

Biological soil crusts in arid habitats



Bunch grass and shrubs



Arid lands without crusts!

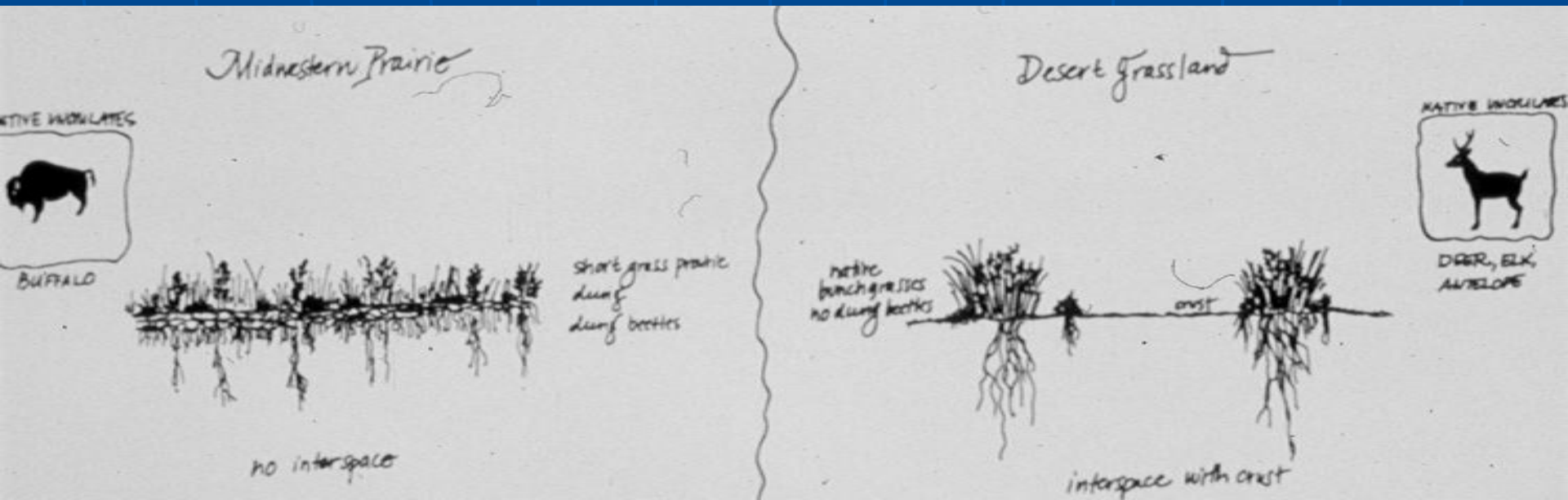


Arid lands without crusts!





Different ecosystems have different processes that they are adapted for



The arid steppe





All Crusts are not created equal



Warm versus Cold deserts



“Crusts are where they are needed”



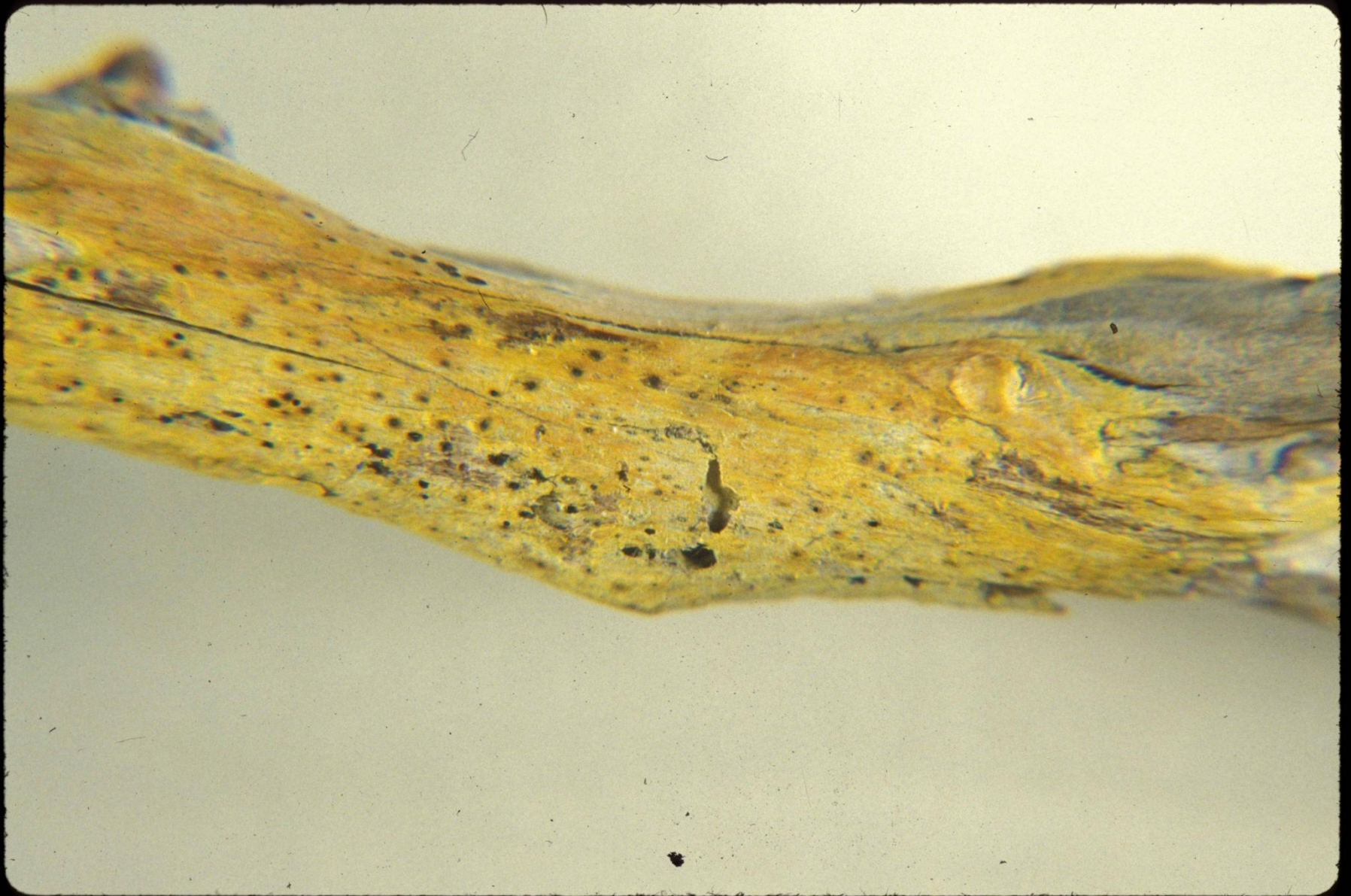
Build the structure and the crusts will come!



Clumped vegetation, Jacks Cr.



