



DENMAN
CONSERVANCY
ASSOCIATION



I'M A BROCCOLI
AND I LOOK LIKE A TREE...



I'M A WALNUT
AND I LOOK LIKE A BRAIN...



I'M A MUSHROOM
AND I HATE THIS GAME.



Monty

**Who are all these
fungi ...**



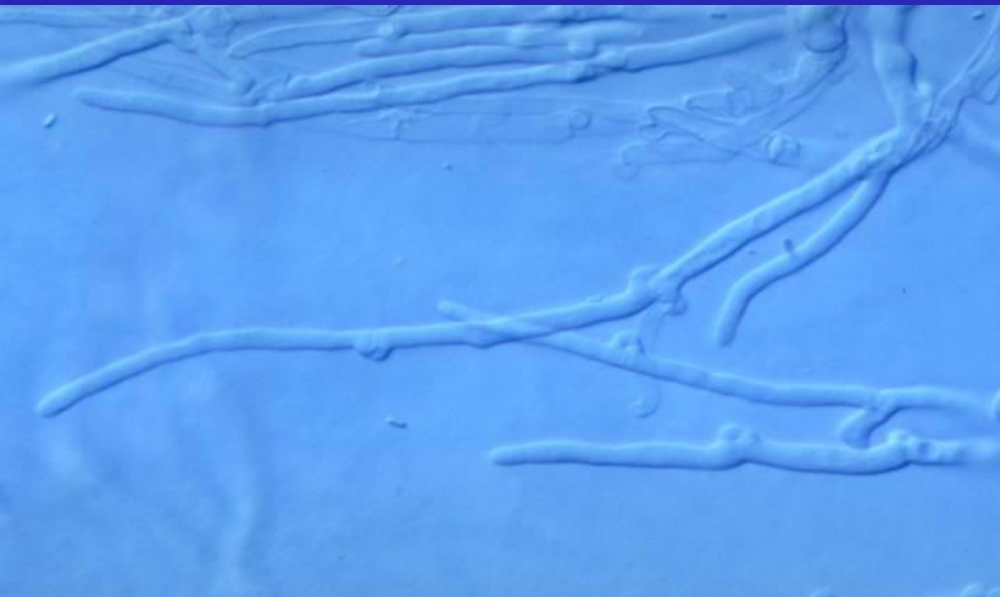
A cluster of several mushrooms with glowing blue caps and stems, growing from a dark, textured forest floor. The mushrooms vary in size and are arranged in a group, with some taller and more prominent than others. The background is dark and indistinct, suggesting a forest setting.

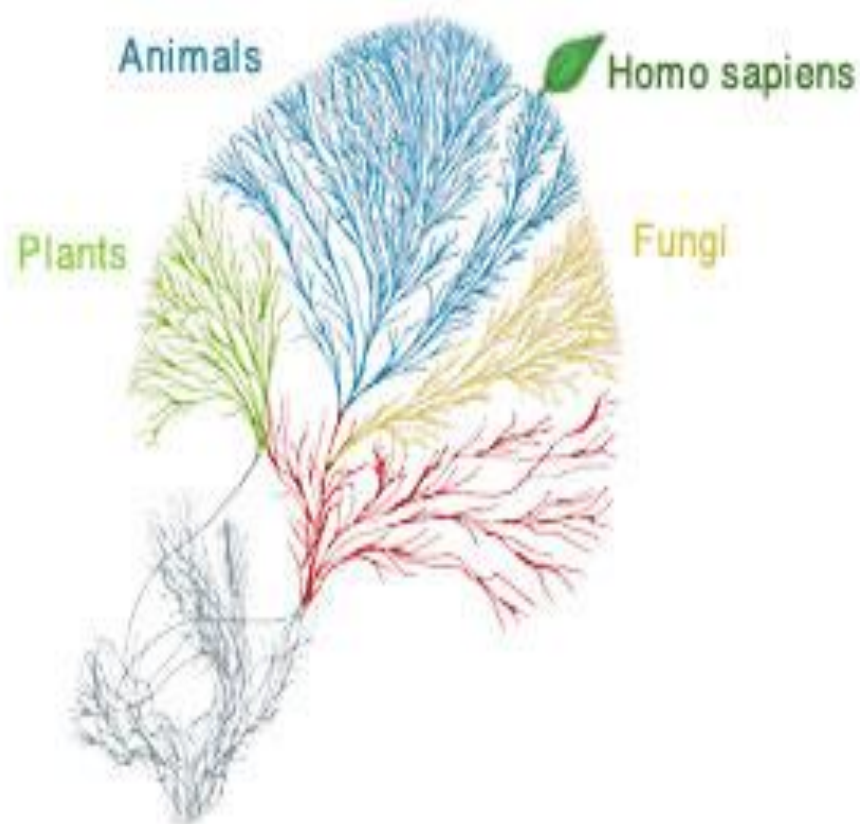
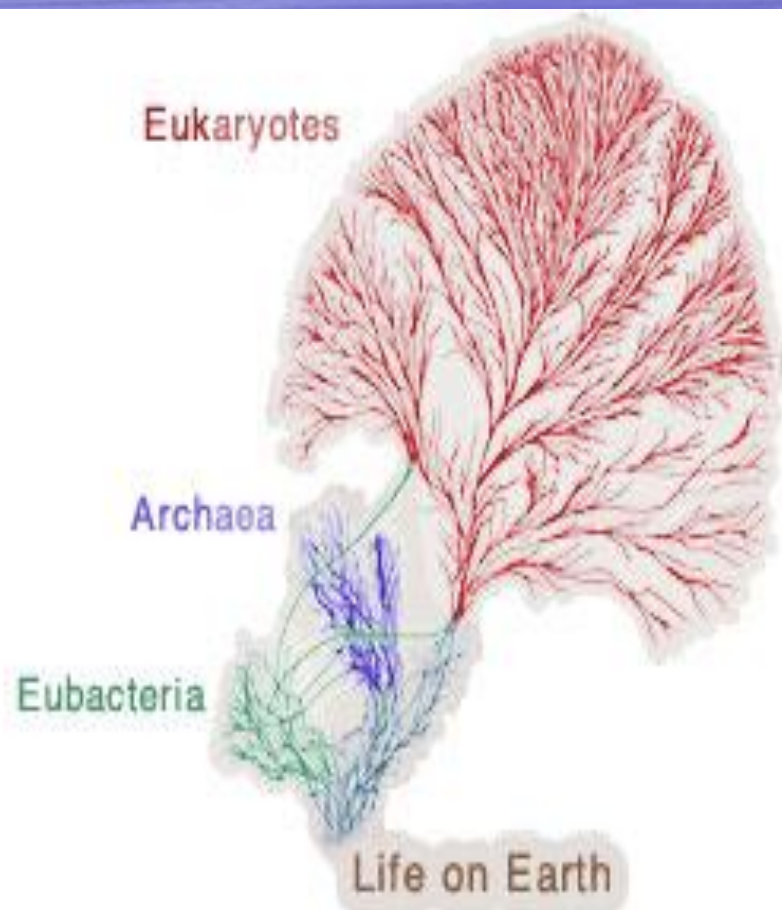
**Who are all these
fungi ...**

... and what are they doing in our forests?

What are fungi?

