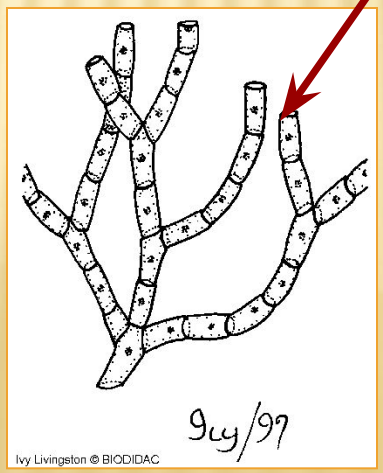
Eukaryotic microorganisms. Fungi

THE CHARACTERISTICS OF FUNGI

- **Cell walls** are made of **chitin** (complex polysaccharide)
- Body is called the **Thallus**
- Grow as **microscopic** tubes or filaments called **hyphae**



THE CHARACTERISTICS OF FUNGI

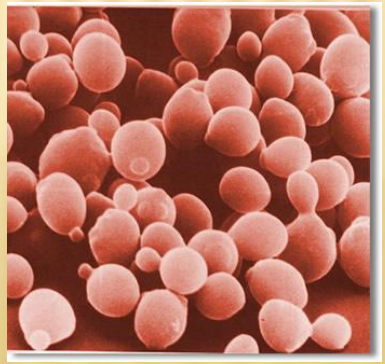
- Grow best in **warm, moist** environments
- **Mycology** is the study of fungi
- **Mycologists** study fungi
- A **fungicide** is a chemical used to kill fungi

Fungicide kills leaf fungus →

THE CHARACTERISTICS OF FUNGI

- Important **decomposers** & **recyclers of nutrients** in the environment
- Most are **multicellular**, except **unicellular yeast**
- Lack **true roots, stems or leaves**

