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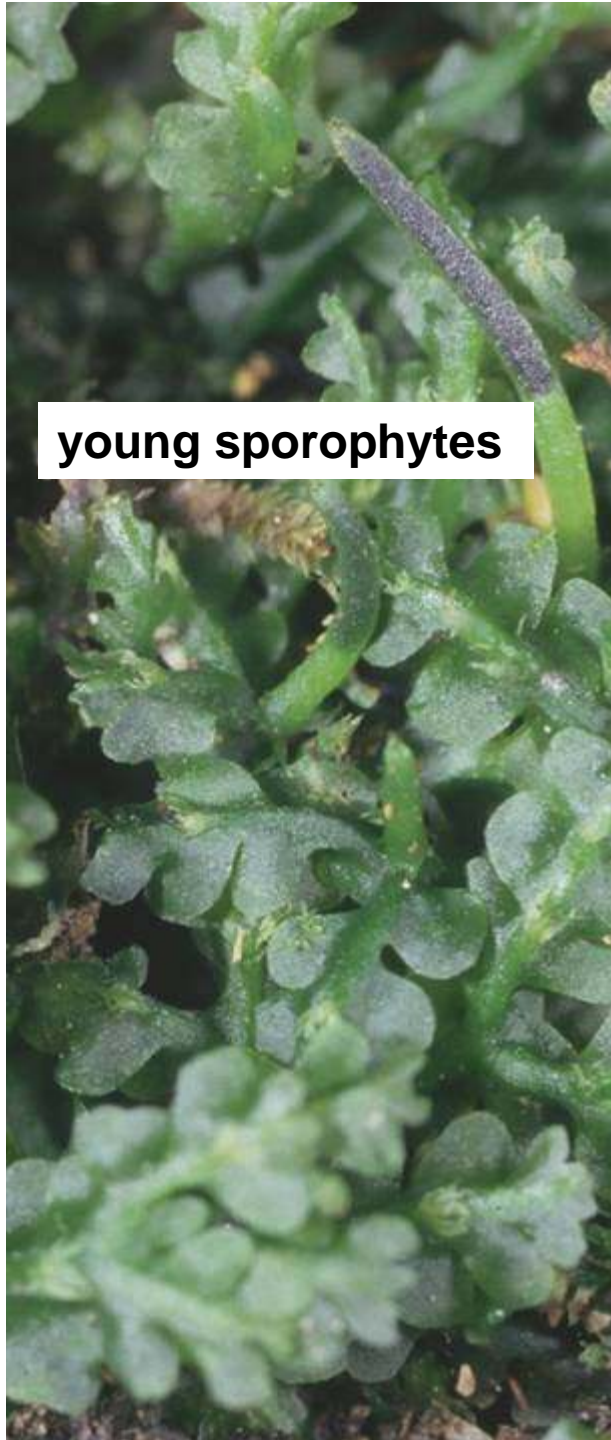


