

# **F.Y.B.Sc. – Botany Paper-I**

## **Plant Diversity-I**

**Semester-I**

### **LICHENS**

- Classification, Structure, Method of Reproduction,
- Economic Importance and Ecological Significance of Lichens.

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# Lichens

- Lichens are very peculiar group of plants as they are composites. The thallus of Lichen is formed of two quite different organisms known as a fungus( a mycobiont) and an alga(a phycobiont). The mycobiont belongs to Ascomycetae or Basidiomycetae, while the phycobiont generally a unicellular alga.

# Lichens

Lichens are symbiotic associations between photosynthetic micro-organisms held in a mesh of fungi.



Different species of lichens growing on a boulder.



*Cladonia fimbriata*

The fungus gives the lichen its shape.

The alga provides the fungus with food. In some lichens the 'alga' is a Cyanobacteria and fixes nitrogen. Lichens are colonizers of bare rock but some species are epiphytes found in tree canopies.

# Symbiosis

together life

**Symbionts:** the organisms involved

**Host:** the larger organism, if there is one

**Mutualism:** both symbionts benefit

**Commensalism:** one symbiont receives benefit while  
neither harming nor helping the other in  
any significant way

**Parasitism:** one symbiont, called a parasite, benefits at the  
expense of the other, usually a host

# There are some 16,000 species of lichen

In contrast to the many thousands of lichen fungi, there are only about 100 photosynthetic partners.

The algal components can live in isolation with the fungal component – so the symbiotic relationship is **not obligate** for them. However, no zoospores (the algal resting stage) or gametes are produced while the alga is in the symbiotic relationship though they can produce them when cultured outside of it.

In contrast the symbiotic relationship **is obligate** for the fungal component. The mycelium of a few species may grow under laboratory conditions, on agar, but no lichen specific thallus is produced and no fruiting body develops.

The oldest certain fossil lichen is Early Devonian (about 400 million years old) from the Rhynie Chert.

Lichens are unique as a symbiotic relationship because they look and behave quite differently from their component organisms. Lichens are regarded as organisms in their own right and are given generic and species names.

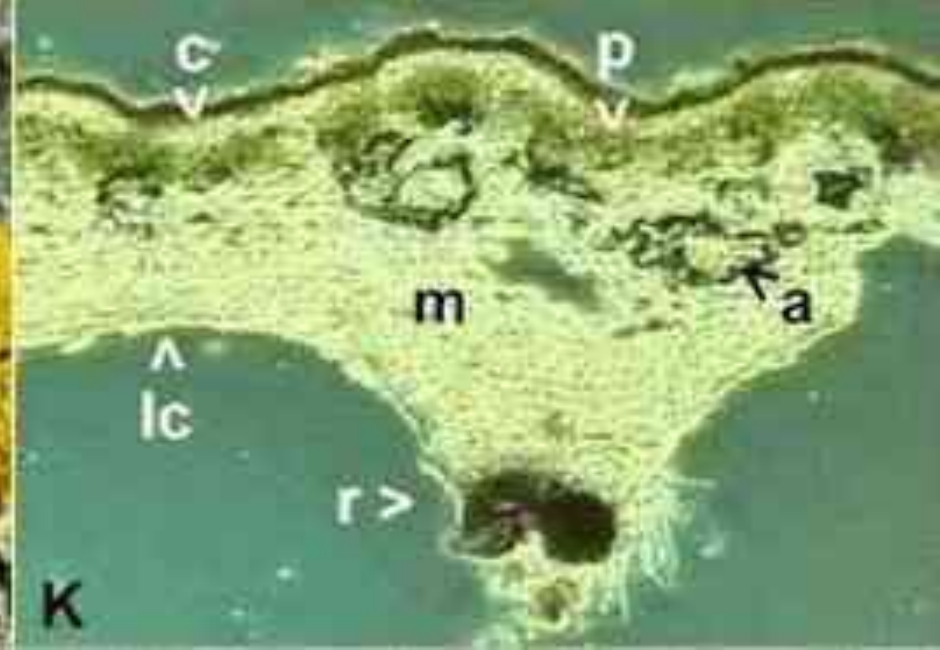
The fungus is termed the mycobiont

The green alga or a cyanobacterium is termed the photobiont.

The "body" of a lichen is termed the thallus, and its general shape is used to group lichens into four broad categories.

Foliose   Fruticose   Squamulose   Crustose





The foliose lichen *Xanthoria parietina*, which grows on surfaces, including concrete, and rocks subjected to sea spray. Much of the surface is covered with bright orange fungal fruiting bodies about 3-5 mm diameter (arrowheads). The orange colour is due to production of the pigment parietin at the lichen surface.

