

Basidiomycetes

Topics (just the very basics):

Basidiomycetes

Characters

Phylogeny and evolution

Major groups

Life cycles

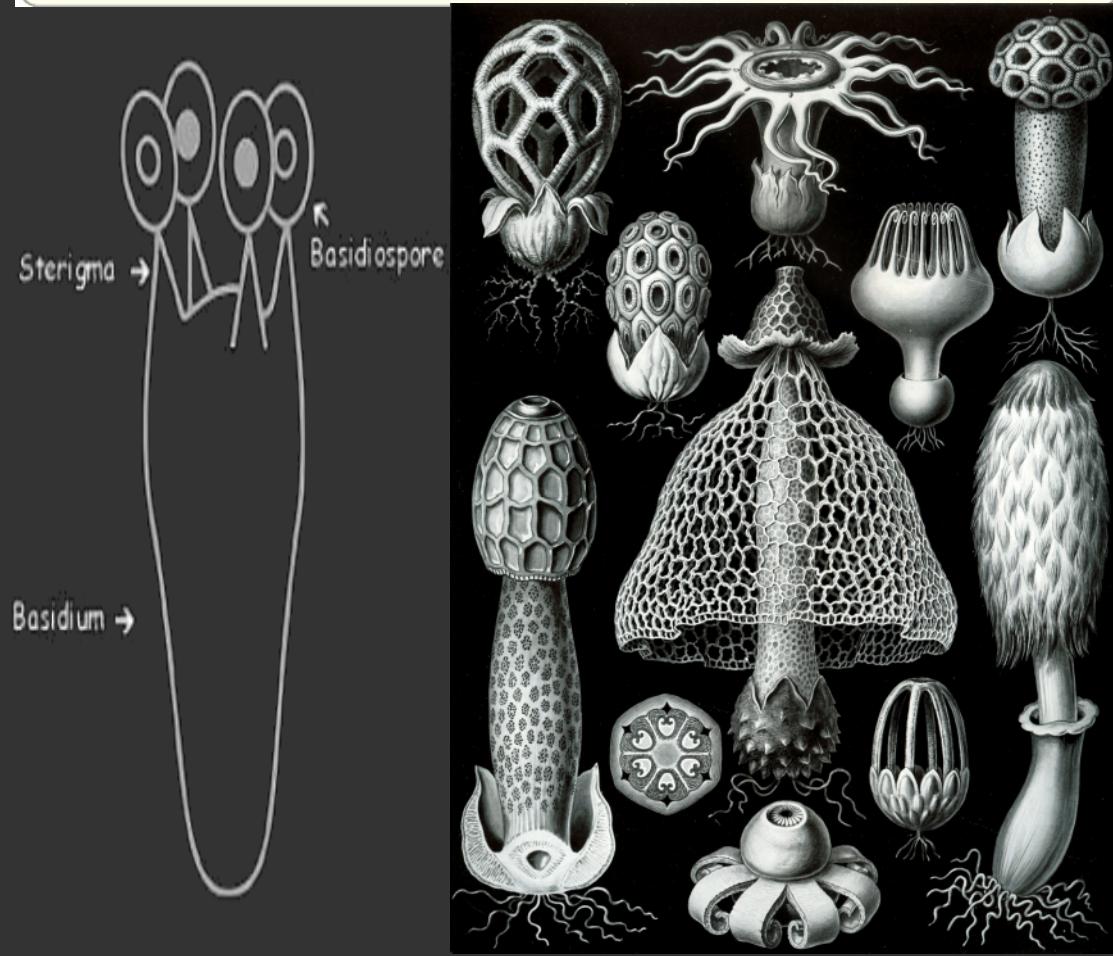
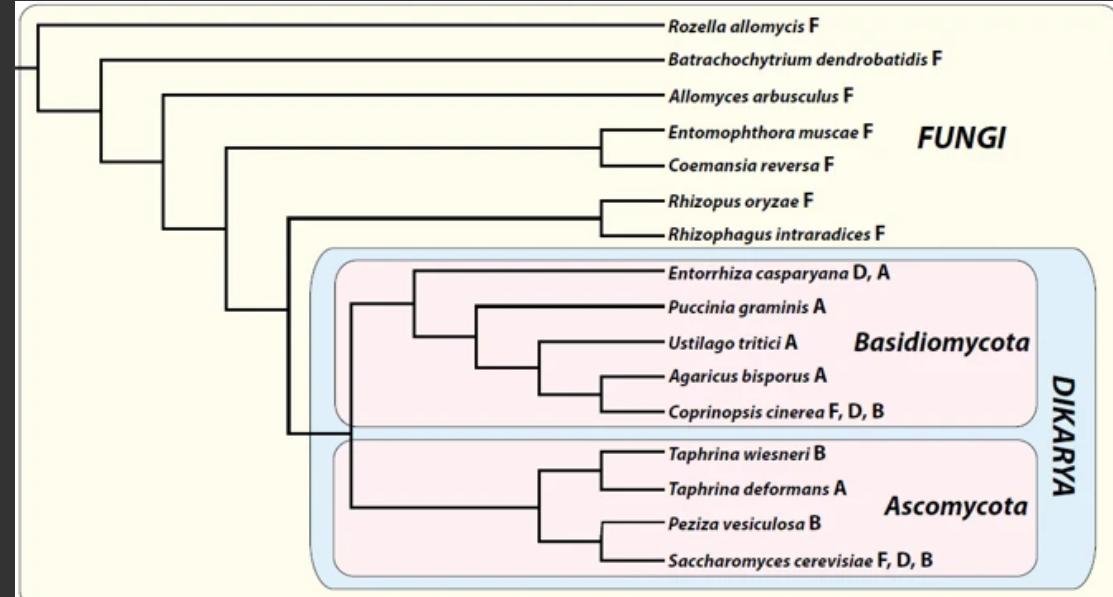
Ecology

Closer look at several subgroups:

Pleurotus

Lycoperdon

Tremella



Basidiomycetes

"The other dikaryotes"

Named after the fact that they make "basidia"

Also known as the "club fungi"