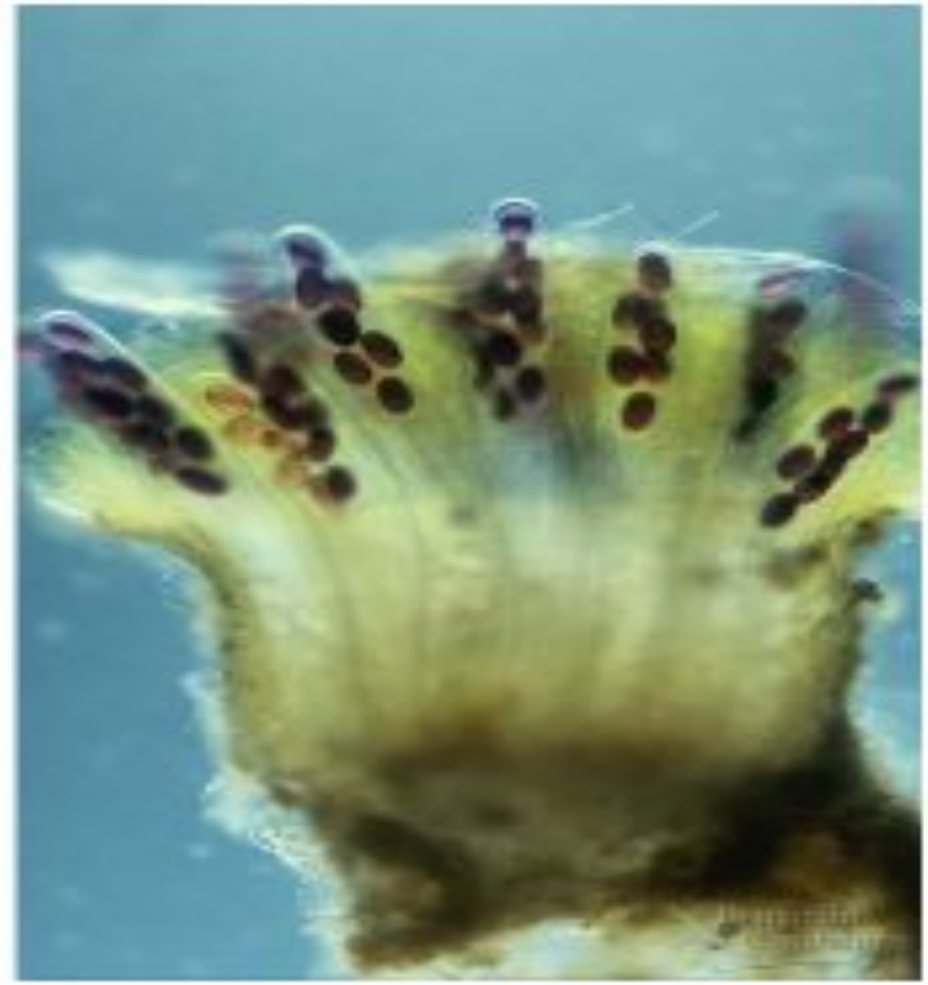
MULTICELLULAR MUSHROOM



UNICELLULAR YEAST

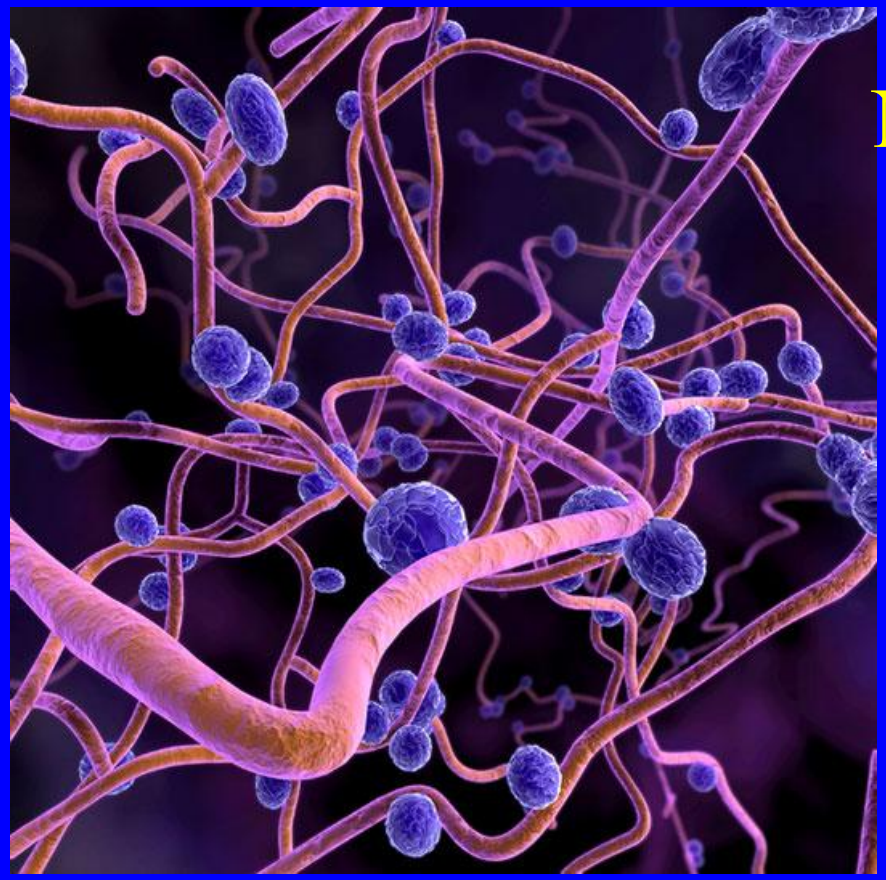
Reproductive Structures

- Make spores, either by mitosis or meiosis
- Some are called “fruiting bodies”



Spores and More Spores

- Fungi are prolific spore producers
- Spores can be sexual, asexual, or both

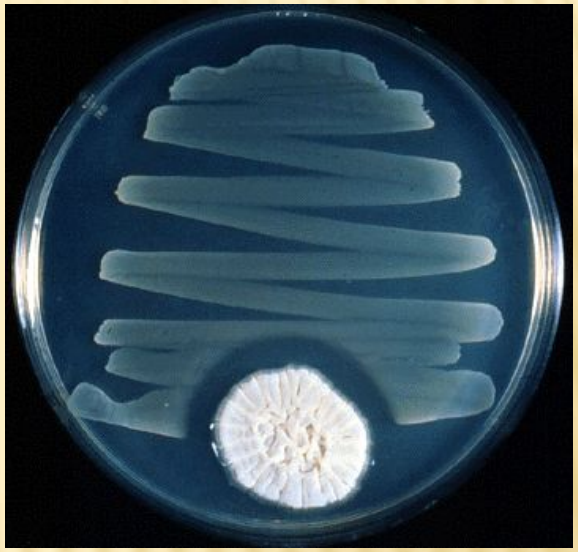


Nail Fungus

Hyphae with spores attached

THE CHARACTERISTICS OF FUNGI

- Fungi include puffballs, yeasts, mushrooms, toadstools, rusts, smuts, ringworm, and molds
- The antibiotic penicillin is made by the *Penicillium* mold

