

MICOSYLVA Mértola, March 2011

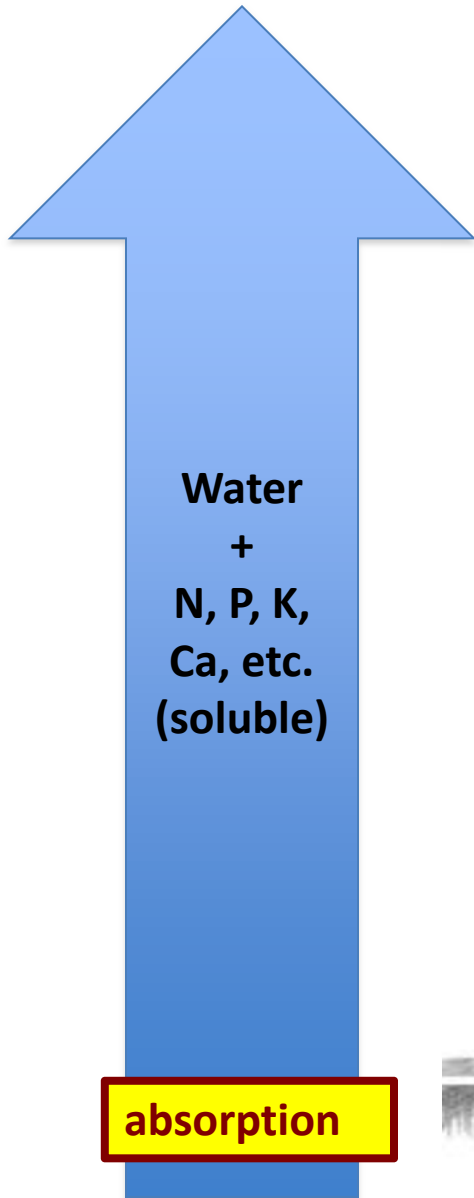
The role of fungi in the nutrition and growth of forest trees

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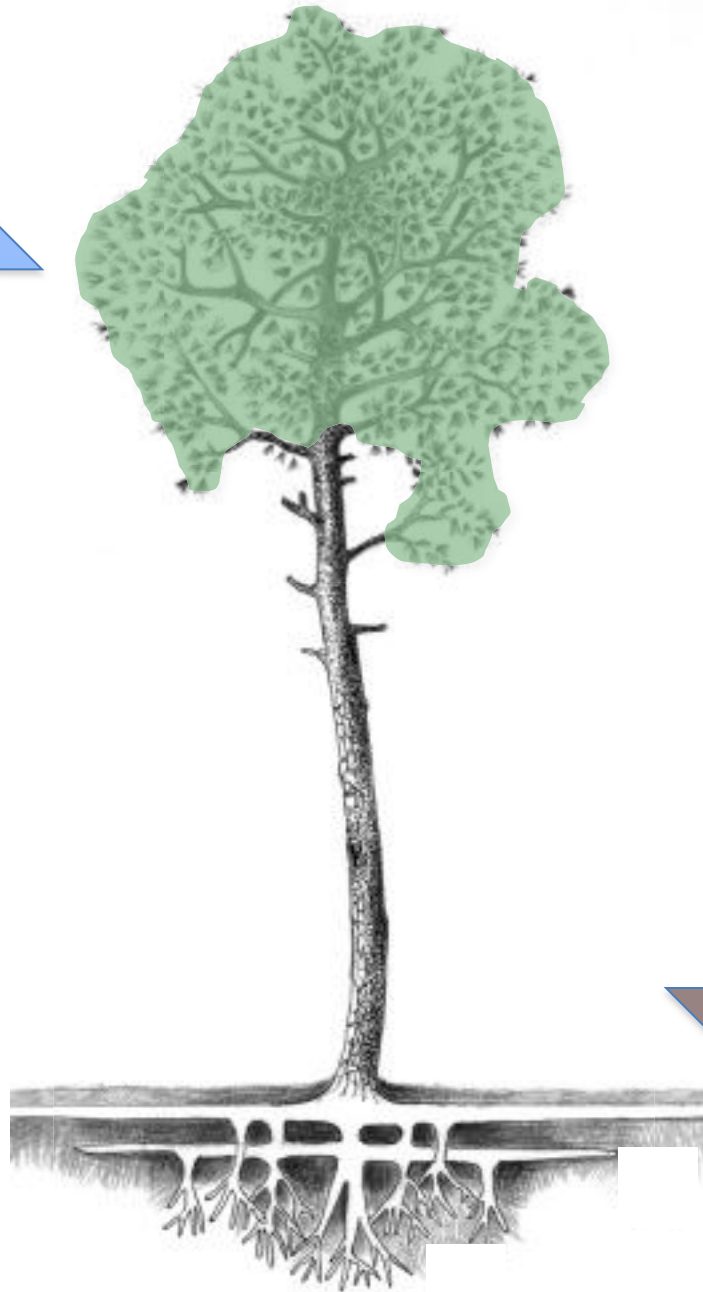


