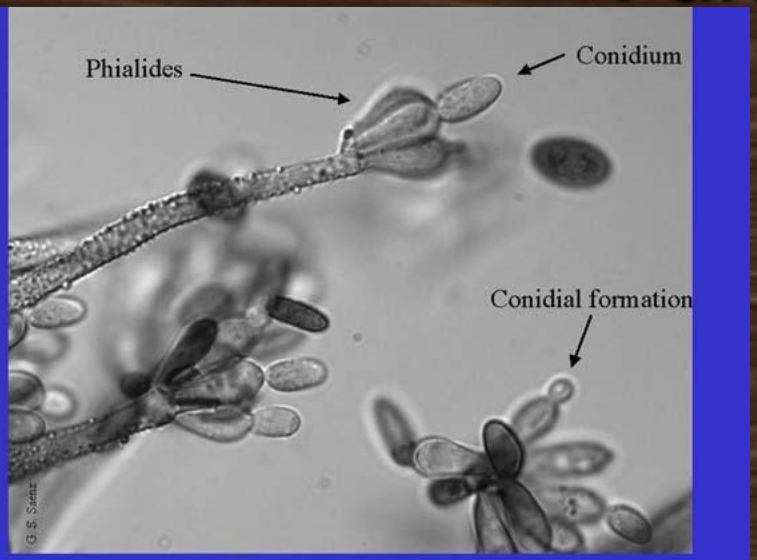
# Eucaryotic Microbes

# Outline

- Algae:
  - Characteristics & classification
  - Medical significance
- Protozoa:
  - Characteristics & classification
  - Medical significance
- Fungi:
  - Characteristics & reproduction
  - Classifications: yeasts, molds, & fleshy fungi
  - Medical significance: mycotoxicoses & fungal infections of humans
- Lichens
- Slime molds

# Kingdom Fungi

# Fungi



*Stachybotrys chartarum* 1000X

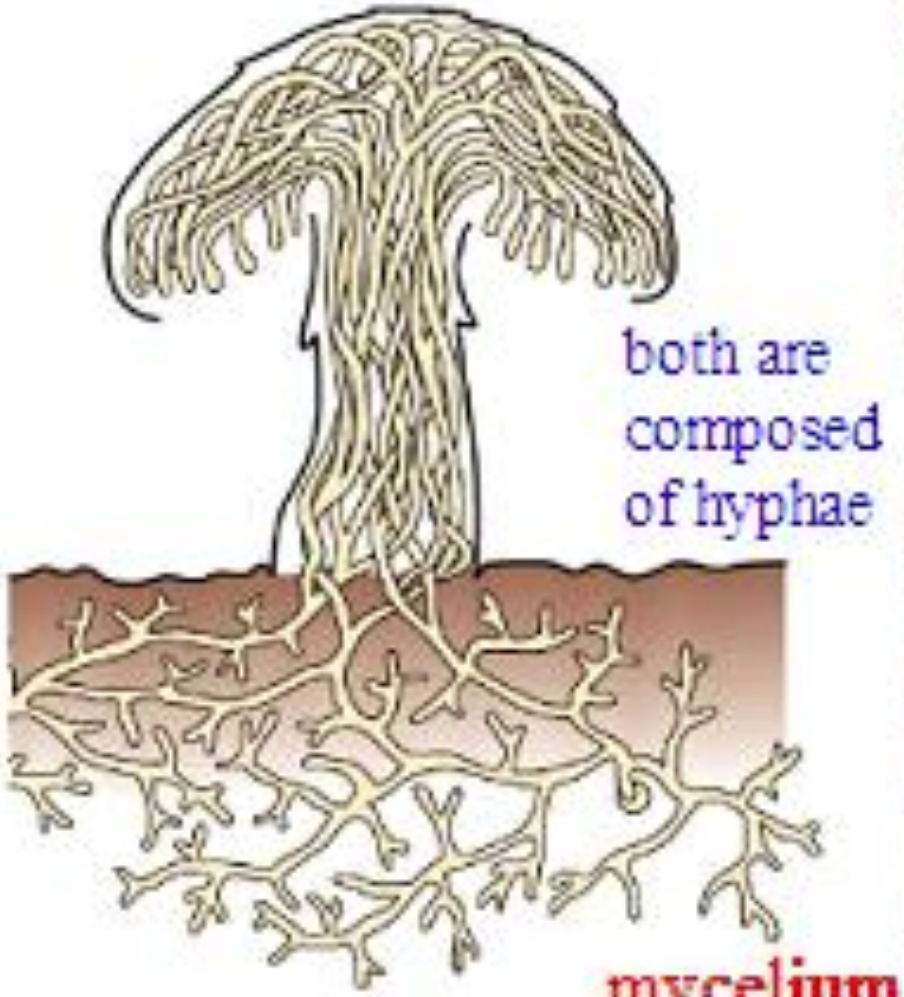

# Fungi

- The study of fungi is called mycology.
- The person who studies fungi is called a myclogist.
- Two forms of fungi:
  - Saprophytic fungi: their main source of food is dead & decaying organic matter.
  - Parasitic fungi: living on and within animals & plants.
- Fungi include: yeasts, molds, & mushrooms

