

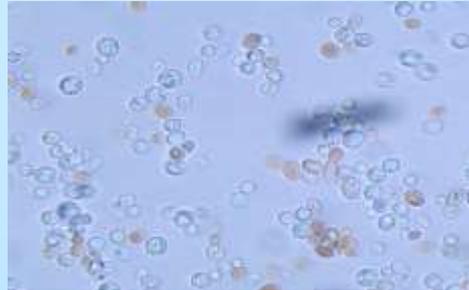
Kingdom Fungi

- The characteristics of fungi
- The evolution of the fungi
- Fungal classification
- Fungal life cycles



The Characteristics of Fungi

- Body form
 - * unicellular
 - * filamentous (tube-like strands called hypha (singular) or hyphae (plural))
 - * mycelium = aggregate of hyphae
 - * sclerotium = hardened mass of mycelium that generally serves as an overwintering stage.
 - * multicellular, such as mycelial cords, rhizomorphs, and fruit bodies (mushrooms)

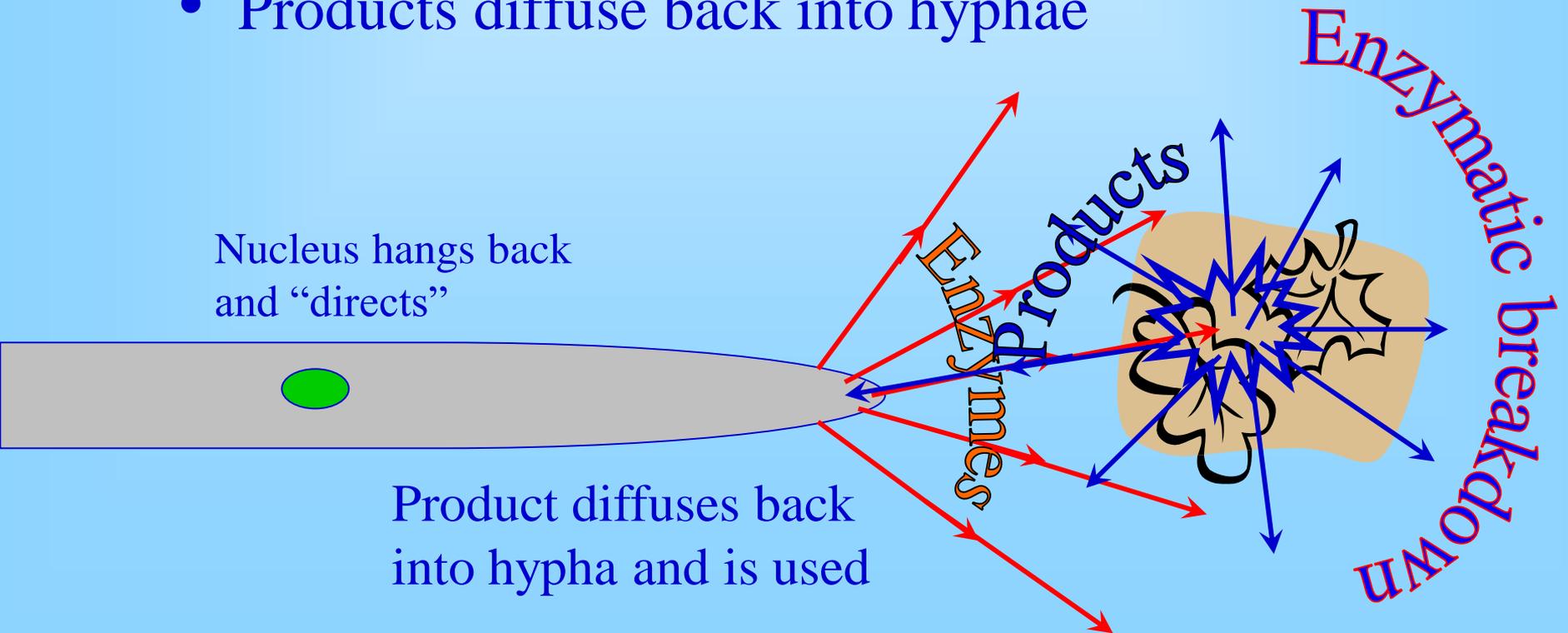


The Characteristics of Fungi

- Heterotrophy - 'other food'
 - * Saprophytes or saprobes - feed on dead tissues or organic waste (decomposers)
 - * Symbionts - mutually beneficial relationship between a fungus and another organism
 - * Parasites - feeding on living tissue of a host.
 - Parasites that cause disease are called pathogens.