Crustose lichen



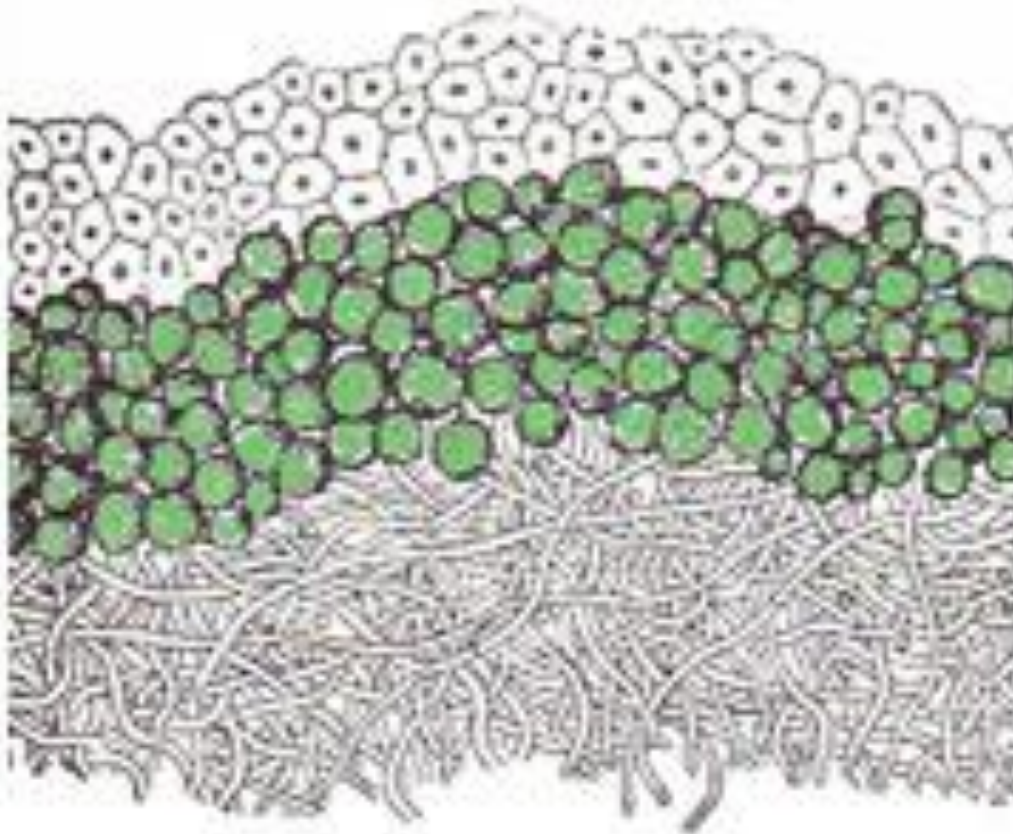
Squamulose lichen



Lichens

- Alice and Freddy

Cross Section of Lichen

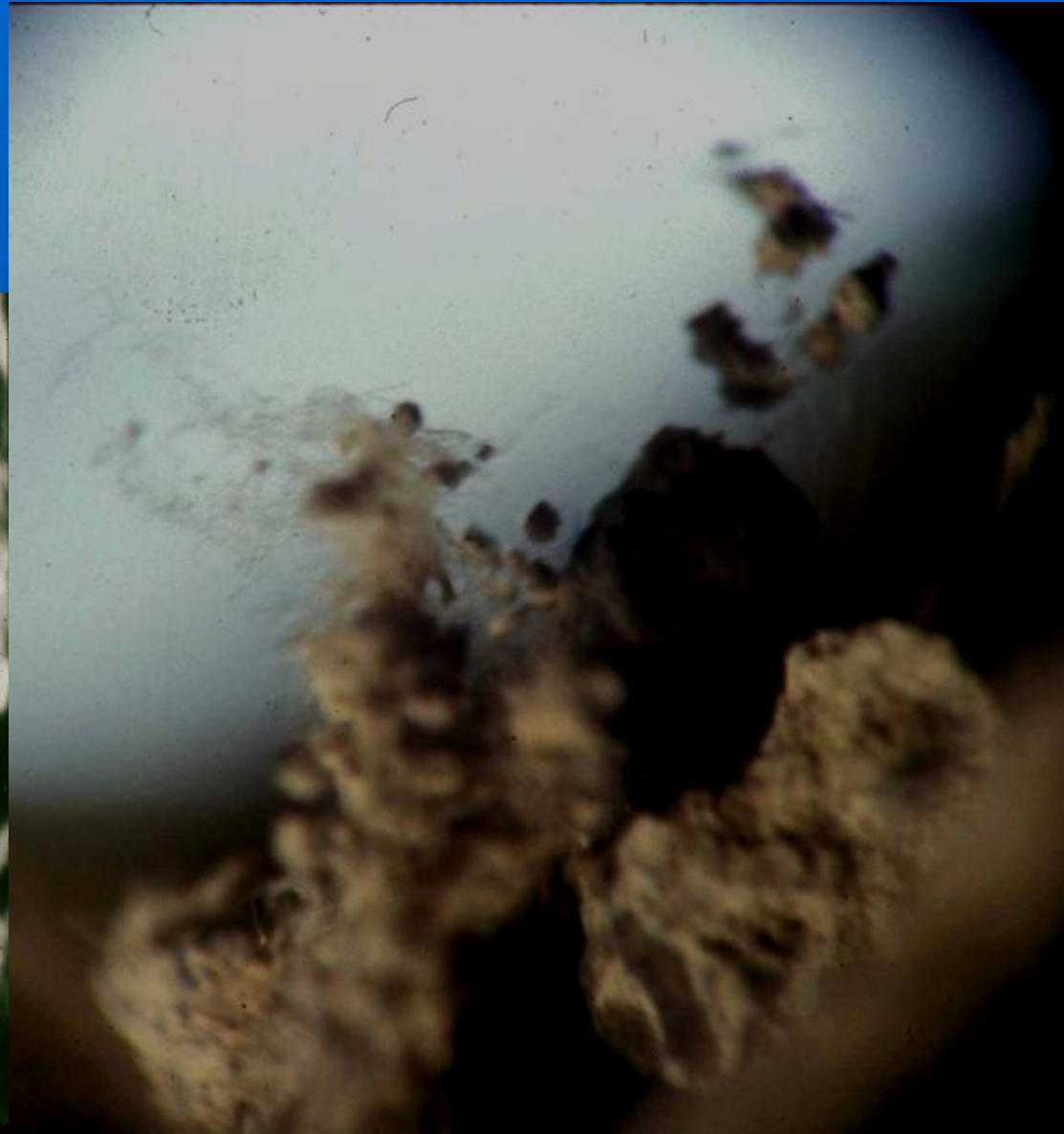
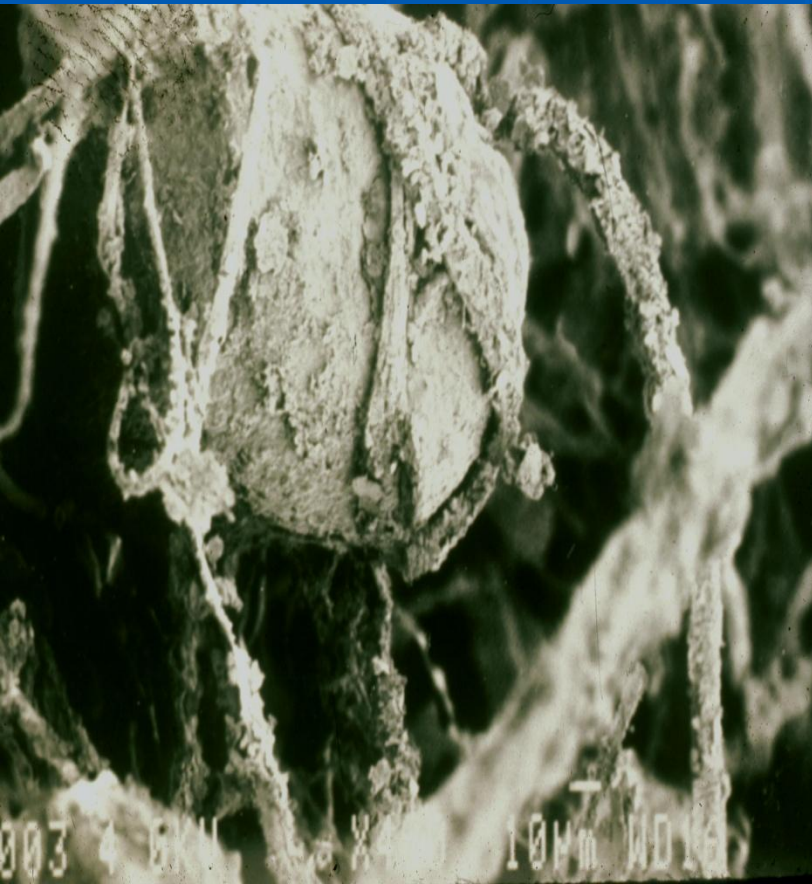