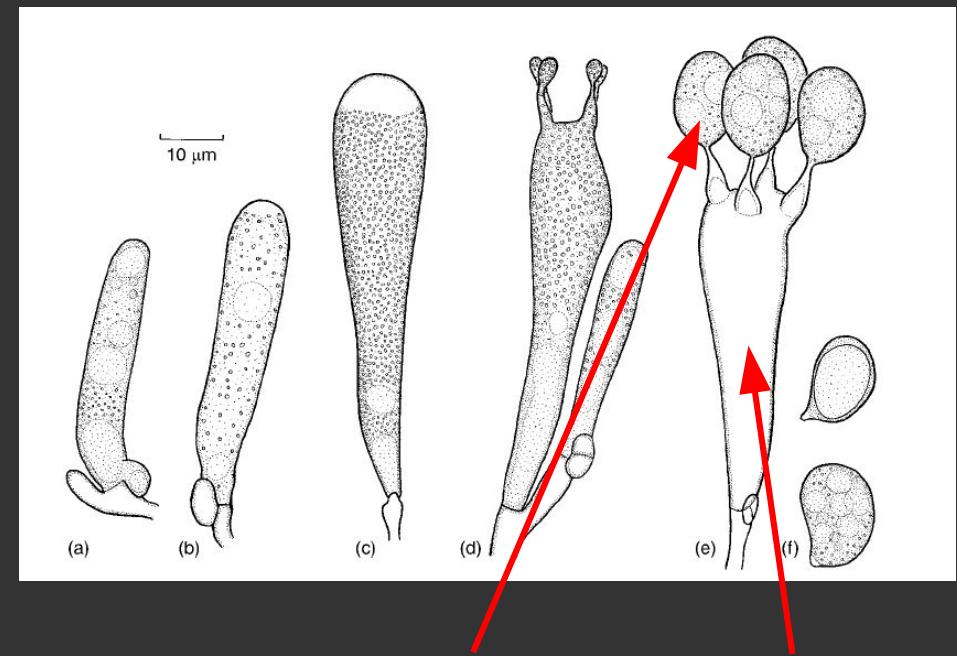
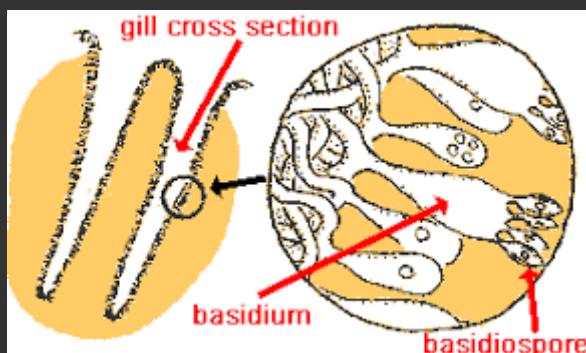
(looks like a club, I guess?)

Very large group of fungi

"Clamp connections" common in hyphae

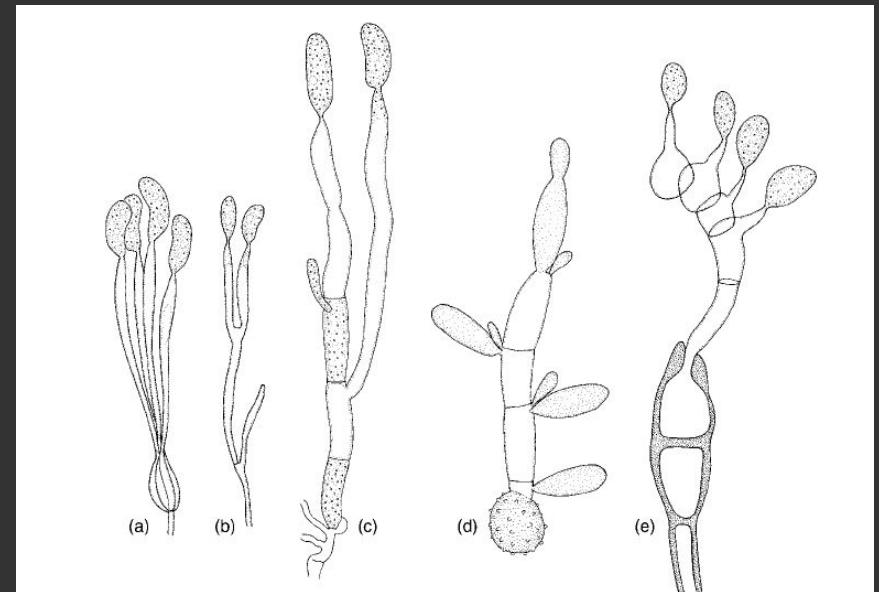
Most "mushrooms" fall into this phylum

Karyogamy and Meiosis only happen in the basidium



Basidiospore

Basidium



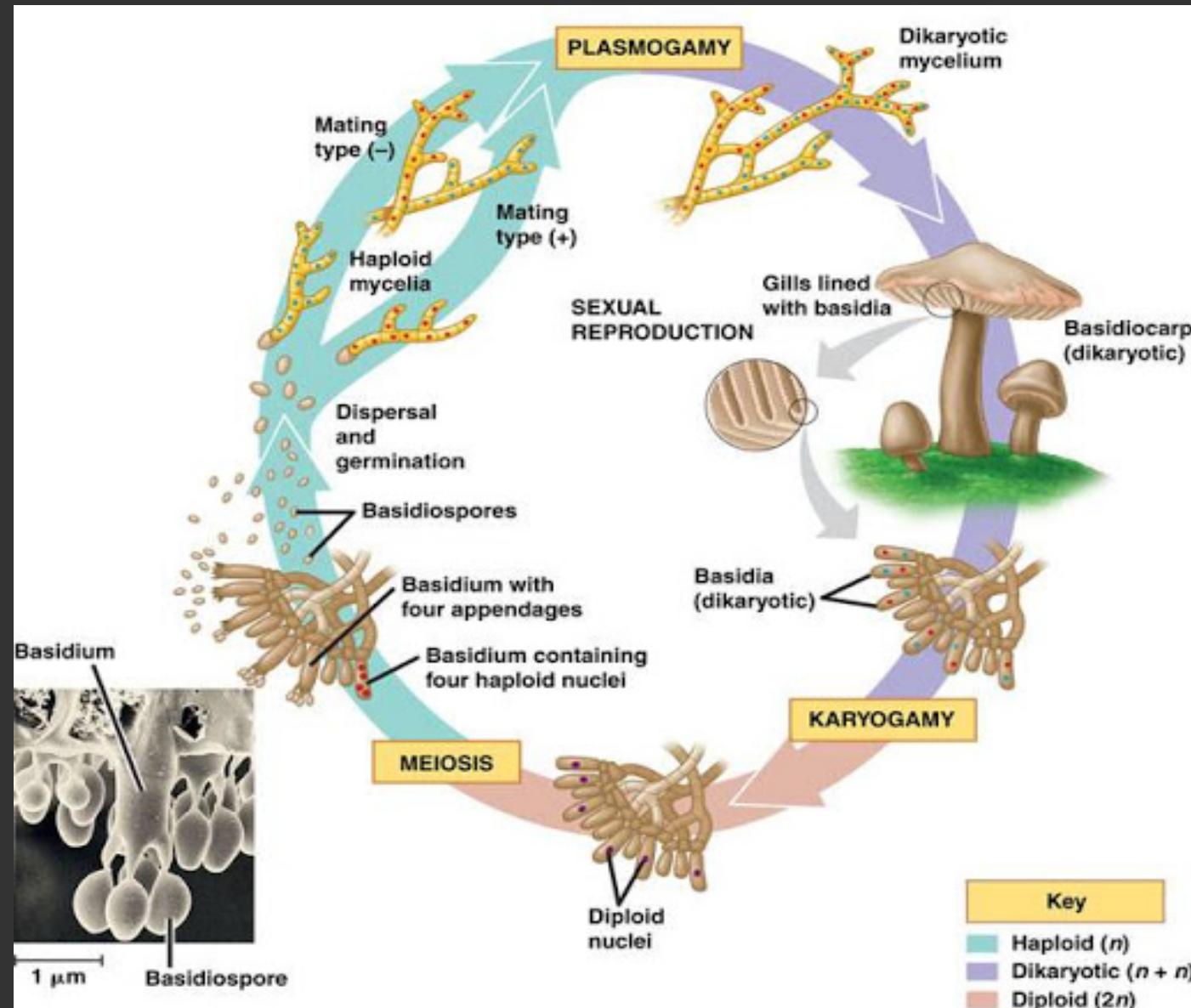
Varieties of basidia

Life cycle

Like ascomycetes, the other dikaryotes, basidiomycetes have an extended dikaryotic stage, only undergoing karyogamy right before meiosis.