Atmosphere



absorption

Soil solution



Atmospheric CO₂

Photosynthesis

Carbon
(sugars)

Root exudates

Why this ...



rather than that ?



Thanks to **organic matter-degrading fungi**:



Another category of fungi
beneficial to forest nutrition and growth:

The **ectomycorrhizal fungi**
which live symbiotically with tree roots



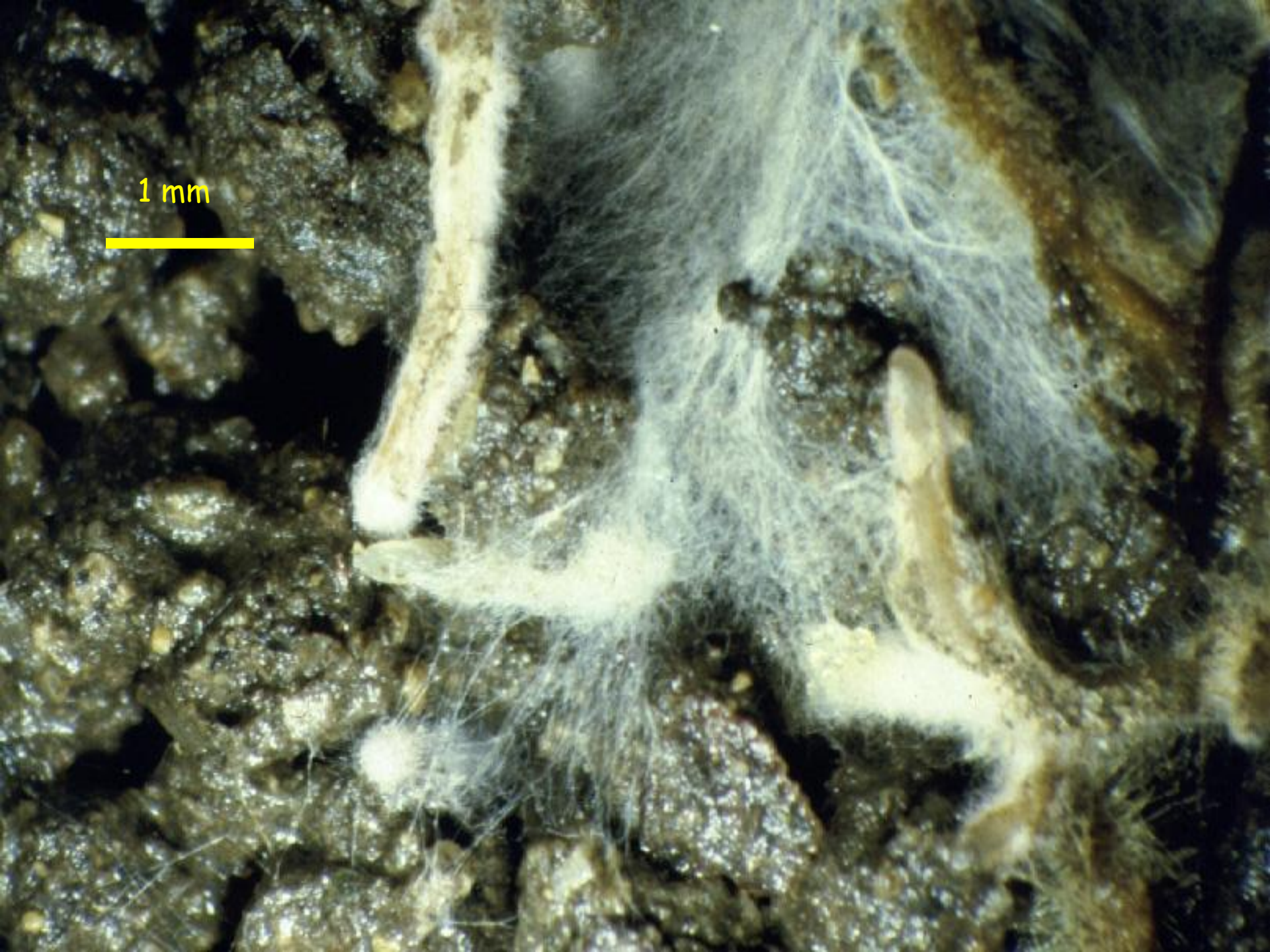