Martin Nebel, Ingrid Kottke, Markus Preußing and
Elke Barth

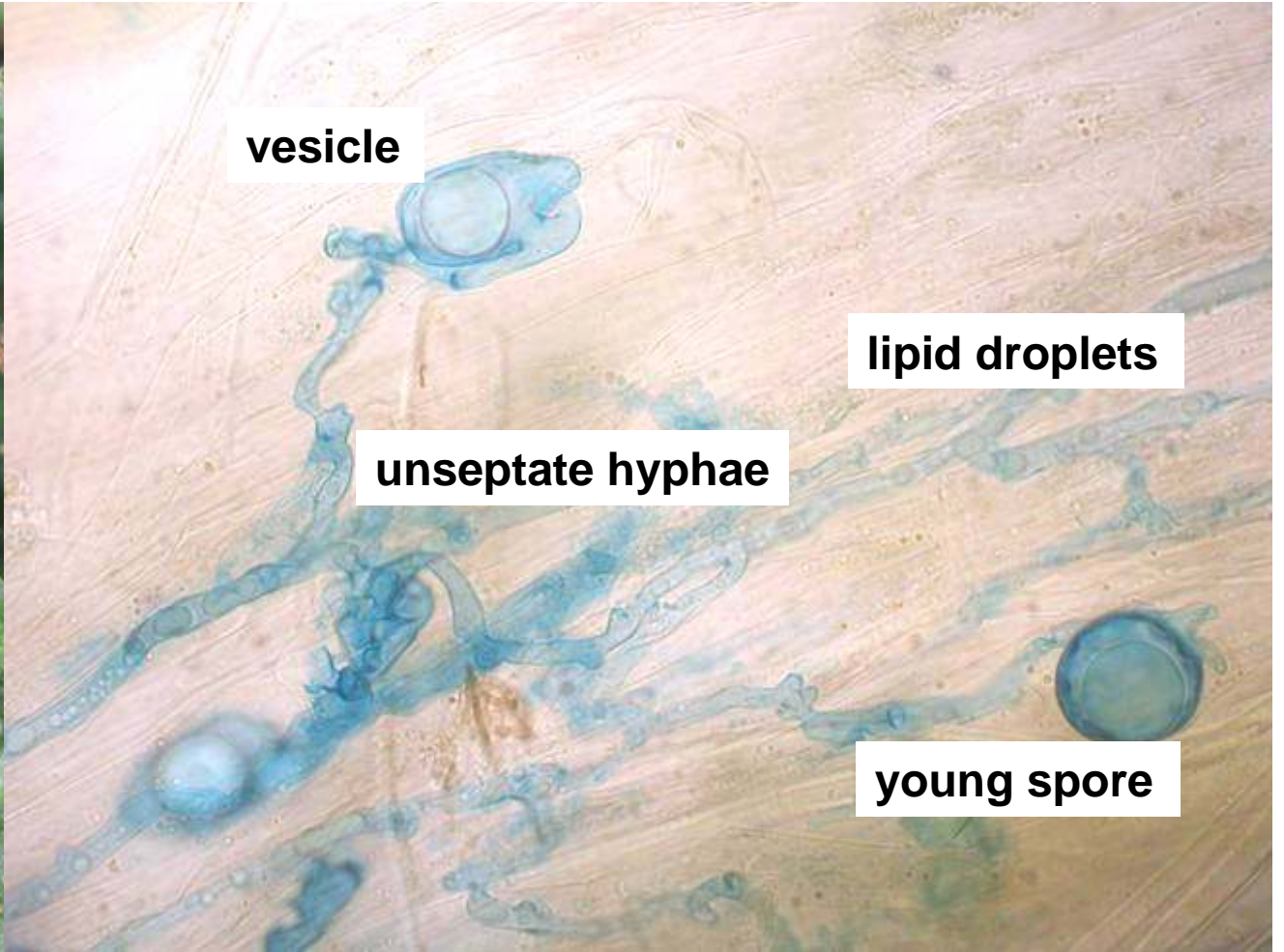
Fungal Symbiosis in Liverworts



Steep slope at the footpath in Bombuscaro



young sporophytes



vesicle

lipid droplets

unseptate hyphae

young spore

Symphyogyna brongniartii

Jensenia erythropus

erect shoots

old shoot

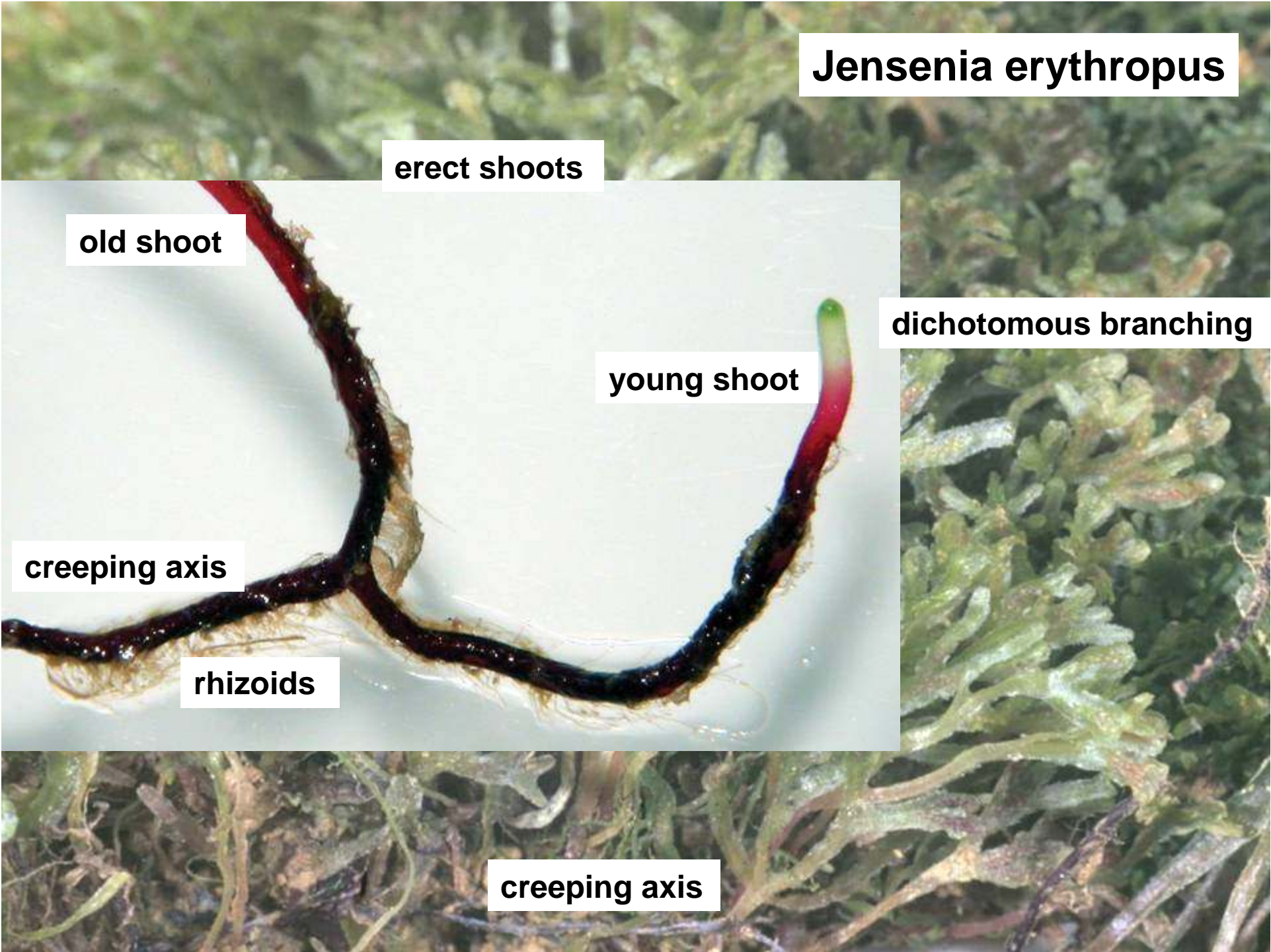