Heterotrophic by Absorption

- Fungi get carbon from organic sources
- Hyphal tips release enzymes
- Enzymatic breakdown of substrate
- Products diffuse back into hyphae



Fungi as Saprobies and Decomposers



Fungi as Symbionts (Mutualism)

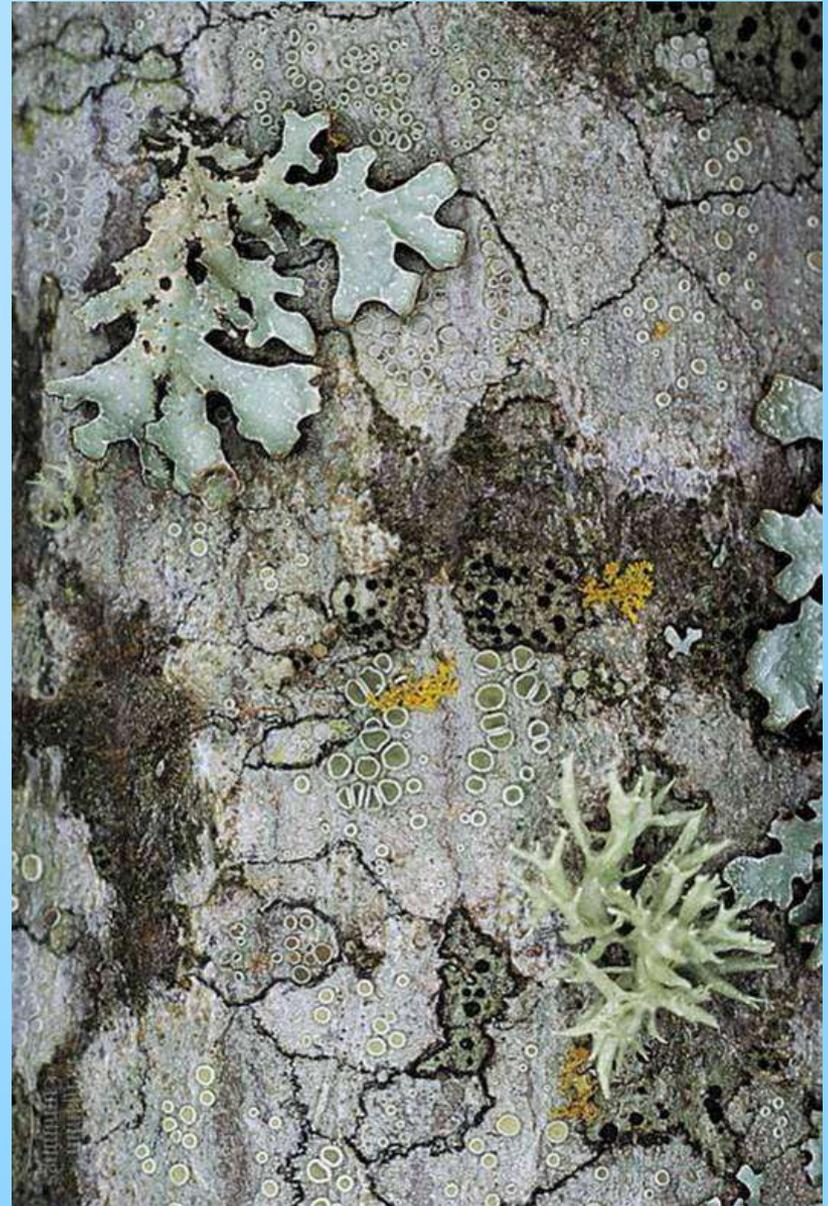


Mycorrhizae

- “Fungus roots”
- Mutualism between:
 - * Fungus (nutrient & water uptake for plant)
 - * Plant (carbohydrate for fungus)
- Several kinds
 - * Zygomycota – hyphae invade root cells
 - * Ascomycota & Basidiomycota – hyphae invade root but don’t penetrate cells
- **Extremely** important ecological role of fungi!