Basidiomycetes spend less time as haploid individuals than Ascomycetes, and asexula reproduction is generally rare.

Karyogamy and meiosis only happen in structures called "basidia."

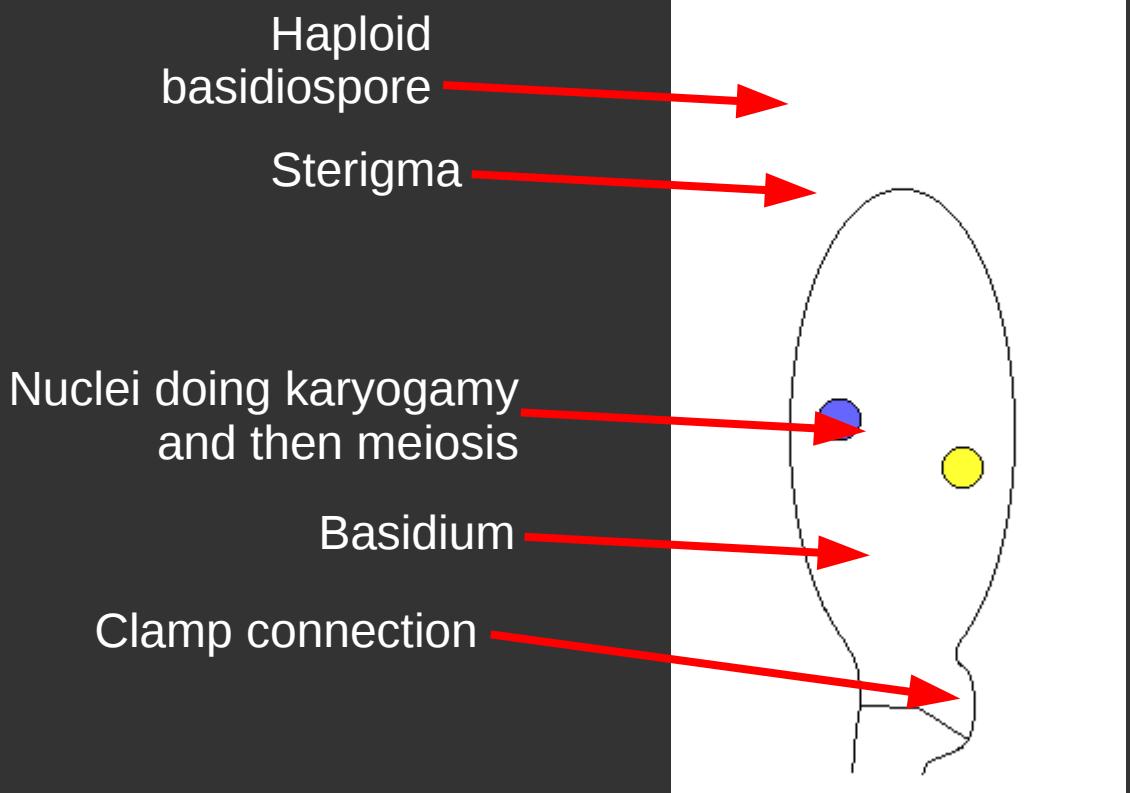
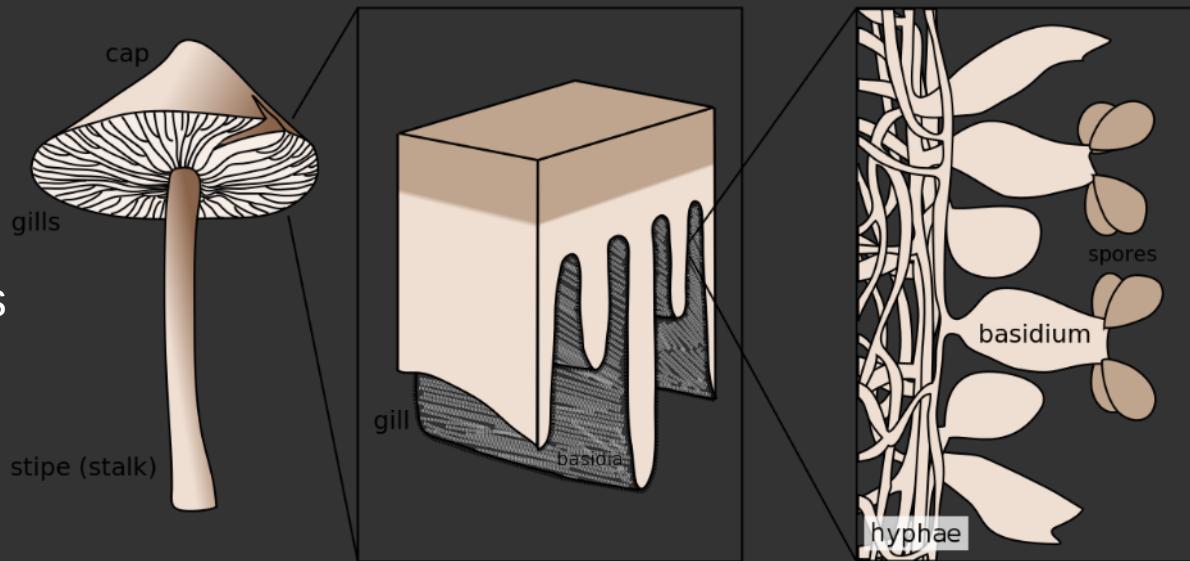


Basidia (basidium, singular).

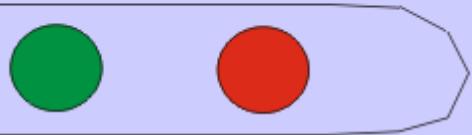
The sexual reproductive structures of basidiomycetes.

The fertile surface where basidia form is called the hymenium, just like in ascomycetes.

Basidiospore being launched from basidium

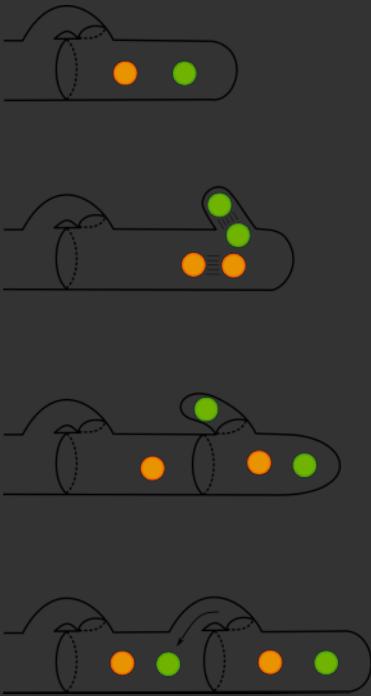


Clamp connections



"Clamp connections" are only found in basidiomycetes, but not *all* basidiomycete fungi have them.

