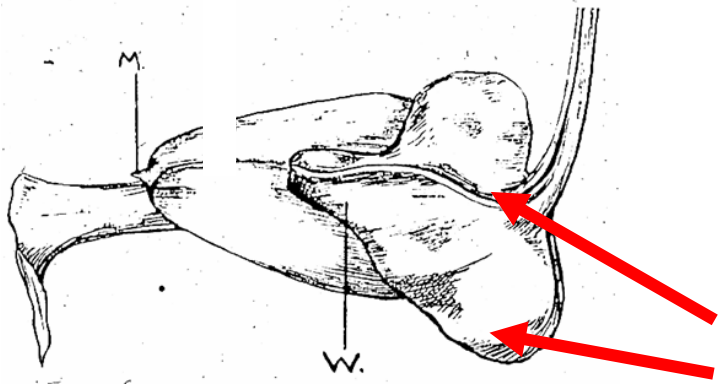
Figure 1. Phylogenetic tree of Major Land Plant groups. Lack of resolution at important nodes are indicated by ellipses.



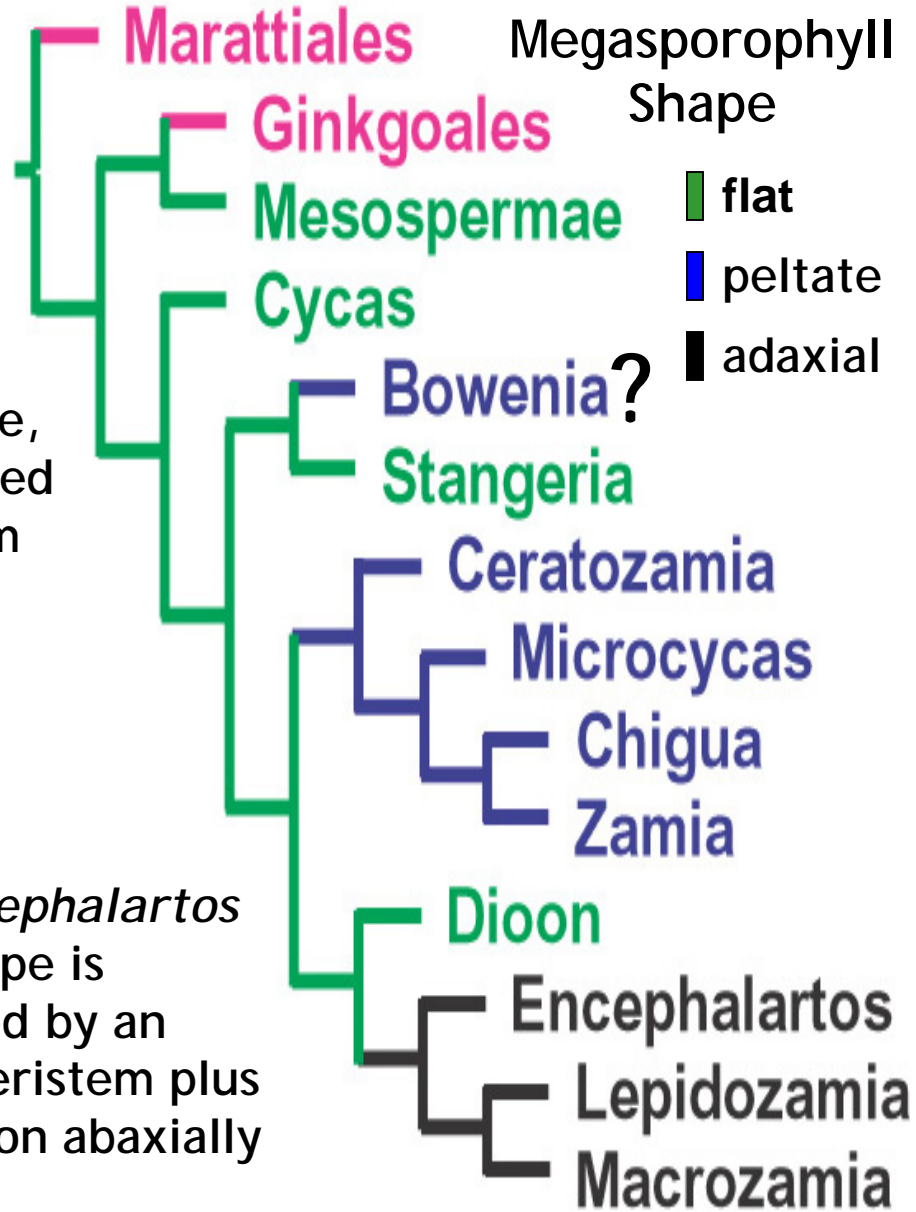




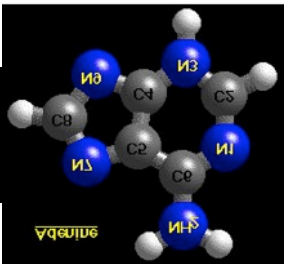
In the *Zamia* Clade, shape is determined by a ring meristem