Cortex (top)

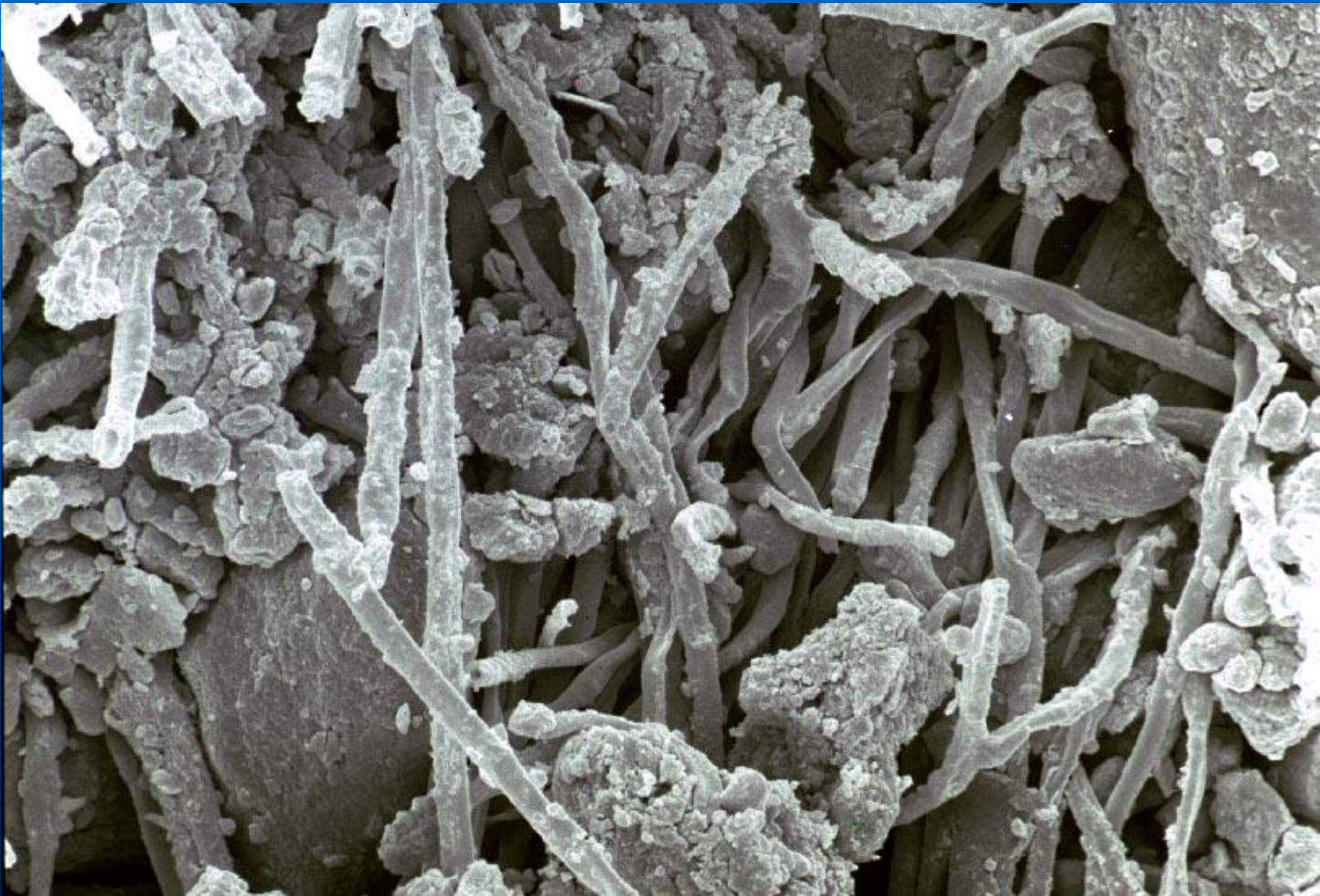
Algal Layer

**Medulla
(bottom)**

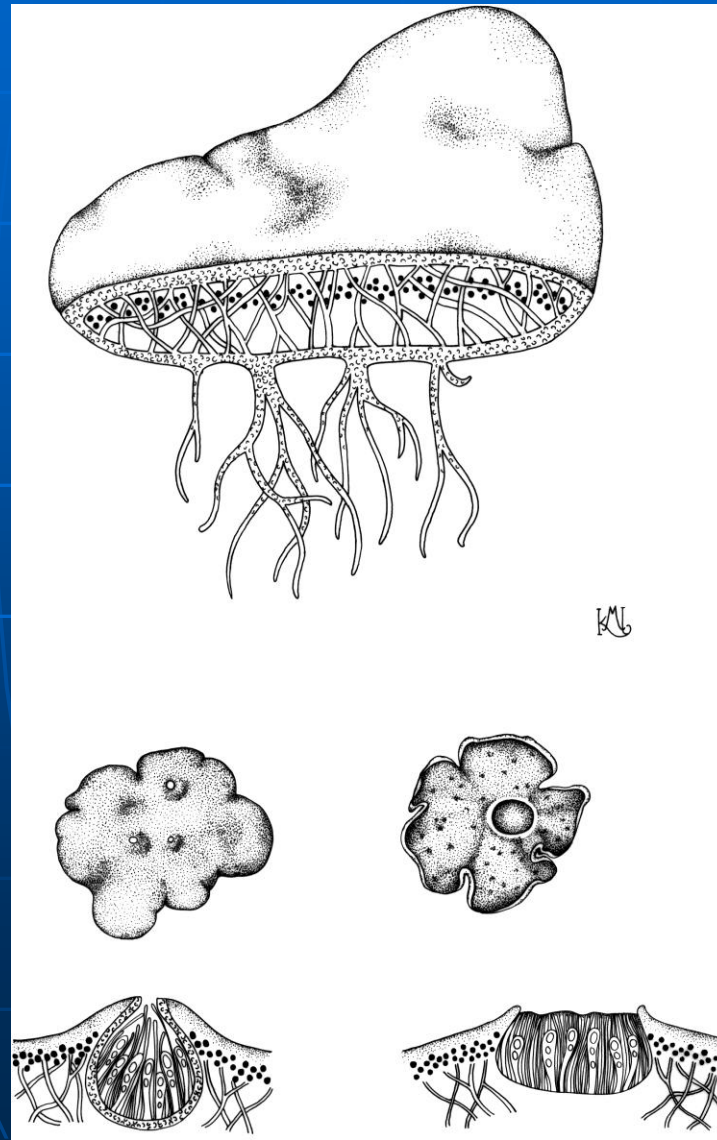