Cross section of one of a lobe viewed by phase-contrast microscopy. The photosynthetic zone (p) is a distinct band of green algal cells. Above this band is the cortex (c) of densely packed fungal cells. The lower part of the thallus consists of a medulla (m) with conspicuous air pockets (a),

# Lichen Classification :

- Lichens are classified on the basis of their fungal components. They are:
- **A. Ascolichens-** Fungal partner from Ascomycetae.
  - i) **Gymnocarpae-** Ascocarp is an apothecium;
  - ii) **Pyrenocarpae-** Ascocarp is a perithecium;
- **B. Basidiolichens-** Fungal partner belongs to Basidiomycetae.
  - Depending on the habitat the lichens are classified as:
  - i) **Saxicolous-** Growing on stones and rocks;
  - ii) **Corticolous-** Growing on barks of trees;
  - iii) **Terricolous-** Growing on soil (terrestrial).



## GENERAL CHARACTERS:

- A lichen thallus is irregular in shape and greyish in colour. Some may be yellow, orange, brown, or red in colour. The thalli show a great diversity in forms and accordingly maybe indentified as
  - 1) Crustose(Crustaceous),
  - 2) Foliose
  - 3) Fruticose

# Crustose lichens:



- **Crustose lichens:** The thallus is insignificant in size and belongs to saxicolous type. It is just a thin layer or a crust closely attached to the substratum. The thallus is divided into hexagonal areas called Areolae

# Foliose lichens:



- **Foliose lichens:** The thallus is foliose(leaf-like) in appearance. It is flat and lobed with distinct upper and lower surfaces. The thallus is attached by means of rhizoid-like outgrowths called rhizinae. A rhizinae may consists of a simple, single branched hypha or a number of closely adhering hyphae. The free end of rhizinae becomes broad to form a disc and functions for absorption and fixation.



# Fruticose lichens:



- **Fruticose lichens:** The thallus is branched, conspicuous and very complex. Branches are usually cylindrical or flattened, but in some species like *Usnea* they hang and are tassel-like. The thallus is attached only at the base by a flattened disc and the upper and lower surfaces are not differentiated. Disc-like ascocarps called apothecium are present.