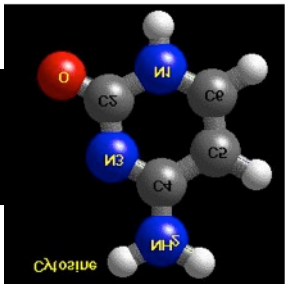
In the *Encephalartos* Clade, shape is determined by an adaxial meristem plus compression abaxially



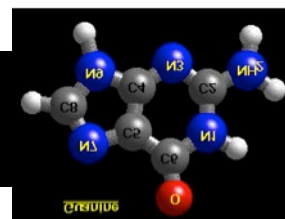
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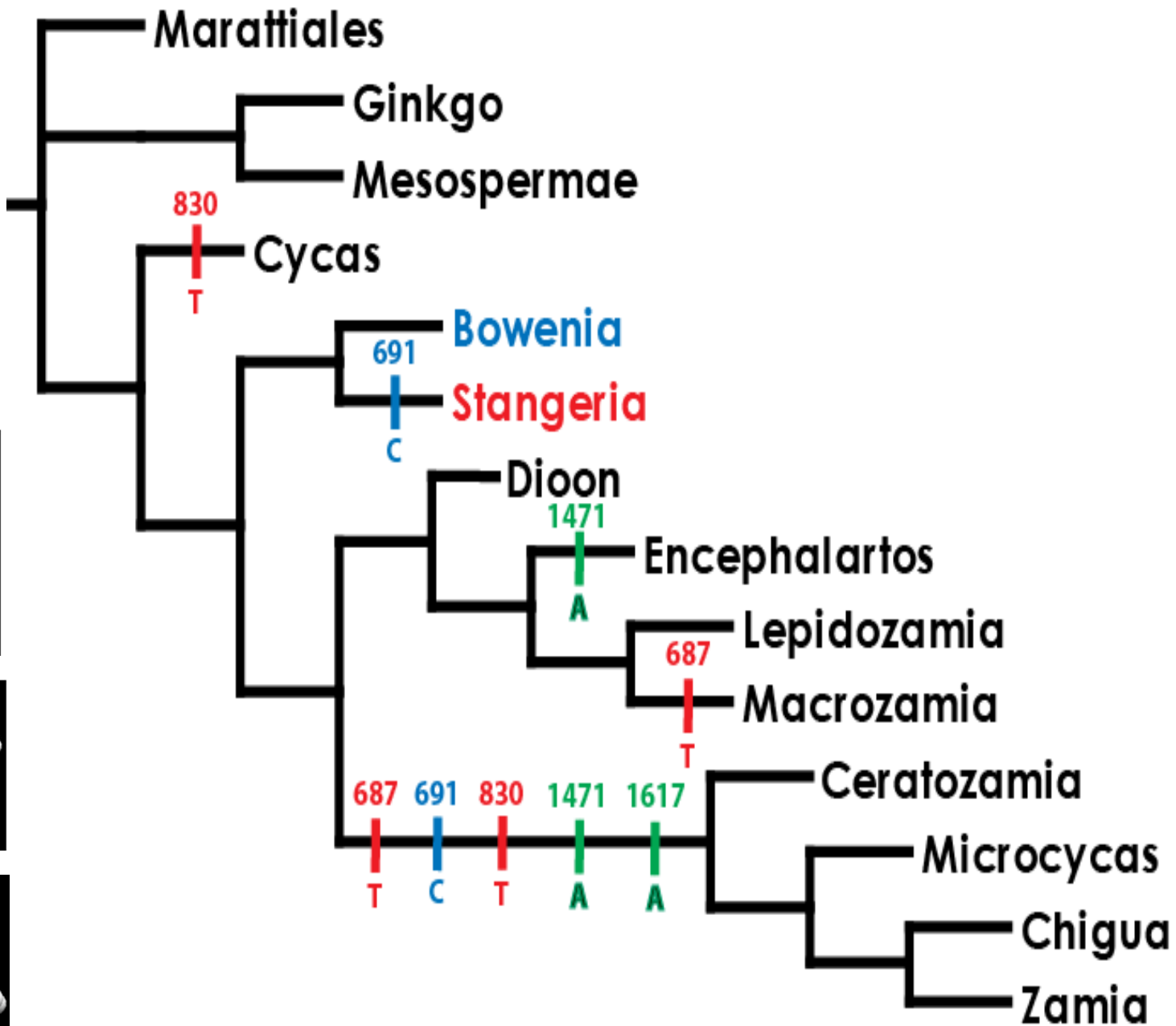
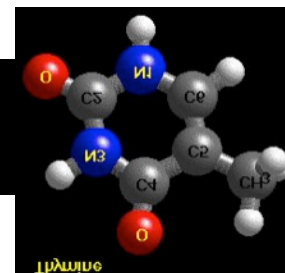
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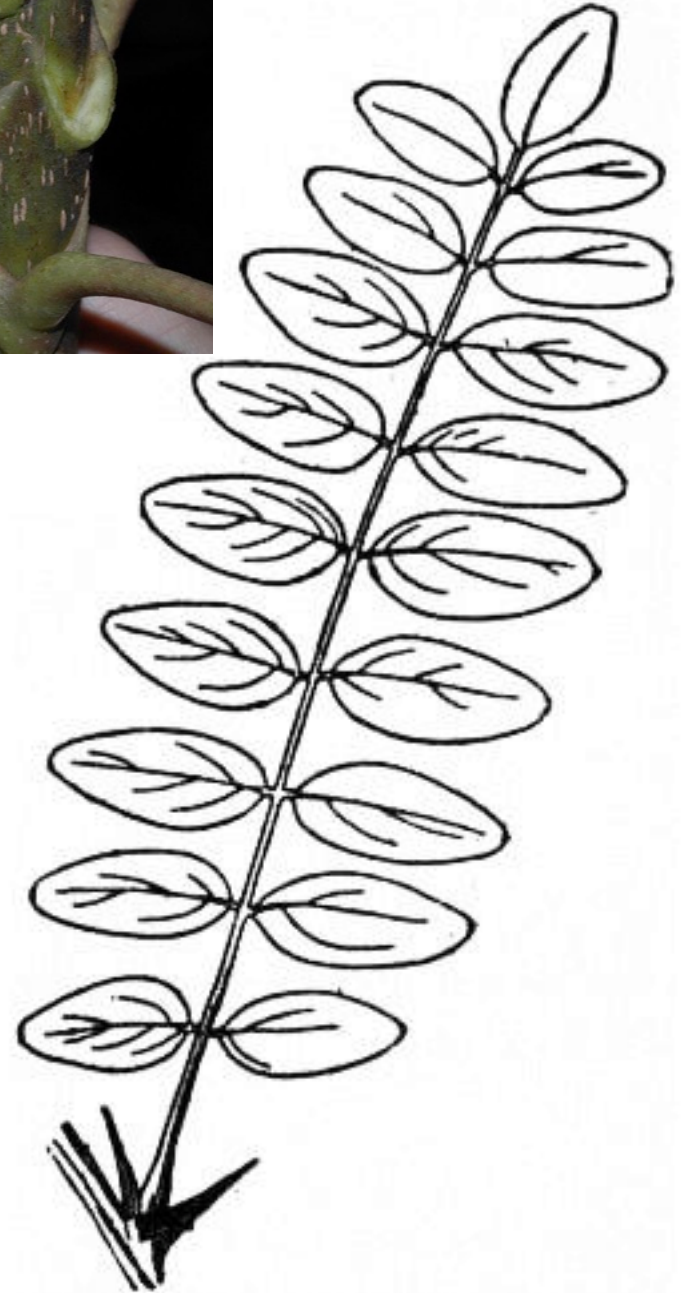
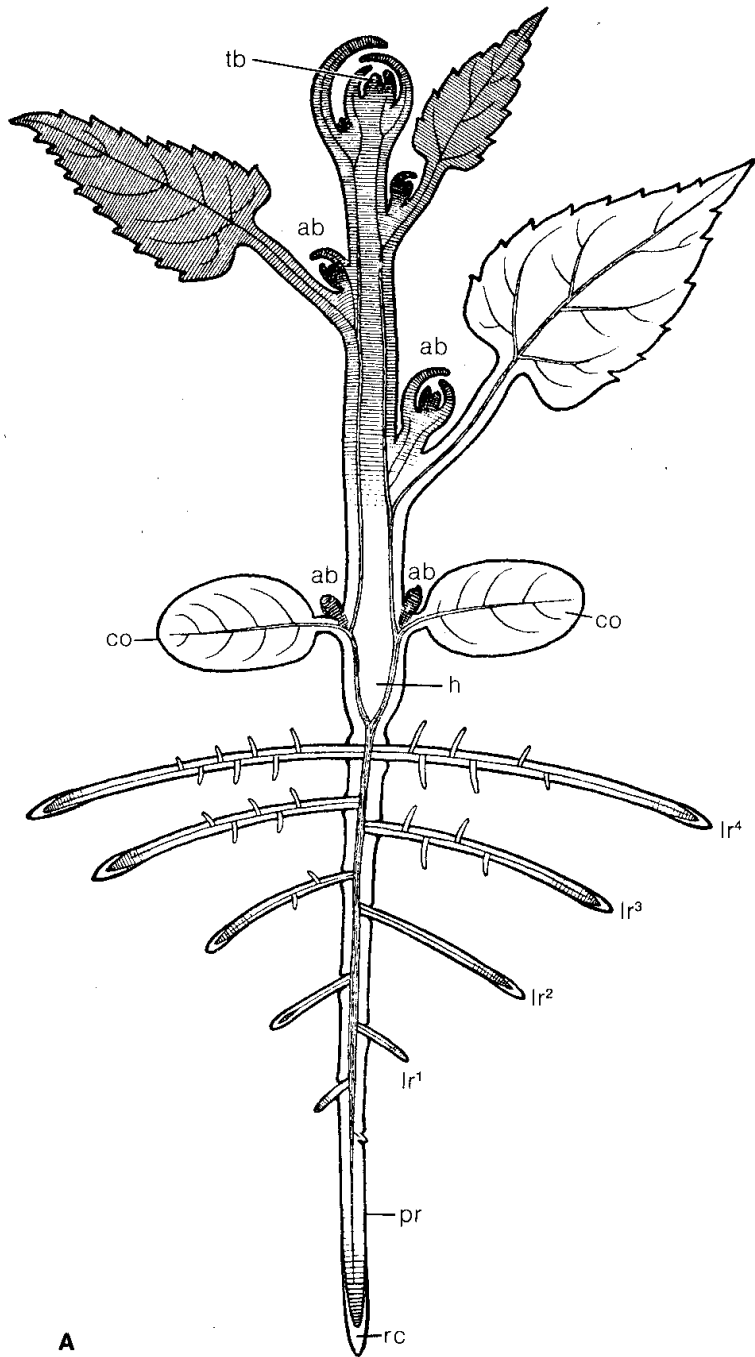