young shoot

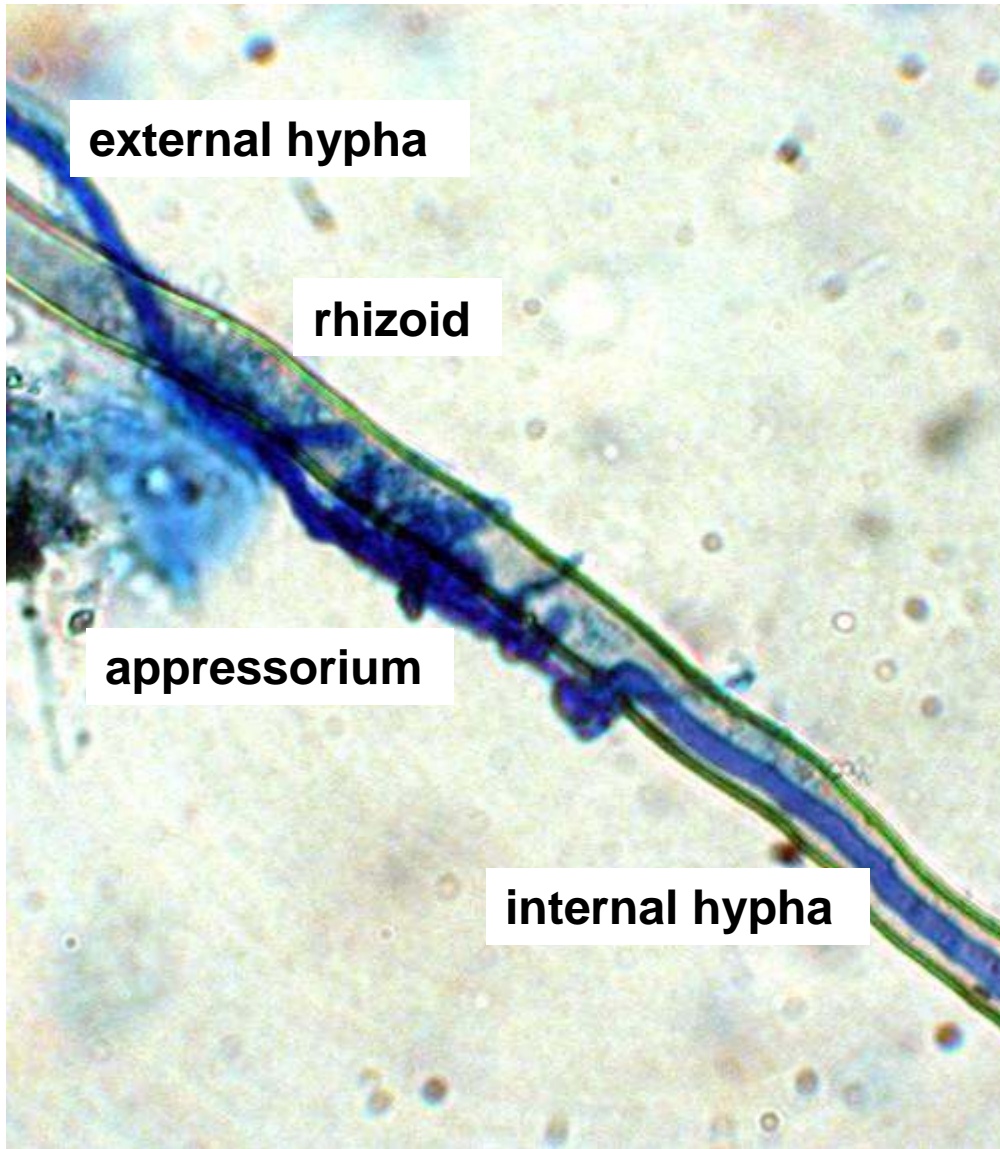
dichotomous branching

creeping axis

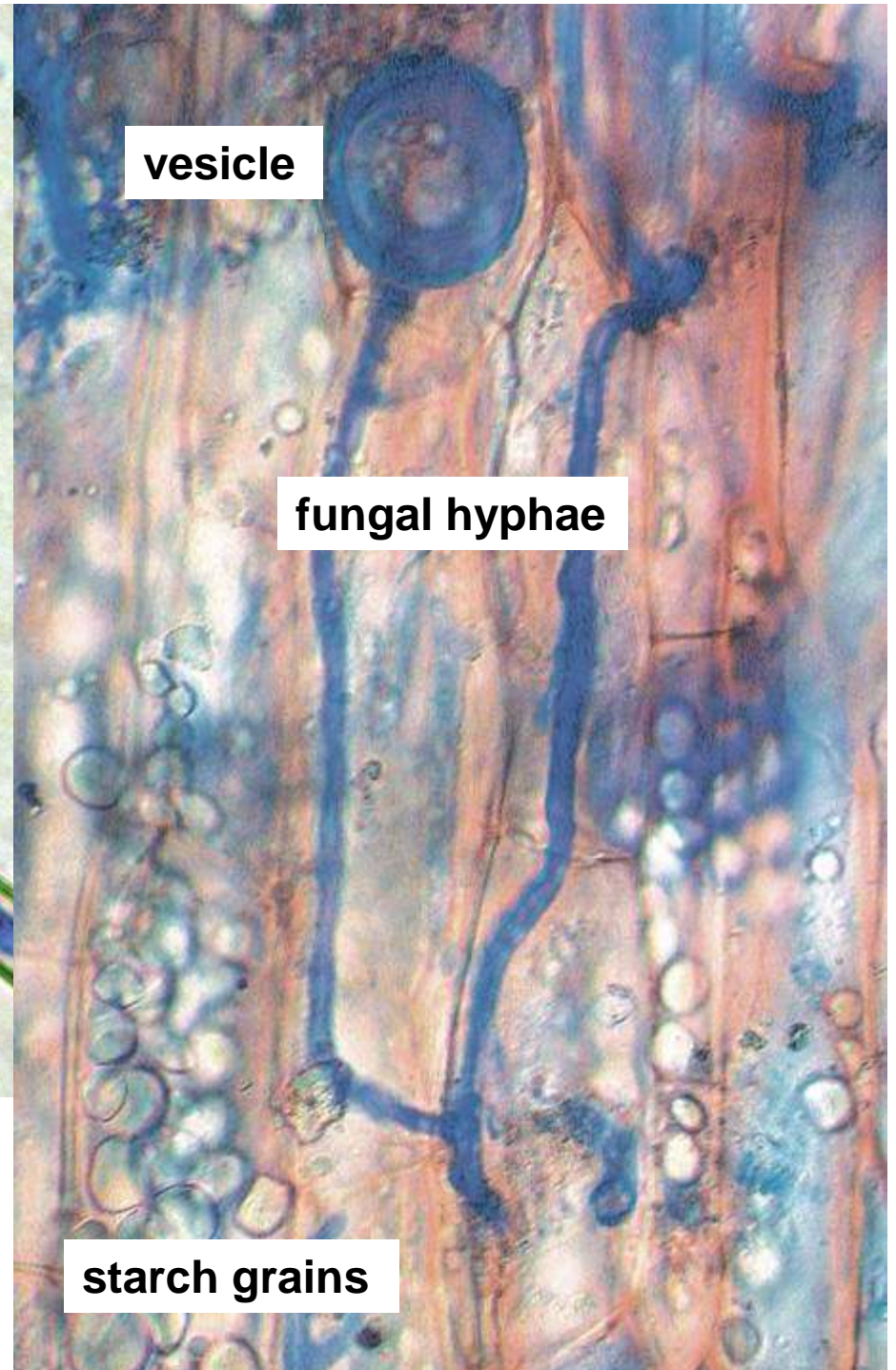
rhizoids

creeping axis





Jensenia erythropus





cell wall penetration

The image shows a microscopic view of fossilized plant tissue. A central greenish area contains several large, roughly rectangular cells with visible cell walls. A black line points to a specific location where the cell wall appears to be broken or penetrated. To the right of this area, there are smaller, more irregular structures. The background is a mix of reddish and blueish tones, likely from the surrounding fossil matrix or other plant parts.

arbuscles

fossil Aglaophyton

(from www.uni-muenster.de/GeoPalaeontologie)