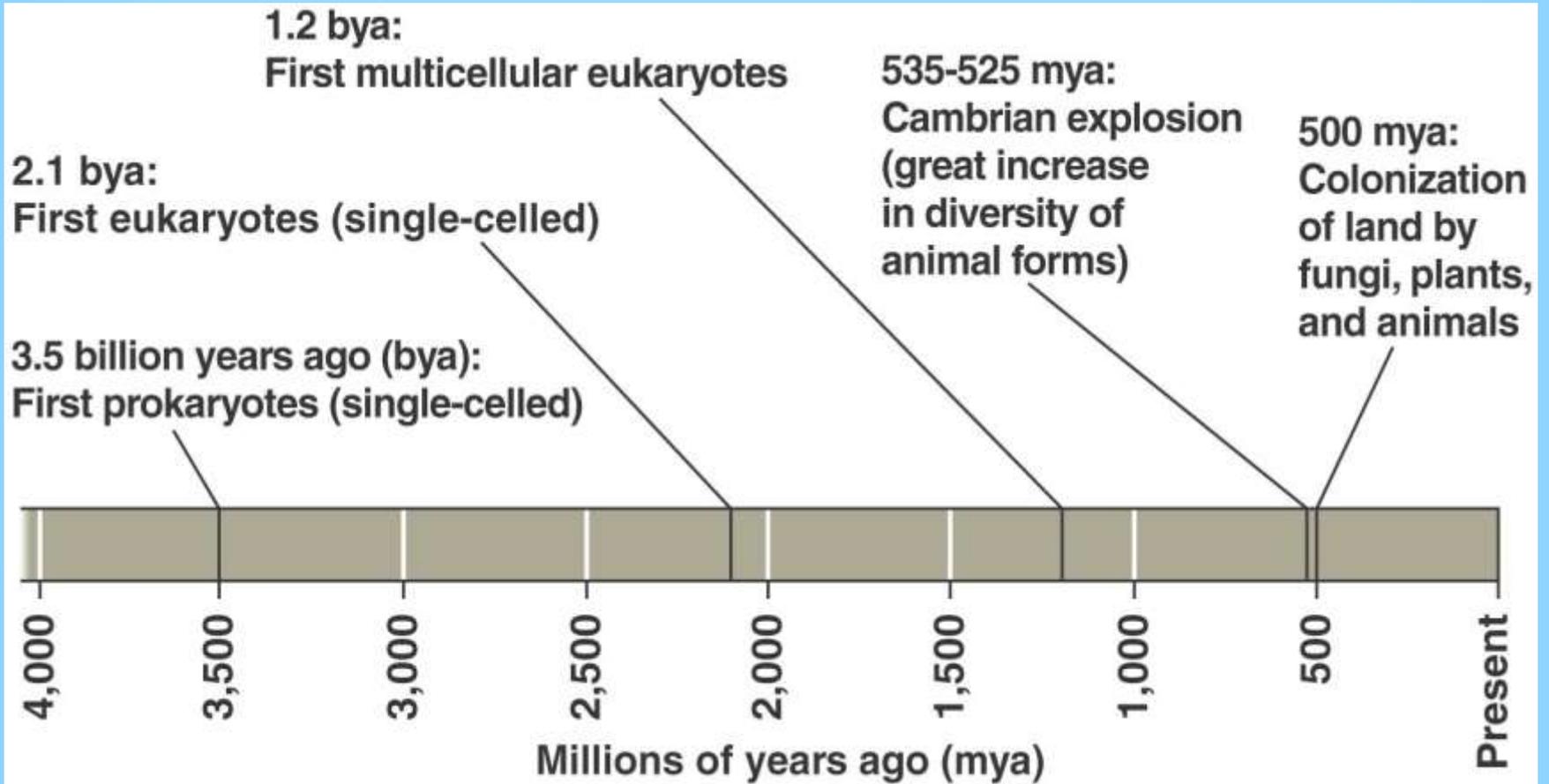
Lichens

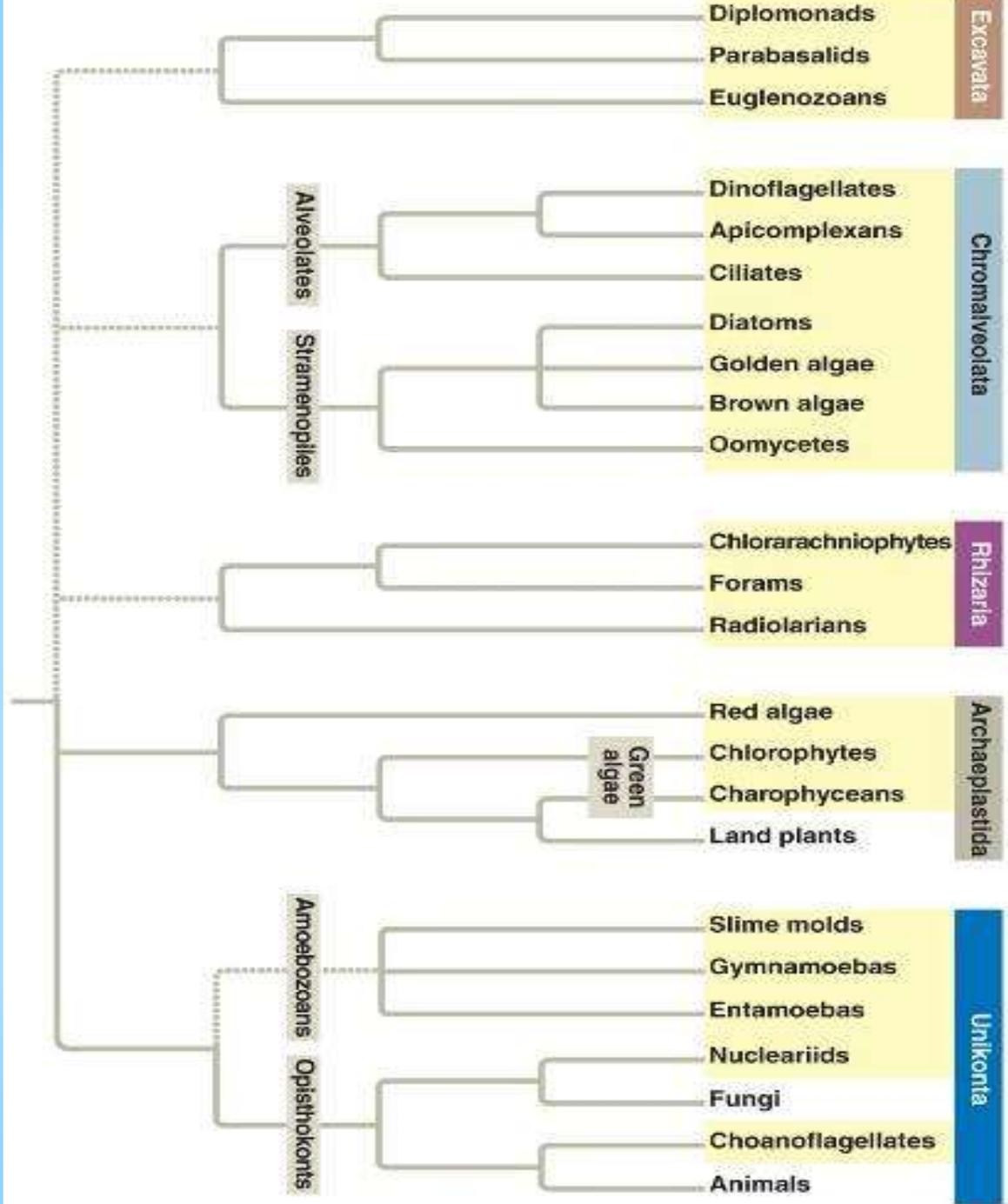
- “Mutualism” between
 - * Fungus – structure
 - * Alga or cyanobacterium – provides food
- Three main types of lichens:
 - * **Crustose lichens** form flat crusty plates.
 - * **Foliose lichens** are leafy in appearance, although lobed or branched structures are not true leaves.
 - * **Fruticose lichens** are even more finely branched and may hang down like beards from branches or grow up from the ground like tiny shrubs.