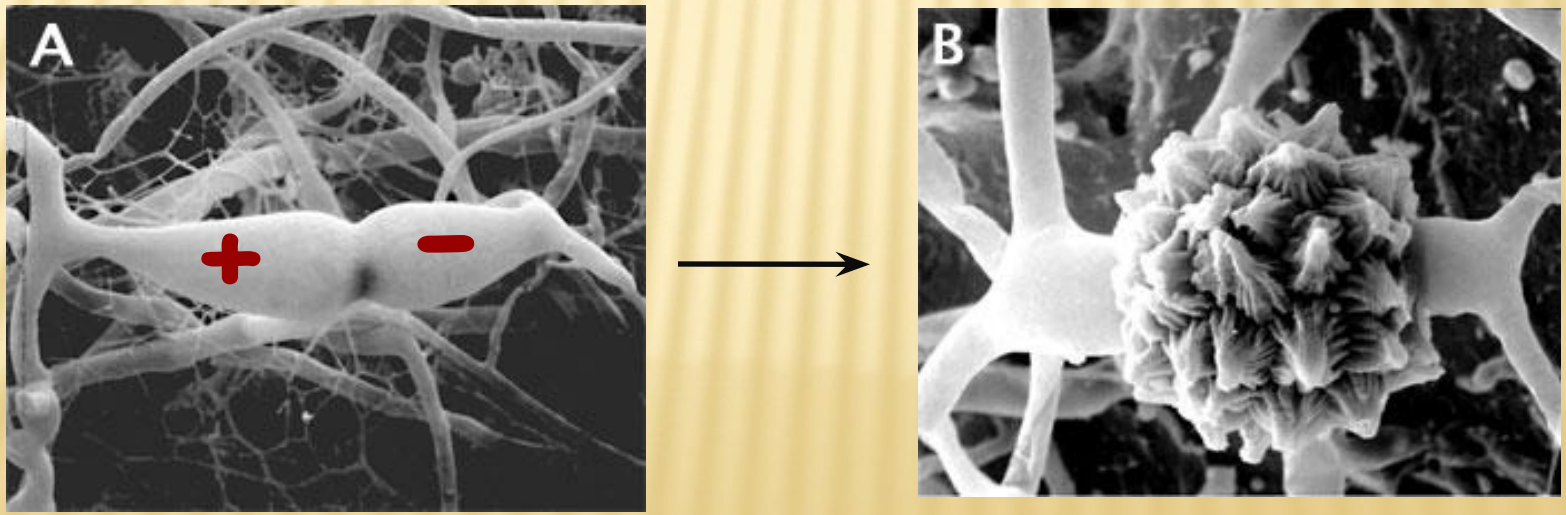


Penicillium mold

Puffball

SEXUAL REPRODUCTION

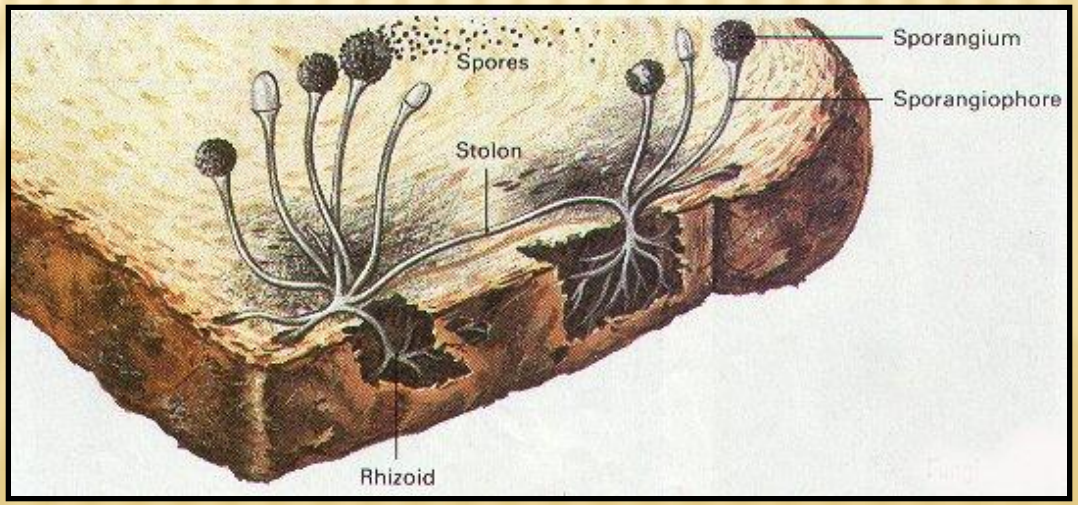
- Haploid 1n hyphae from 2 mating types (+ and -) FUSE (Fertilization)
- Forms a hyphae with 2 nuclei that becomes a ZYGOTE
- The zygote divides to make a SPORE