- eukaryotic (have nuclei)
- heterotrophic and absorbent
- amoeboid, to unicellular (yeast) to (usually) filamentous
- generally don't move around much
- cell walls contain chitin
- most reproduce by various types of spores

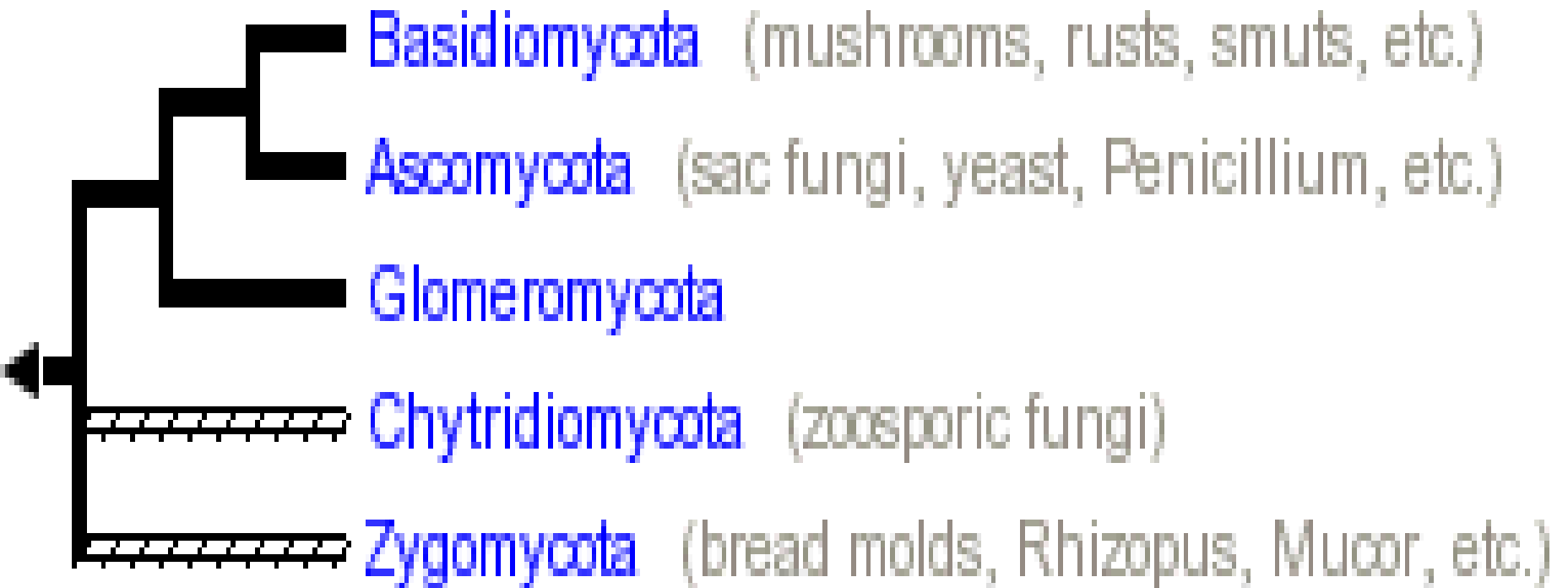




Fungi are Diverse!



fungus phyla



fungus phyla

- Zygomycota
- Chytridiomycota
- Glomeromycota
- Ascomycota
- Basidiomycota

fungus phyla

- Zygomycetes
- Chytridiomycetes
- Glomeromycetes
- Ascomycetes
- Basidiomycetes

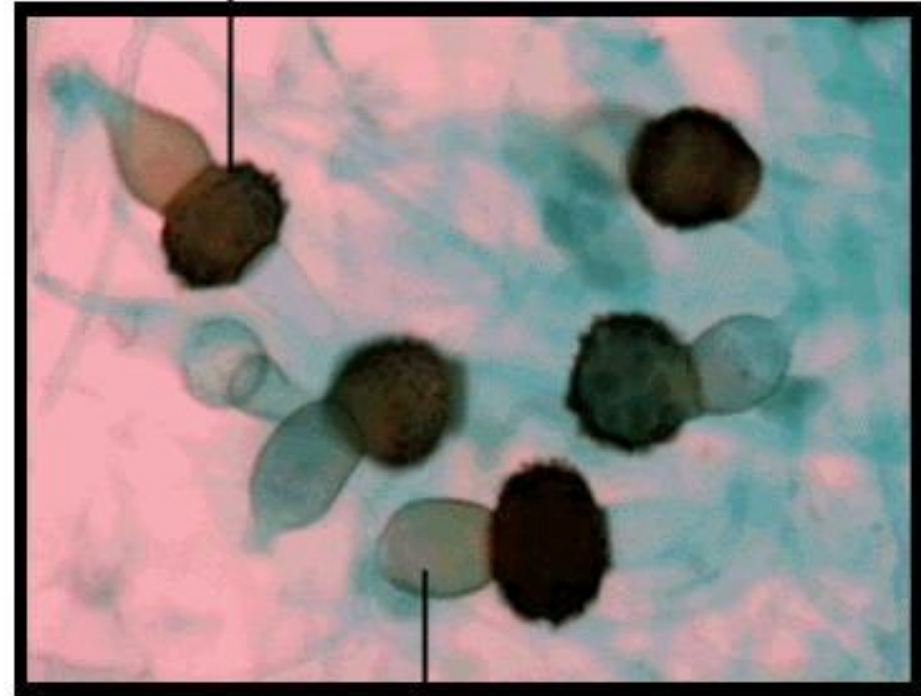
fungus phyla

- **Zygomycetes**
- Chytridiomycetes
- Glomeromycetes
- Ascomycetes
- Basidiomycetes



Pilobolus

Zygosporangium containing Zygospore



Suspensor cell

Rhizopus

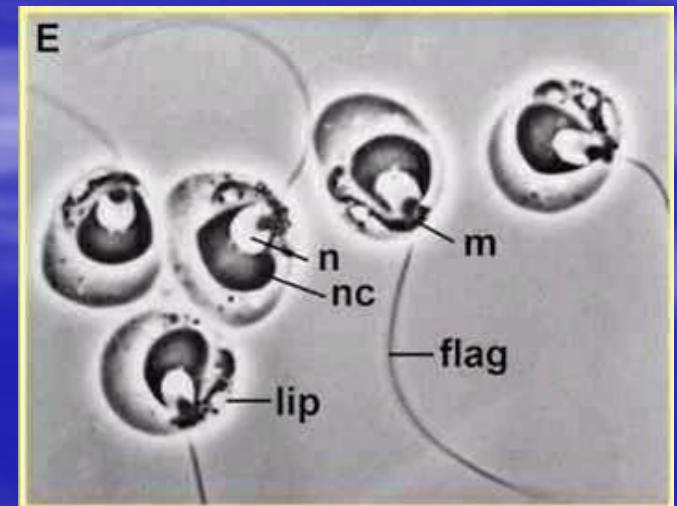
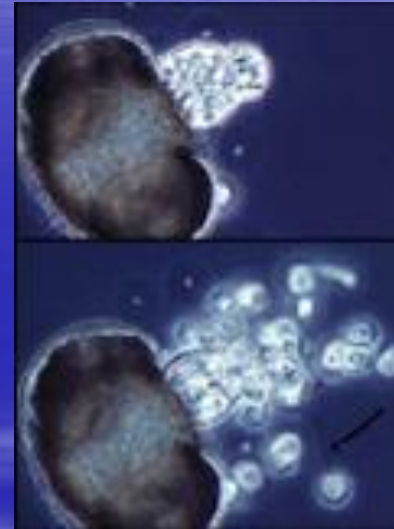
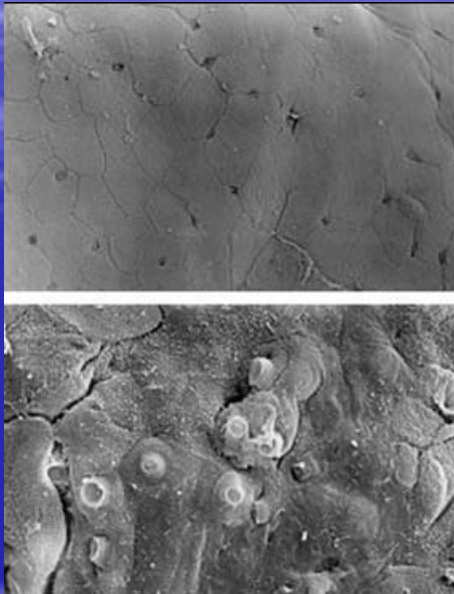


