

Crustose *Rhizocarpon*





Squamulose *Stereocaulon*



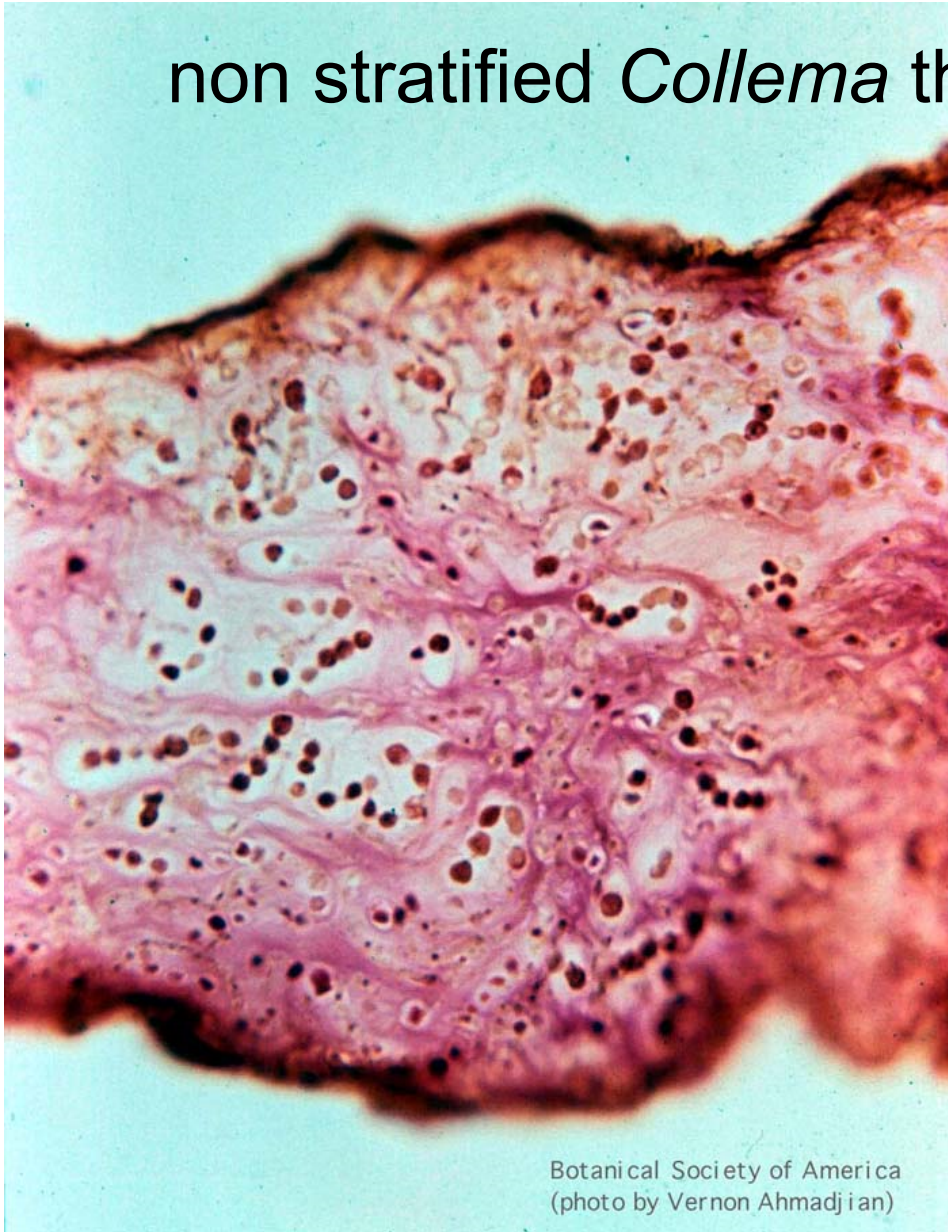
Fruticose

Ramalina menziesii

Foliose *Peltigera elizabethae*

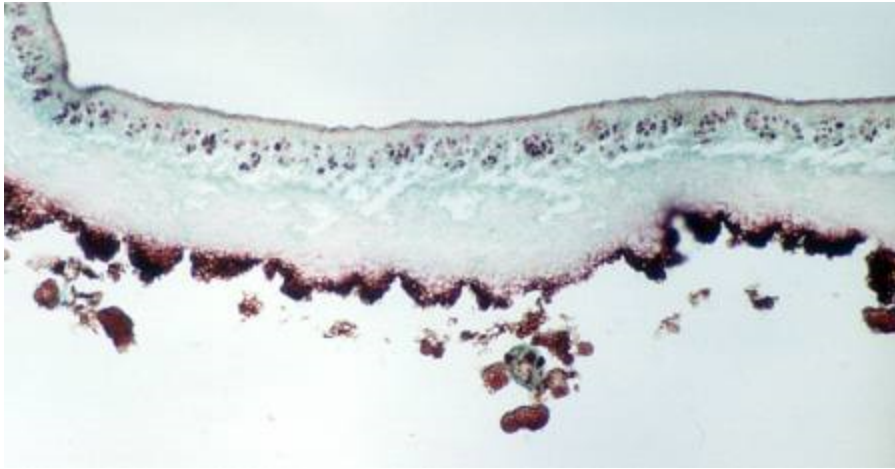


non stratified *Collema* thallus

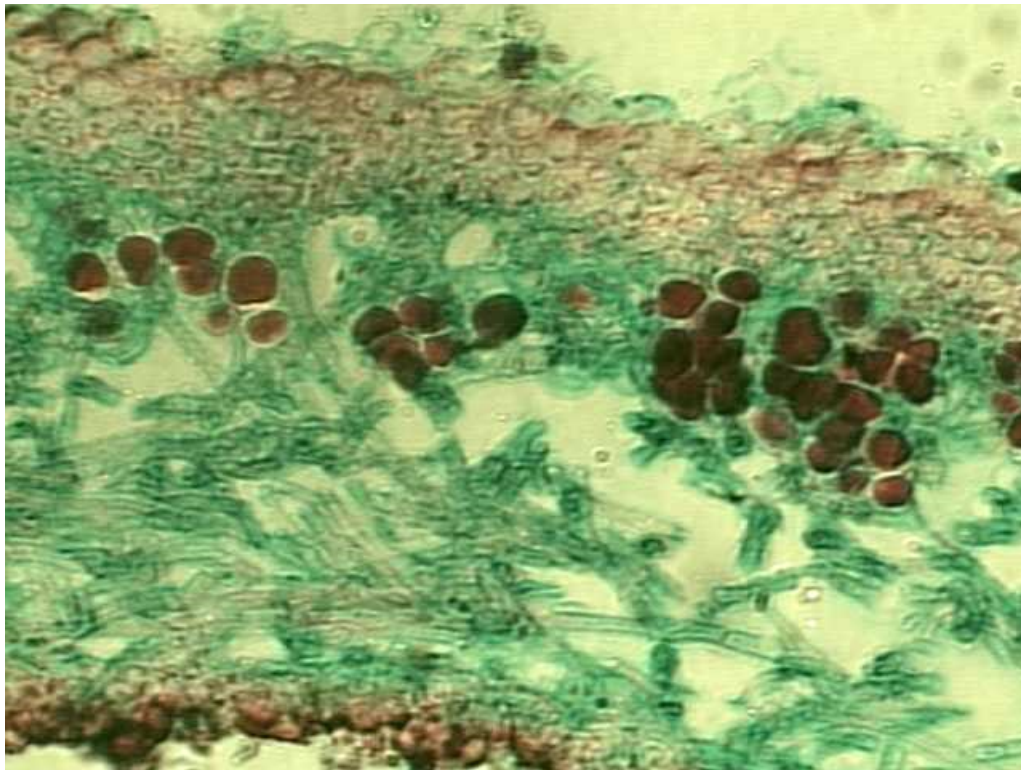