# Characteristics of Fungi

- They are not photosynthetic.
- Fungal cell walls do not have cellulose.
- Fungal cell walls do contain a polysaccharide called chitin.
- Many fungi are unicellular (e.g., yeasts), others grow as filaments called hyphae, which interwine to form a mass called a mycelium.
- Some fungi have septate hyphae, others have aseptate hyphae

fruiting bodies



both are composed of hyphae

mycelium

# 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.

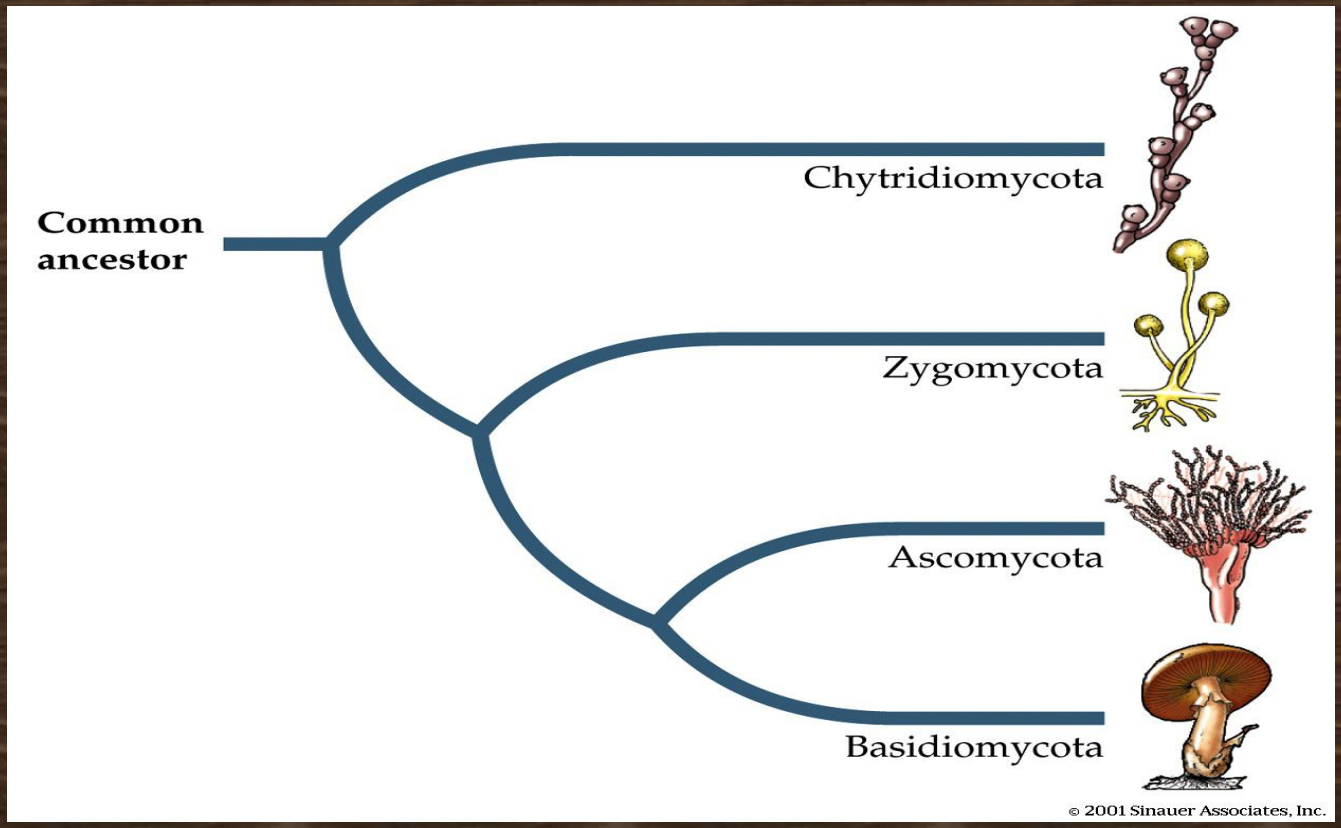
# Reproduction

- Fungal cells can reproduce by budding, or the formation of spores.
- Spores - asexual (product of mitosis) or sexual (product of meiosis) in origin.
- Purpose of Spores
  - Allows the fungus to move to new food source.
  - Most often dispersed by wind but some spread by insects or other small animals
  - Resistant stage - allows fungus to survive periods of adversity.
  - Many people are allergic to fungal spores

# Medical Significance of Fungi

- Many diseases of crop plants, grains, corn, & potatoes, are caused by molds (called blights & rusts)
- Some molds produce toxins that cause disease in human and animals
- Mycotoxins: toxins produced by molds & certain types of fleshy fungi
- Mycotoxicoses: the diseases they are caused by molds, and certain types of fleshy fungi
- Mycosis: infectious diseases of human and animals caused by molds & yeasts

# Diversity in Fungi




- Deuteromycota "Deuteromycetes" - paraphyletic

# HUMAN-FUNGUS INTERACTIONS

- **Beneficial Effects of Fungi**
  - Decomposition - nutrient and carbon recycling.
  - Biosynthetic factories. Can be used to produce drugs, antibiotics, alcohol, acids, food (e.g., fermented products, mushrooms).
  - Model organisms for biochemical and genetic studies.