Entomophthorales

fungus phyla

- Zygomycetes
- Chytridiomycetes
- Glomeromycetes
- Ascomycetes
- Basidiomycetes

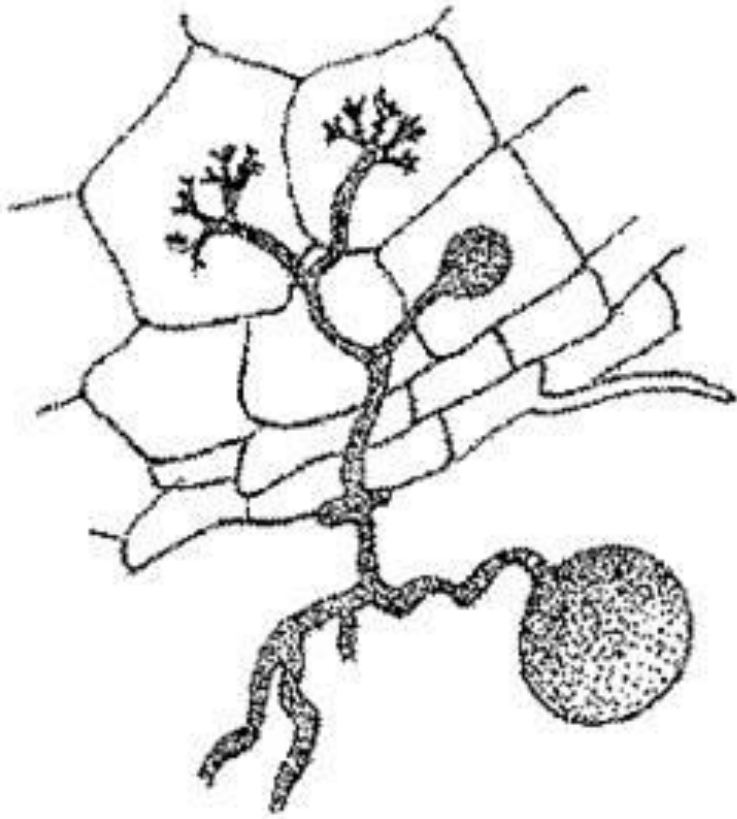
chytridiomycosis caused by *Batrachochytrium dendrobatidis*



fungal phyla

- Zygomycetes
- Chytridiomycetes
- **Glomeromycetes**
- Ascomycetes
- Basidiomycetes

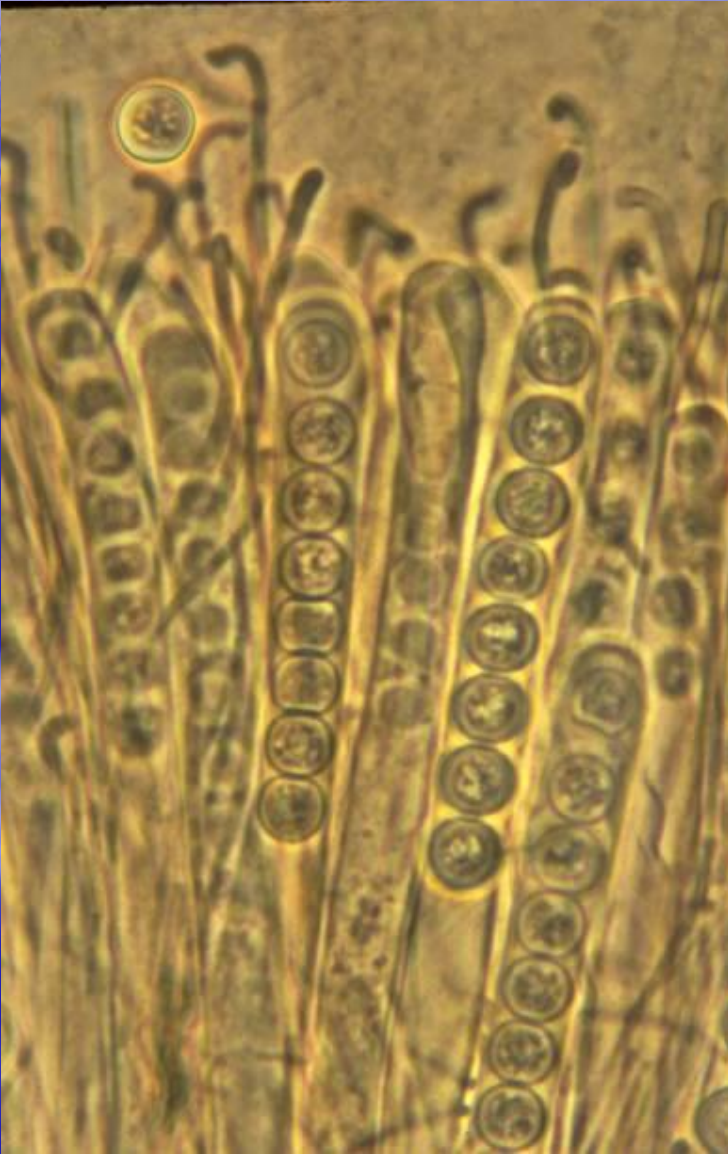
vesicular – arbuscular mycorrhizae



fungal phyla

- Zygomycetes
- Chytridiomycetes
- Glomeromycetes
- **Ascomycetes**
- Basidiomycetes

Ascomycetes ('sac fungi')



Penicillium



yeasts (basidiomycetes and ascomycetes)

CBC News - Deadly fungus kills four in B.C. - Microsoft Internet Explorer provided by Pacific For

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Deadly fungus kills four in B.C.

Last Updated Tue, 04 Sep 2001 14:10:14

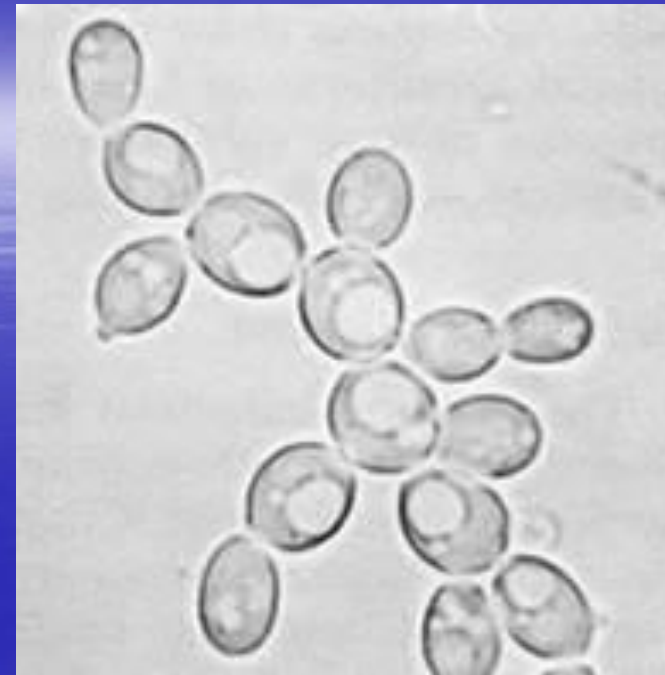
VICTORIA - Health authorities in British Columbia are baffled, trying to find the source of an outbreak of a deadly fungus that has killed four people.

It's called cryptococcus neoformans and it causes cryptococcal disease which attacks the respiratory and central nervous systems. There are at least 25 cases on Vancouver Island, five times the normal rate of infection.

Doctors commonly see cryptococcal disease in patients with HIV or weak immune systems. B.C.'s Centre for Disease Control many of the

Authorities have issued a public health warning telling people to stay away from pigeon droppings, rotting trees and dust.