Lichen roots!



Lichen roots up close



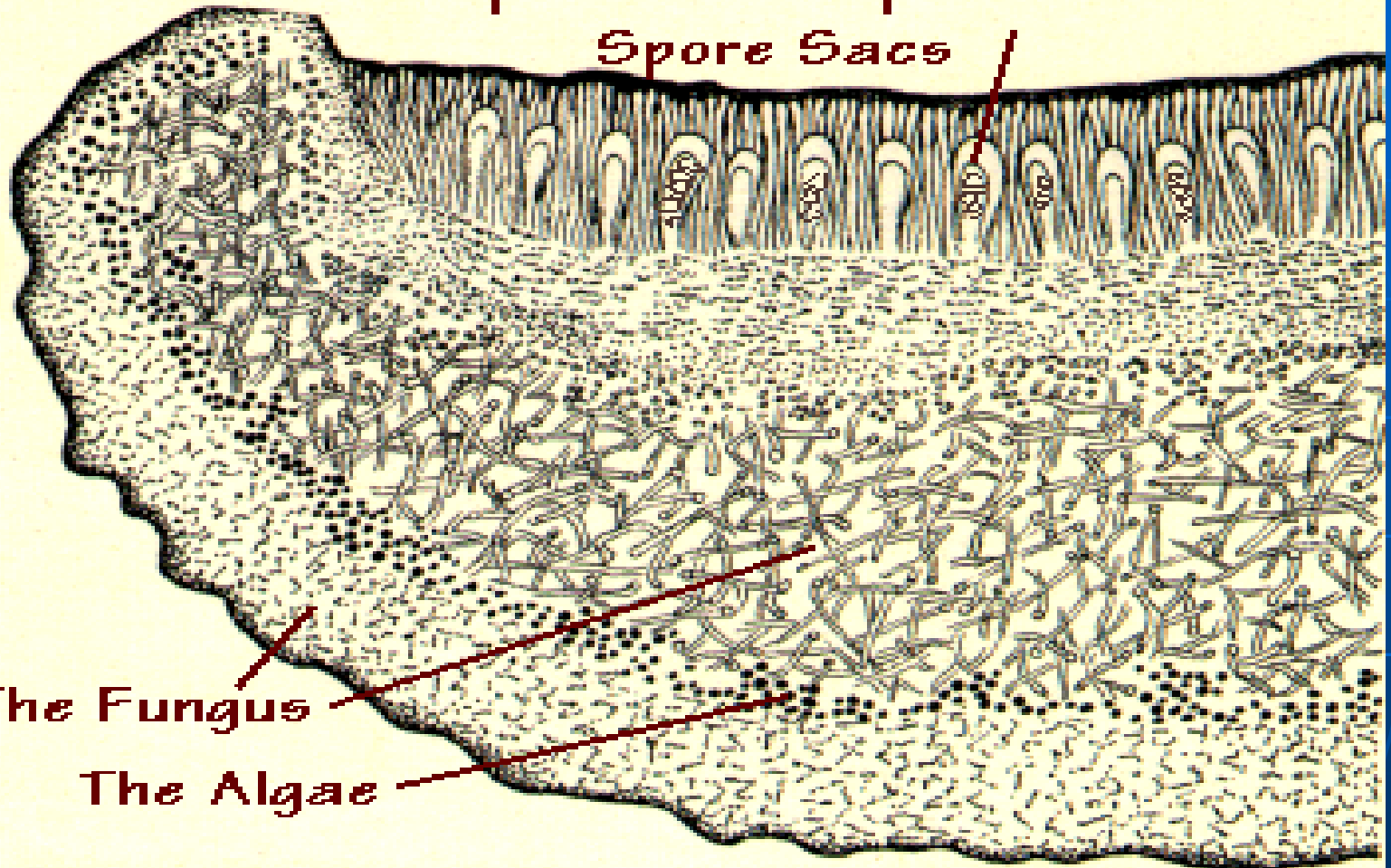
Lichen roots!