Fungi as Parasites & Pathogens

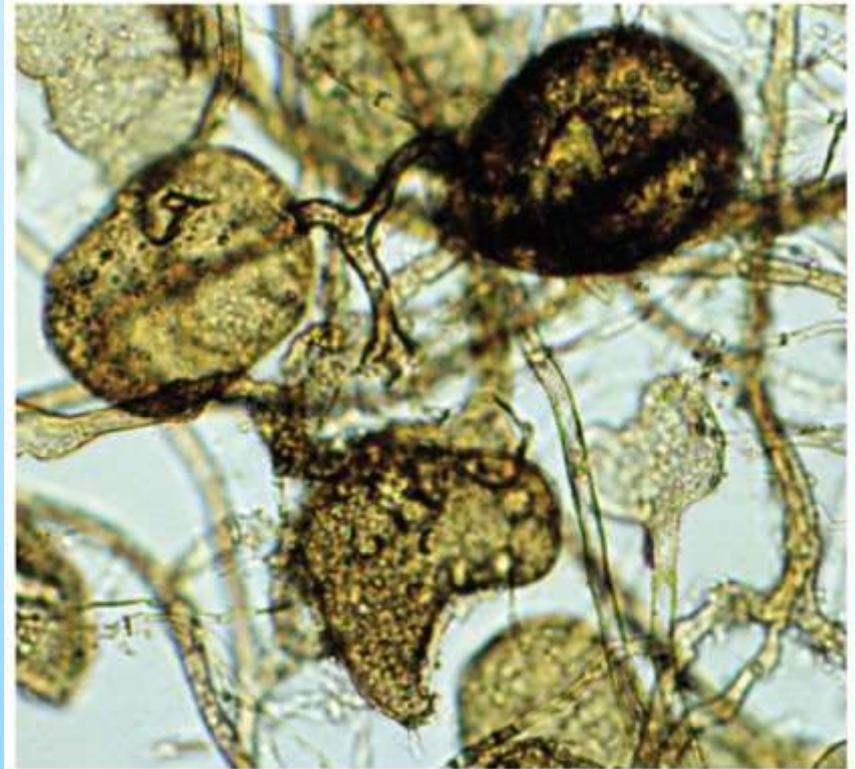






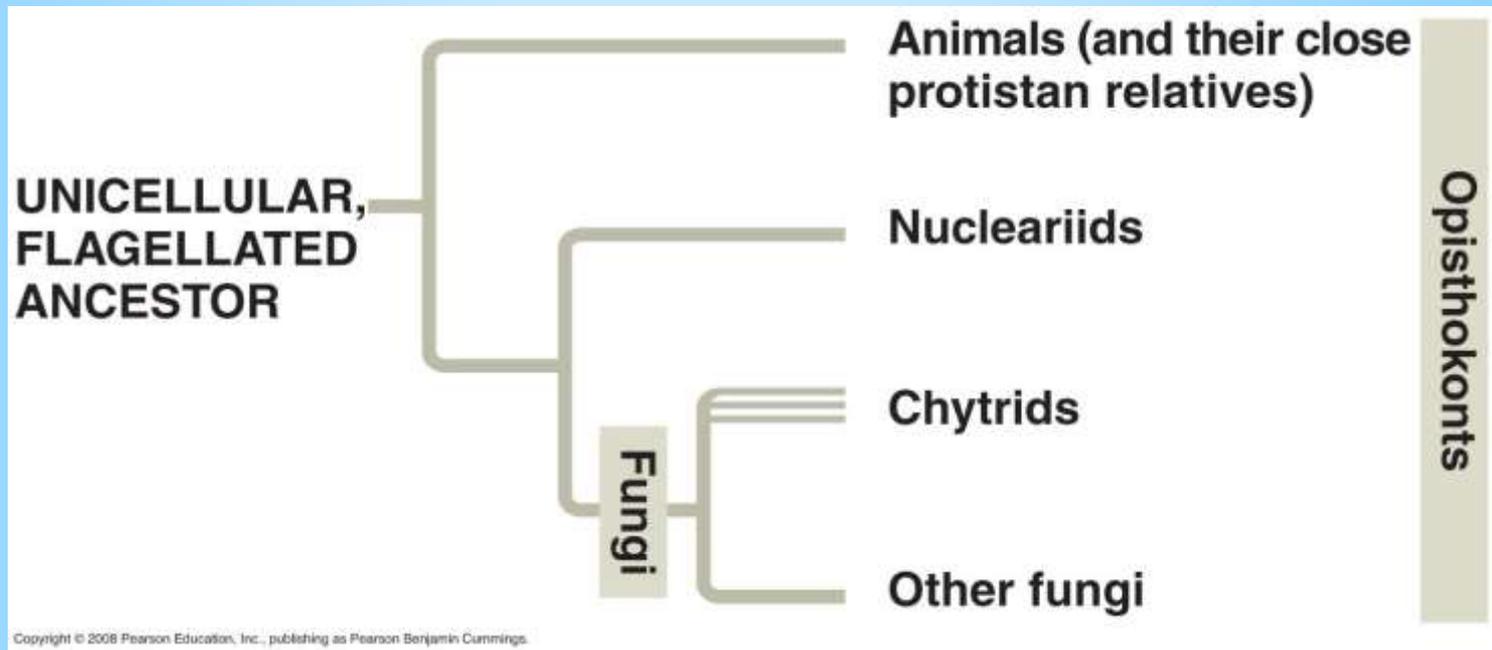
Evolution of Fungi

- Earliest fossil fungi
 - * Fungal spores
 - * 460 million years old



50 μm

Opisthokonts



- Sister taxon to Fungi: Nucleariids

Evolution of the fungi

Ancestral eukaryote

Diplomonads

Diplomonadida

Trichomonads

Parabasala

Euglenoids

Euglenozoa

Kinetoplastids

Dinoflagellates