Botanical Society of America
(photo by Vernon Ahmadjian)

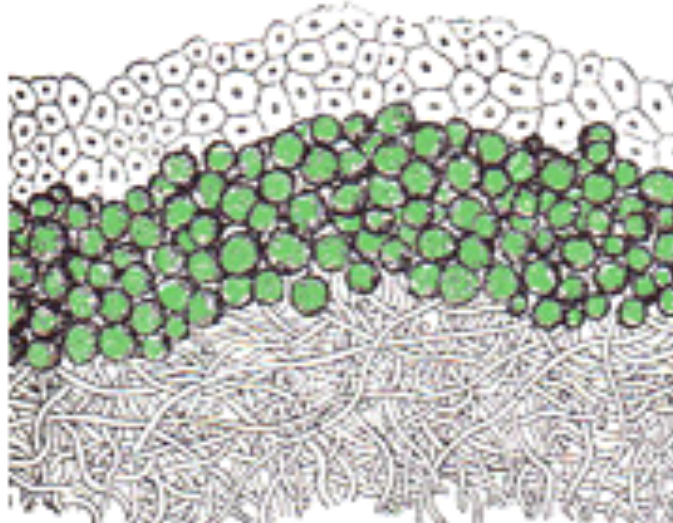




Stratified Thallus
Algae in a distinct layer



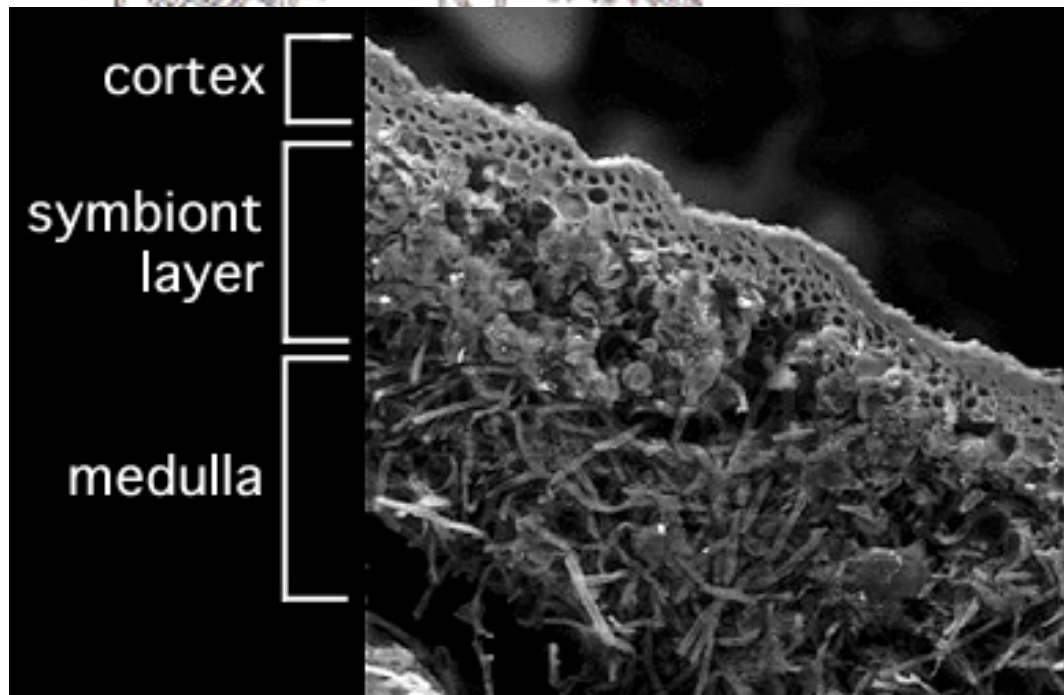
Cross Section of Lichen



Cortex (top)

Algal Layer

Medulla
(bottom)