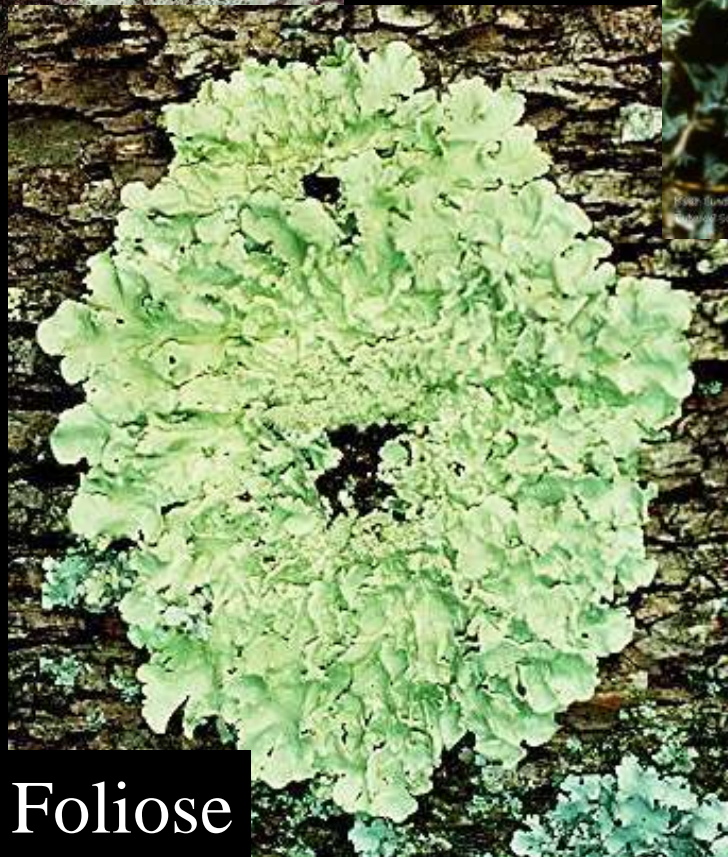
Fruticose



Crustose



Foliose





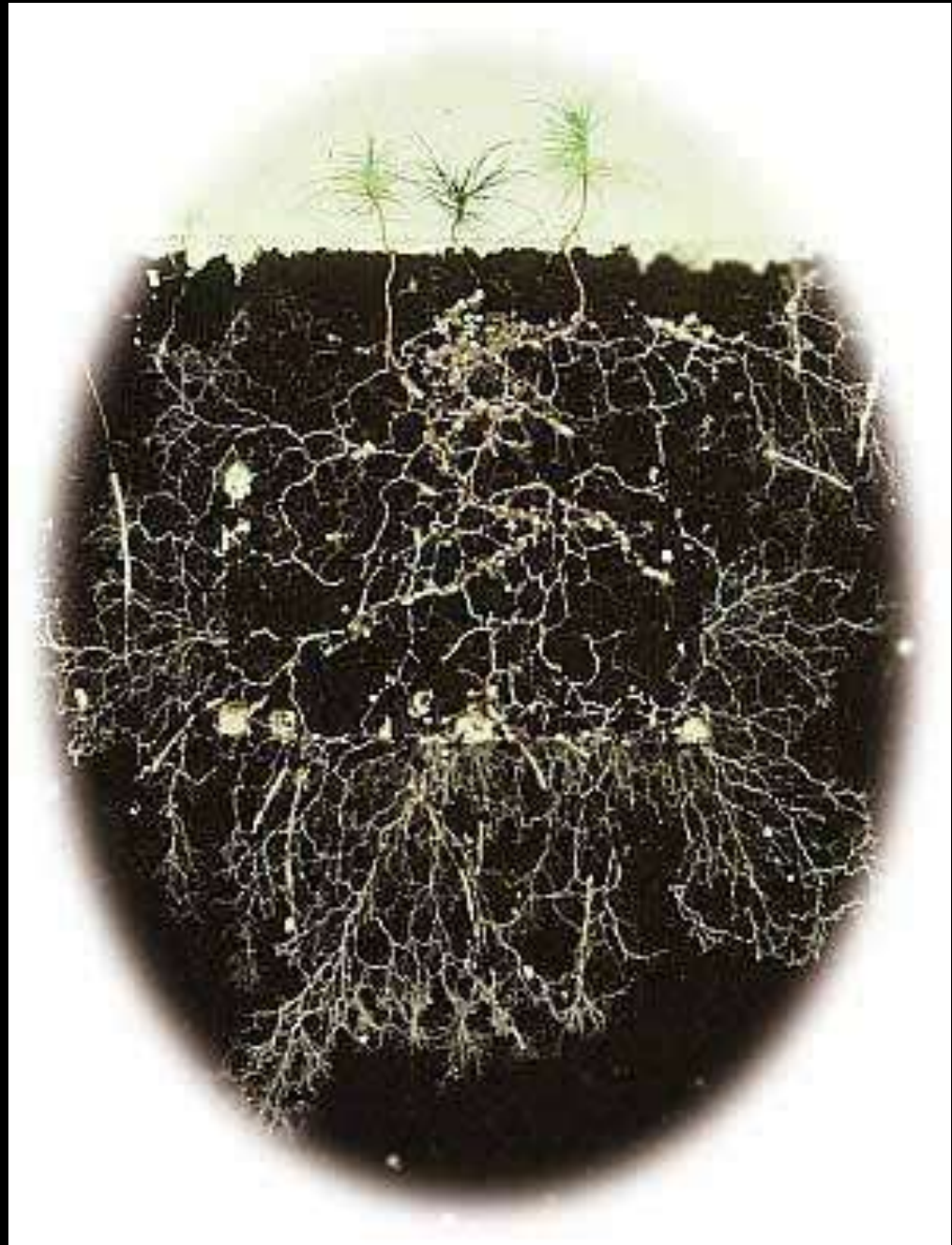
# Mycorrhizae

Mycorrhizae means “fungus-root”; mutualistic relationship between plant and fungi