1 cm

1 cm



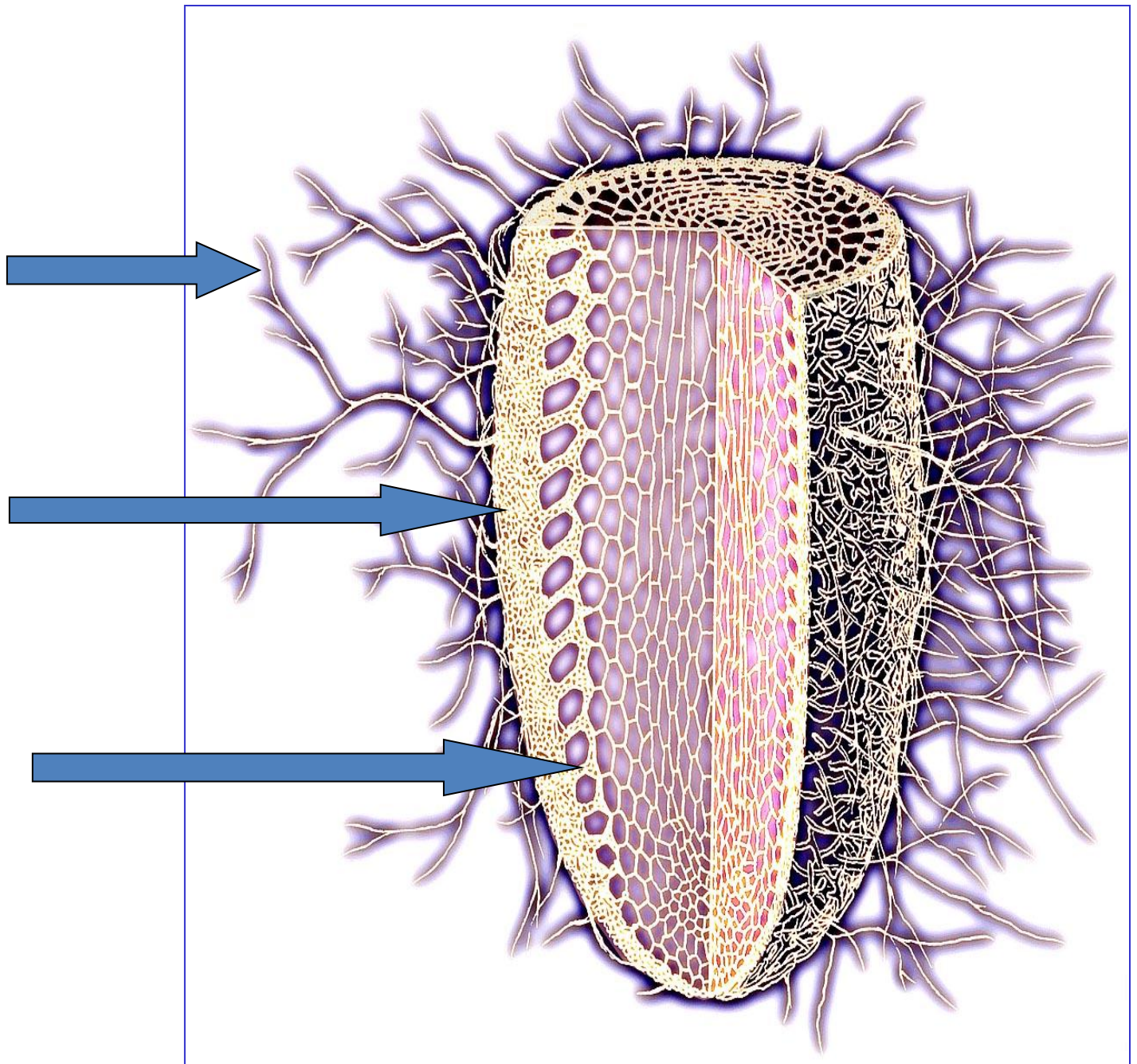
1 mm



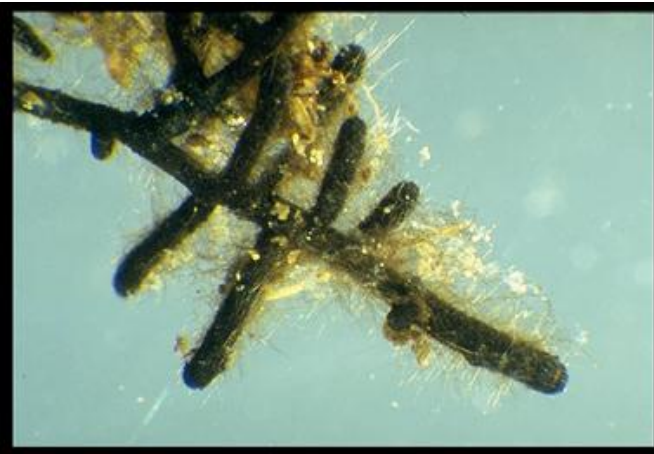
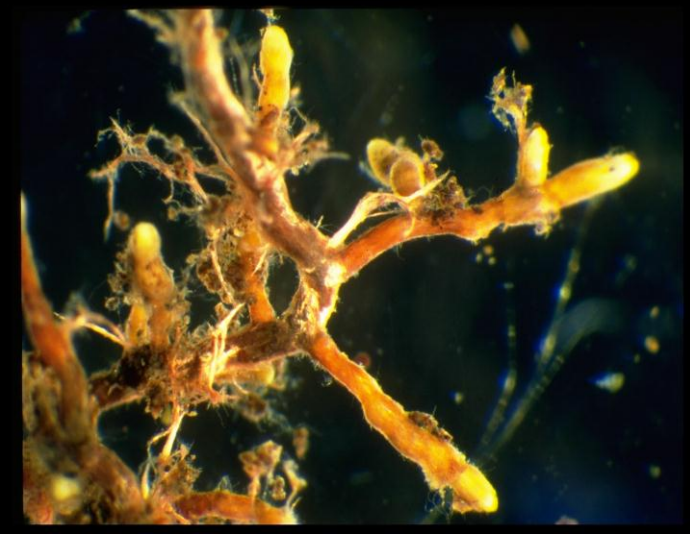
External
mycelium

Fungal sheath
("mantle")