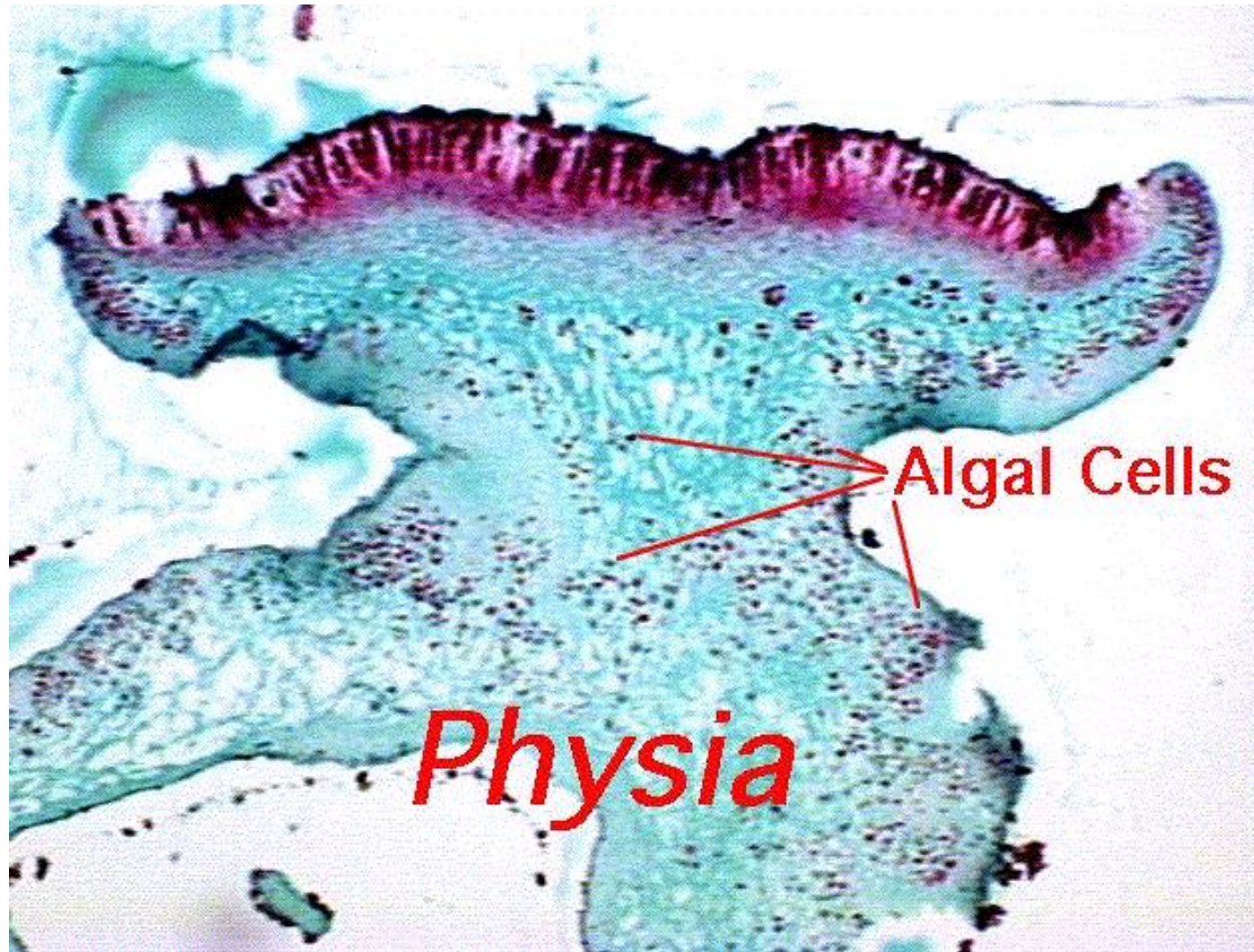


cortex

symbiont
layer

medulla

Lecanorine apothecia include an algal layer



Reproduction

Asexual fungal spores (conidia)

Meiospores (ascospores & basidiospores)

Diaspores = vegetative propagules with both fungal and algal components

Cephalodia

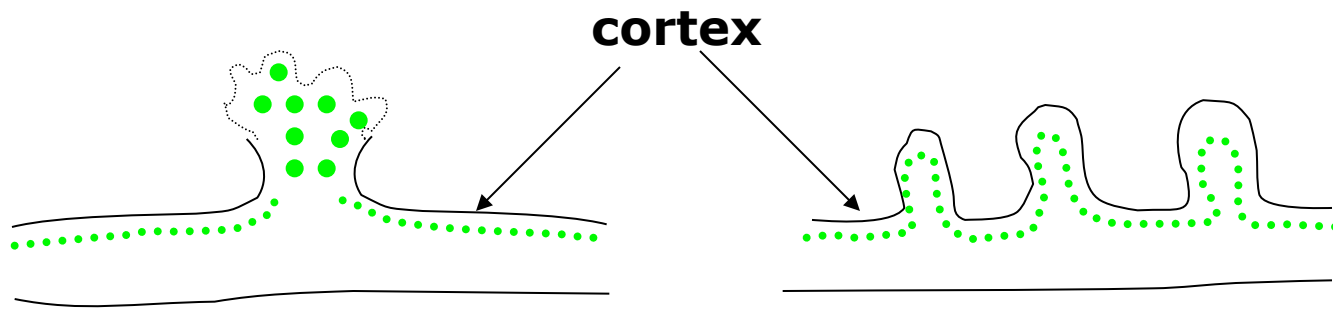
Gall-like swellings containing cyanobacteria on or in thallus of lichen with algal photobiont; primary function is nitrogen fixation, may also be propagule