Apicomplexans

Alveolata

Ciliates

Water molds

Diatoms

Stramenopila

Golden algae

Brown algae

Red algae

Rhodophyta

Chlorophytes

Charophyceans

Chlorophyta

Plants

Plantae

Plasmodial slime molds

Mycetozoa

Cellular slime molds

Fungi

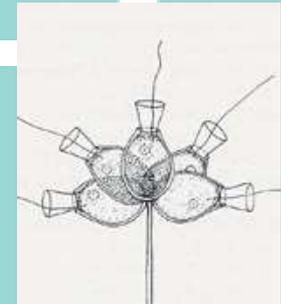
Fungi



Choanoflagellates

Metazoa

Animalia



Hyphae

25 μm

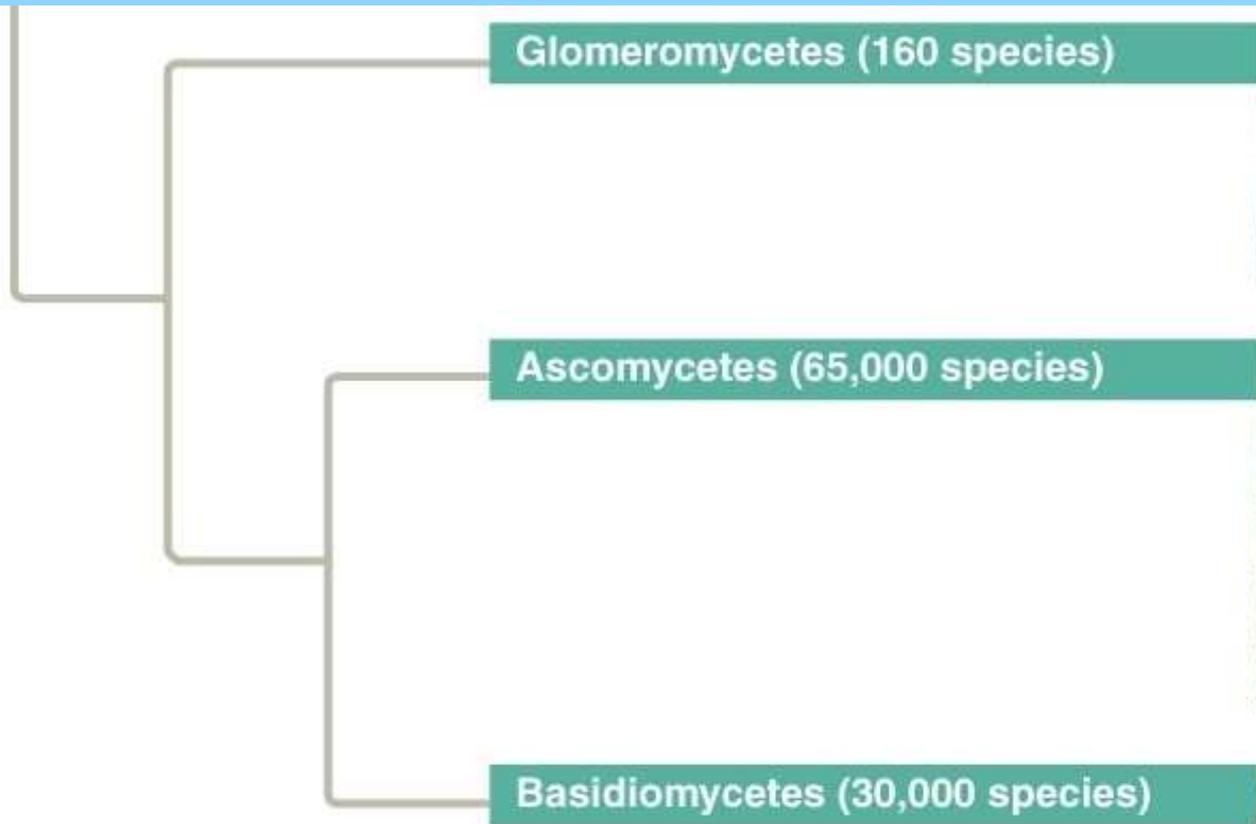
Chytrids (1,000 species)