They're a way to make sure that each cell compartment stays dikaryotic as the hypha grows via mitosis.



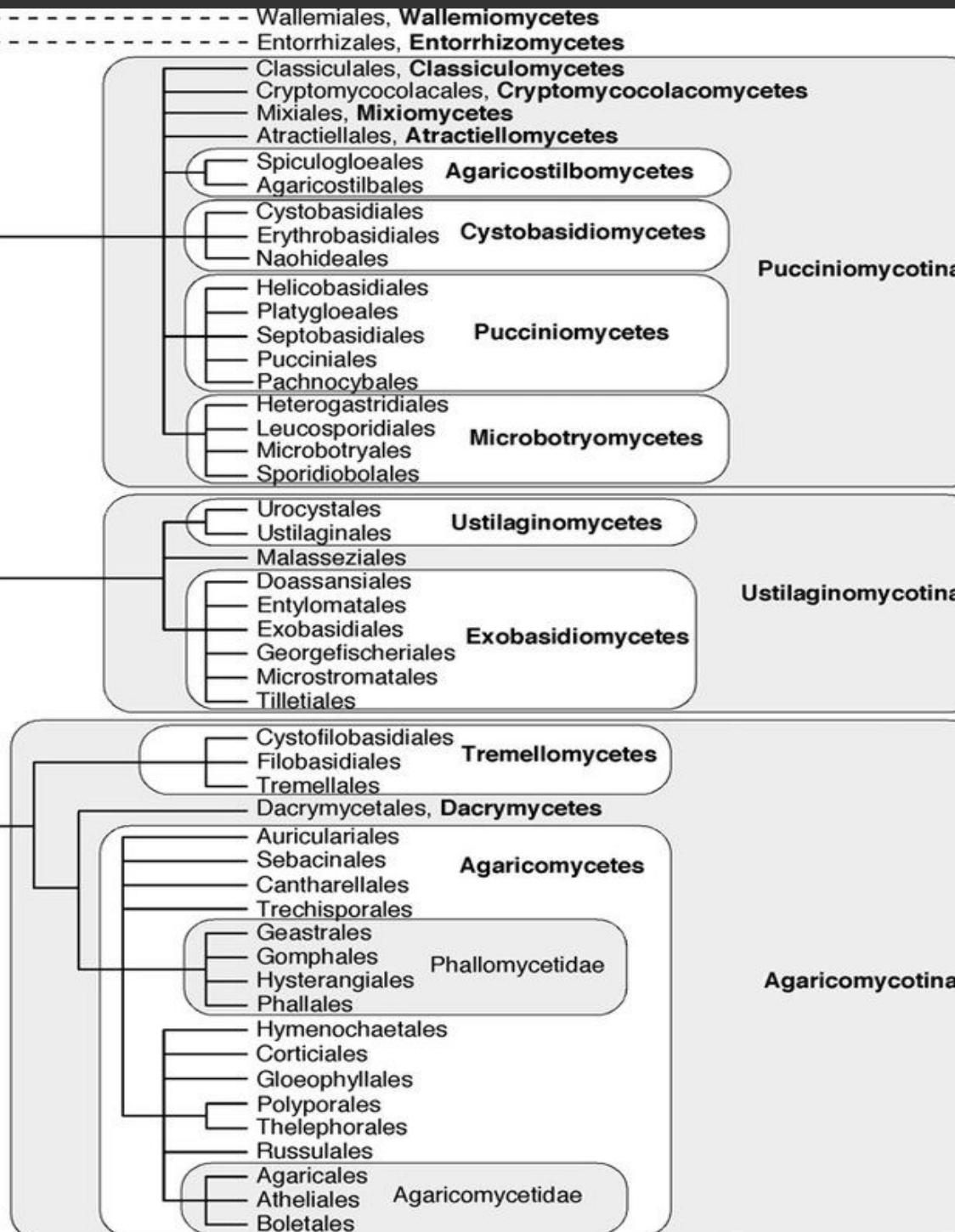
If you see clamp connection on a hypha,
you're looking at a dikaryotic basidiomycete



Can you spot the clamp connection?

Phylogeny and major groups

Major morphological traits are not well-preserved

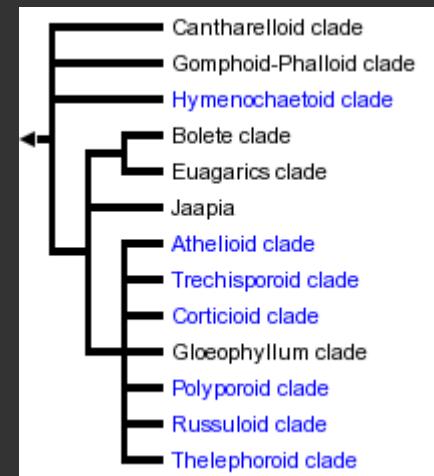
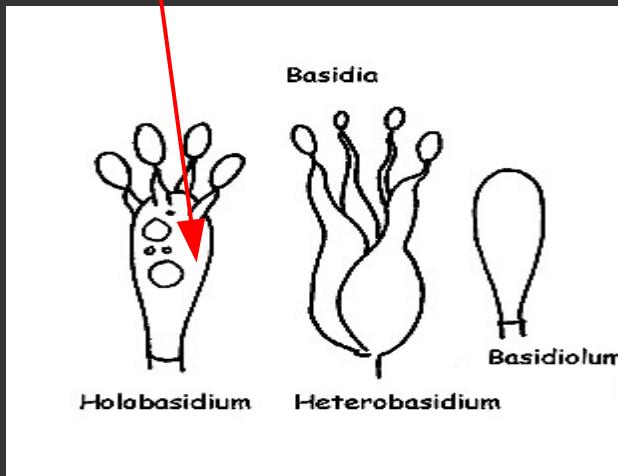


"Rust fungi, jellies, etc"

"Smut fungi"

"Mushrooms, Jellies, some yeasts"