Apothecia on a lichen



Reproductive Spores in
Spore Sacs

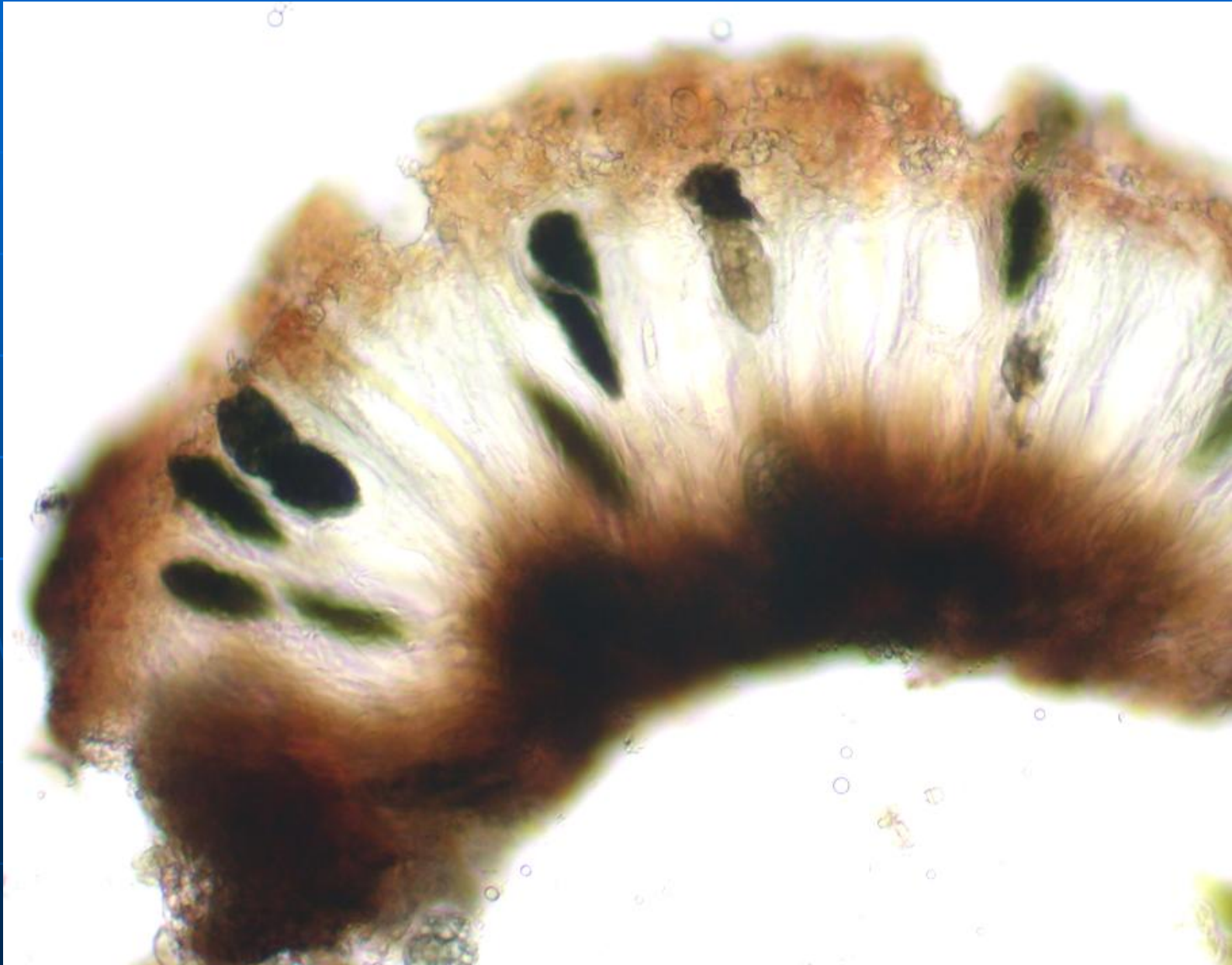


The Fungus

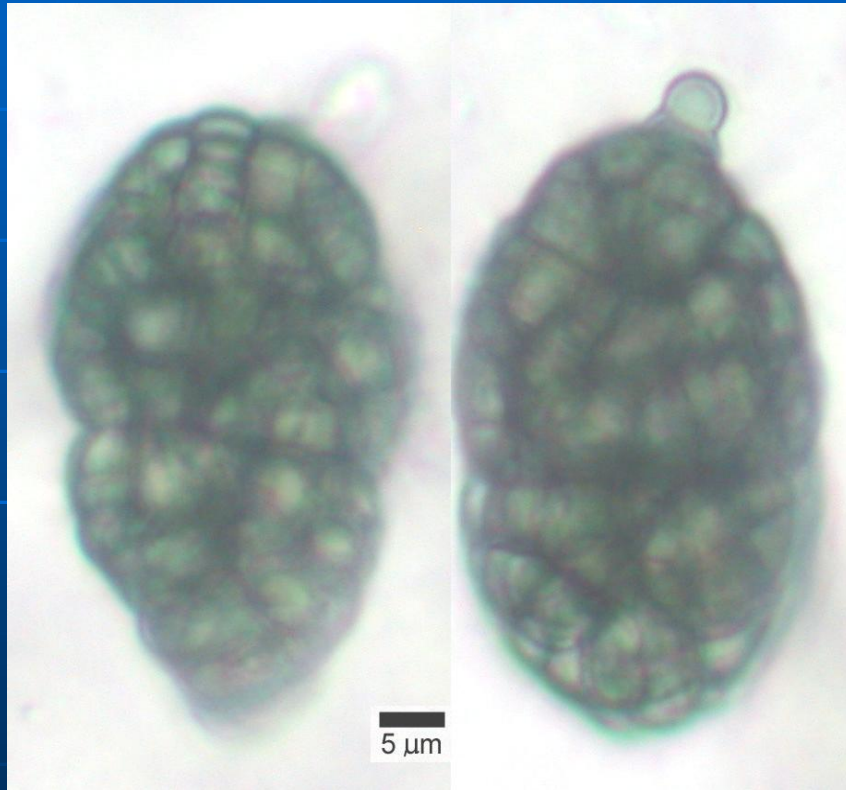
The Algae

Cross-cut through an Apothecium