G



T





Several Reasons to Cautiously Handle Plants

PO:0025613	<u>spine petiole</u>	A petiole (PO:0020038) that is sclerified and persistent.
PO:0025169	<u>prickle</u>	A portion of epidermis that is a sclerified outgrowth.
PO:0025170	<u>root prickle</u>	A prickle that is part of a root.
PO:0025171	<u>shoot axis prickle</u>	A prickle that is part of a shoot axis.
PO:0025172	<u>thorn</u>	A branch that is a sclerified, pointed outgrowth.
PO:0025173	<u>spine leaf</u>	A leaf that is a sclerified and pointed and lacks a lamina.
PO:0025174	<u>spine stipule</u>	A stipule that is sclerified and pointed.
PO:0025175	<u>leaf prickle</u>	A prickle that is part of a leaf.

Spines

Petiole



Stipules



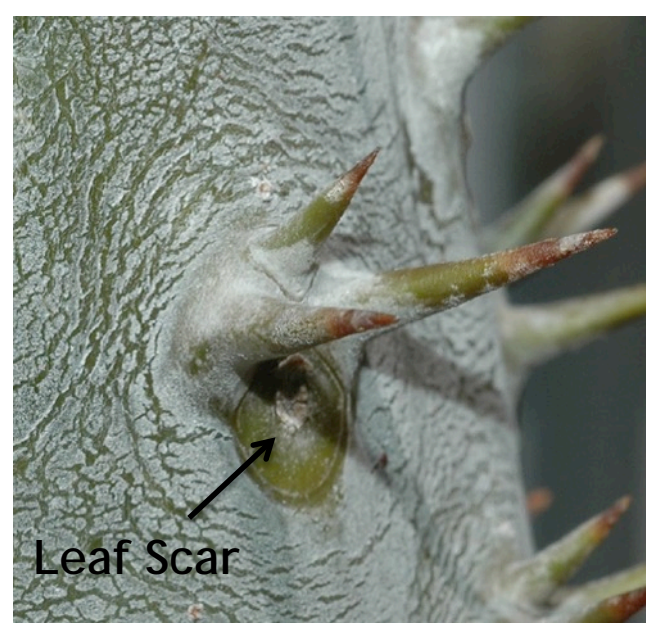
Whole leaf



Leaflet







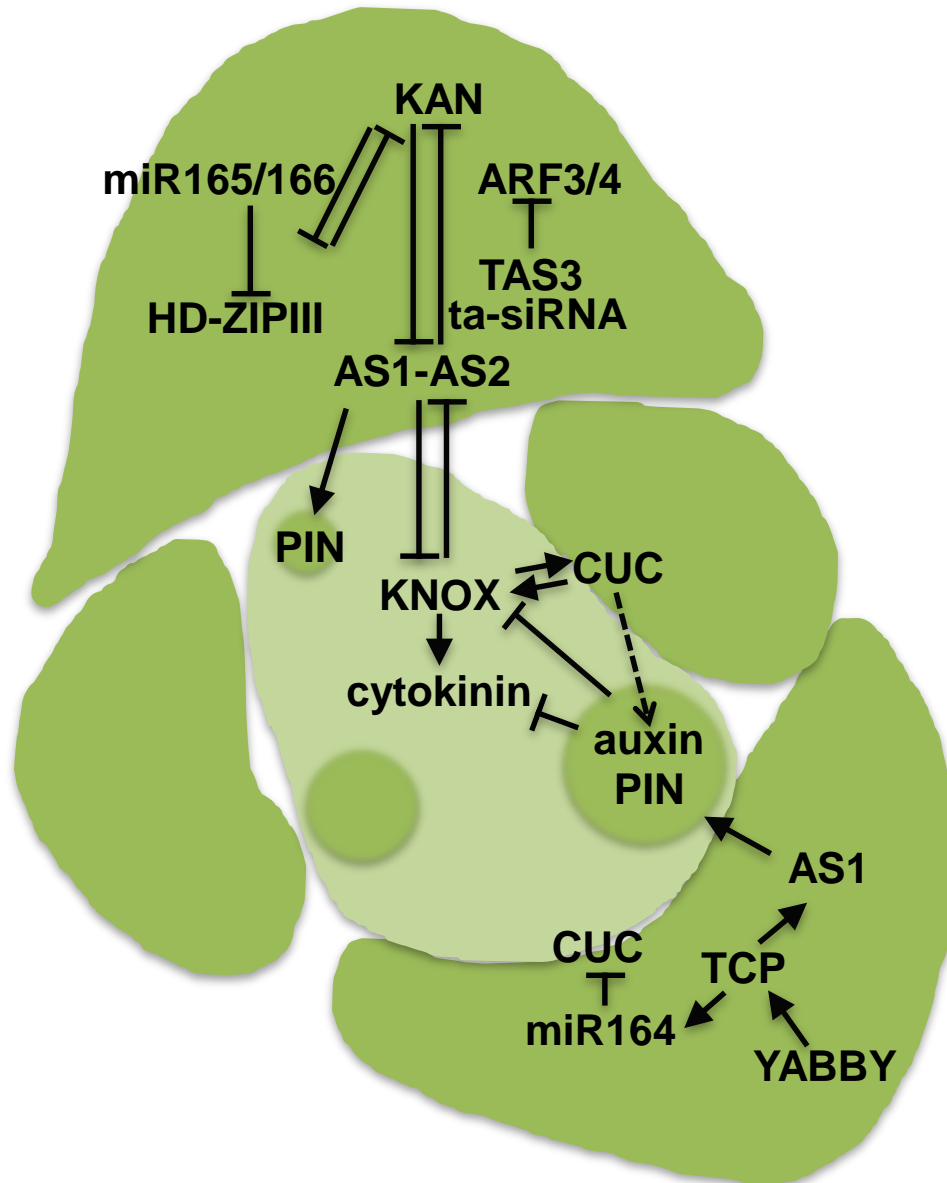


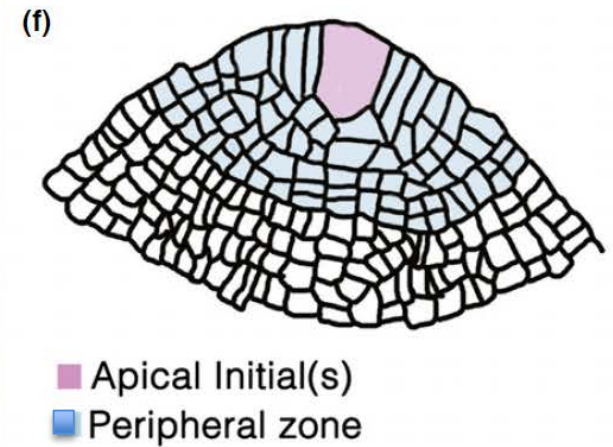
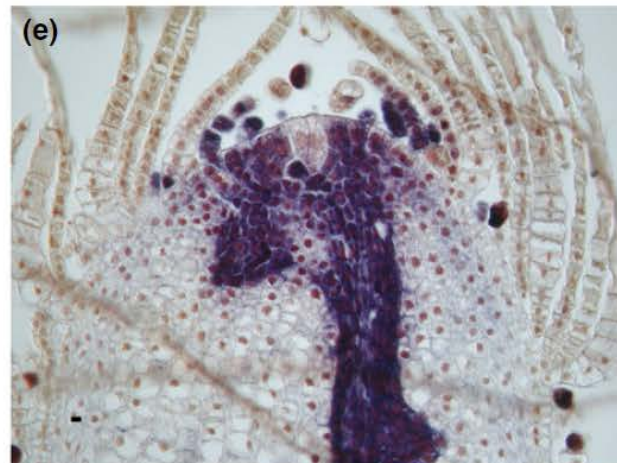
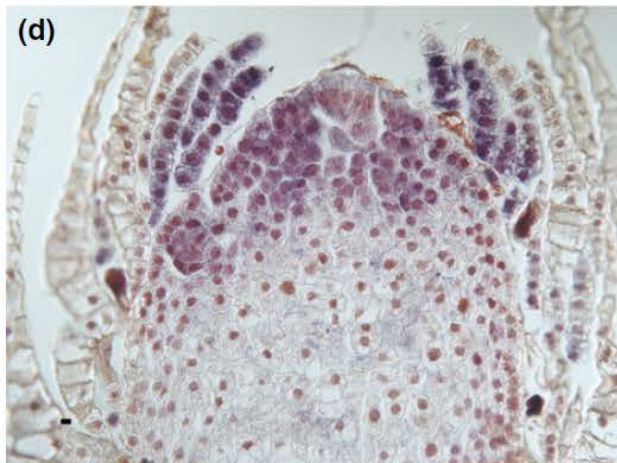
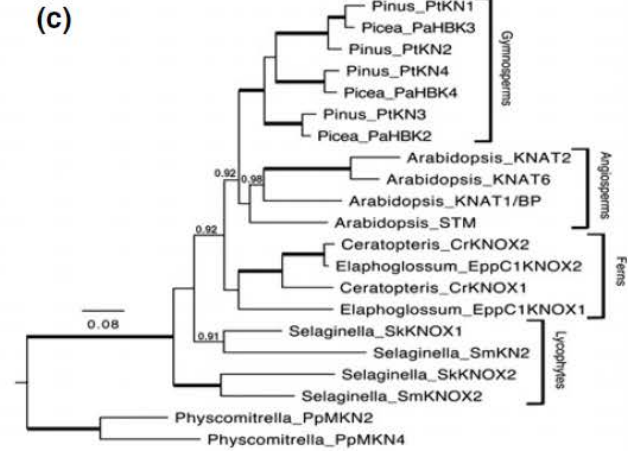
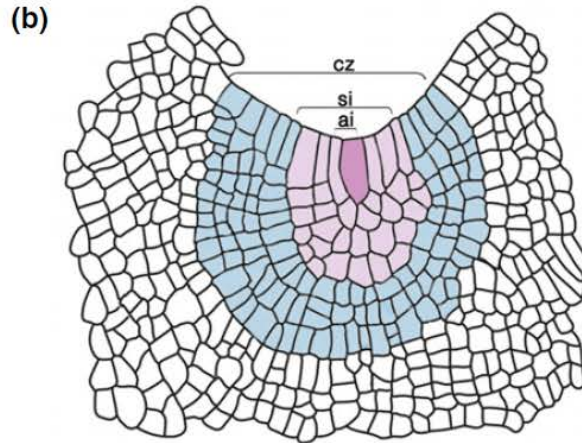
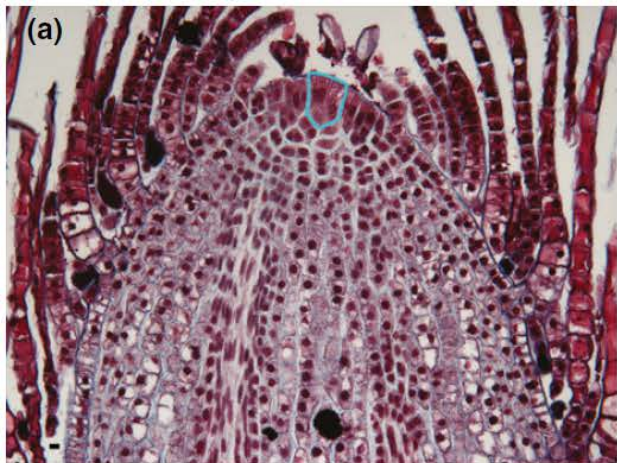


