

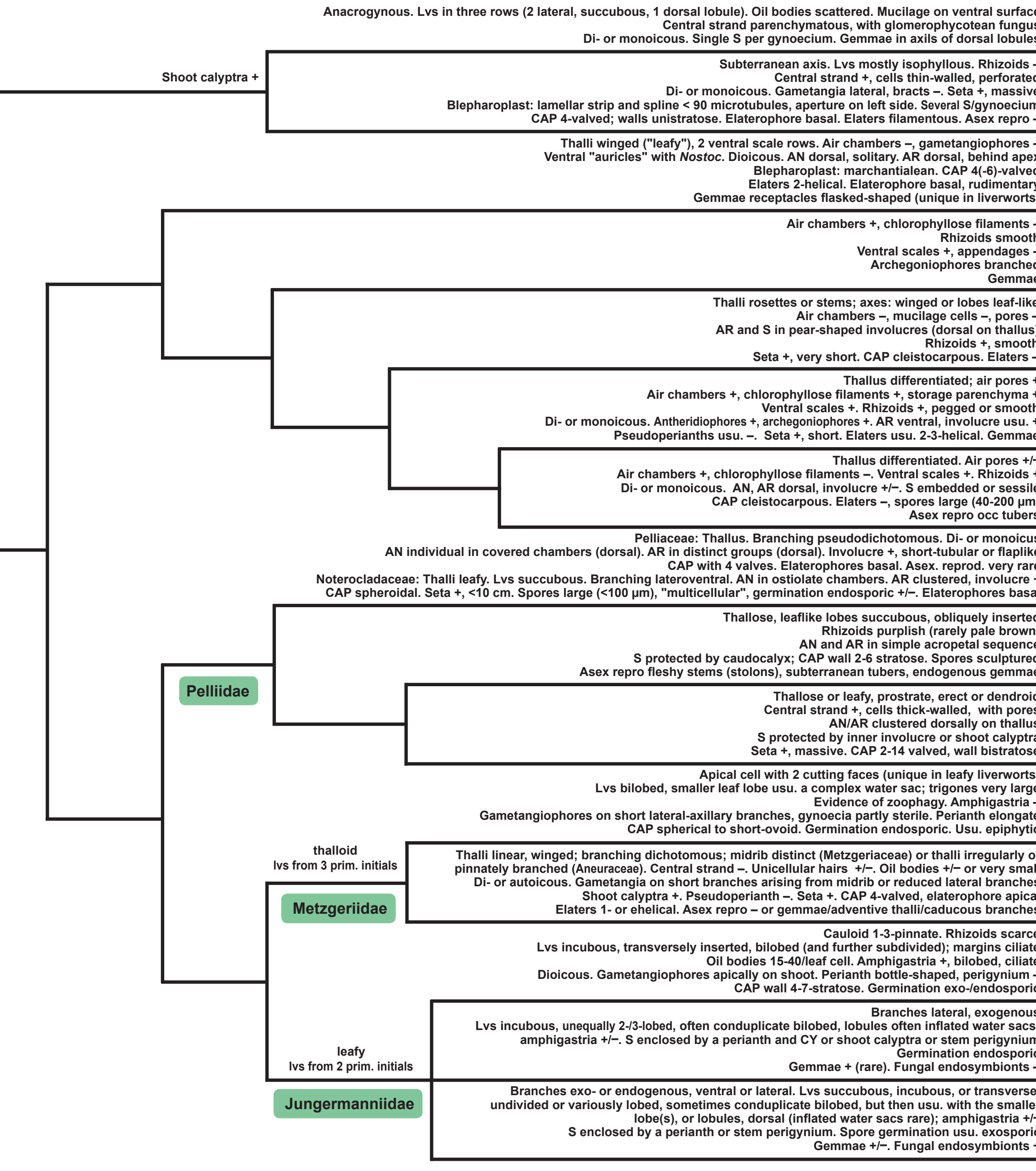
# BRYOPHYTE PHYLOGENY

## Nonvascular Land Plants (Liverworts, Mosses, Hornworts) – Systematics and Characteristics

### MARCHANTIOPHYTA

#### Liverworts

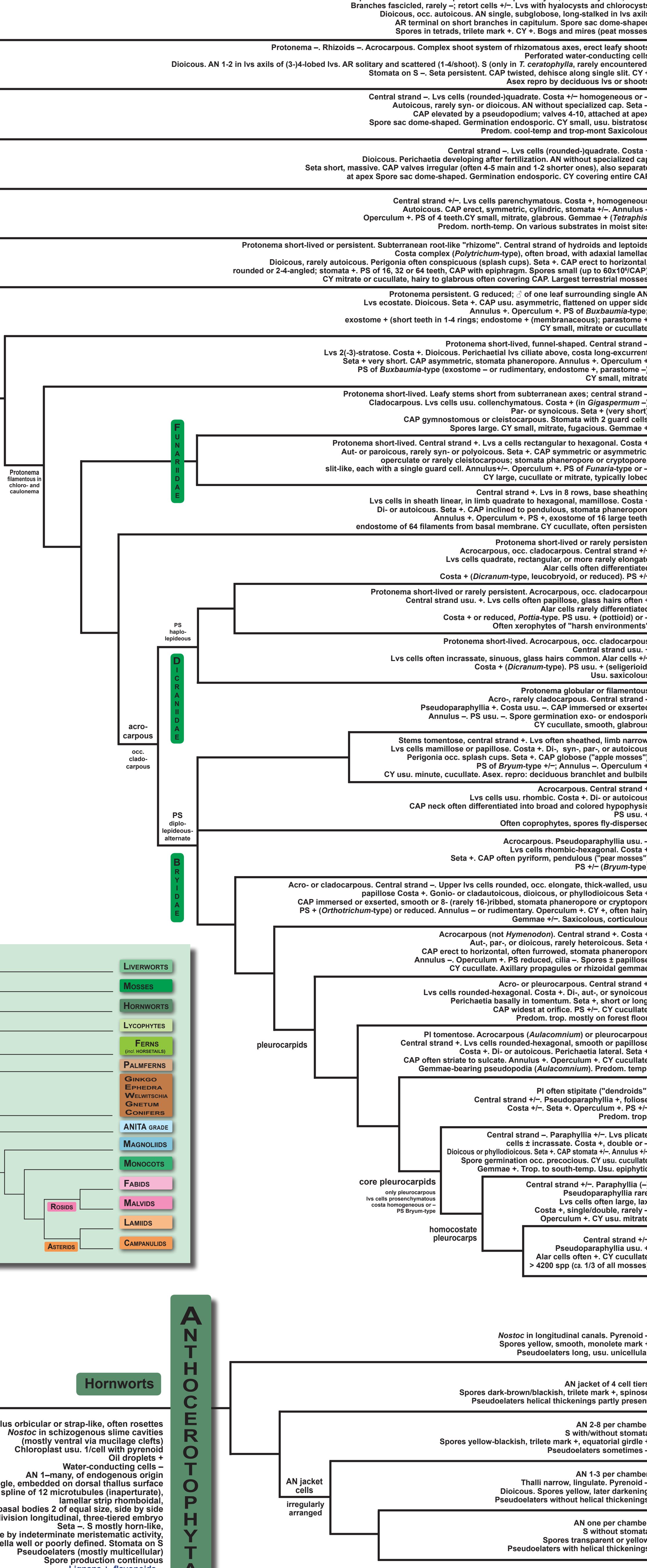
Thallose or foliose  
Rhizoids + Oil bodies +  
Perforated water-conducting cells  
Mycorrhizal with endophytic Glomeromycota  
Gametangia protective structures +  
Gametangial ontogeny without apical cells  
Blepharoplast: plastid and associated posterior  
mitochondrion positioned at cell terminus  
Zygote division transversal: epi- and hypobasal cells  
Seta +  
CAP without columella  
Elaters (unicellular), Stomata –  
ca. 5000 spp.  
Lunularic acid