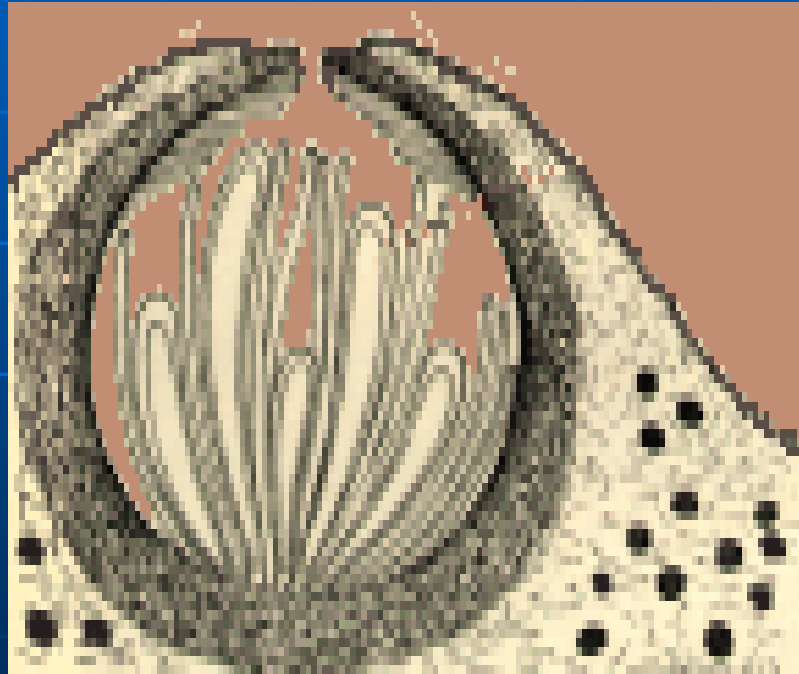
Spores of the crustose lichen



Different size and shaped spores



Perithecia



Cross section of a lichen

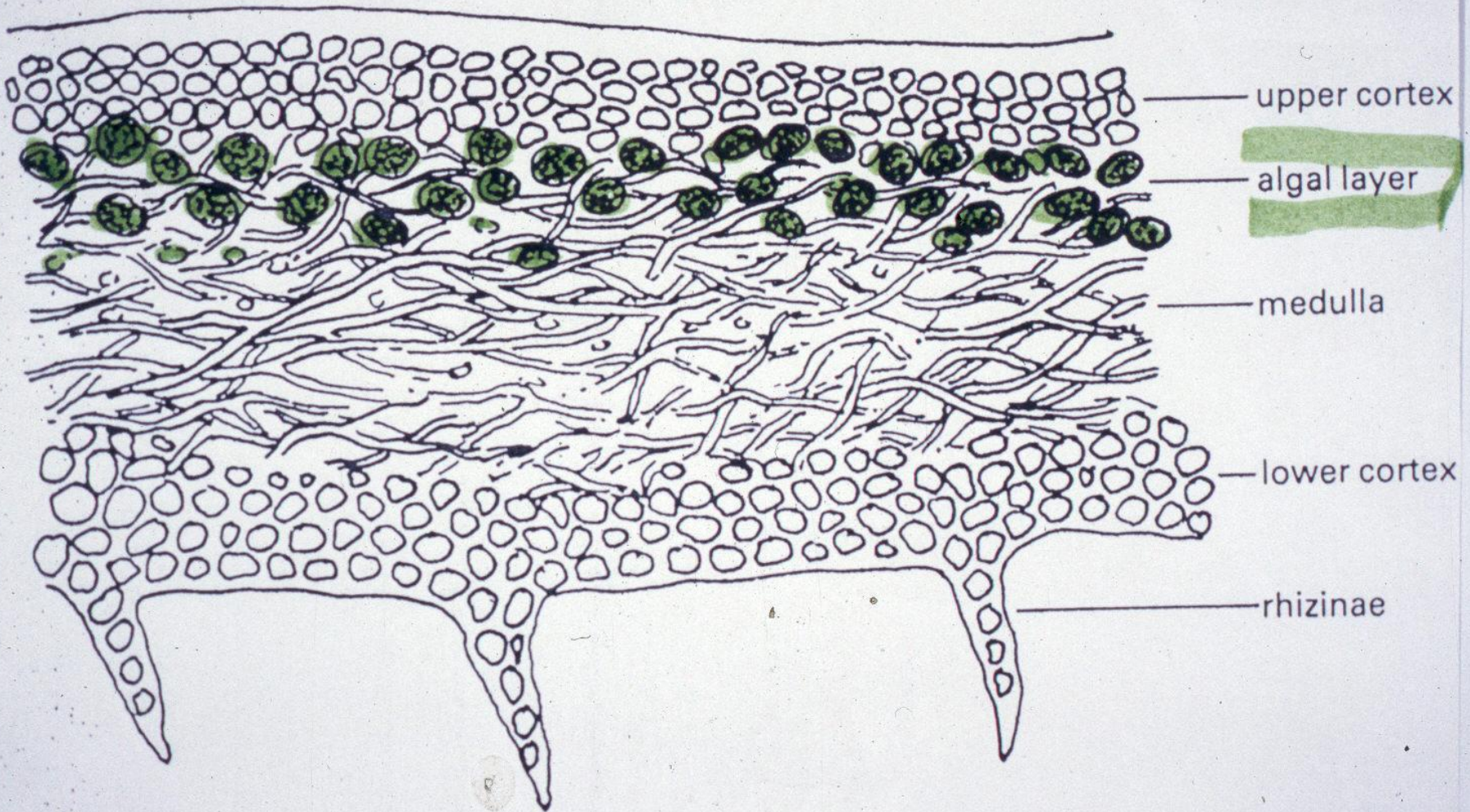
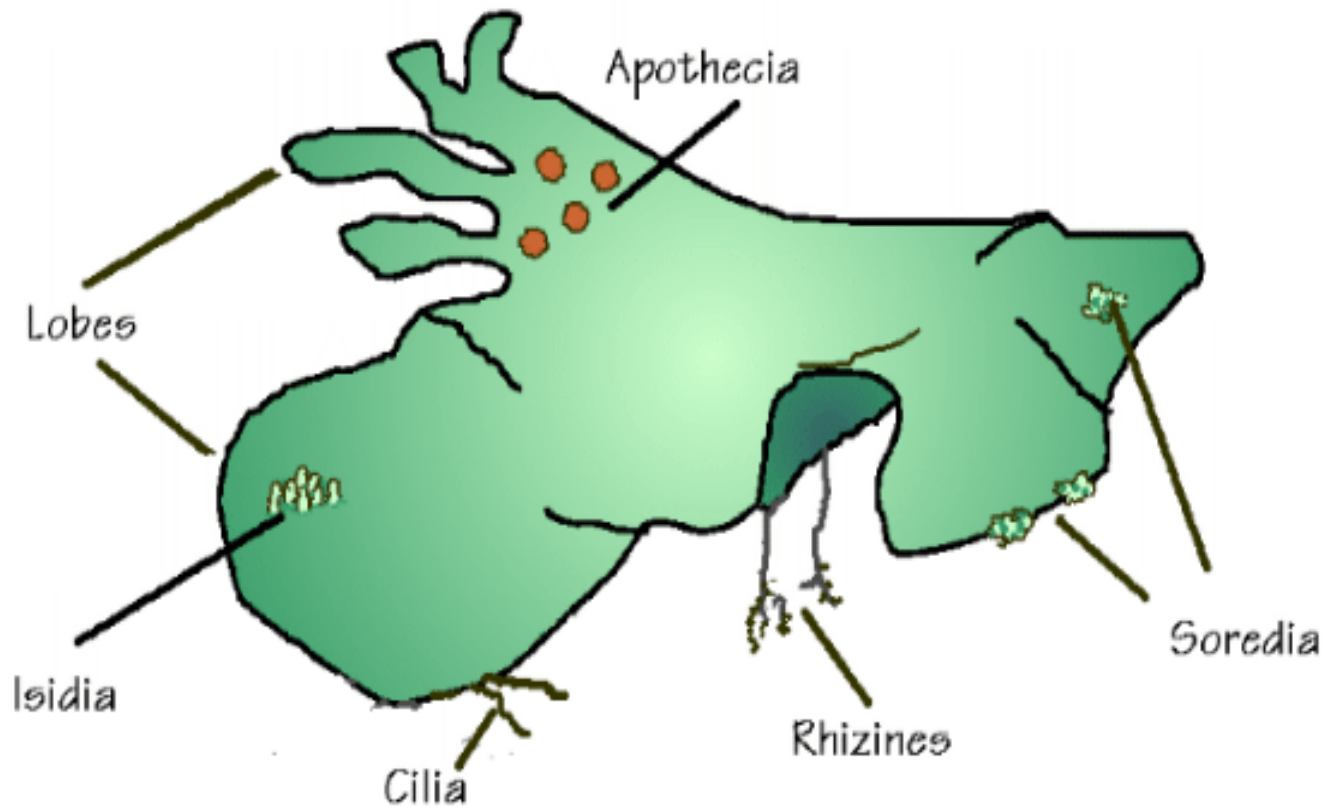