Hartig net







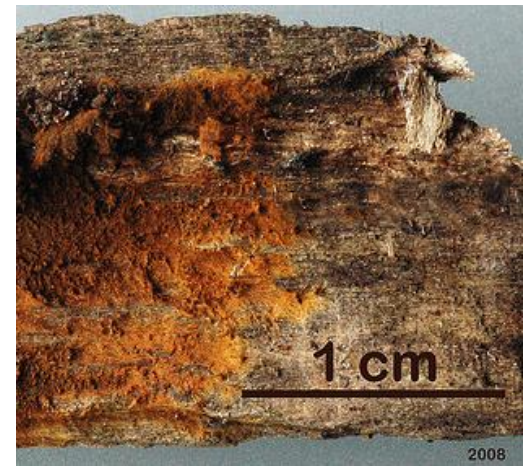


**the ectomycorrhizal symbiosis contributes
to tree nutrition in many ways:**

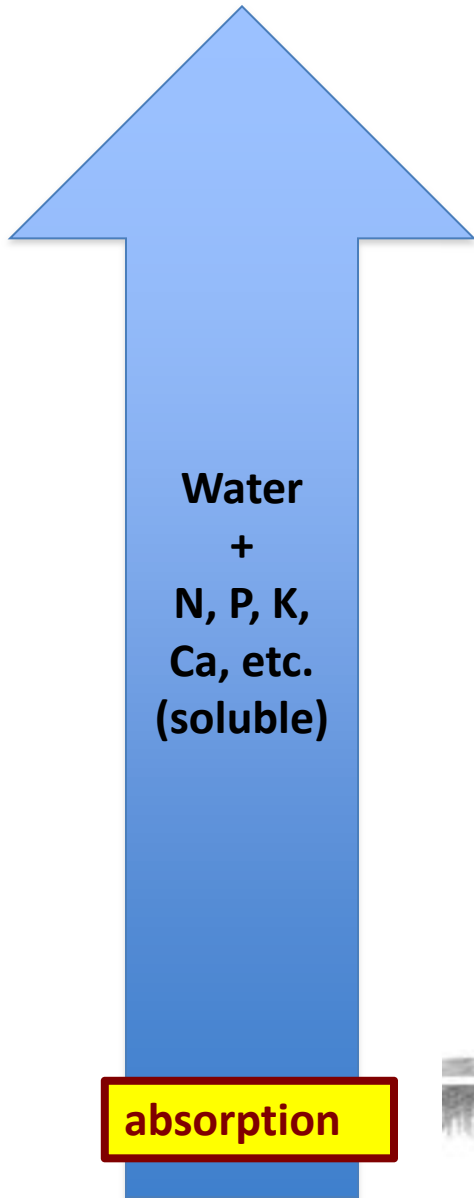
- increased surface area of the soil-root interface
- increased foraging range of the roots
- access to finer soil pores
- mineral weathering
- degradation of soil organic matter
- connecting trees and allocating resource

**The “symbiotic services” have a cost for the trees.
Ectomycorrhizal fungi are greedy for carbon as sugars for:**

- growth
- respiration (basic metabolism)
- reproduction (building sporocarps)



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The ectomycorrhizal symbiosis

PLANT

FUNGUS



SUGAR

SOIL NUTRIENTS

Adapted from Dirk Radecker

The ectomycorrhizal symbiosis is more or less beneficial to the host-tree, depending on the fungus and on the sugar / mineral nutrients balance



It is possible to improve tree growth by choosing the associated fungi



Practical application to forest plantations





Douglas-fir seedlings inoculated
with *Laccaria bicolor* S238N

Control bench with
Non-inoculated seedlings

Semis de Douglas 1+1 inoculés
Avec *Laccaria bicolor* S238N

Planche témoin :
semis 1+1 non inoculés

Laccaria bicolor



Thelephora terrestris





Three year old Douglas-fir plantation in central France



Control plot planted with non-inoculated seedlings



Plot planted with seedlings inoculated in the nursery with *Laccaria bicolor* S238N