Isidia

Small, cortex-covered protuberance containing fungal and algal cells

Soredia

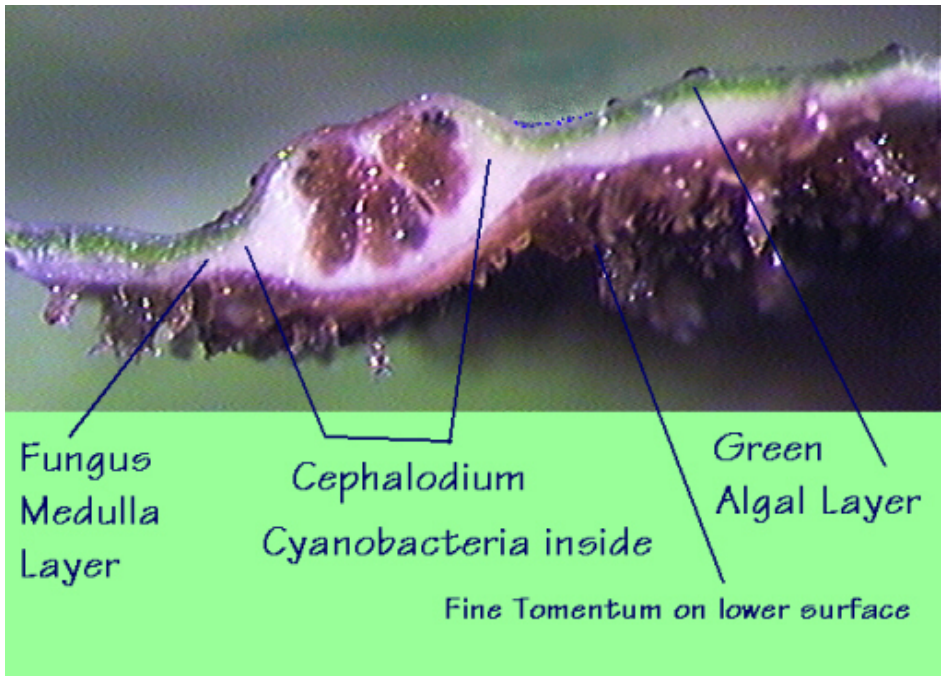
A few algal cells surrounded by fungal hyphae formed in small, pustule-like breaks in cortex called soralia