FIGURE 1 Cross section through a typical foliose lichen thallus

Foliose Thallus

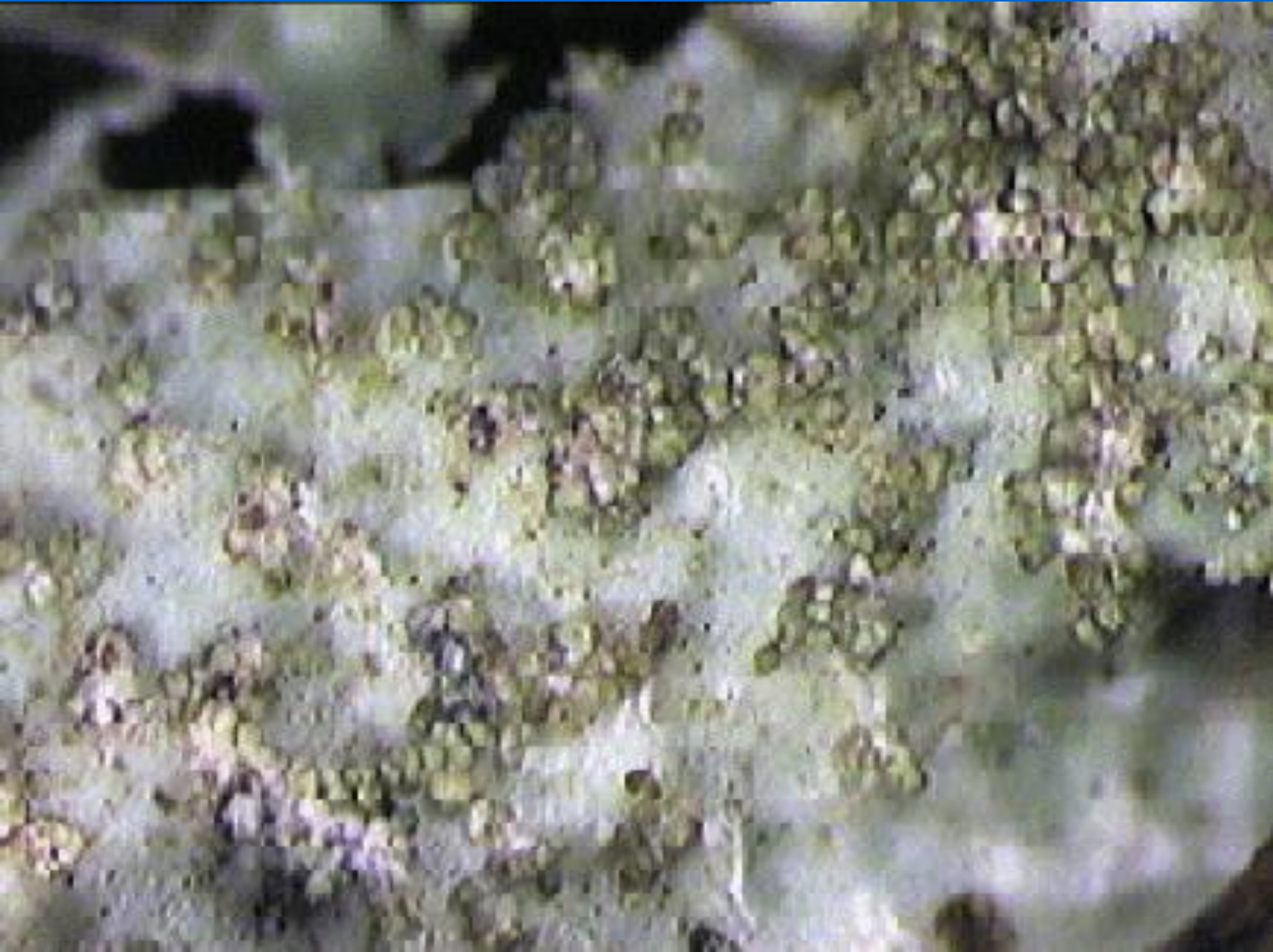


soredia erupting
from inside the
lichen



note how the fungus wraps
around the algal cells

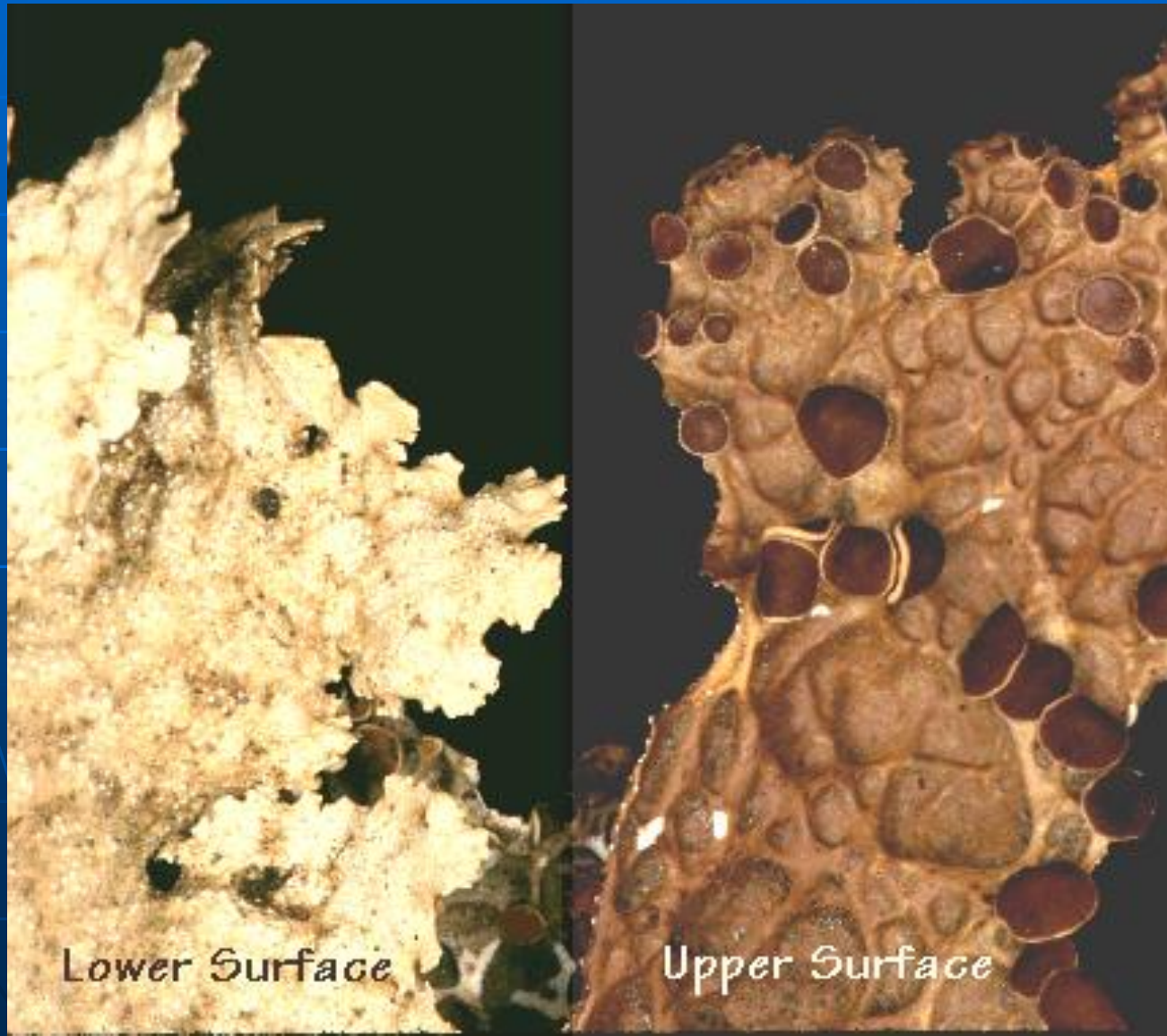
soredia



Fungal hyphae surrounding the algal cells forming the soredia



Lower and upper surface



Different Growth Forms



Morphological groups

- Cyanobacteria- Algae
- lichens
 - Crustose, Gelatinous, squamulose, foliose, fruticose
- Bryophytes
 - Short mosses, tall mosses
 - Liverworts

Cyanobacteria



Cyanobacteria





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Crustose lichen





- Why did the soil cross the Road?

- Because there were not enough biological soil crusts to hold the soil in place.



Gelatinous lichen



Gelatinous Lichens



Squamulose lichen



Squamulose lichen



Psora, a squamulose lichen



Foliose lichen



Fruticose Lichen



Fruticose lichen



Fruitcose lichen, Cladonia