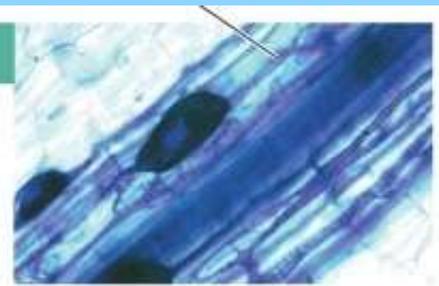
Zygomycetes (1,000 species)



Fungal hypha



Glomeromycetes (160 species)



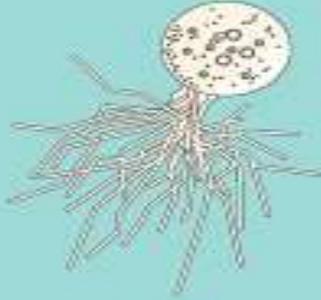
Ascomycetes (65,000 species)



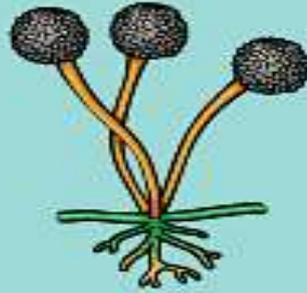
Basidiomycetes (30,000 species)



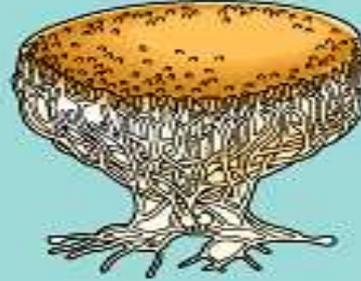
Chytrids



Zygozote fungi



Sac fungi



Club fungi



Chytridiomycota

Zygomycota

Ascomycota

Basidiomycota

zygosporangia

asci

basidia

motile spores

Loss of flagella

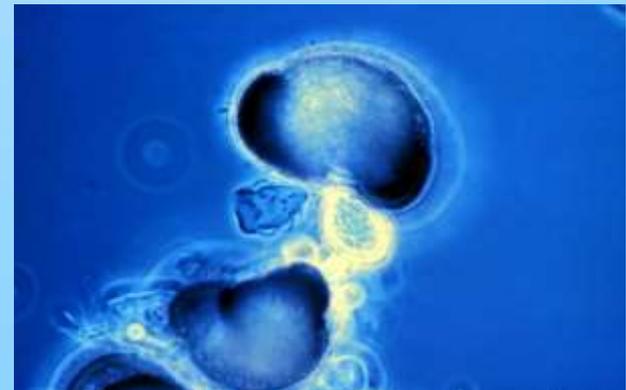
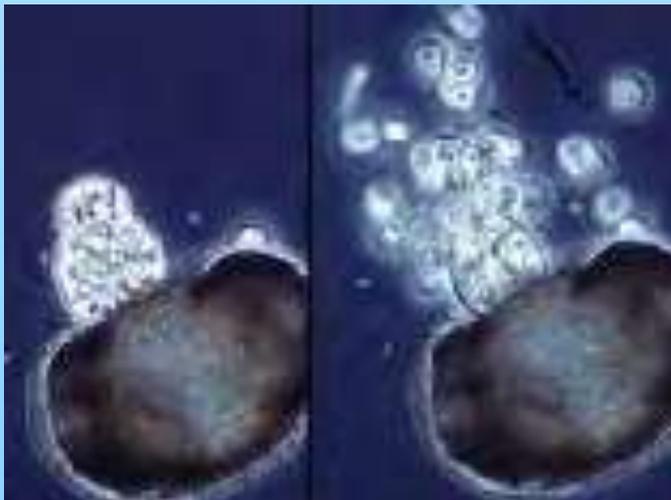
Classification & Phylogeny

Chytridiomycota – “chytrids”

- Simple fungi
- Produce motile spores - zoospores
- Mostly saprobes and parasites in aquatic habitats
- Could just as well be Protists