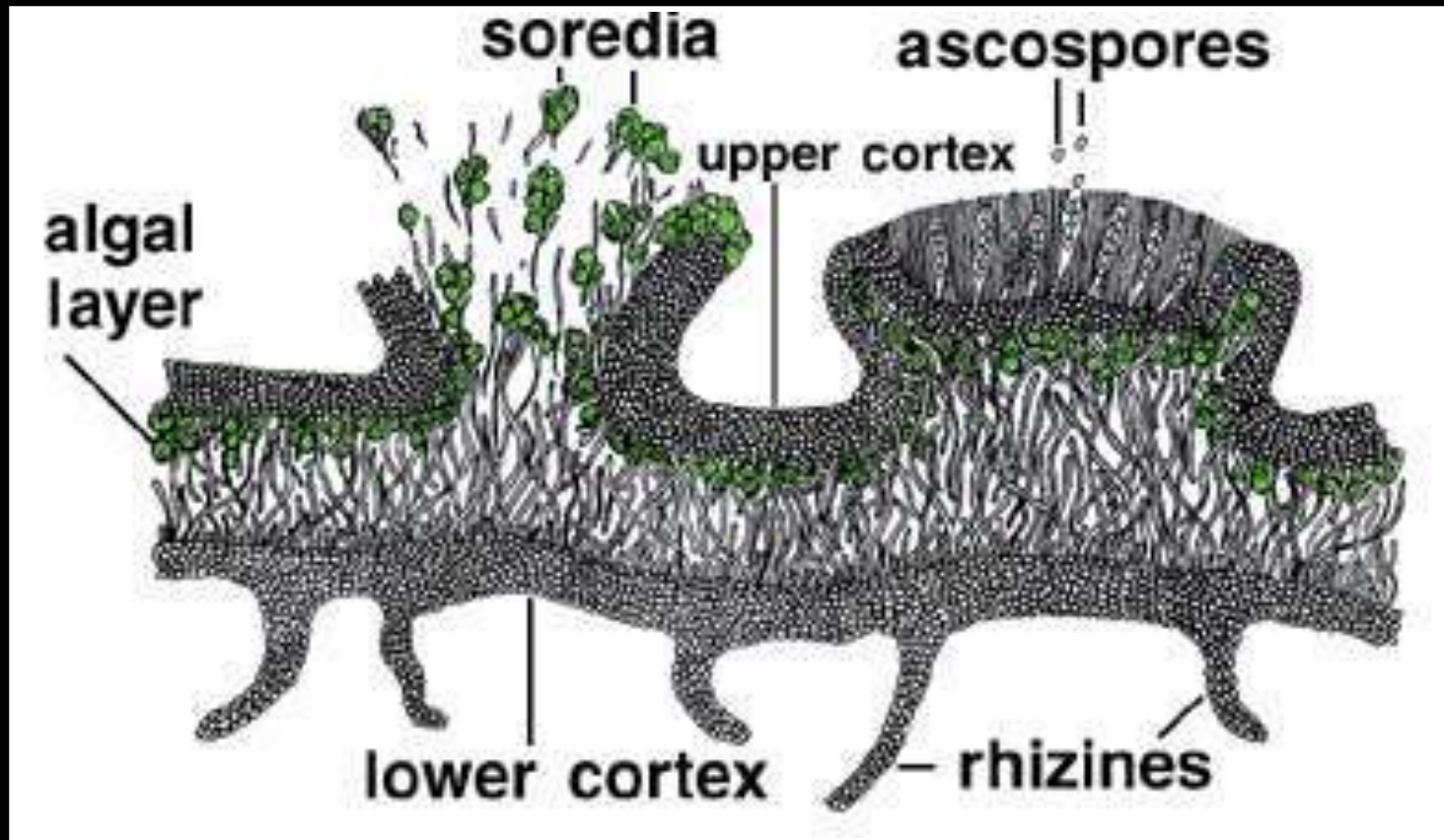
The plant photosynthesizes while the fungus more efficiently takes up nutrients and water from the rhizosphere than the roots would alone.

## **Plant benefits include:**

- Improved nutrient/water uptake
- Improved root growth
- Improved plant growth and yield
- Improved disease resistance
- Reduced transplant shock
- Reduced drought stress