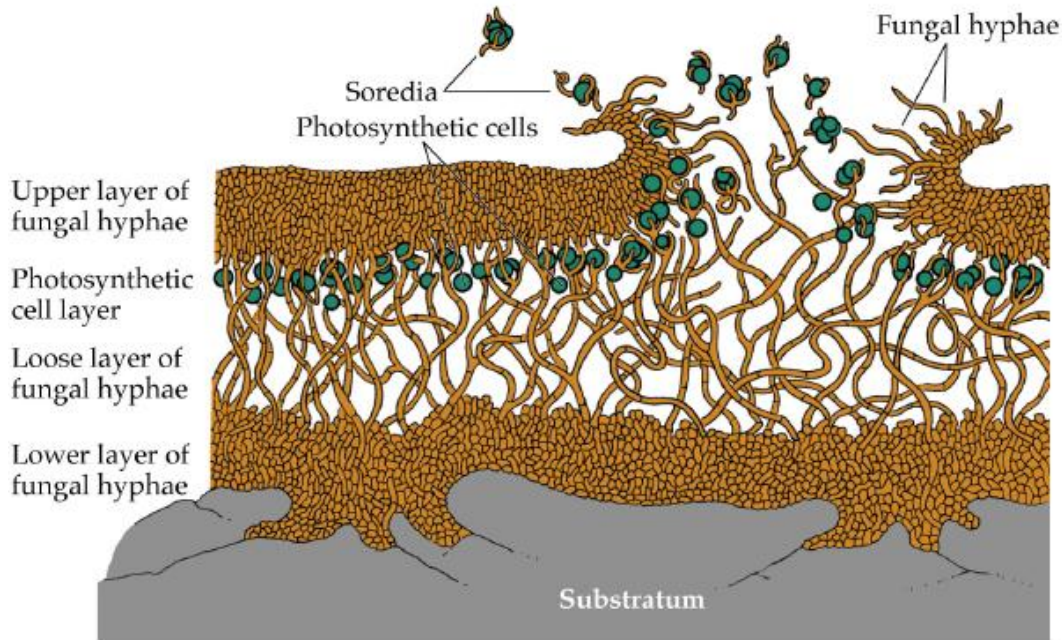
cortex

Soredia in soralium

Isidia

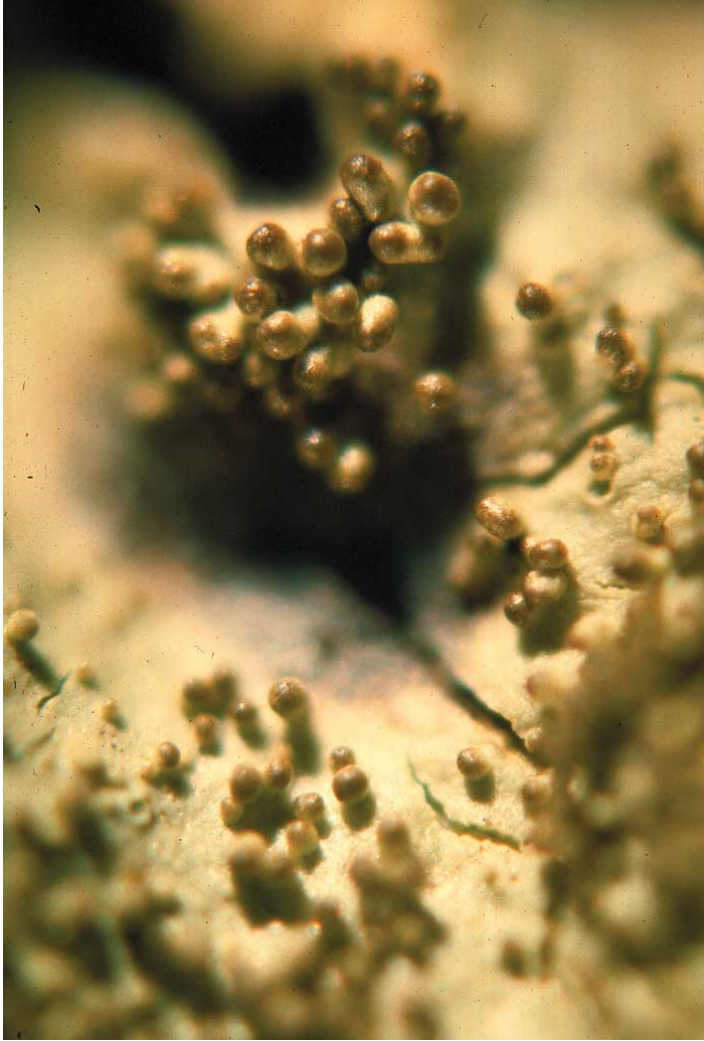


Cephalodia



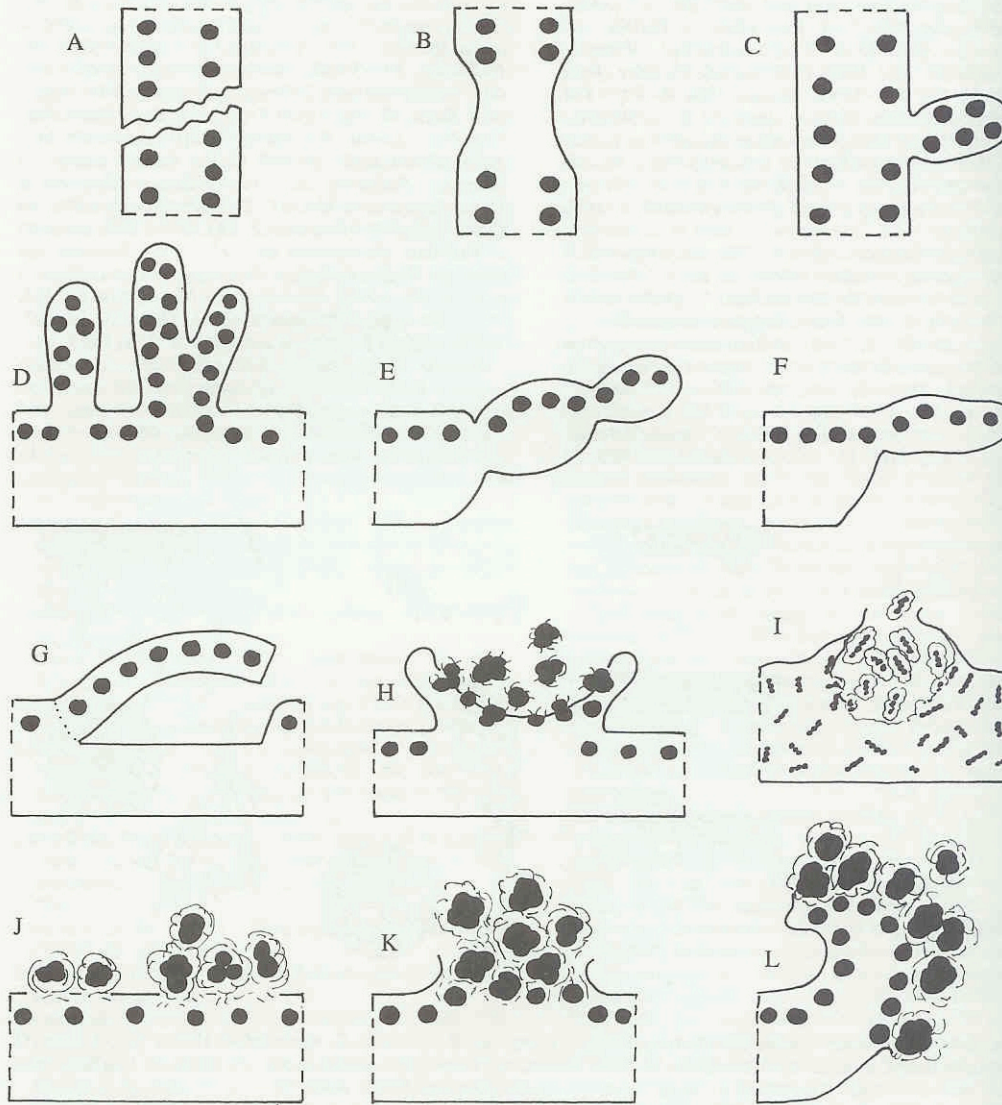
Soredia





Isidia

Lichen diaspores



Isidia

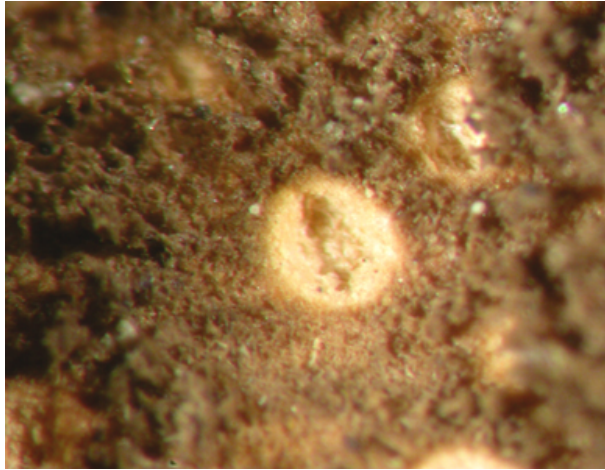
Thallus fragmentation
spinule

Lobules

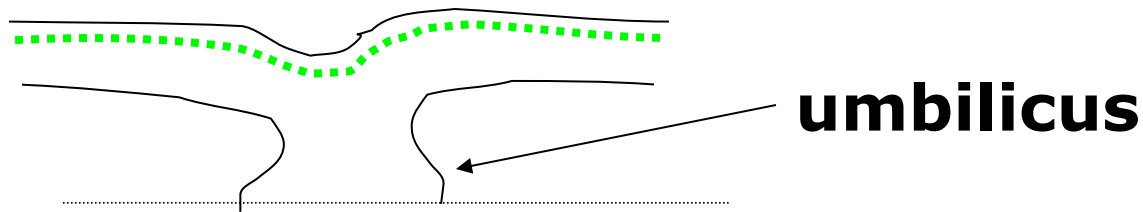
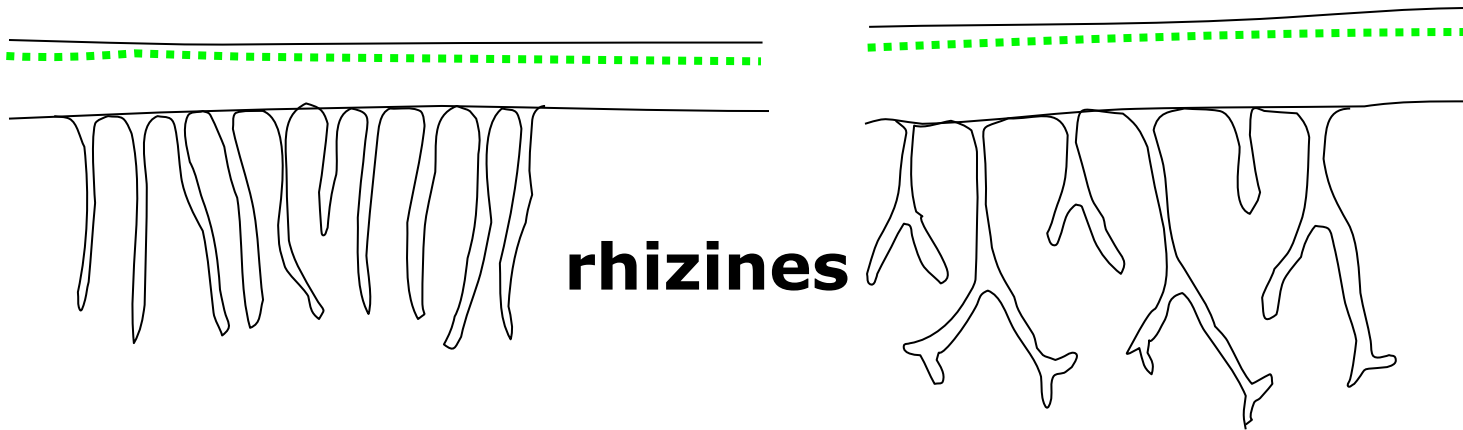
Soralia/Soredia

Other thallus structures

cyphellae, pseudocyphellae



Organs of attachment





Omphalina (=Lichenomphalia) umbellifera (the "greenpea mushroom lichen")



Pannaria pezizoides



Parmotrema perforatum



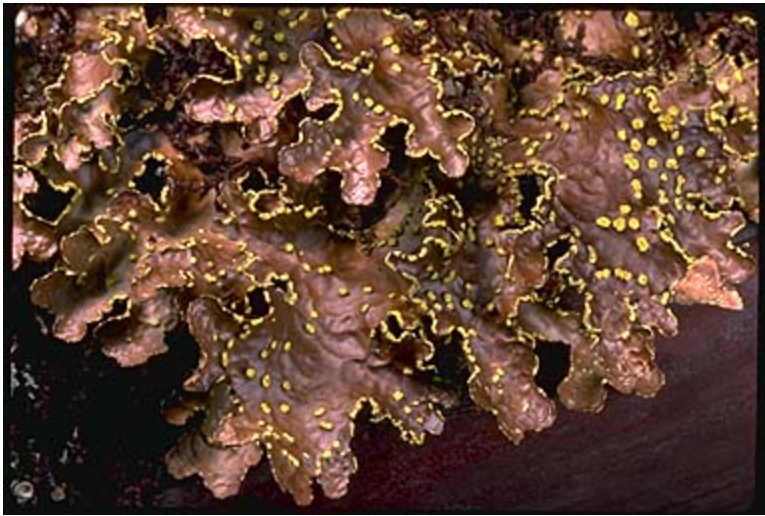
Peltigera leucophlebia



Phaeographis inusta, one of the "dark-spored script lichens". The dark lines are ascocarps of the lichen fungus.



Pilophorus acicularis, the "devil's matchstick" on a mossy boulder, northwestern Oregon.



Pseudocyphellaria crocata on a branch of manzanita (*Arctostaphylos* sp.) on the coast of Oregon.

Sticta limbata ("powdered moon lichen") on a twig, southwestern Washington.



Thamnolia vermicularis, the "whiteworm lichen", on alpine soil, northwestern Washington. The golden plover uses this lichen as nesting material.





Niebla combeoides
("bouquet fog lichen") *Niebla* species in North America grow in "fog deserts", areas along the west coast that have little summer rain but plentiful fog.



"Double-rim saucer lichen" (*Ochrolechia oregonensis*) on conifer bark, Oregon Coast Range.





Usnea fillipendula ("fishbone beard lichen") on a spruce trunk, north shore of Lake Superior, Ontario.



Usnea longissima, or "Methuselah's beard lichen", hanging from a Douglas-fir (*Pseudotsuga menziesii*) in the Oregon Cascades. This is easily the longest lichen in the world.

parasitic lichens, lichenicolous lichens

develop within thallus of another lichen species

may acquire photobiont “by theft” from host

Diploschistes muscorum begins by parasitizing *Cladonia* spp., which are completely overgrown. Initially have the photobiont of the *Cladonia* (*Trebouxia irregularis*) but older thalli contain the species *T. showmanii*.