Chytridium growing on spores



Chytriomycetes growing on pine pollen

Zygomycota – “zygote fungi”

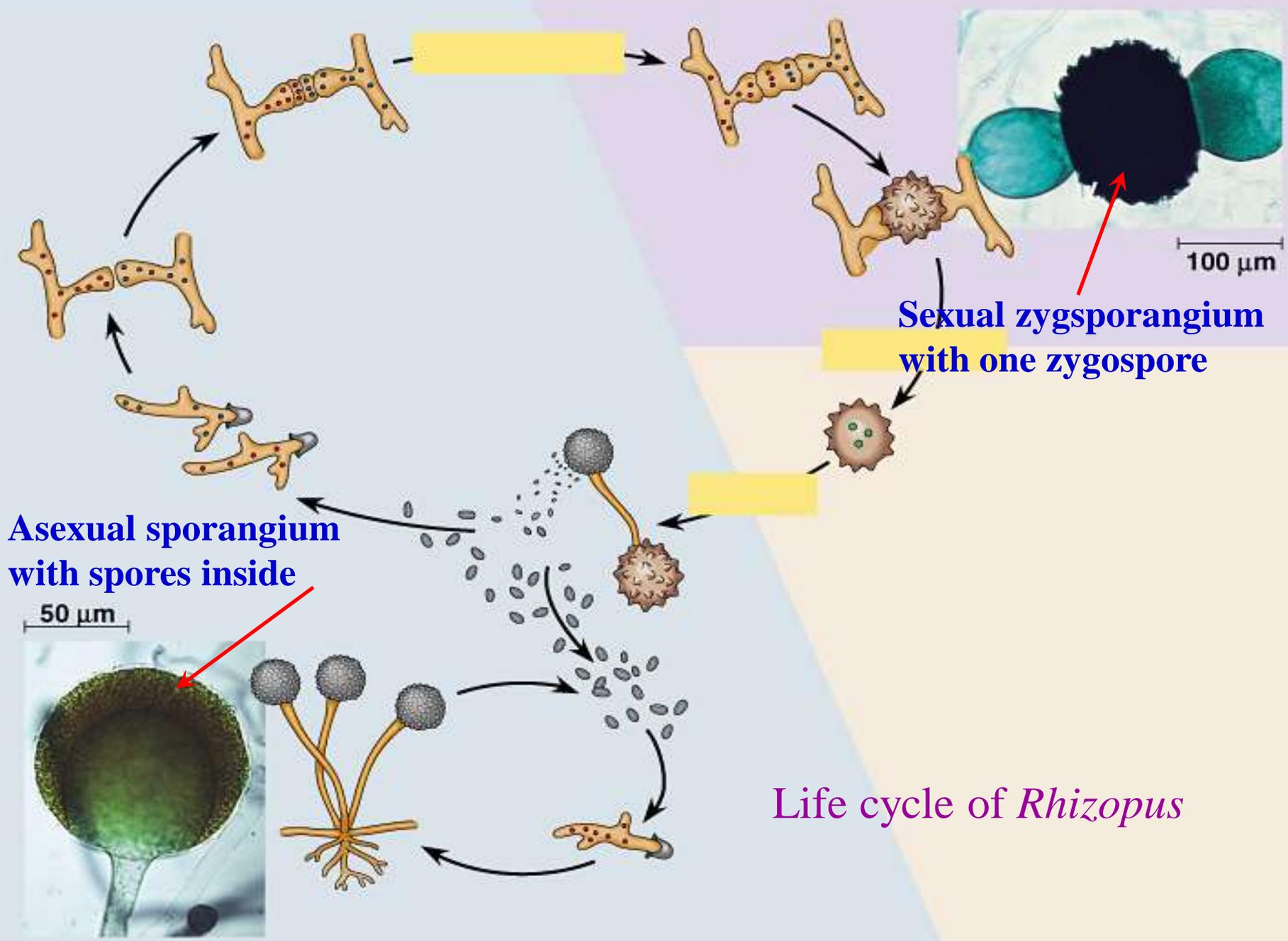
Rhizopus on strawberries



- Sexual Reproduction - zygosporangia
- Asexual reprod. – common (sporangia – bags of asexual spores)
- Hyphae have no cross walls
- Grow rapidly
- Decomposers, pathogens, and some form mycorrhizal associations with plants



Rhinocerebral zygomycosis



Life cycle of *Rhizopus*

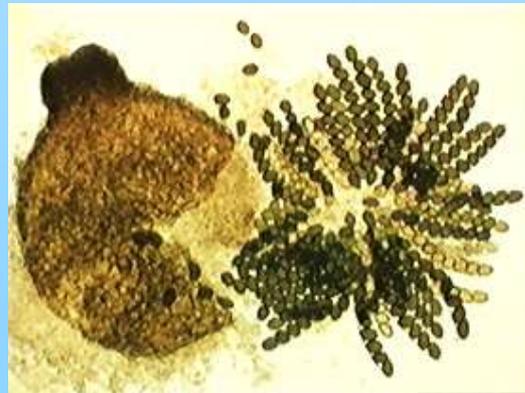
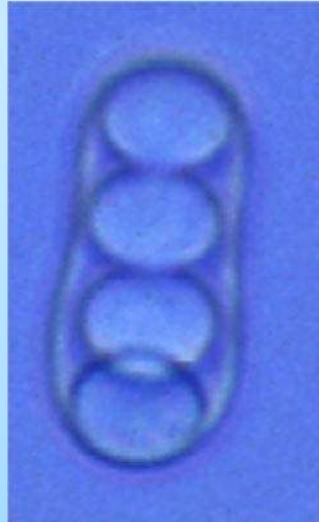
Ascomycota – “sac fungi”