- Treubiales** Treubiaceae
- Haplomitriales** Haplomitriaceae
- Blasiales** Blasiaceae
- Neohodgsoniales** Neohodgsoniaceae
- Sphaerocarpaceles** Riellaceae Sphaerocarpaceae
- Marchantiales** Aytoniaceae Cleveaceae Conocephalaceae Cyathodiaceae Dumortieraceae Exormotheaceae Lunulariaceae Marchantiaceae Monosoleniaceae Targioniaceae
- Ricciales** Ricciaceae Oxymitraceae
- Pelliales** Notoeciaceae Pelliaceae
- Fossombroniales** Fossombronaceae Petalophyllaceae
- Pallaviciniales** Pallaviciniaceae
- Pleuroziales** Pleuroziaceae
- Metzgeriales** Aneuraceae Metzgeriaceae
- Ptilidiales** Ptilidiaceae
- Porellales** Jubulaceae Frullaniaceae Lejeuneaceae Lepidolaenaceae Porellaceae Radulaceae
- Jungermanniales** Acrobolbaceae Balantiopsaceae Calypogeiaceae Cephaloziaceae Cephalozellaceae Geocalycaceae Gymnomitriaceae Jungermanniaceae Lepidiziaceae Lophoziaceae Scapaniaceae Trichocolaceae
- Sphagnales** Sphagnaceae Flatbergiaceae Ambuchananiaceae
- Takakiales** Takakiaceae
- Andreaeales** Andreaeaceae
- Andreaebryales** Andreaebryaceae
- Tetraphidales** Tetraphidaceae
- Polytrichales** Oedopodiaceae Polytrichaceae
- Buxbaumiales** Buxbaumiaceae
- Diphysciales** Diphysciaceae
- Gigaspermiales** Gigaspermaceae
- Funariales** Disceliaceae Encalyptaceae Funariaceae
- Timmiales** Timmiaceae
- Dicranales** Bruchiaceae Calymniaceae Catoscopiaceae Dicranaceae Ditrachaceae Fissidentaceae Leucobryaceae Rhabdoweisiaceae
- Pottiales** Pottiaceae Ephemeraceae
- Grimmiales** Grimmiaceae Seligeriaceae
- Hedwigiales** Hedwigiaceae Helicophyllaceae Rhacocarpaceae
- Bartramiales** Bartramiaceae
- Splachnales** Meesiaceae Splachnaceae
- Bryales** Bryaceae Mniaceae Plagiomniaceae
- Orthotrichales** Orthotrichaceae
- Orthodontiales** Orthodontiaceae
- Rhizogoniales** Calomiaceae Cyrtopogonaceae Mitteniaceae Rhizogoniaceae Spiridentaceae
- Aulacomniales** Aulacomniaceae
- Hypnodendrales** Braithwaiteaceae Hypnodendraceae Pterobryellaceae Racopilaceae
- Ptychomniales** Garovagiaceae Ptychomniaceae
- Hookeriales** Daltoniaceae Hookeriaceae Hypopterygiaceae Leucomiaceae Pilotrichaceae Saulomataceae Schimperobryaceae
- Hypnales** Amblystegiaceae Anomodontaceae Brachytheciaceae Calliergonaceae Campyliaceae Cryphaeaceae Hypnaceae Hylacomniaceae Hypopterygiaceae Lembophyllaceae Leskeaceae Metariaceae Miyabaceae Neckeraceae Plagiotheciaceae Pterobryaceae Pyraliadelphaceae Sematophyllaceae Thuidiaceae Trachylomaceae
- Leiosporocerotales** Leiosporocerotaceae (LEIOSPOROCEROS)
- Anthocerotales** Anthocerotaceae (ANTHOCEROS, SPHAEROSPOROCEROS) Foliocerotaceae (FOLIOCEROS)
- Notothyladales** Notothyladaceae (NOTOTHYLAS, PHAEOCEROS, PARAPHYMATOCEROS, HATTIROCEROS, MESOCEROS)
- Phymatocerotales** Phymatocerotaceae (PHYMATOCEROS)
- Dendrocerotales** Dendrocerotaceae (DENDROCEROS, MEGACEROS, NOTROCEROS, PHAEMEGACEROS)