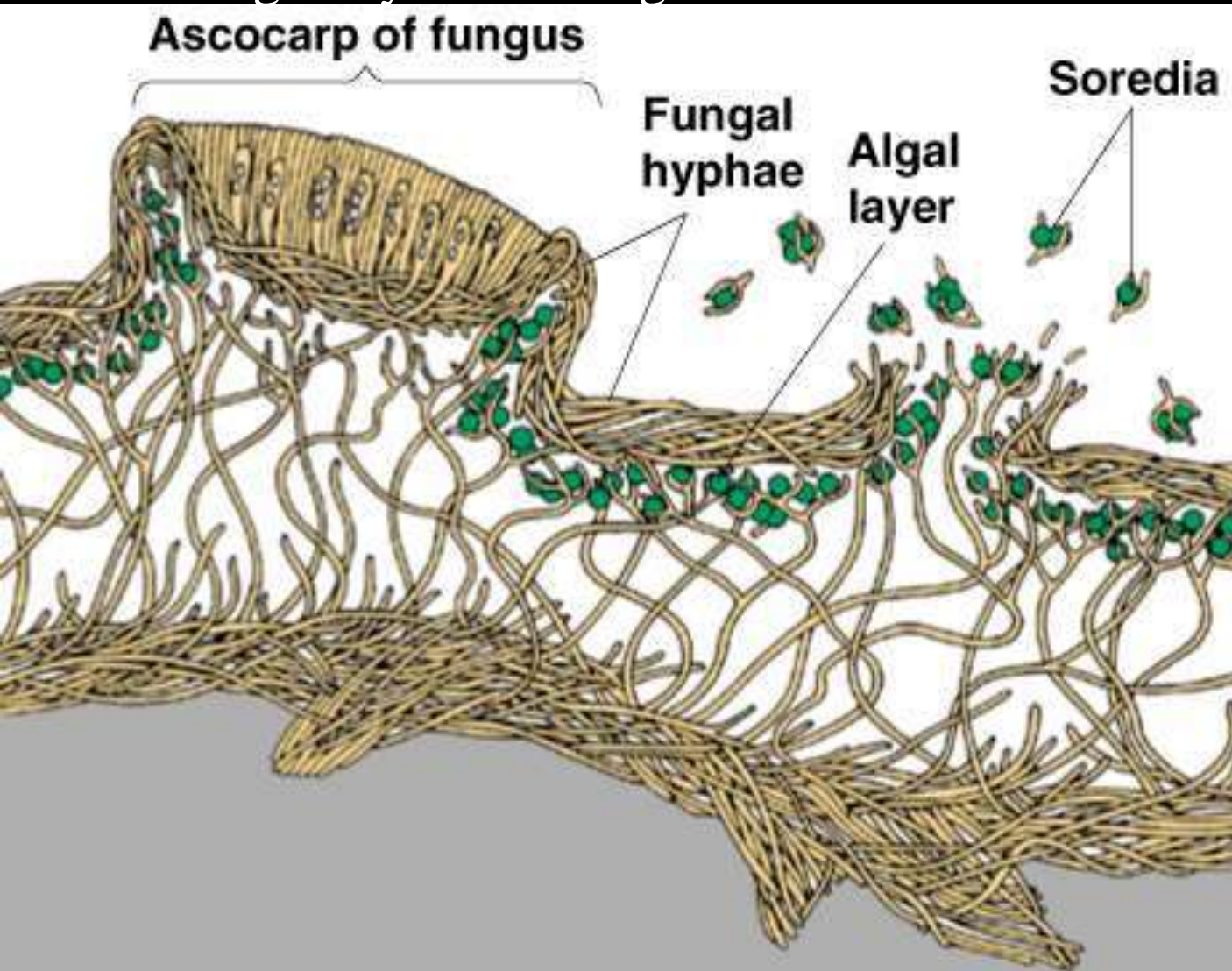




**Soredia** are the asexual reproductive part of lichens, containing both symbionts. **Rhizines** may be present to anchor the lichen. Notice the distinctive **algal layer** and the **fungal layer** present in the above illustration.

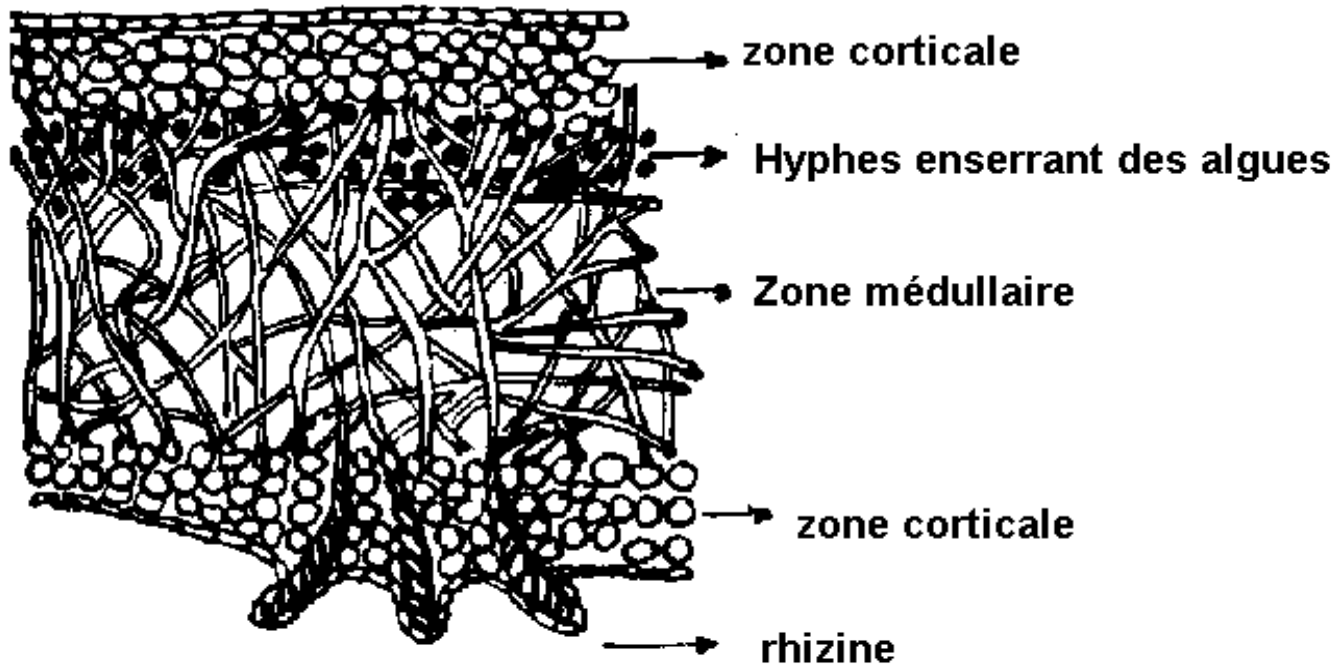
# Cross-section through a lichen

Fruiting body of the fungus



Fungal hyphae:  
a filament,  
composed of  
single cells  
joined together  
end to end