Homobasidiomycetes: Basidia are complete and non-segmented. (Paraphyletic grouping)



agarics



boletes



polypores



gasteromycetes



russulas

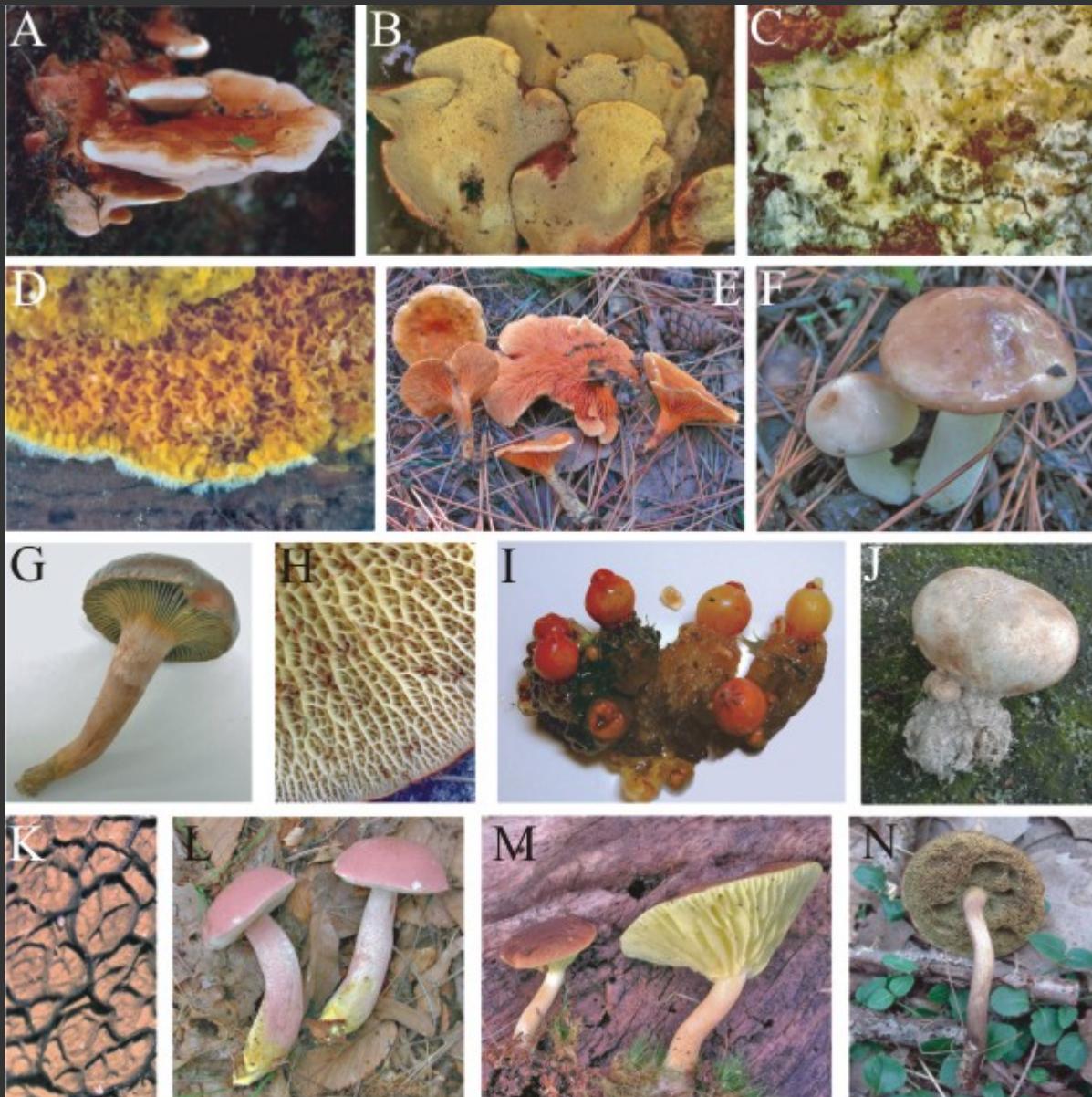
Boletales (paraphyletic)

Yeah, so "boletes" are mushrooms with spongy pores instead of gills.

Not all Boletales are boletes though.



Still have basidia, though, lining the surface of the cylindrical tubes...



Morphological diversity in Boletales. A, *Bondarcevomyces taxi*; B, *B. taxi*, pores; C, *Coniophora puteana*; D, *Leucogyrophana mollusca*; E, *Hygrophoropsis aurantiaca*; F, *Suillus granulatus*; G, *Chroogomphus vinicolor*; H, *Boletinellus meruloides*, hymenophore; I, *Calostoma cinnabarinum*; J, *Scleroderma septentrionale*; K, *Meiorganum neocaledonicum*, young hymenophore; L, 'Tylopilus' chromapes; M, *Phylloporus centroamericanus*; N, *Xerocomus* sp.

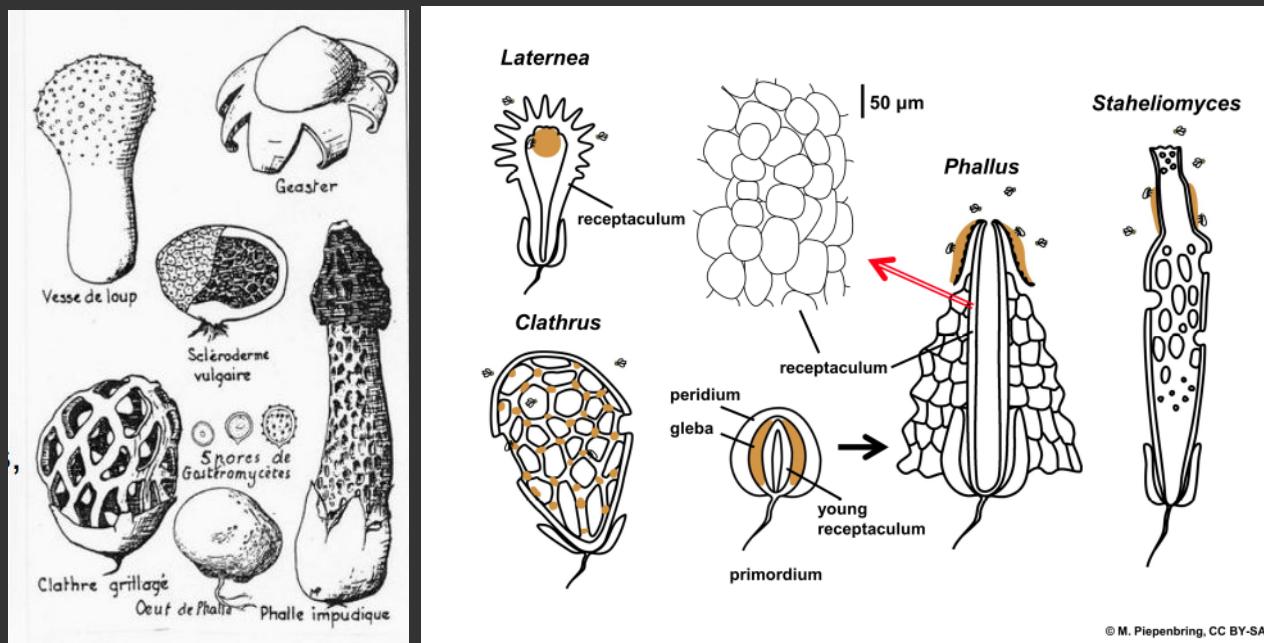
"Gasteromycetes" (not a real clade!)

Above-ground (epigeous)

Below-ground (hypogeous)

Basidiospores mature inside basidiocarp

Basidiospores are not forcibly discharged



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Gomphoid-phalloid 1,3,4,5,6,7

Cantharelloid 1,3,4,5

Hymenochaetoid 2,3,5

Russulloid 1,2,3,4,5,6,7

Thelephoroid 2,3,4,5

Polyporoid 1,2,3,5

Bolete 1,2,5,6,7

Euagarics 1,2,4,5,6,7

Sporocarp/hymenium type

1 gills

2 poroid

3 toothed

4 club

5 crust

6 gasteromycete
epigeous

7 truffle

hypogeous

Sporocarp characters
are not reliable
indicators of phylogeny!