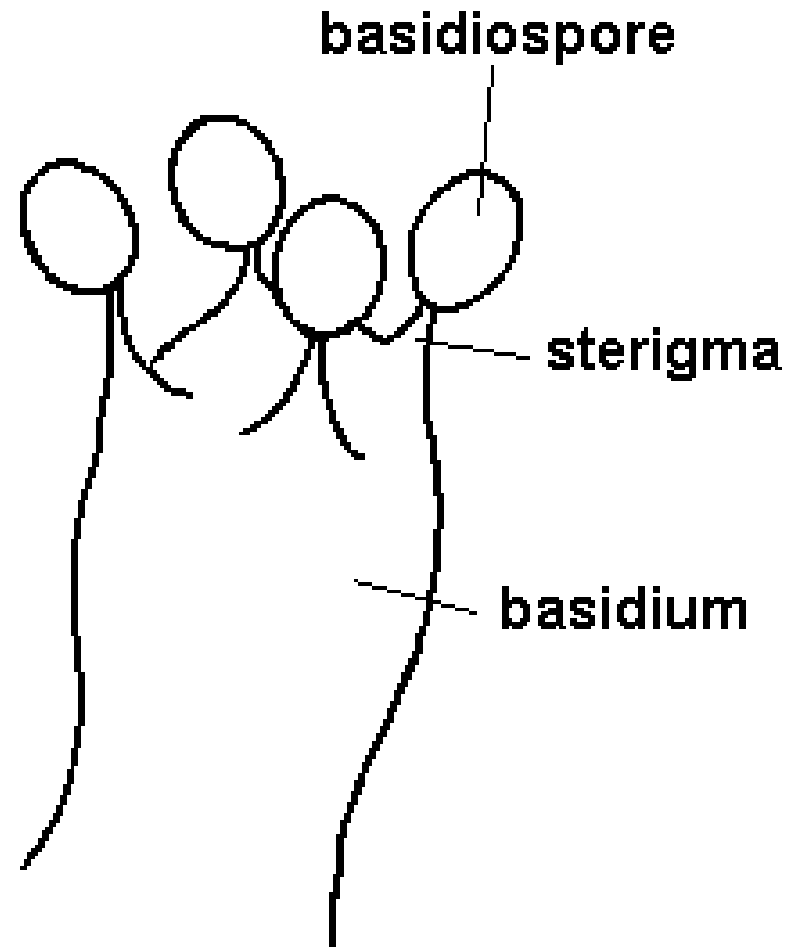
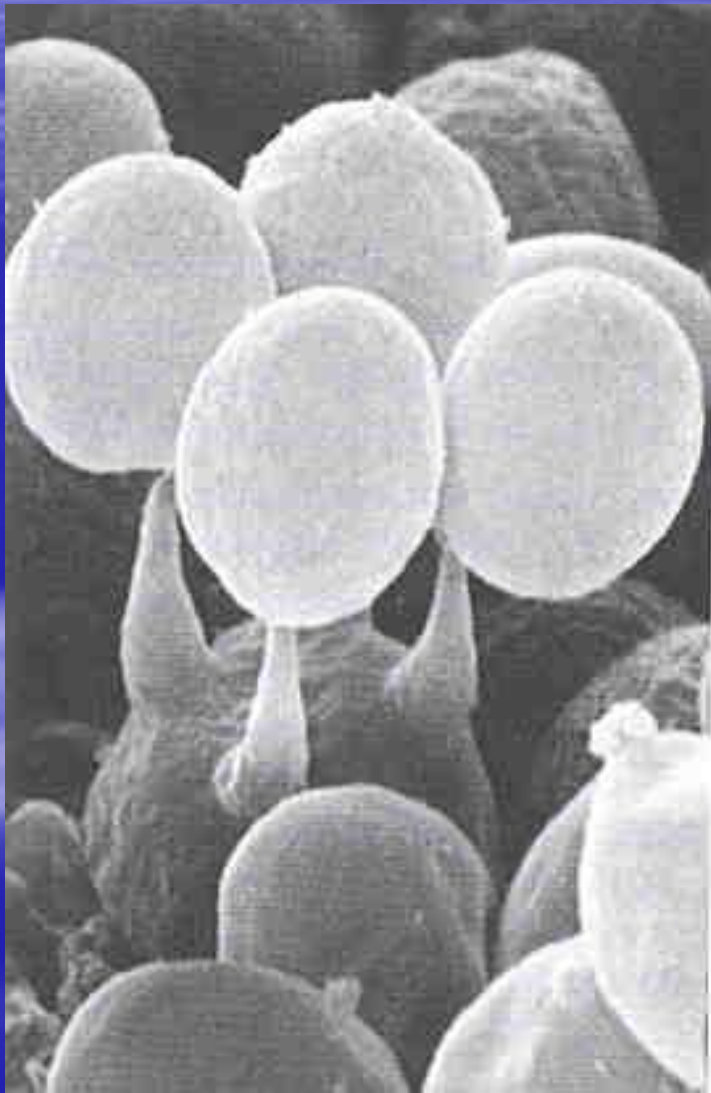
CBC Television Celebrating Fifty Years



fungus phyla

- Zygomycetes
- Chytridiomycetes
- Glomeromycetes
- Ascomycetes
- Basidiomycetes

Basidiomycetes ('club fungi')





rusts



smuts

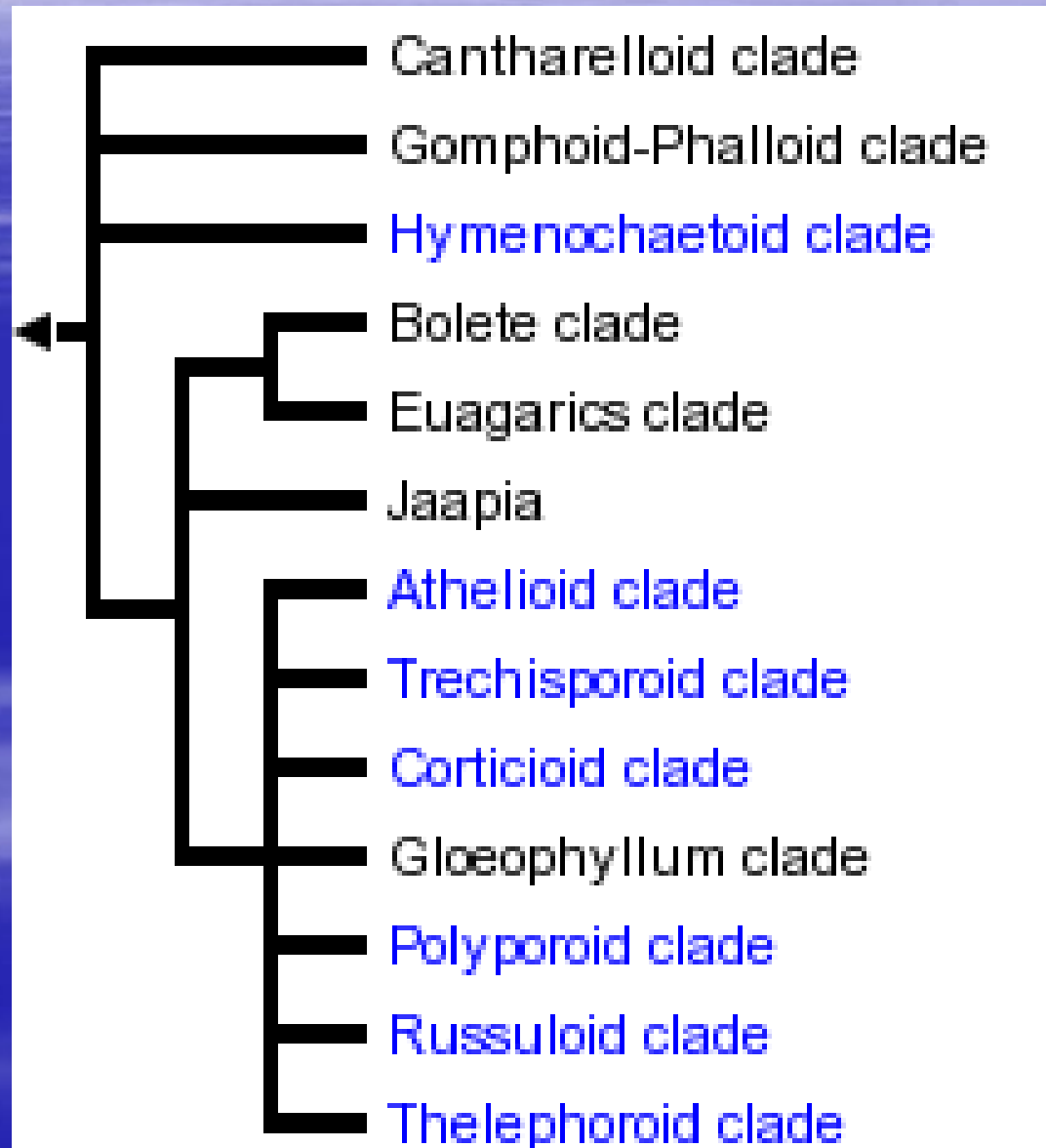
+ Hymenomycetes (the rest)



jelly fungi

+ Homobasidiomycetes (the rest)