Jensenia erythropus

Aneura pinguis

male branches

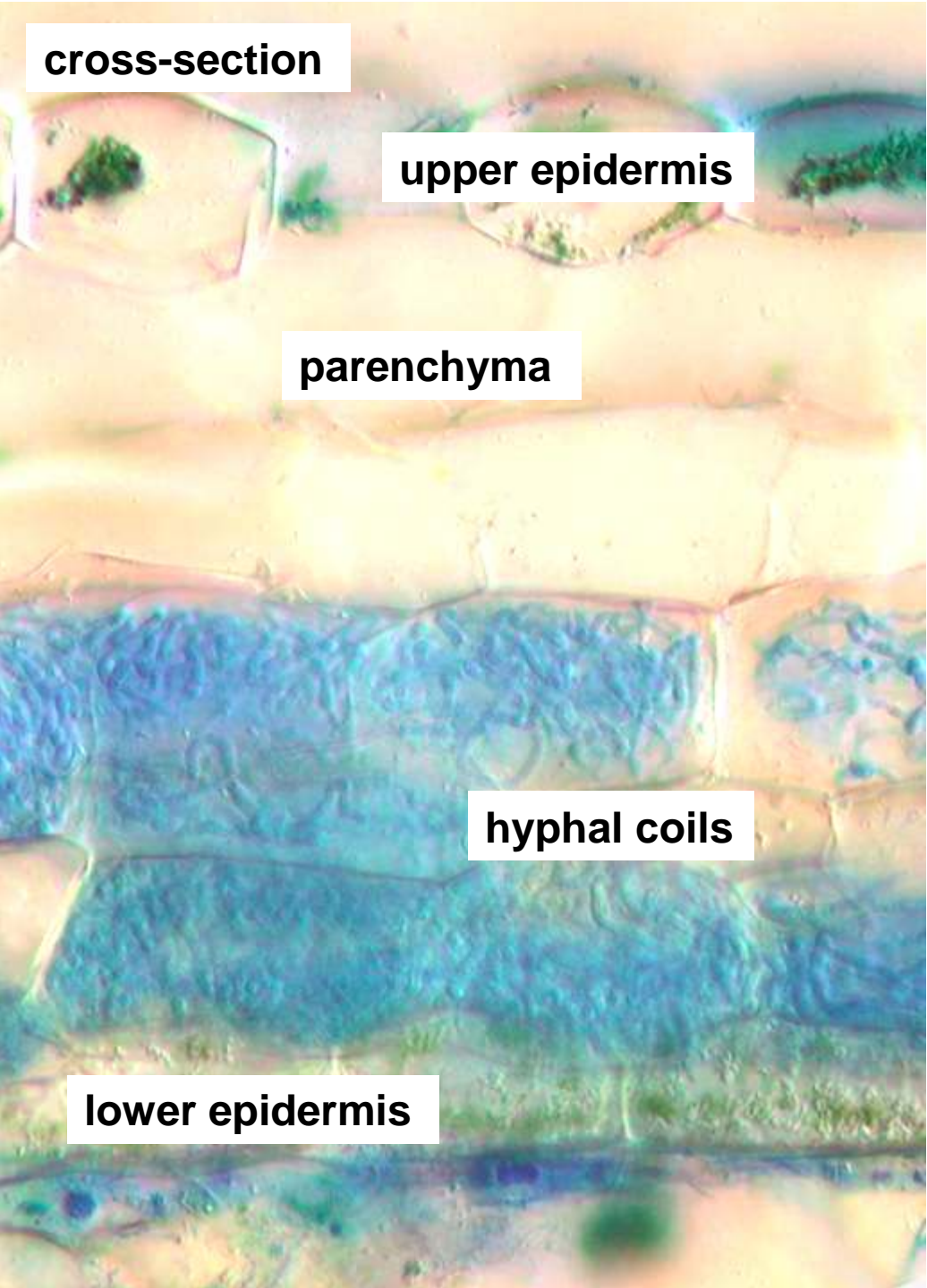
cross-section

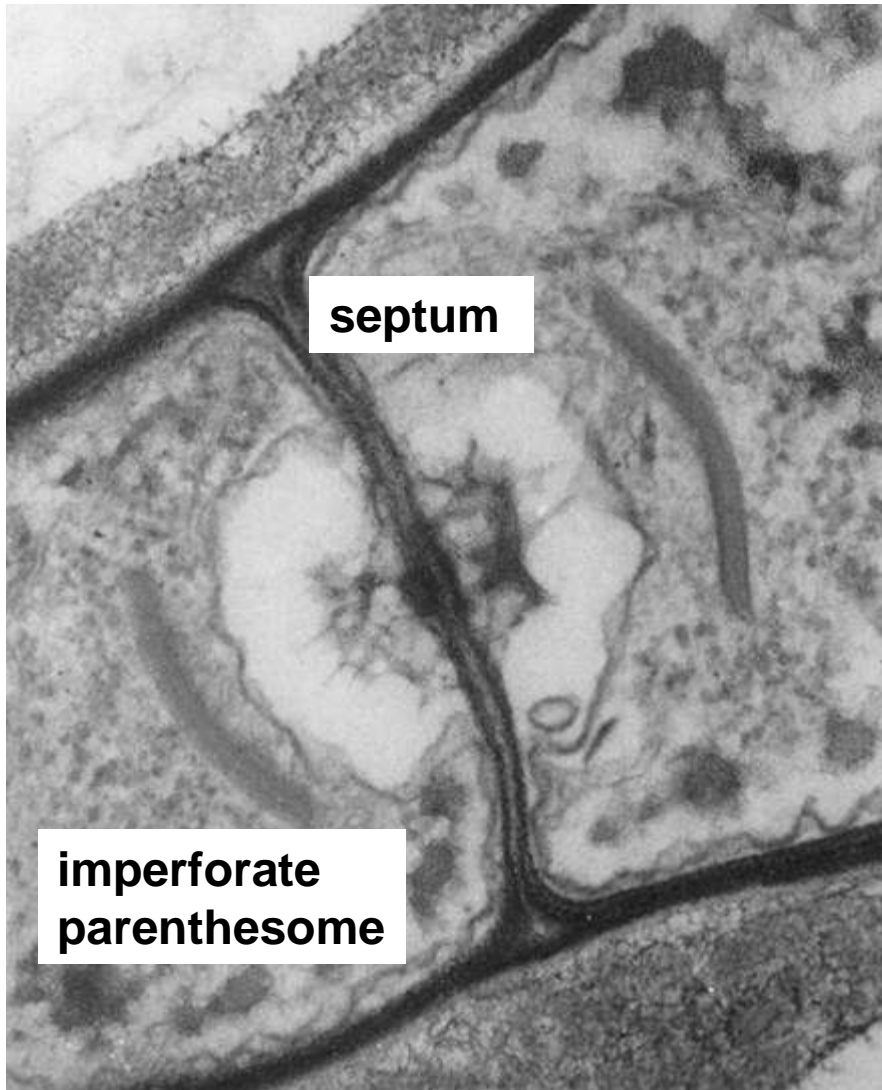