Gasteromycetes: spore dispersal is "passive"



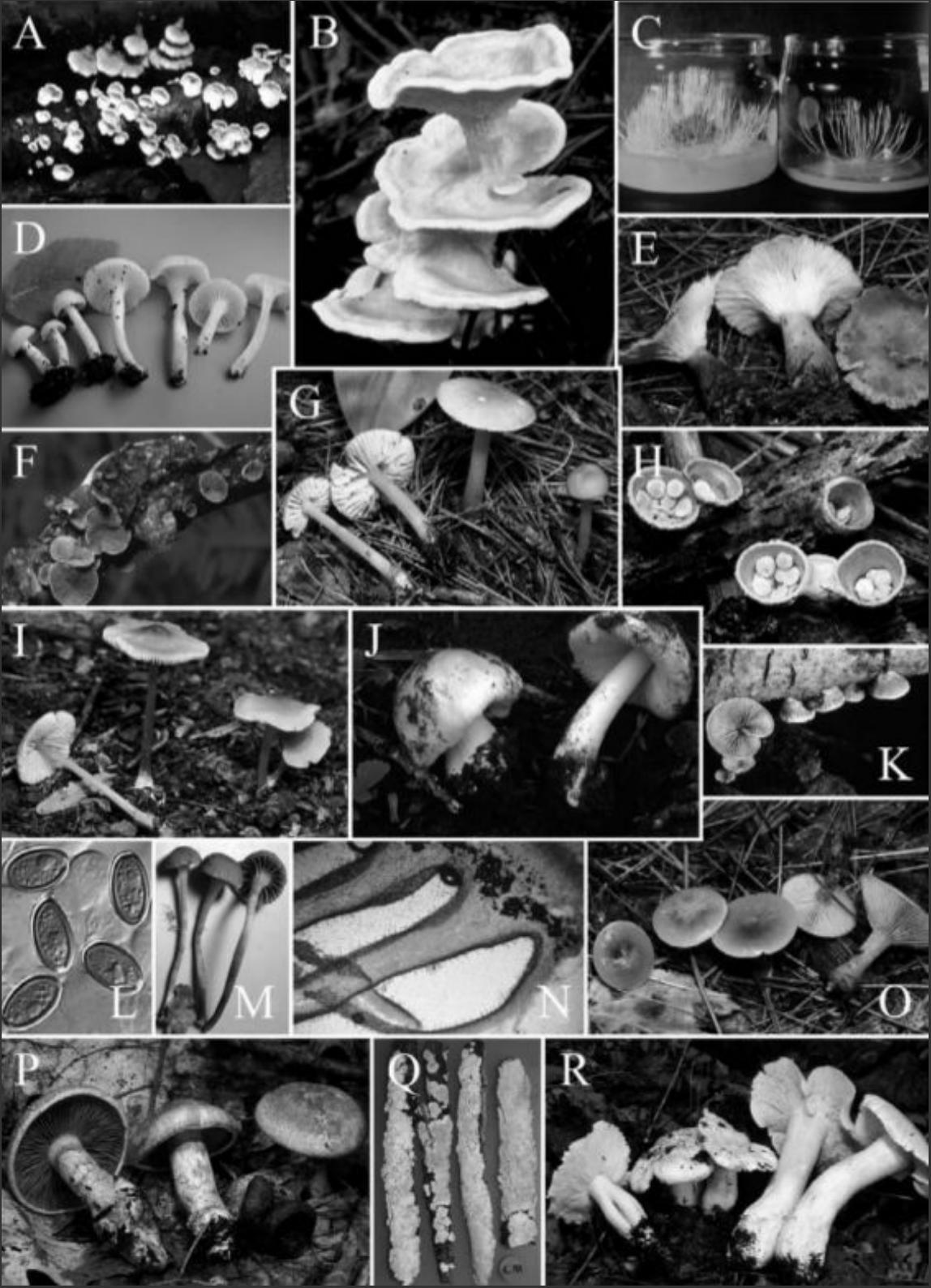
Agaricales -

Traditionally, the "gilled fungi" though, of course, there are gilled fungi in other groups and some agaricalean fungi don't have gills.

Fungal taxonomy is...fun, err... stupid...

...well, earlier taxonomists happened to choose a lot of traits that aren't phylogenetically conserved. Bad luck!