Homobasidiomycetes



Gasteromycetes



how do you increase surface area
to hold more basidia?



how do you increase surface area
to hold more basidia?



culinary classification of mushrooms

As many, or more than 1.5 million species of fungi worldwide

>70,000 species described by mycologists

10,000 mushroom species

400 species probably poisonous

2,000 species probably edible

20 common poisonous species

100 species widely picked

80 species grown experimentally

< 6 common lethal species

15-30 species commonly eaten

40 species commercially cultivated

5-6 species produced on a large scale

**Who are all these
fungi ...**



... and what are they doing in our forests?



Lifestyles of the rich and fungal

Lifestyles of the rich and fungal

- parasites
- saprophytes
- predators
- symbionts





Lifestyles of the rich and fungal

- **parasites**
- saprophytes
- predators
- symbionts

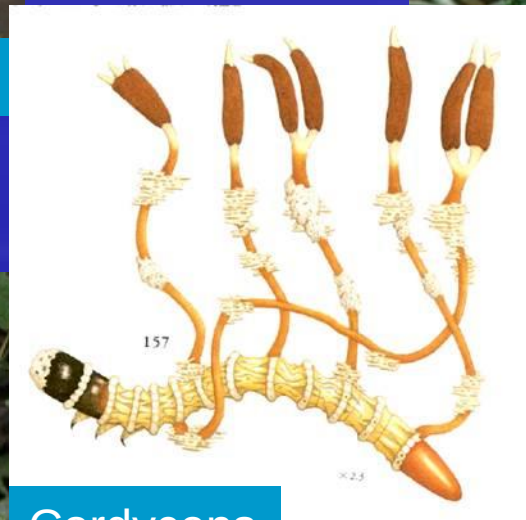




jelly fungi



rusts



Cordyceps



powdery mildews



ringworm



(*Ganoderma applanatum*)



Phellinus pini



turkey tail (*Trametes versicolor*)