upper epidermis

parenchyma

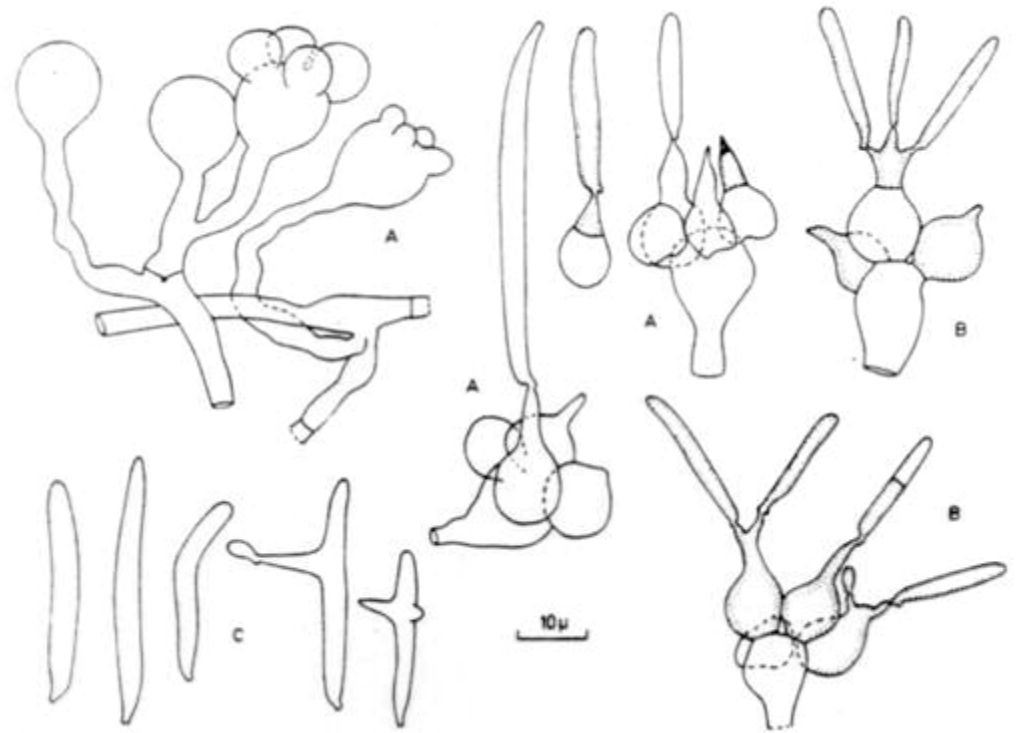
hyphal coils

lower epidermis

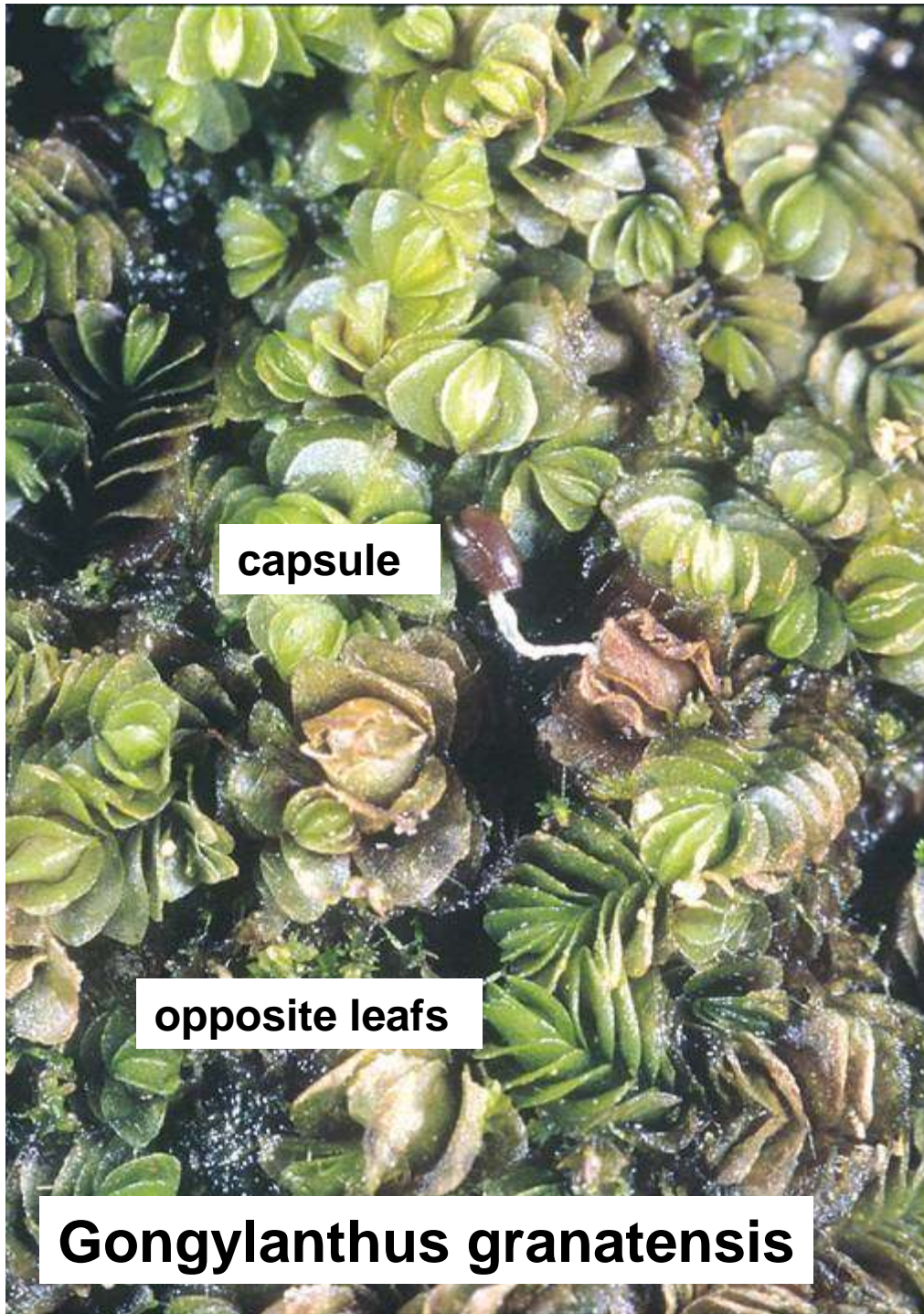