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Short mosses



Tall Moss, twisted moss, *Tortula ruralis*



Liverwort



Bryophytes, Mosses & Liverworts



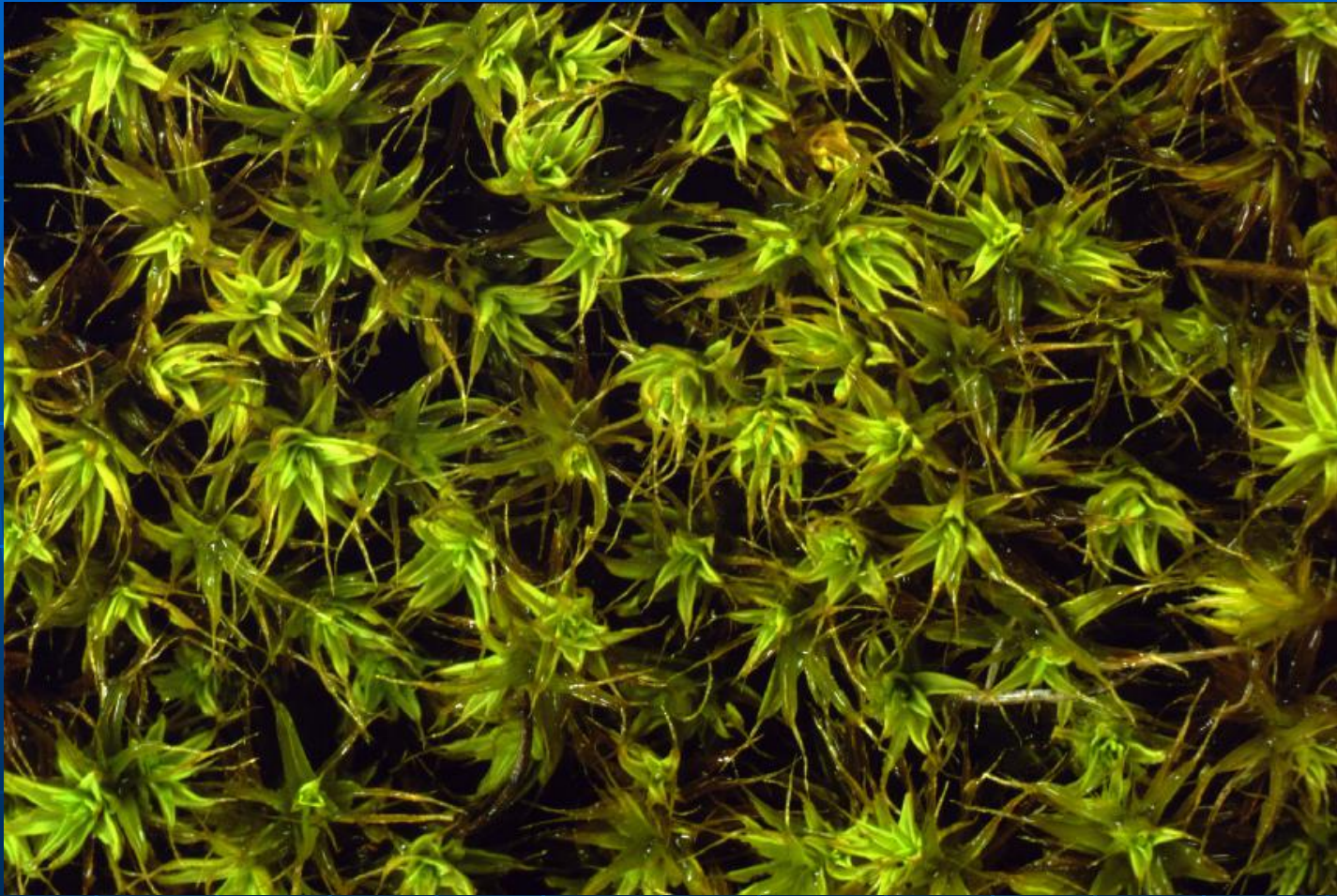
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What type of Crust?



What type of Crust?



Why not use species level data?

Biological considerations

- 1. Morphological groups are functionally similar**
- 2. Difficult to identify in the field**
- 3. Is independent of continent, region or area**

Why not use species level data?

Efficiency considerations

- 1. Easier to measure with less indecision and > repeatability**
- 2. More rapid and statistically powerful data analysis**
- 3. Rapid field measurements**
- 4. Less costly to monitor**

Midwestern Prairie

NATIVE MAMMALS



BUFFALO



Short grass prairie
deer &
dung beetles

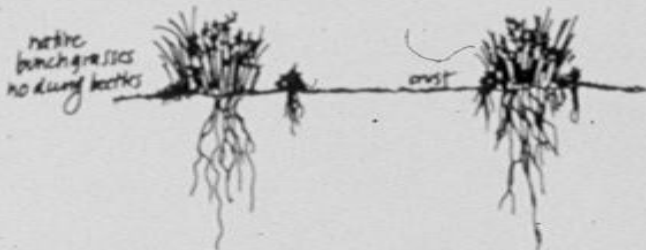
no interspace

Desert Grassland

NATIVE MAMMALS



DEER, ELK,
ANTelope



native
bunch grasses
no dung beetles

crust

interspace with crust