### BRYOPHYTA

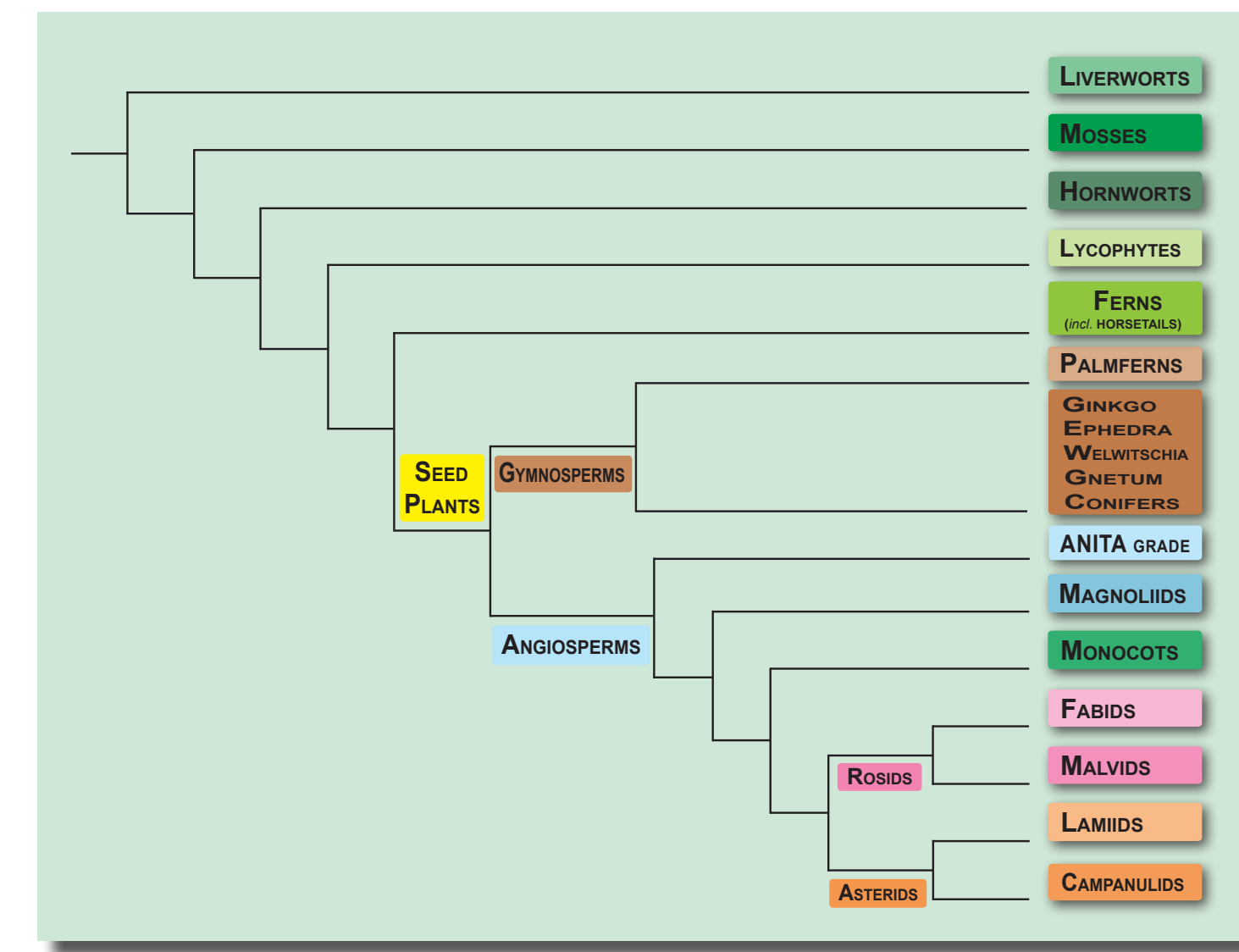
Protonema thallose. Leafy  
Lvs cells parenchymatous  
Rhizoids multicellular  
Mykorrhiza –  
Gametangial ontogeny with apical cells  
Blepharoplast: plastid and associated  
posterior mitochondrion positioned  
along inner nuclear surface;  
occurrence of a stray microtubules  
Seta +  
CAP with PS and columella  
Elaters –  
Stomata on S  
ca. 13,000 spp.