Tendrils

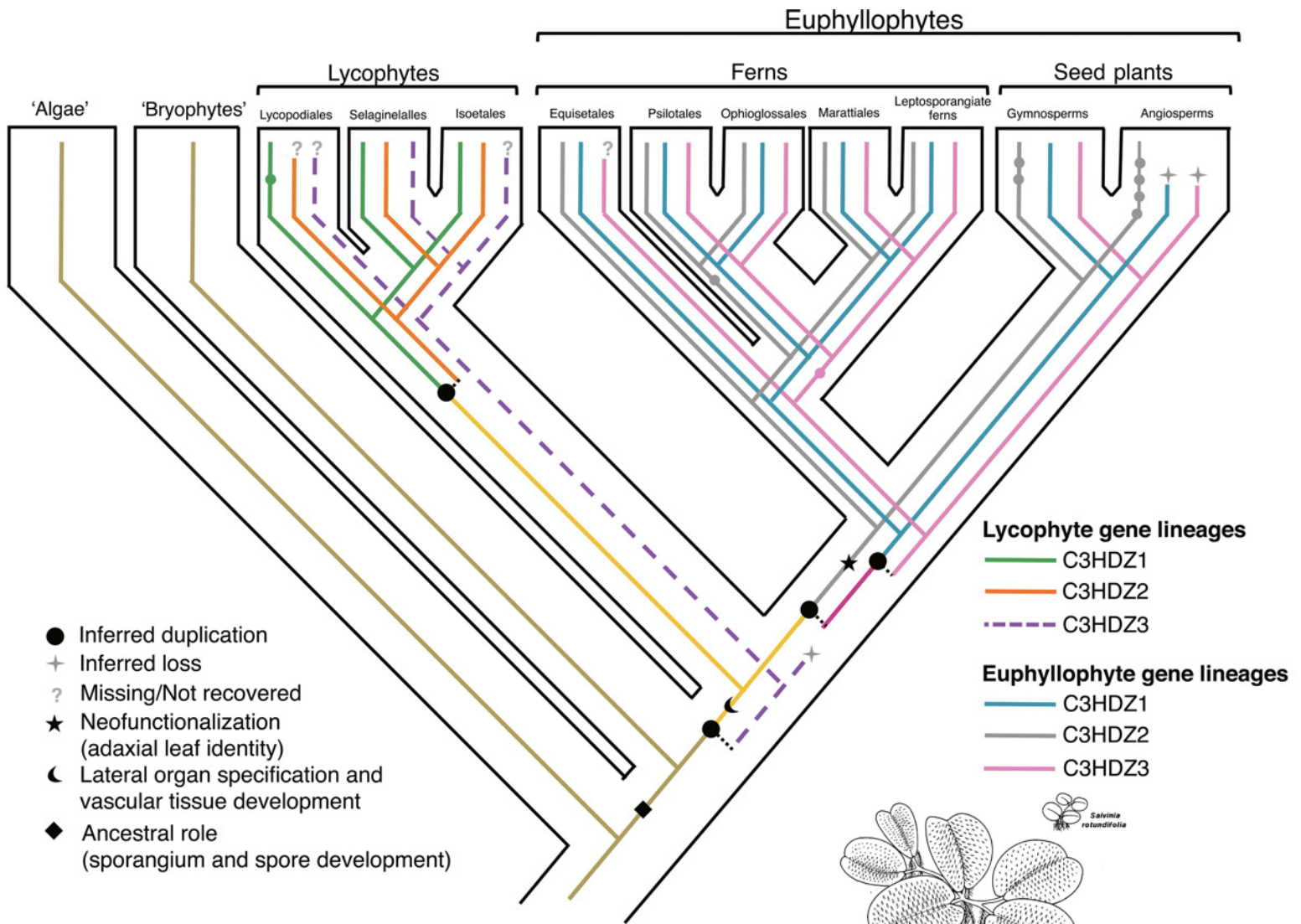
PO:0025367	<u>prophyll tendril</u>	A prophyll that is slender and coiling and lacks a lamina.
PO:0025366	<u>leaf rachis tendril</u>	A leaf rachis that is slender and coiling and lacks a lamina.
PO:0025365	<u>stem apex tendril</u>	A shoot axis that arises from the apical part of a stem and is slender and coiling.
PO:0025364	<u>branch tendril</u>	A branch that is slender and coiling.
PO:0025363	<u>leaf apex tendril</u>	A leaf apex of a laminar vascular leaf that is slender and coiling.
PO:0025362	<u>leaflet tendril</u>	A leaflet that is slender and coiling and lacks a lamina.
PO:0025361	<u>leaf tendril</u>	A vascular leaf that is slender and coiling and lacks a lamina.

Molecular genetics of leaf development in Angiosperms



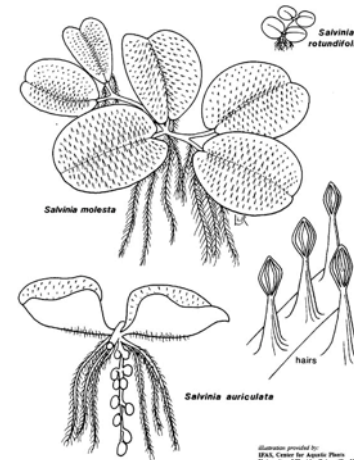


(a)



Class III HD-Zip Genes

Vasco et al. New Phytologist. 2016.