# Thallus Structure :

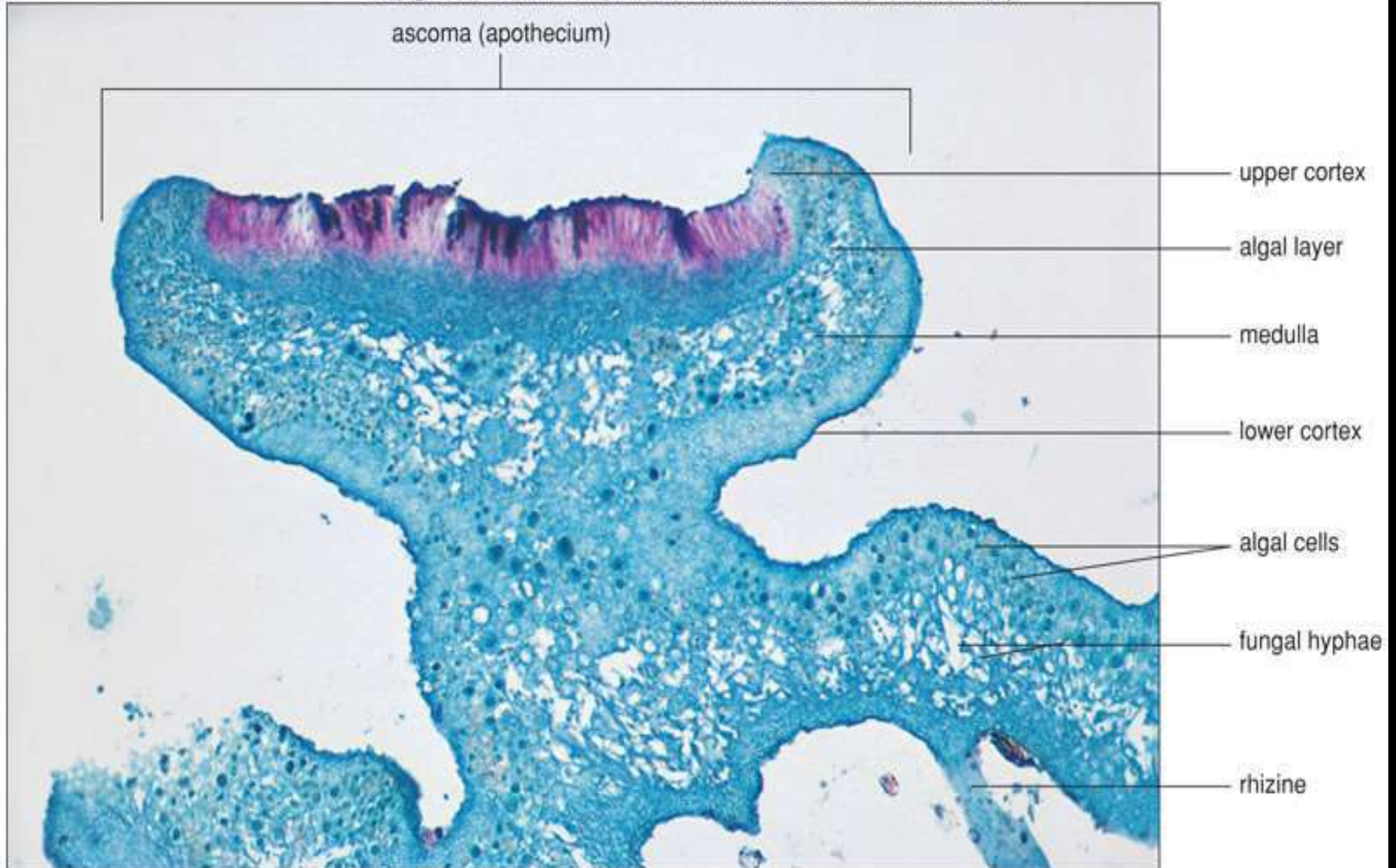


**Vue microscopique d'une coupe  
longitudinale d'un lichen crustacé**



# Lichens

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Photomicrograph by G.S. Ellmore

# Foliose lichens



Foliose lichens have a flat, leaf-like structure



*Parmelia physodes*, growing on the twigs of a shrub.





Fruticose lichens have an erect or pendulous, bushy structure



Squamulose lichens have a thallus consisting of minute, scale-like squamules

*Lecanora muralis*  
with ascocarps pink-brown



# Lichens

Lichens are mutualistic symbiotic organisms.