Diploschistes muscorum



lichens parasitic on bryophytes

Dimerella lutea develops a crustose thallus between the cuticle and leaf cells of leafy liverworts



foliicolous lichens

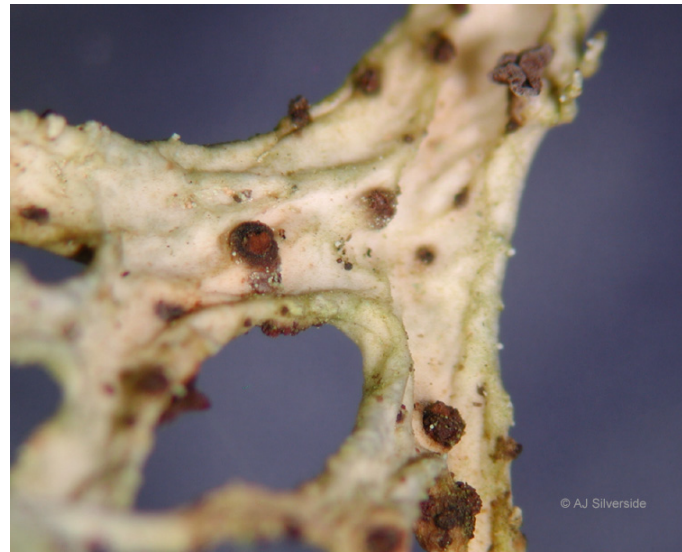
mainly found on the leaves of tropical rainforest trees

Phycobionts filamentous green algae, e.g. *Cephaleuros*, which can be free living and are considered leaf pathogens

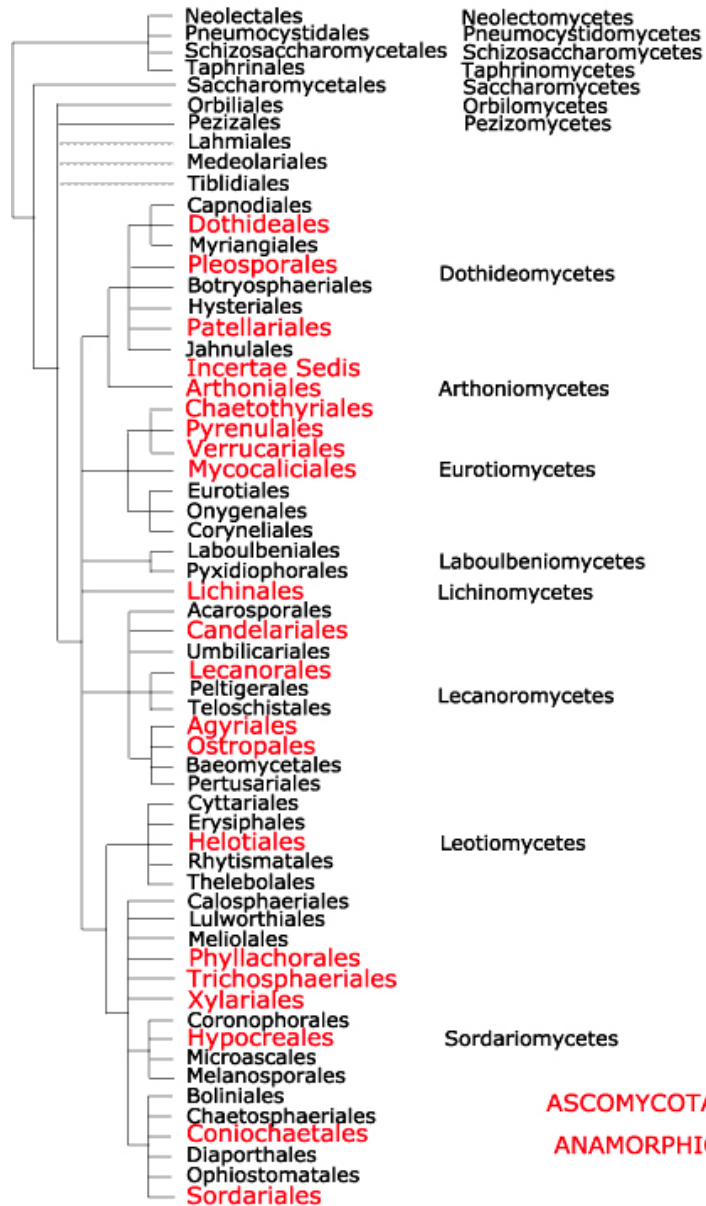


lichenicolous fungi

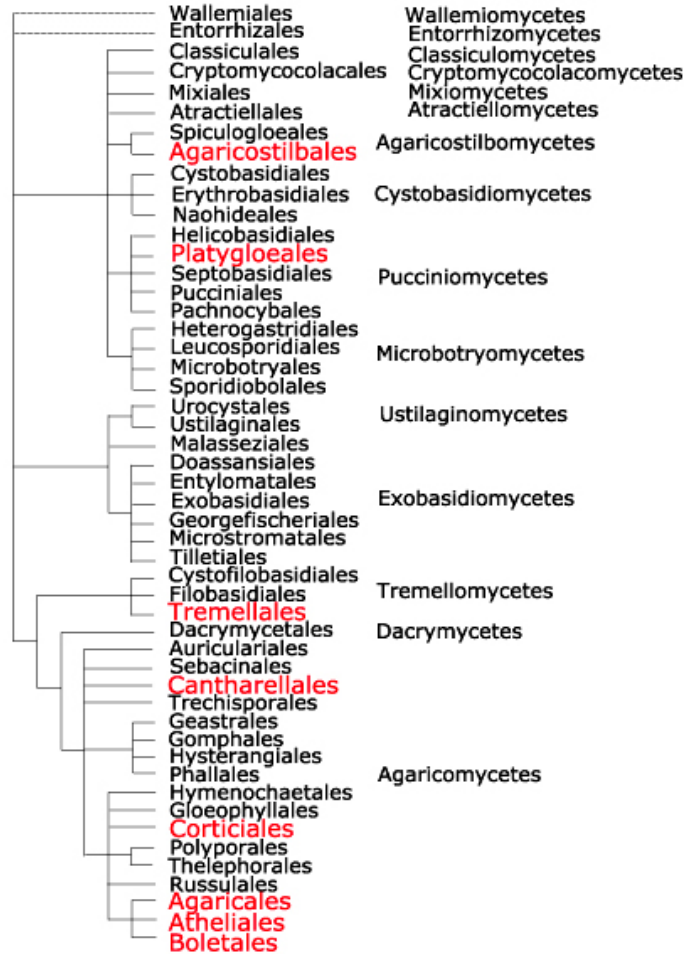
About 1000 spp of lichenicolous fungi, fungi that are specialized to inhabiting lichens. Some species are pathogens, cause death of lichen thallus. examples *Biatoropsis usnearum*, *Athelia arachnoidea*