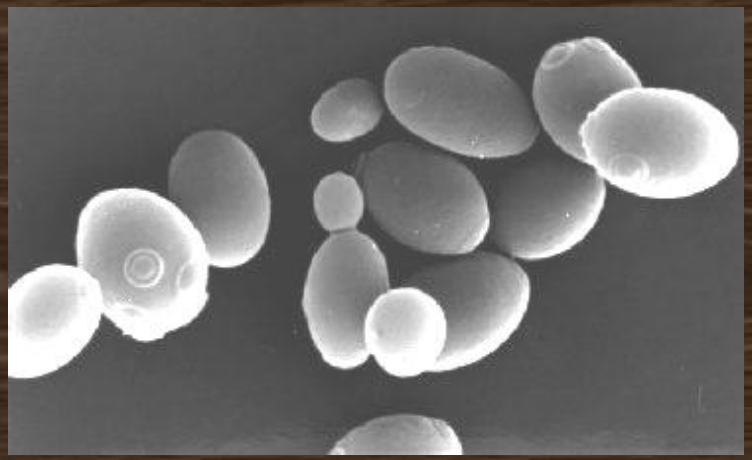
- **Harmful Effects of Fungi**
  - Destruction of food, paper, and cloth.
  - Animal and human diseases, including allergies.
  - Toxins produced by poisonous mushrooms and within food (e.g., grain, cheese, etc.).
  - Plant diseases.

# Yeasts

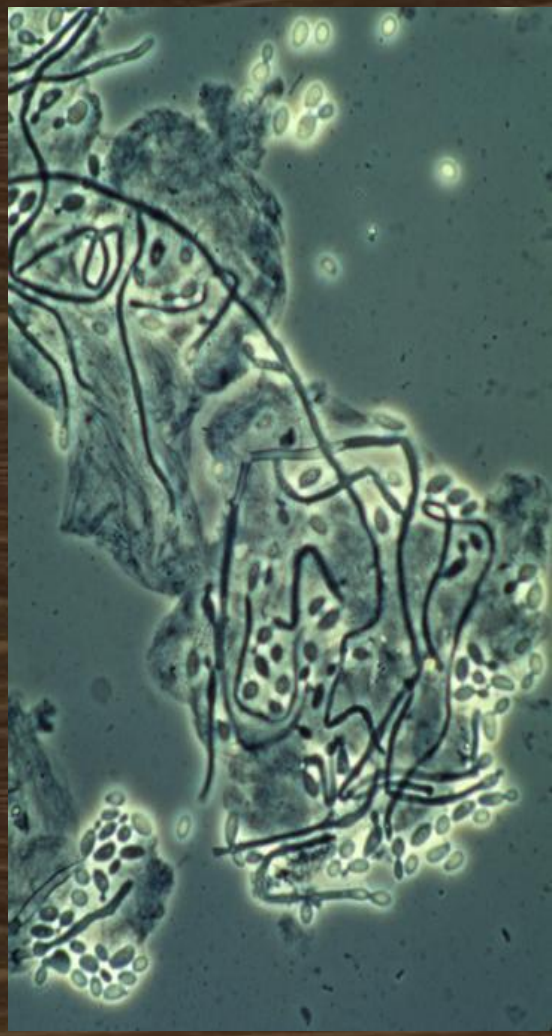
- Yeasts are oval, unicellular
- Are responsibe for fermintation processes
- Saccharomyces (bakers yeast):

  - Ferments sugar to alcohol under anaerobic conditions

  - Under aerobic conditions it breaks down simple sugar to carbon dioxide and water (used to leaven light bread)



*Saccharomyces*



*Candida*

# Yeasts

- Many yeasts consider a good source of nutrients for human (produce many vitamins & proteins).
- Some yeasts are human pathogens (*candida albicans, cryptococcus neoformans*
- Usually produce by budding.
- Some yeasts produce thick wall, spore like structures called chlamydospores

# Molds

- Rapidly growth
- They grow in the form of cytoplasmic filaments or hyphae that make up mycelium.
- Consist of aerial hyphae, & vegetative hyphae.
- Reproduction by spore formation either sexually or asexually on the aerial hyphae.
- Many human importances:
  - Some types produce many of antibiotics, such as penicillin, cephalosporium
  - Some molds are used to produce enzymes such as amylase, citric acid.
  - Give the flavor of some types of cheeses

# Fleshy Fungi

- Consider macroorganisms.
- Found in forests such as mushrooms.
- Many mushrooms are delicious to eat.
- Others are extremely toxic and may cause permanent liver & brain damage or death if ingested .

# Lichens

- A combination of two organisms: an algae, and a fungus.
- Symbiotic relationship: both parties benefit.
- Lichens may be brown, orange, and other colors.
- Are classified as protists.

# Slime molds

- Have both fungal and protozoal characteristics.
- Two types cellular slime molds, and plasmodial (a cellular) slime molds.
- Are classified as protists.