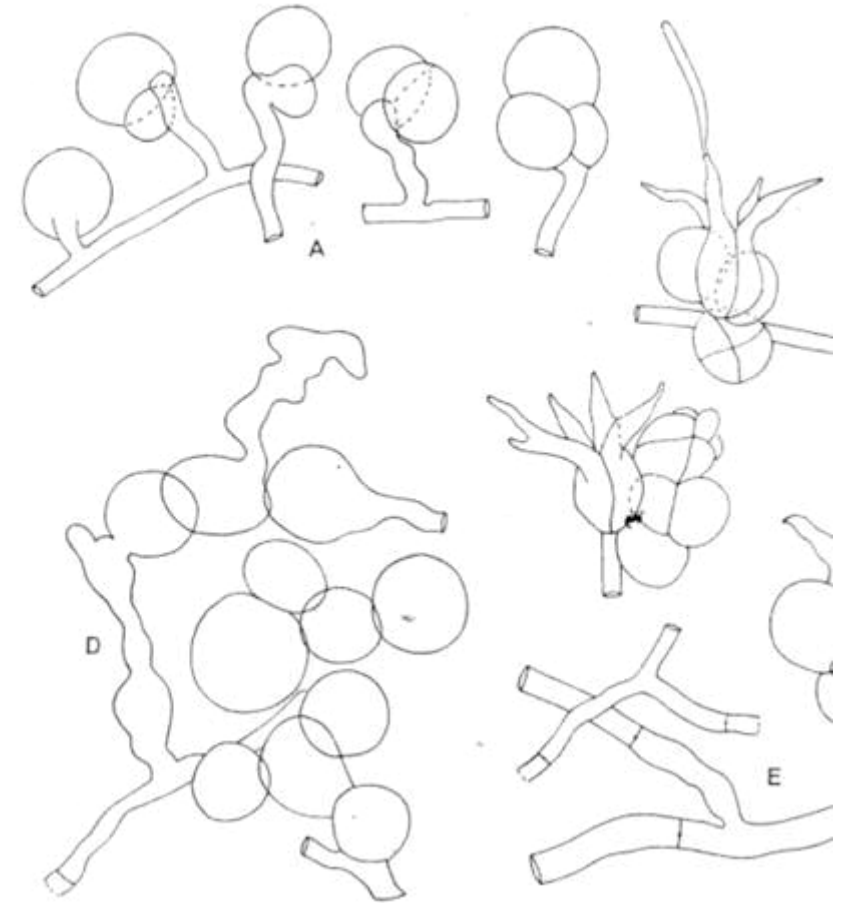
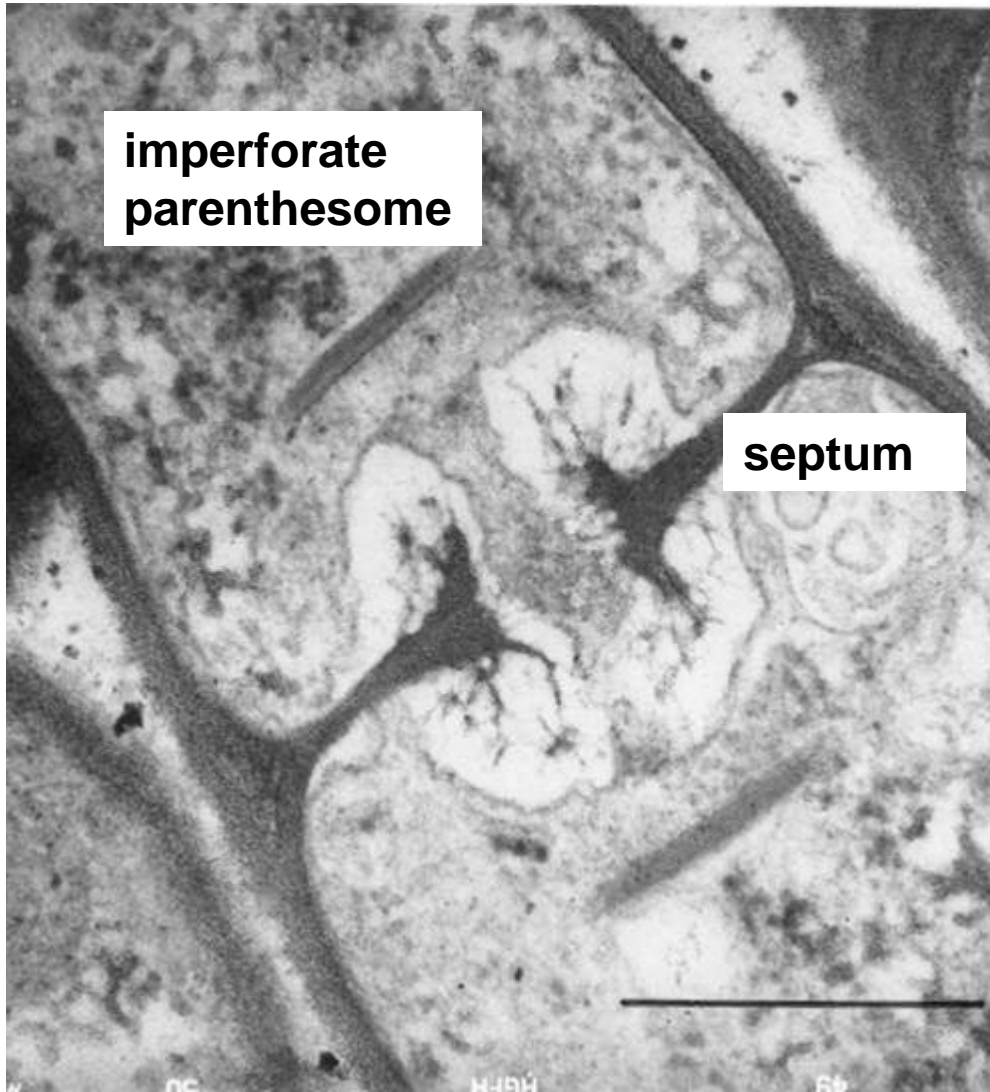
doliporus in *Tulasnella*
from KOTTKE et al. 2003