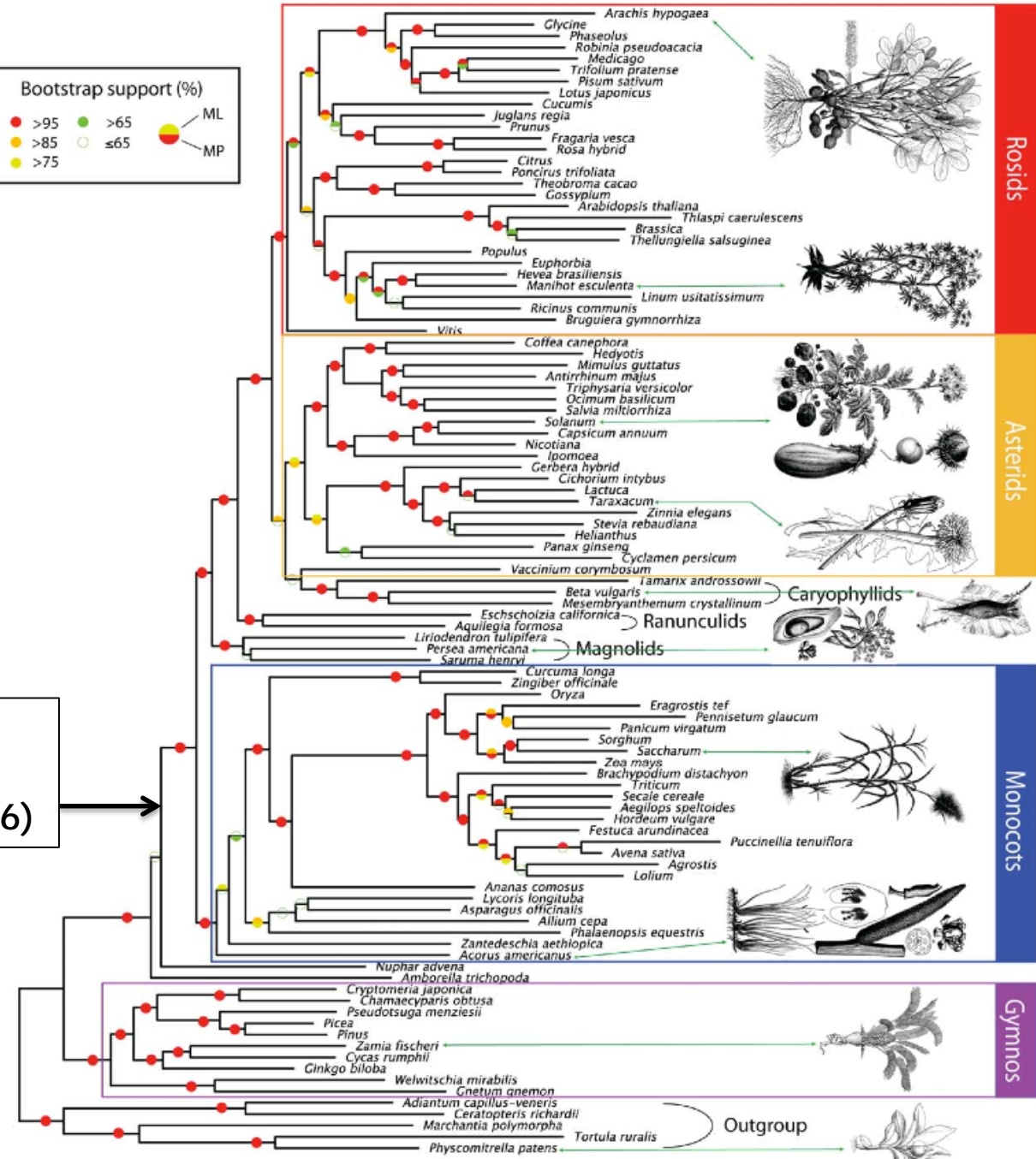


Big Trees

Bootstrap support (%)

- >95
- >85
- >75
- >65
- ≤65

ML
MP



Rosids

Asterids

Monocots

Gymnos

Monocot Clade:
Cell-fate commitment
siRNA & miRNA (AGO1 & RDR6)

0.2

Conclusions

- A Long Way To Go
- Dealing With Synonymy Is Achievable
- Progress Is Being Made

Current and Future Directions

- Imaging
- Mining 1kp
- Mining GO Terms

Thank you Ramona, Laurel, Barry, and Pankaj!

THE
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