Témoin

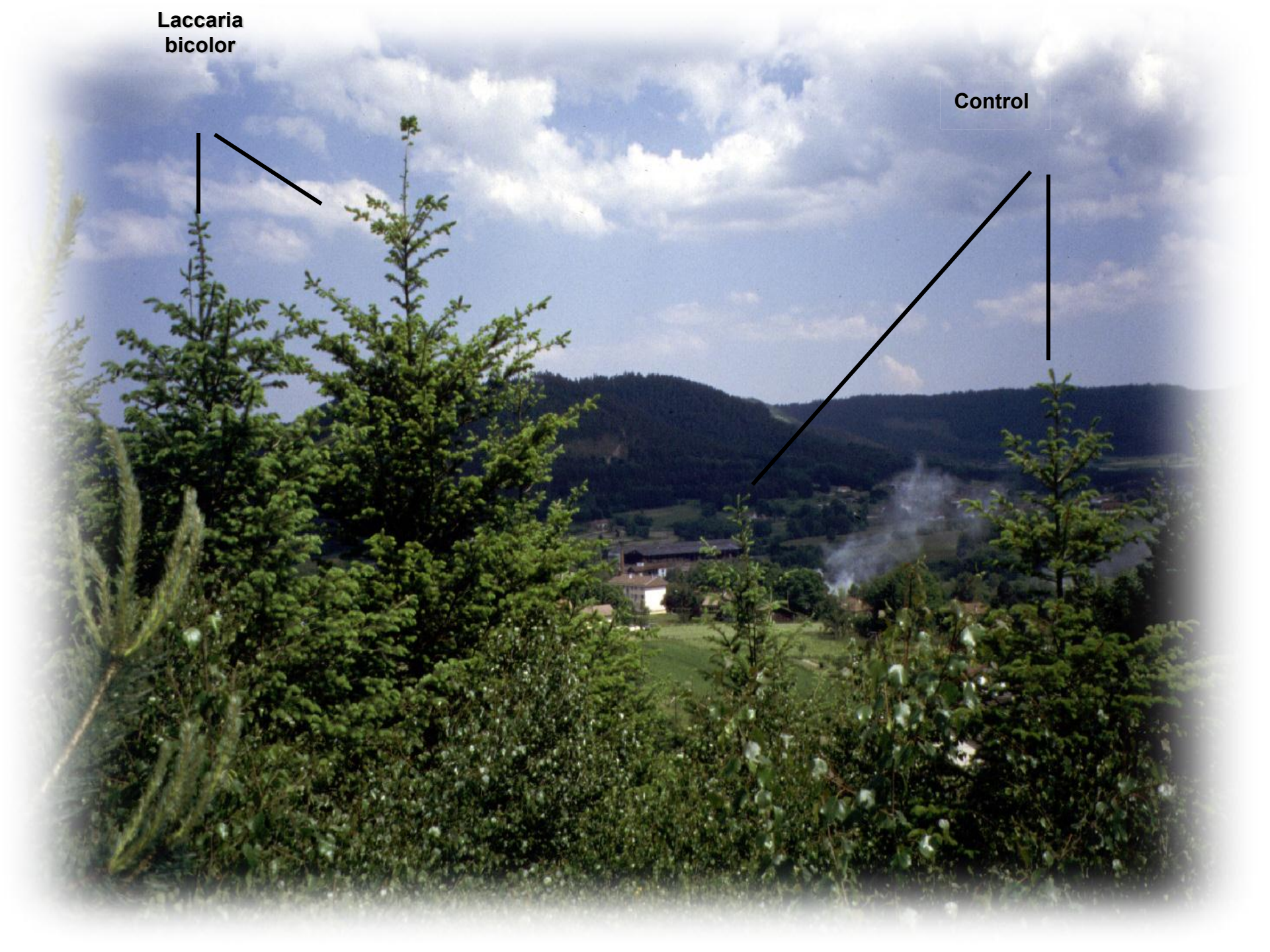
L. sp. 1

L. sp. 2

L. bicolor
S238N

**Laccaria
bicolor**

Control



One often needs
someone smaller