parasites



Armillariella mellea



Phaeocollybia kaufmannii



Ganoderma lucidum,



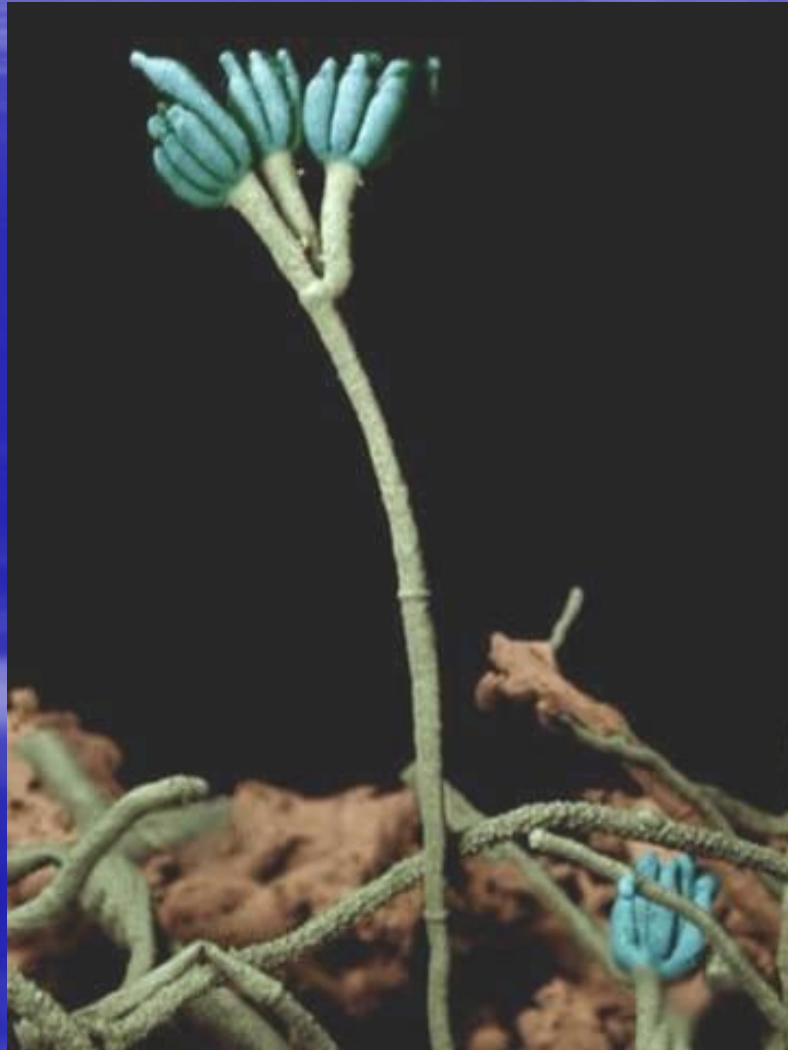
lobster mushroom



© Andrew Parker

Lifestyles of the rich and fungal

- parasites
- **saprophytes**
- predators
- symbionts



saprophytes



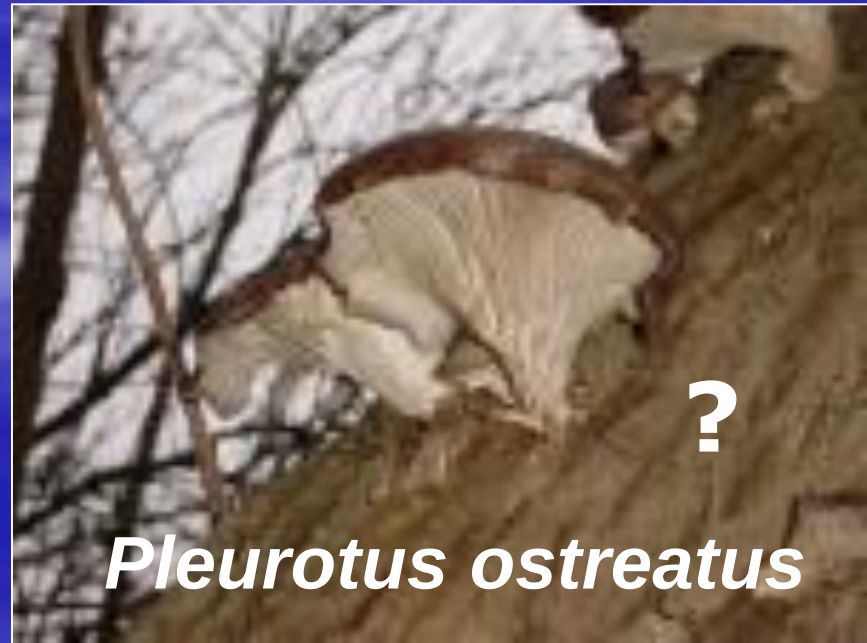
Tremella mesenterica



Marasmius oreades



Psilocybe coprophila



Pleurotus ostreatus



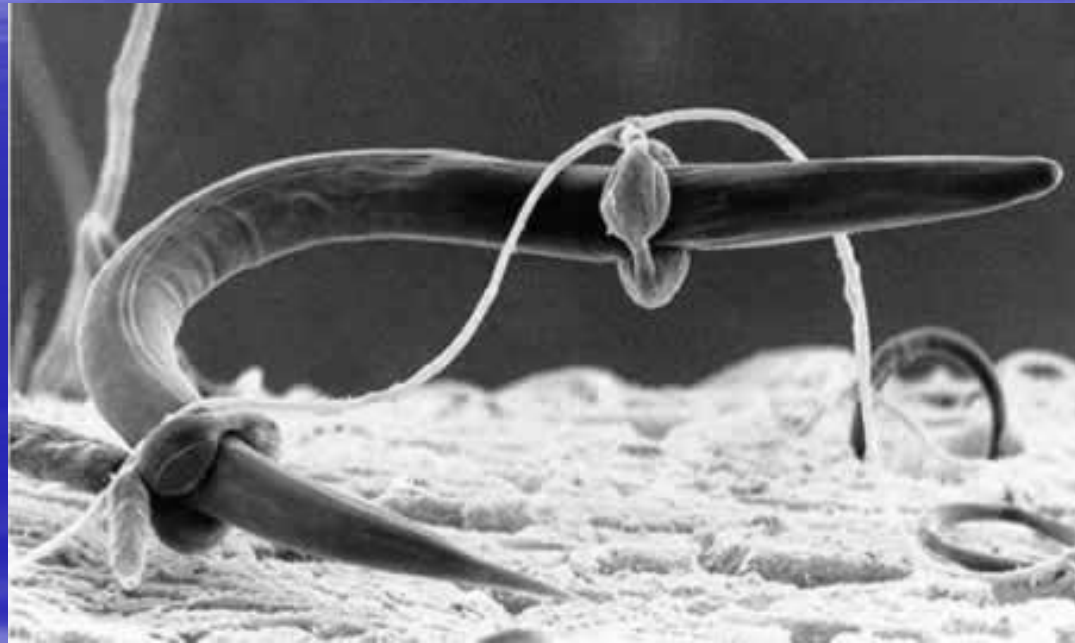
orange peel fungus (*Aleuria aurantia*)



spirit gummy bear (*Pseudohydnum gelatinosum*)