ANGIOSPERM PHYLOGENY POSTER

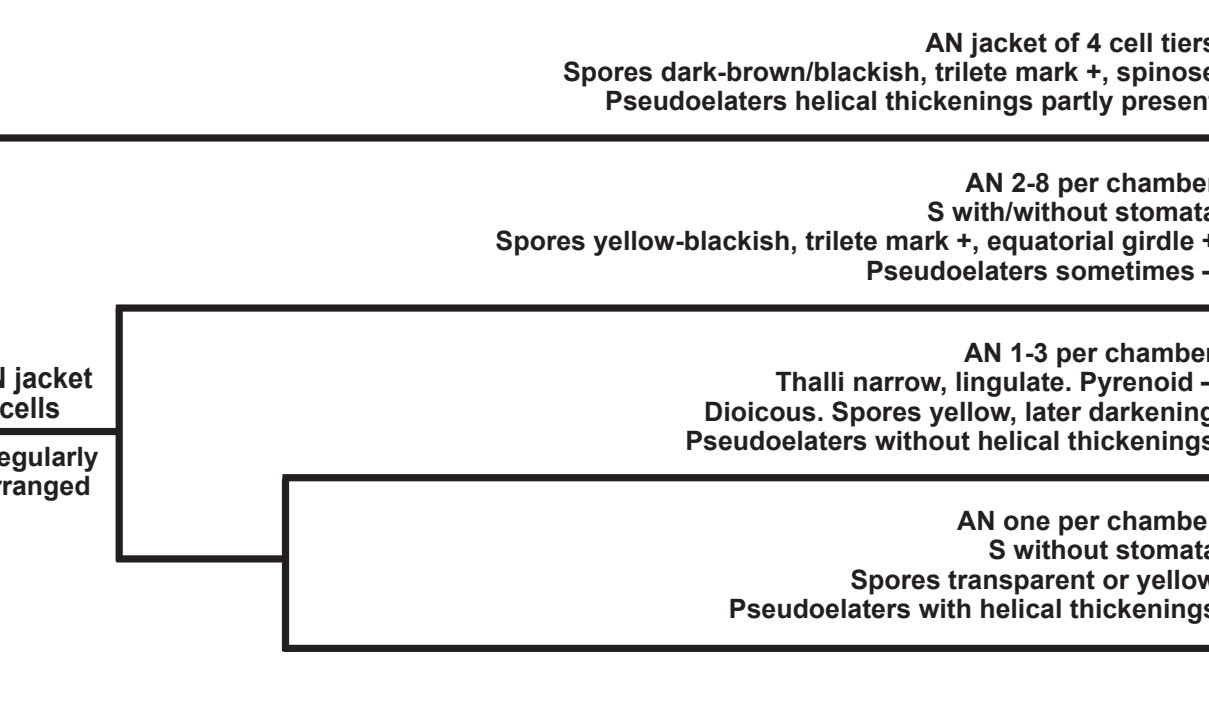
TRACHEOPHYTE PHYLOGENY POSTER

BRYOPHYTE PHYLOGENY POSTER



### ANTHOCEROTOPHYTA

Thallus orbicular or strap-like, often rosettes  
Nostoc in schizogenously silice cavities  
(mostly lateral via mucilage clefts)  
Chloroplast usu. 1/cell with pyrenoid  
Oil droplets +  
Water-conducting cells –  
AN 1-many, of endogenous origin  
AR single, embedded on dorsal thallus surface  
Blepharoplast: splane of 12 microtubules (inaperturate),  
lamellar strip rhomboidal,  
basal bodies 2 of equal size, side by side  
Zygote division longitudinal, three-tiered embryo  
Seta – S mostly horn-like,  
growing from base by indeterminate meristematic activity,  
columella well or poorly defined, Stomata on S  
Pseudolaters (mostly multicellular)  
Spore production continuous  
Lignans +, flavonoids –  
ca. 200 spp



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• hypothetical tree based on molecular phylogenetic data (Feb. 2013)  
• branch lengths deliberate, not expressing actual time scale position of  
many characters on tree unclear; some minor orders/families omitted  
• if a character is marked as being a potential synapomorphy at a particular node,  
this does not mean that all members of that clade possess that character  
• Phylogenetic References: Judd W et al. (2007); Simpson M (2010); Soltis DE et al. (2005);  
Cox et al. (2010); Knoop (2010); Villarreal et al. (2010); Shaw et al. (2011)  
• Characters from: Frey et al. (2009) and Goffinet/Shaw (2009); Lignone et al. (2012)  
• Abbreviations: G gametophyte, S sporophyte, AR archegonium, AN antheridium,  
CAP capsule, CY calyptra, PS peristome  
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