But "Euagaricales" is monophyletic



Heterobasidiomycetes: basidia that are fragmented



dacrymycetaceae

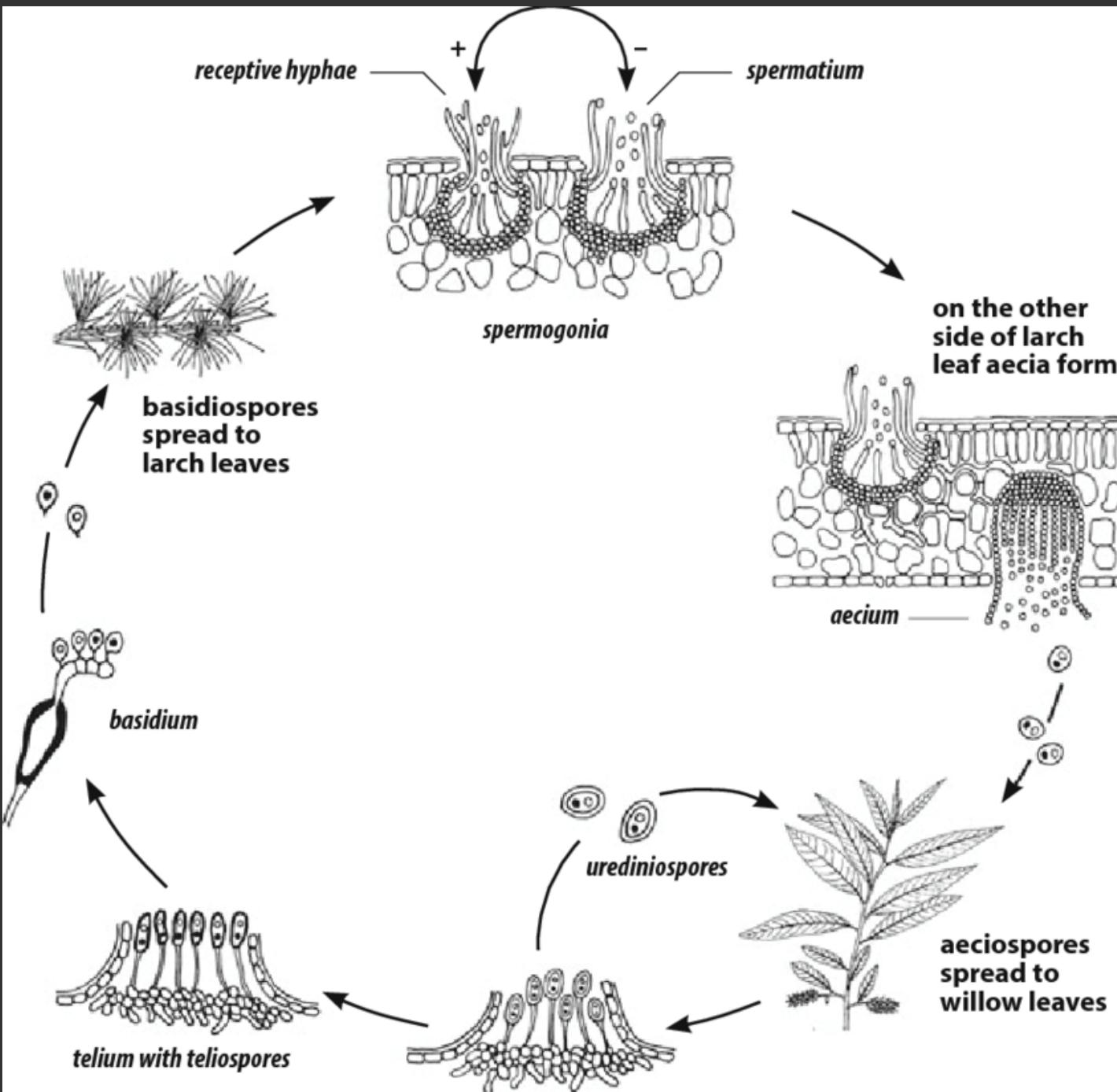


auriculariaceae



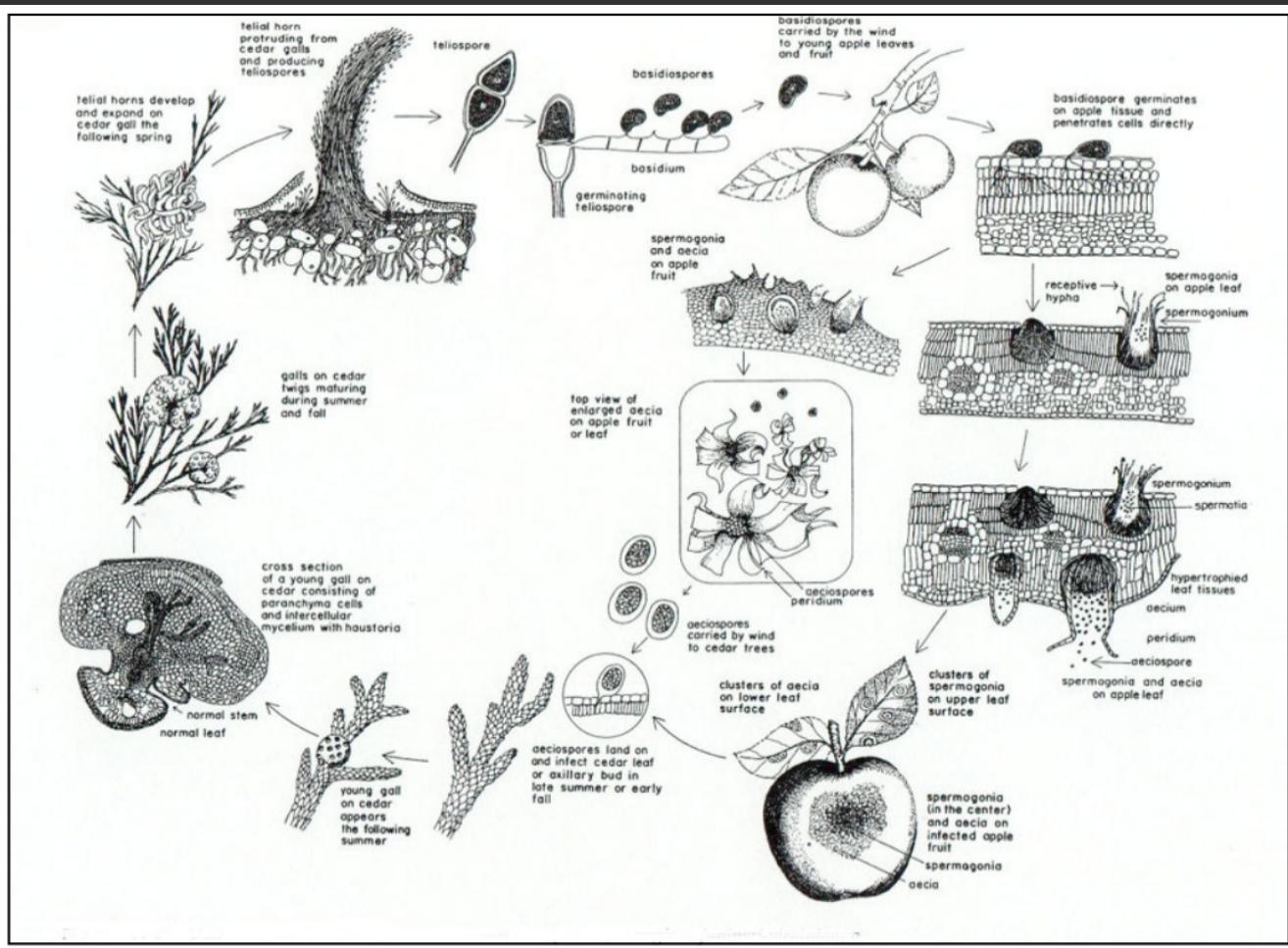
tremellaceae

Rusts and smuts: obligate plant parasites, worst (best?) life cycles ever



"Cedar-Apple rust"

Which host is telial and which is aecial?

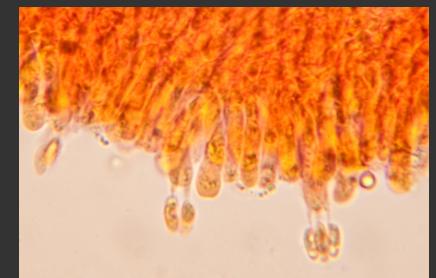


Pleurotus ostreatus (Aragricales)
The oyster mushroom

Easy to grow at home
(bonus assignment)

Saprotrophic
(also predatory!)