Crustose lichens produce a flat crust on or beneath rock or tree surfaces





































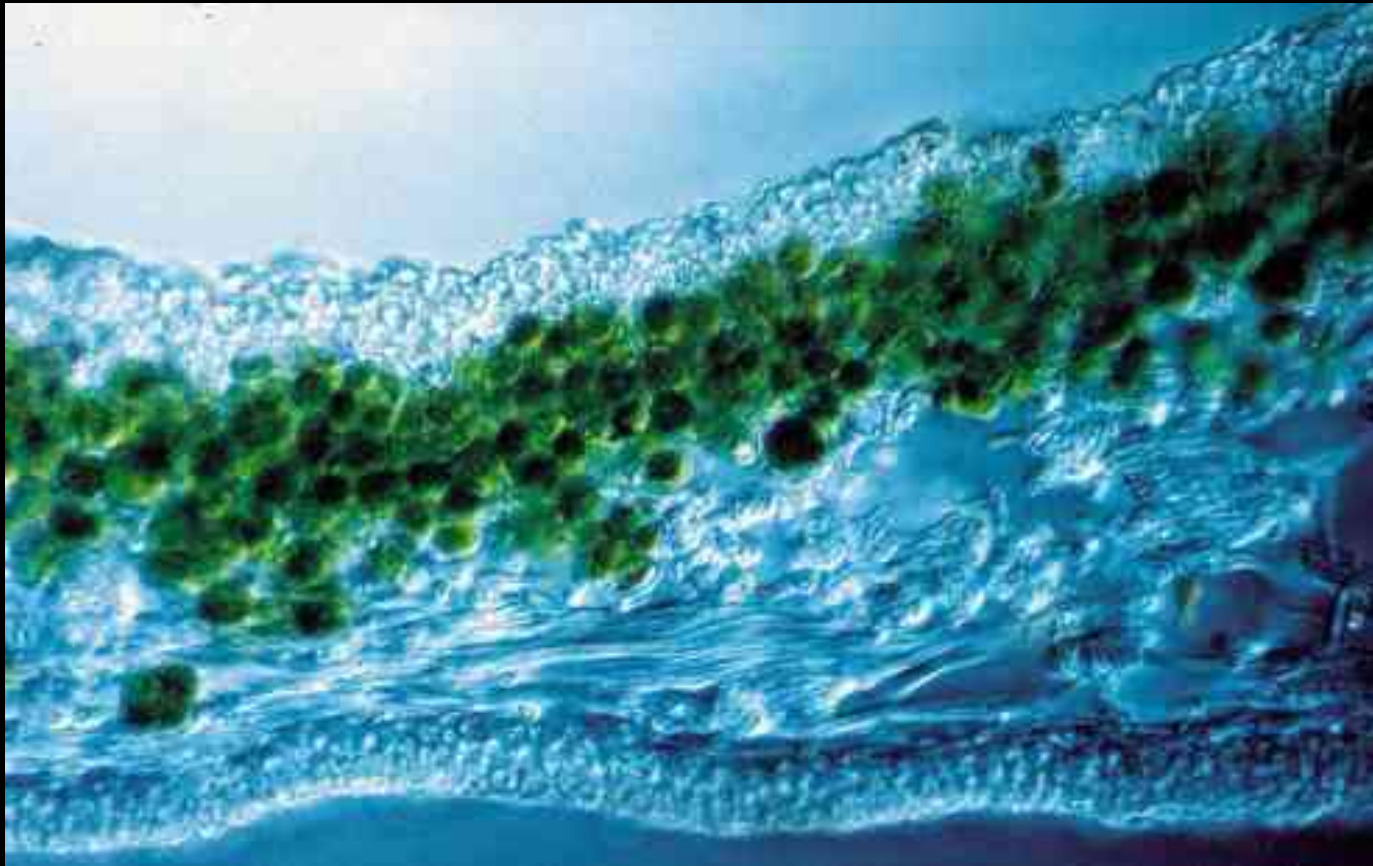




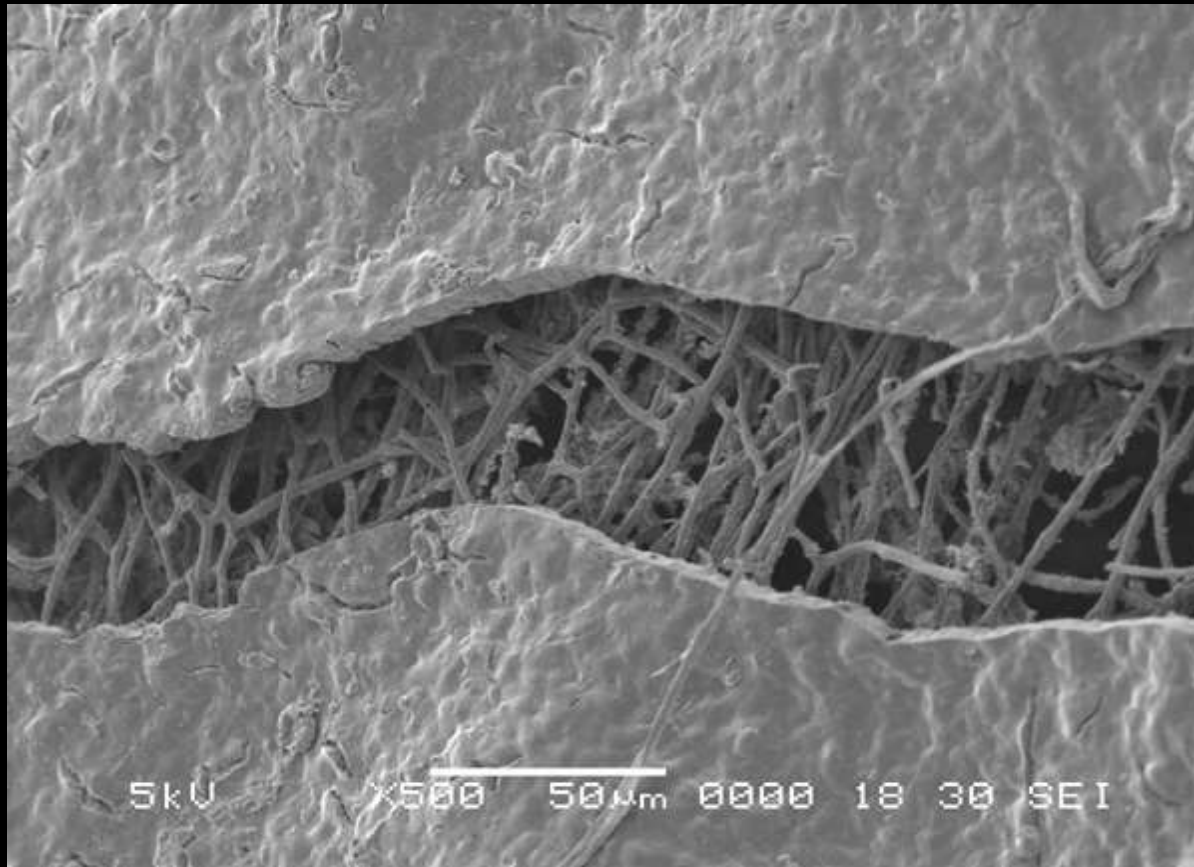




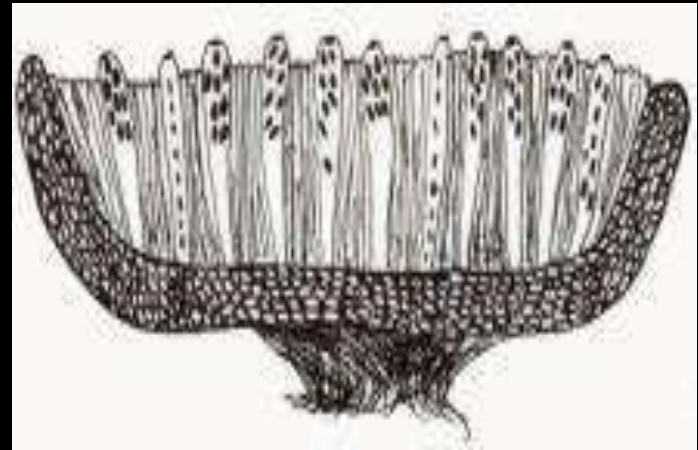