Lifestyles of the rich and fungal

- parasites
- saprophytes
- **predators**
- symbionts



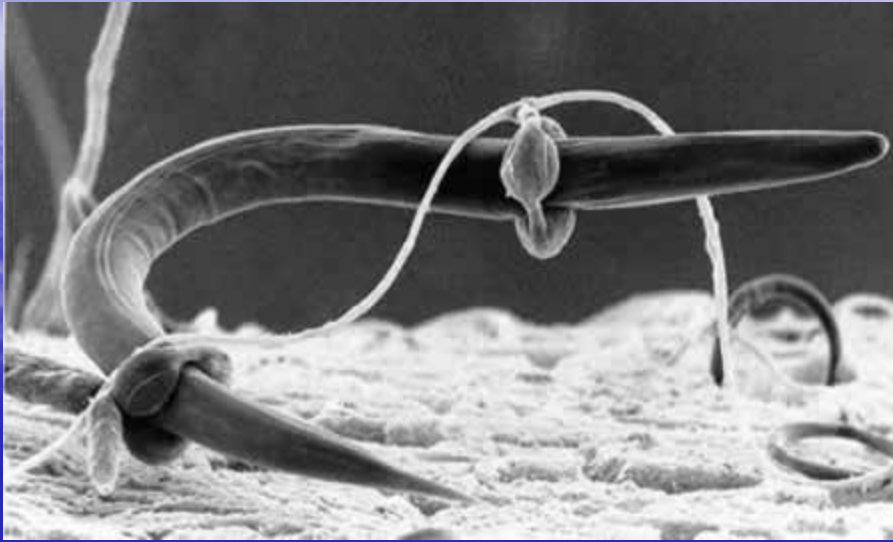
predators



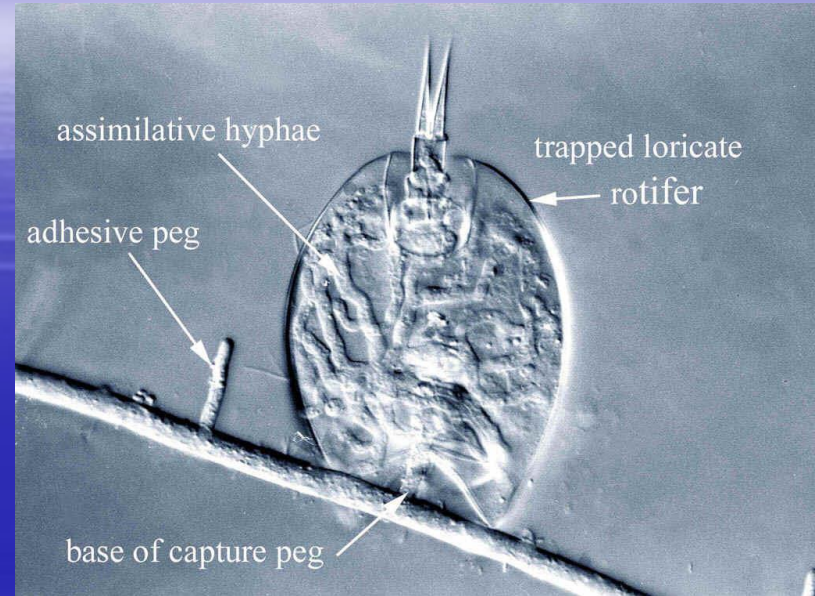
predators



Predatory fungi

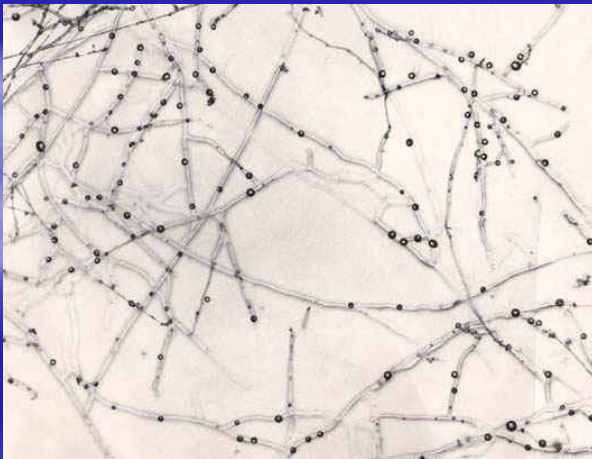


***Arthrobotrys* – traps nematodes**



***Zoophagus* – adhesive
pegs trap rotifers**

George Barron



**Paralytic droplets
(ostreatin) produced by
Pleurotus ostreatus
hyphae**



Lifestyles of the rich and fungal

- parasites
- saprophytes
- predators
- **symbionts**



lichens



Lobaria pulmonaria



Peltigera aphthosa



Cladonia macilenta



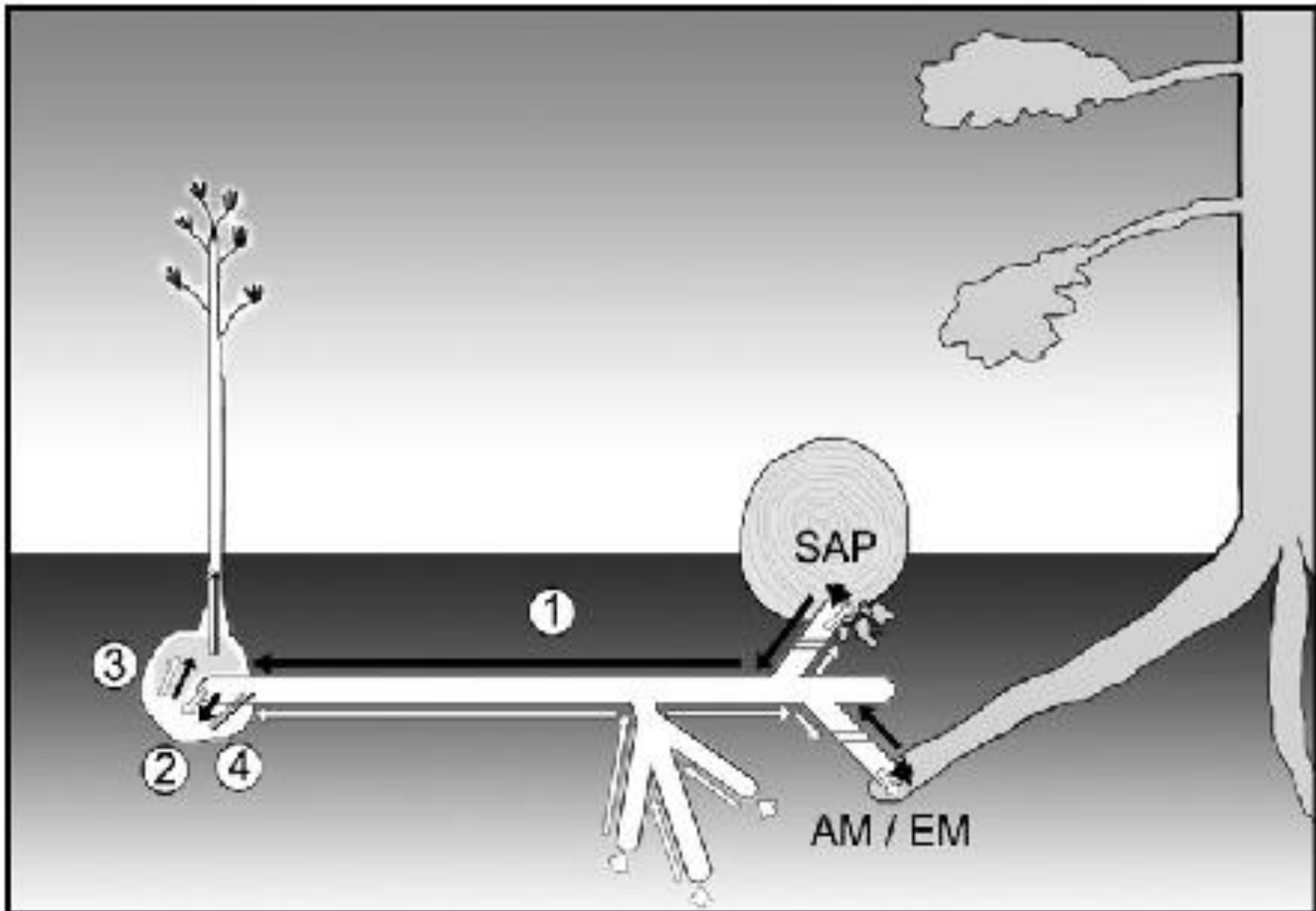
Icmadophila ericetorum



Mycoheterotrophy and mixotrophy and other crazy ideas



Movement of carbon (black arrows) and nutrients (white arrows) in myco-heterotrophy (from Leake and Cameron 2010)



Candystick (*Allotropia virgata*)



- Mycoheterotrophic
- Fungal associate:
pine mushroom
(*Tricholoma magnivelare*)



Coralroots (*Corallorhiza* species)



- Four species in BC: spotted coralroot (*C. maculata*), western coralroot (*C. mertensiana*), striped coralroot (*C. striata*), yellow coralroot (*C. trifida*), all in our area (but yellow coralroot more of an interior BC species)
- All myco-heterotrophic
- Fungal associates:
 - spotted coralroot, 20 species in Russulaceae
 - western coralroot, 3 closely related *Russula* species
 - striped coralroot, Thelephora-*Tomentella* species

Spotted Coralroot (*C. maculata*)

Wintergreens (*Pyrola*, *Moneses* and *Orthilia* species)



White-veined wintergreen
(*Pyrola picta*)

- Six species of *Pyrola* potentially in our area
- One-sided wintergreen (*Orthilia secunda*)
- Single delight (*Moneses uniflora*)
- White-veined wintergreen (*Pyrola picta*) is mycoheterotrophic
- Green wintergreen (*Pyrola chlorantha*) and one-sided wintergreen (*Orthilia secunda*) are demonstrated mixotrophs
- Fungal associates: a variety of ectomycorrhizal species, including several *Tricholomas*

Gnome Plant (*Hemitomes congestum*)

- Mycoheterotrophic
- Fungal associate:
Hydnellum peckii and
H. aurantiacum



Strawberries and cream
(*Hydnellum peckii*)

Indian-pipe (*Monotropa uniflora*)



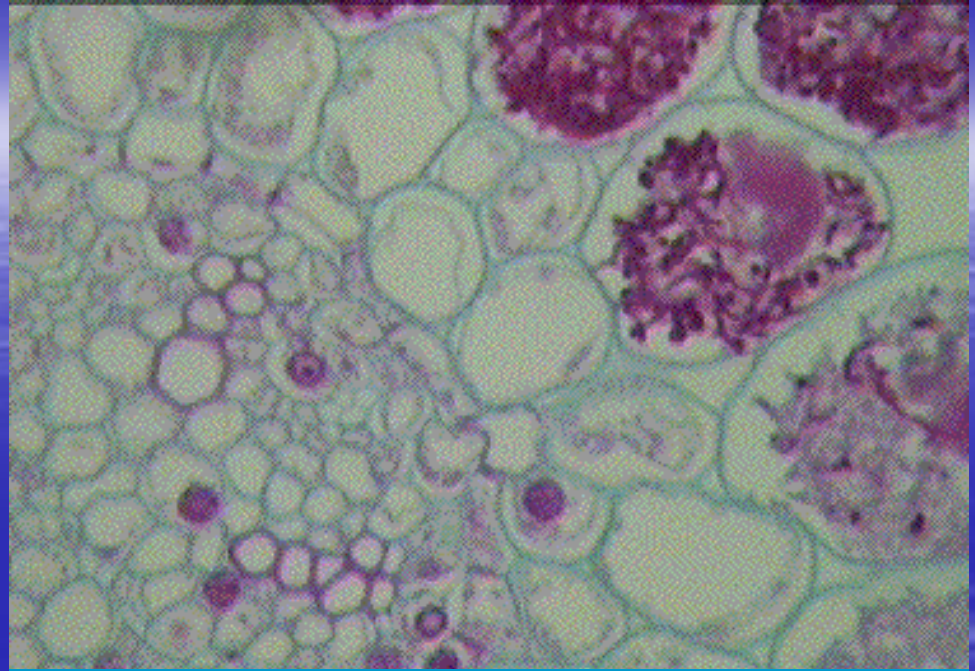
Daniel Mosquin photo

- Mycoheterotrophic
- Fungal associate:
Russulaceae, often short-stemmed *Russula* (*Russula brevipes*)