***Tulasnella calospora* (Basidiomycetes)**
from WARCUP & TALBOT 1967



**Distinct leavy liverwort with
Sebacina as symbionts**



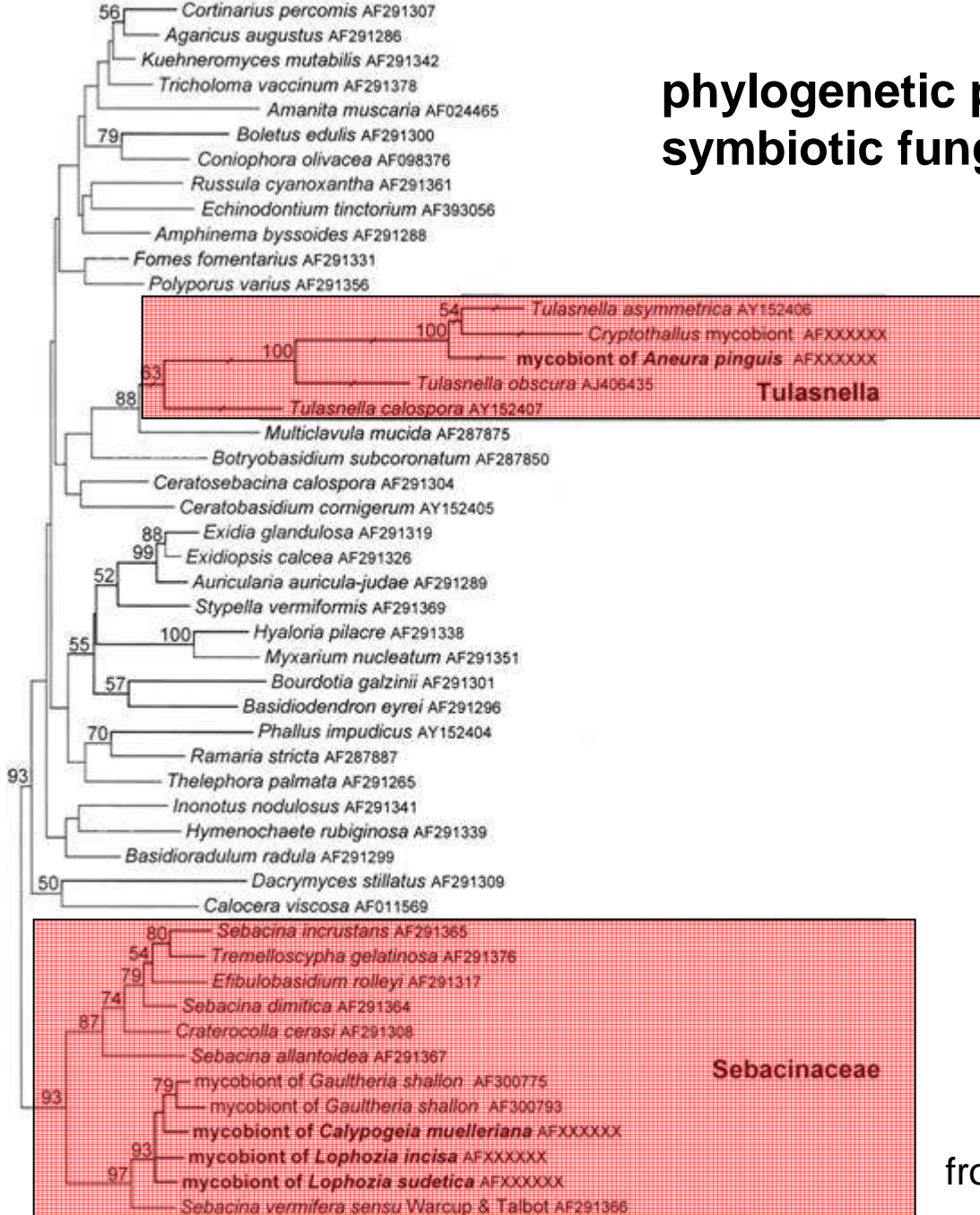
Sebacina vermifera

from WARCUP & TALBOT 1967

doliporus in *Sebacina*

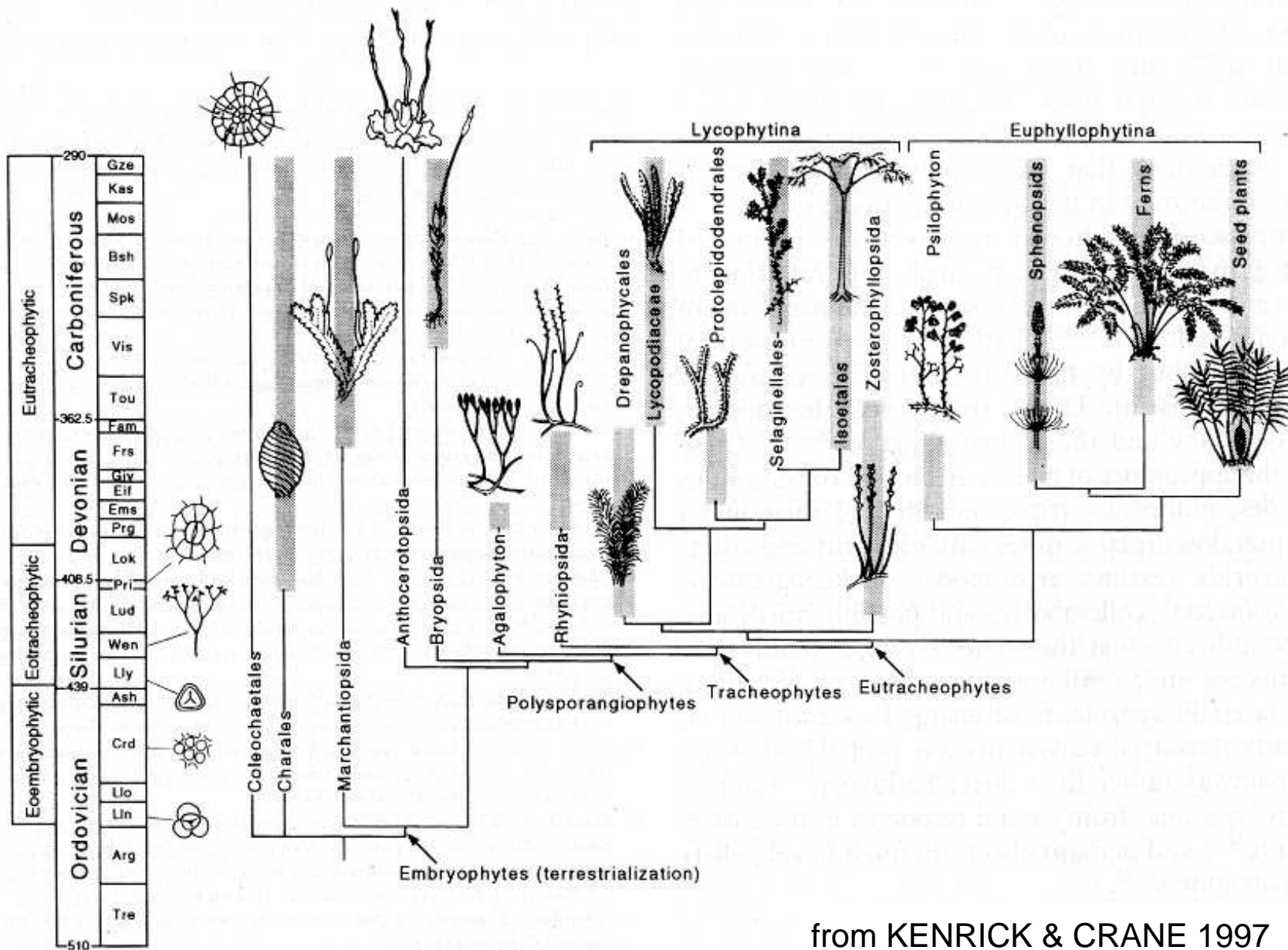
from KOTTKE et al. 2003)

phylogenetic position of symbiotic fungi of liverworts



— 0.01 substitutions/site

from Kottke et al. 2003



from KENRICK & CRANE 1997

Conclusions

Symbiotic fungi in liverworts
have a key function for the
evolution of terrestrial
ecosystems

Thanks to the DFG (DFG project FOR 402) for the generous financial support, and the NCI for research facilities.

Publications:

Nebel, M., H.-P. Kreier, M. Preussing, M. Weiss et I. Kottke (2004): Symbiotic fungal associations of liverworts are the possible ancestors of mycorrhizae. – in: R. Agerer, M. Piepenbring et P. Blanz (eds.): *Frontiers in Basidiomycote Mycology*: 339-360. IHW-Verlag. Eching.

Kottke, I. et M. Nebel (submitted): *Jensenia erythropus* – a model of an ancestral landplant. - *Can. J. Bot.*