# Thallus – Microscopic



# Thalle – microscopic :



# Apothecium :



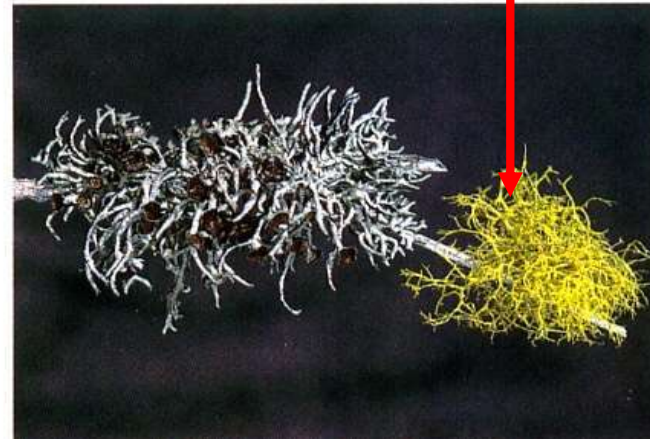
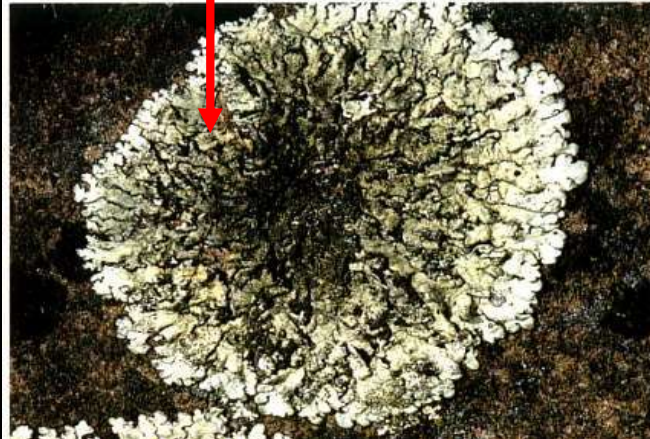




# LICHENS



A.





# Lichens





THANK YOU