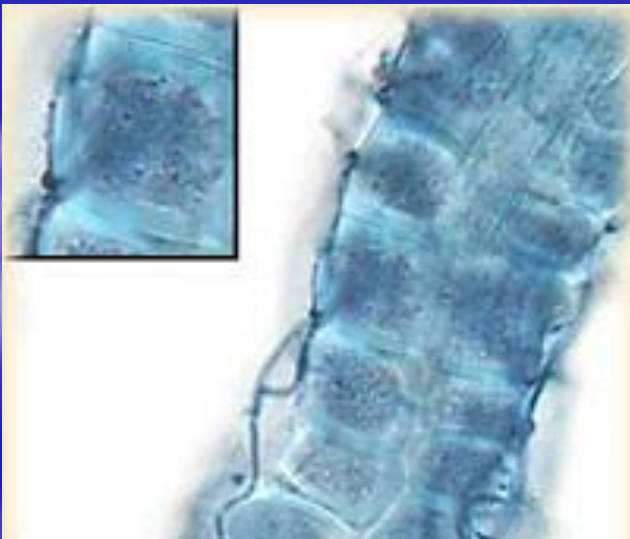




ectomycorrhizae



VA (endo-) mycorrhizae



ericoid mycorrhizae



salal

mycorrhizae



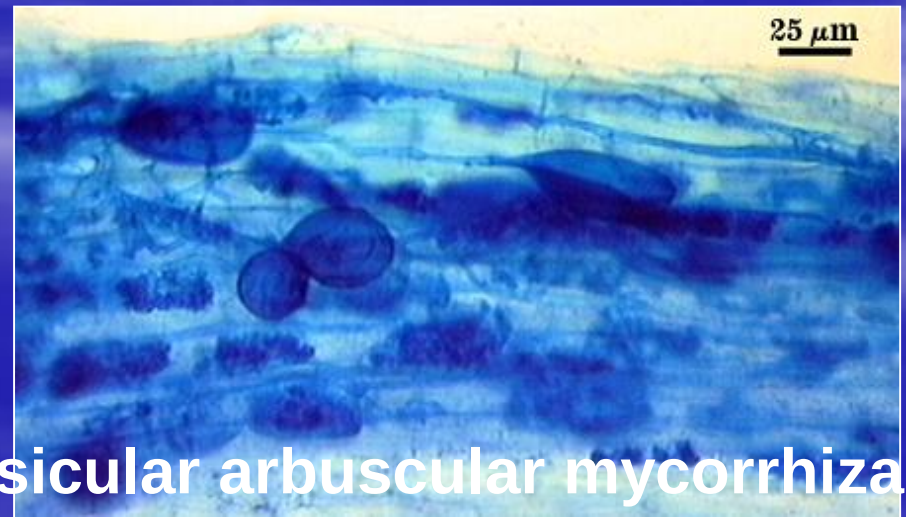
Tricholoma magnivelare



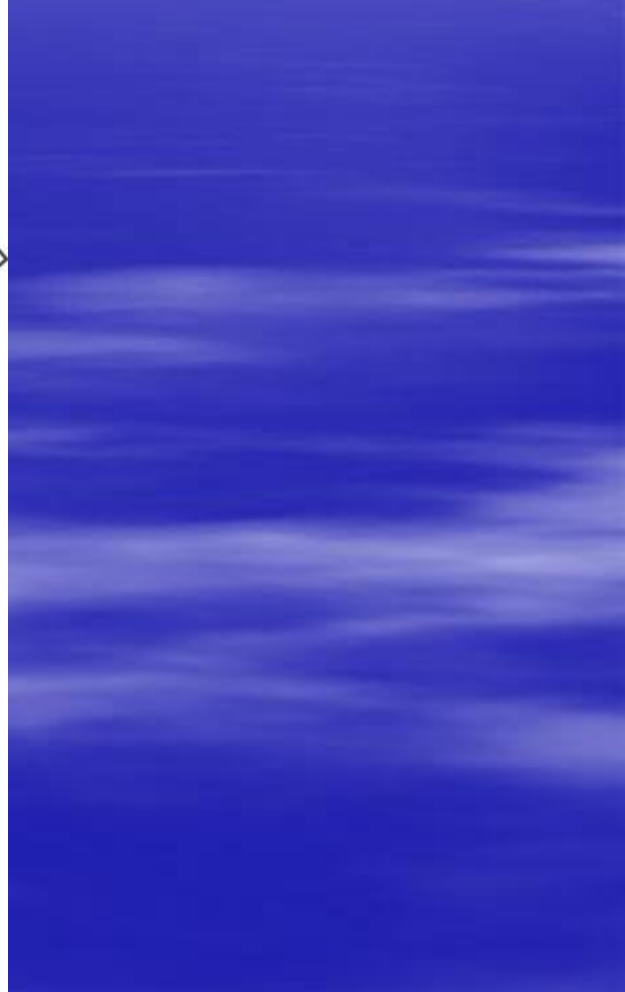
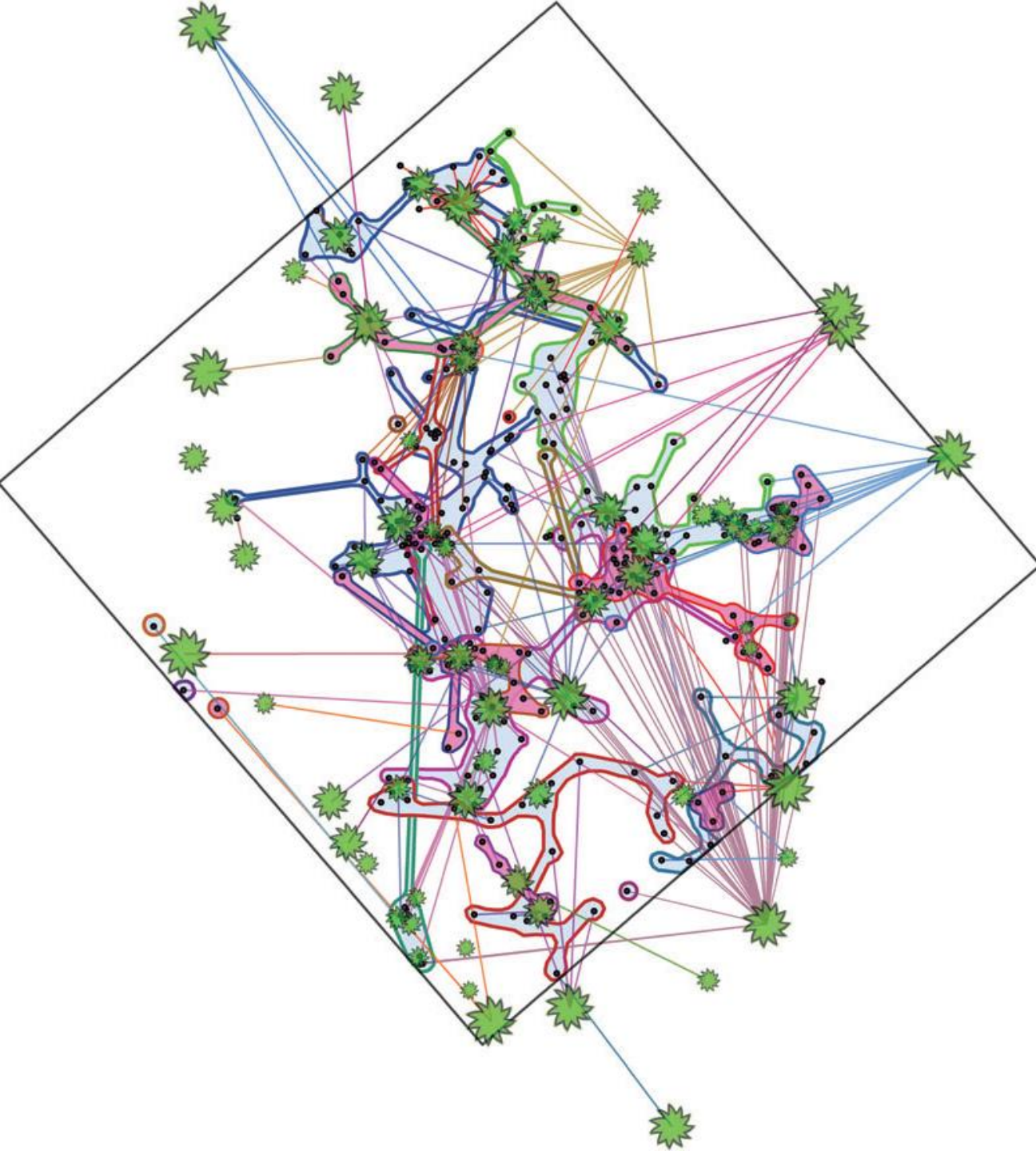
Cantharellus formosus



ectomycorrhizal root tip



vesicular arbuscular mycorrhizae





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