- Sexual Reproduction – asci (sing. = ascus)
- Asex. Reprod. – common
- Cup fungi, morels, truffles
- Important plant parasites & saprobes
- Yeast - *Saccharomyces*
- Decomposers, pathogens, and found in most lichens



A cluster of asci with spores inside

Sac fungi diversity



REWARD
WANTED



THE WILD MOREL MUSHROOM

ALIAS: MORCHELLA CONICA
MORCHELLA DELICIOSA
MORCHELLA ESCULENTA
MORCHELLA VULGARIS
MORCHELLA SEMILIBERA
or Early Morel or Sponge Mushroom

DESCRIPTION: Cone head with ridges and holes like a sponge. Light tan to dark brown in colour. White stem. Big enough to see.

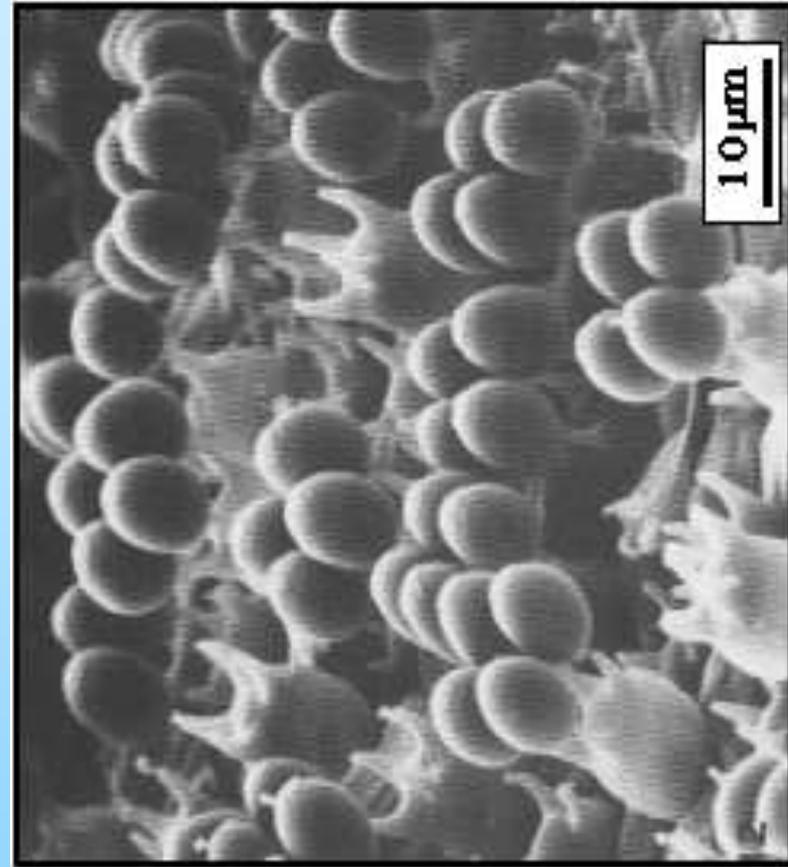
LAST SEEN: Every Spring along old fences, old apple orchards, in ungrazed meadows, forest burns, along river banks, woods and gardens. Climbs to higher elevations as weather warms. Loves ground temperature of 40° rain then sun.

**HIGHEST BOUNTY PAID TO HUNTERS
OF THESE WILD CRITTERS. MORE INFORMATION...**

OLYMPIC MOUNTAIN MUSHROOMS
683-9579 *locally call 344 0883*

Basidiomycota – “club fungi”

- Sexual Reproduction – basidia
- Asexual reprod – not so common
- Long-lived **dikaryotic** mycelia
- Rusts & smuts –plant parasites
- Mushrooms, polypores, puffballs, boletes, bird’s nest fungi
- Enzymes decompose wood, leaves, and other organic materials
- Decomposers, pathogens, and some form mycorrhizal associations with plants



SEM of basidia and spores

haploid
mycelium

Hyphal fusion
of haploid
mycelia → mycelium and fruiting
body are **dikaryotic**

Mushroom Life Cycle

N

2N

N+N

Meiosis

Nuclear
fusion in
basidium

young basidia - the
only diploid cells



Bioluminescence in *Mycena*



Deuteromycota – Form Phylum “Imperfect Fungi”

- Fungi that seldom or never reproduce sexually.
- Asexual reproduction by vegetative growth and production of asexual spores common.

COMPILED BY KOUSIK GHOSH
FROM DIFFERENT SOURCES

THANK YOU