Widespread globally

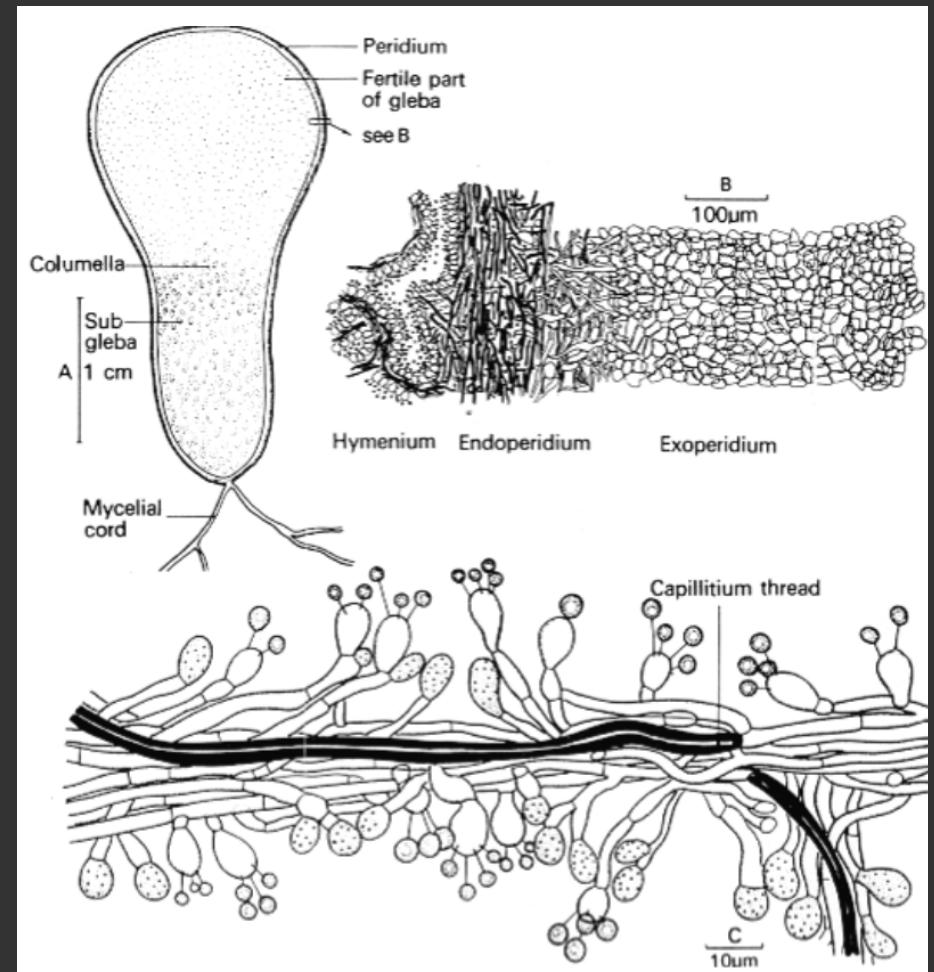


Lycoperdon sp. (Aragricales)
"Common puffball"

Probably the most
commonly seen puffball
in North America

Saprotrophic

Widespread globally

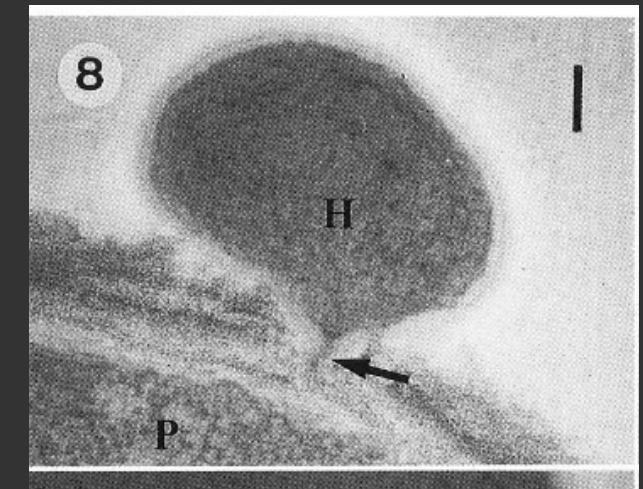
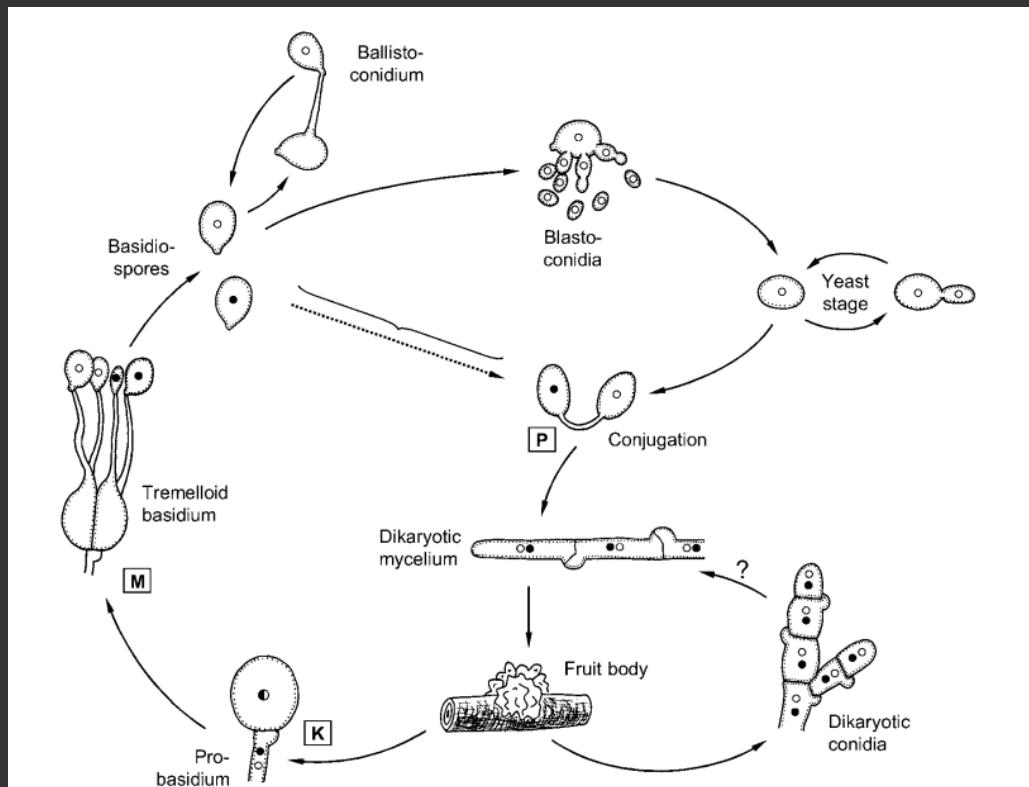


Tremella sp. (Tremellales)

Mycoparasitic

Has yeast form in life cycle

Basidiocarps are gelatinous



Haustorium



Basidiomycete ecology (life, as we know it, depends on these doing their thing)

Found in nearly every environment on Earth

Crucial for carbon cycling

Plant diseases, but also ectomycorrhizae that forests depend on

Some animal pathogens

Nematode hunters

So, how do Basidiomycetes fit into our picture of fungal evolution, morphology, physiology, diversity, and ecology?

Evolution -

Morphology -

Physiology -

Diversity -

Ecology -

Assignments

- 1.** Read Webster & Weber, sections: 18, 19.1, 19.4.5, 20.1, 20.3, 21.1, 21.5
 - These cover an introduction to Basidiomycetes and then closer looks at some specific groups
- 2.** You will have a Canvas quiz on the assigned readings and will also have to participate in a Slack discussion about them.
- 3.** Go through the website materials and try to get a feel for Basidiomycetes. The terminology should be coming a bit easier now. Nothing is too different from the Ascomycetes. But having outside resources helps present the material in a variety of ways that help with retention.
- 4.** Study for the first exam, which will be held on Canvas next week. Topics will focus on terminology, and the major groups of fungi we've covered so far.