ASCOMYCOTA



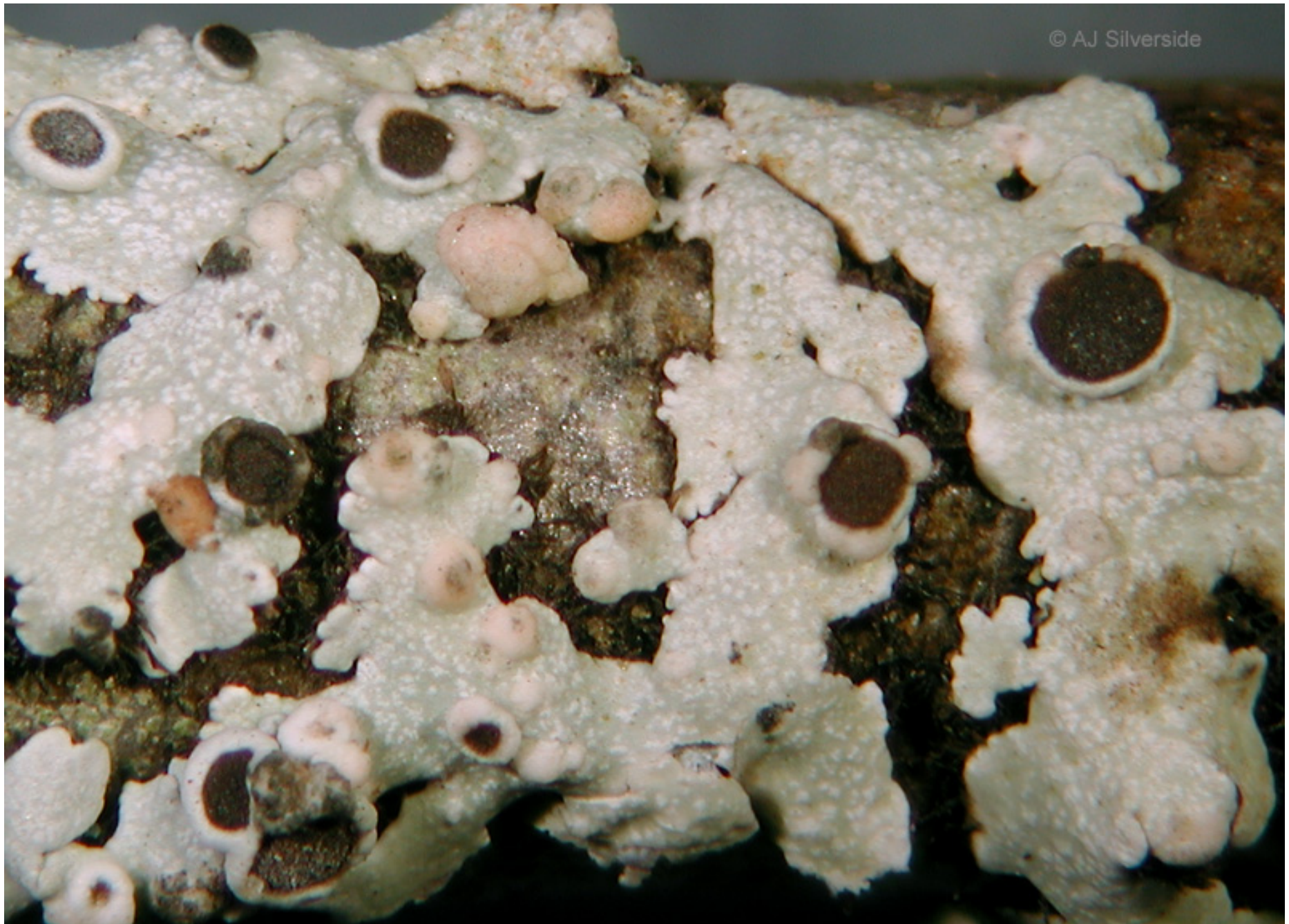
BASIDIOMYCOTA



ASCOMYCOTA INCERTAE SEDIS

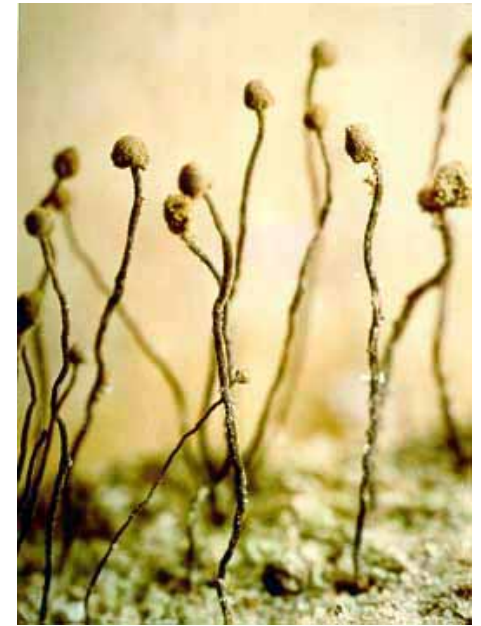
ANAMORPHIC ASCOMYCOTA

Distribution of lichenicolous fungi



Caliciales, Mycocaliciales
“pin lichens”

ascoma a mazaedium



Mycocalicium spp. resemble Calicium, but belong to the Eurotiomycetes (group that includes *Aspergillus*, *Penicillium*).



Sphaerophorus