SPORE FORMS

ASEXUAL REPRODUCTION

- **Fruiting Bodies** are modified hyphae that make **asexual** spores
- An upright stalk called the **Sporangiosphore** supports the spore case or **Sporangium**

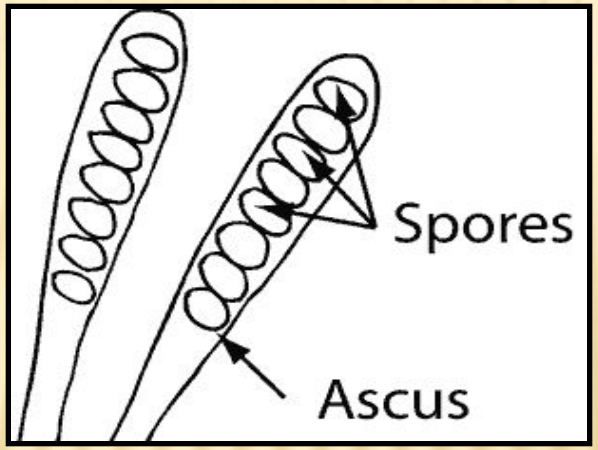


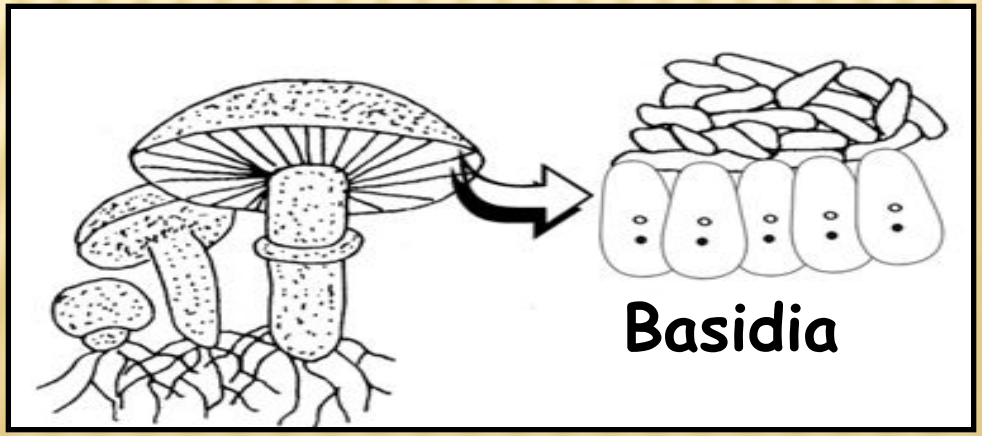
IT'S ALL ABOUT THE SPORES!

- Fungi are classified by their **REPRODUCTIVE STRUCTURES** and **SPORES**
- The reproductive structures are:
  - **BASIDIA** - BASIDIOMYCOTA
  - **SPORANGIA** - ZYGOSPORANGIA
  - **ASCUS** - ASCOMYCOTA

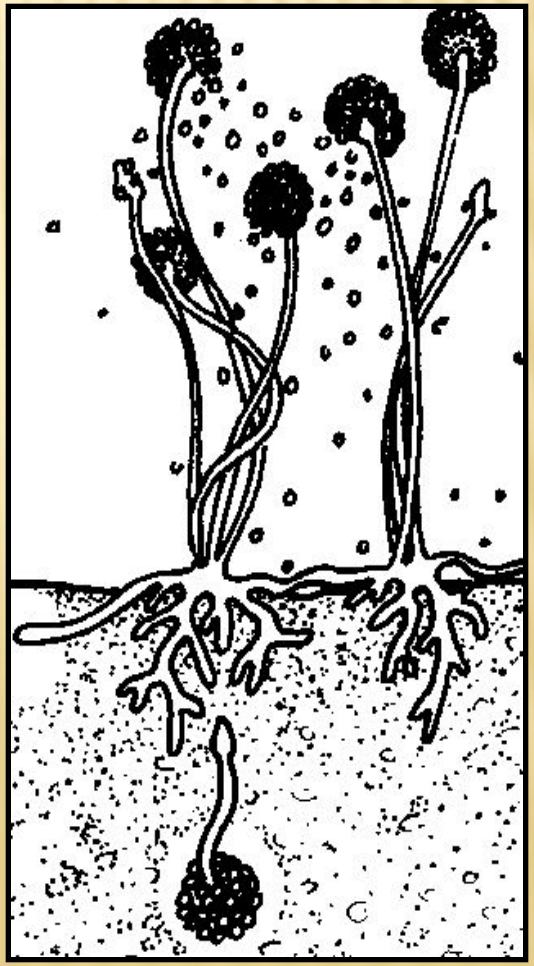
ASEXUAL REPRODUCTION

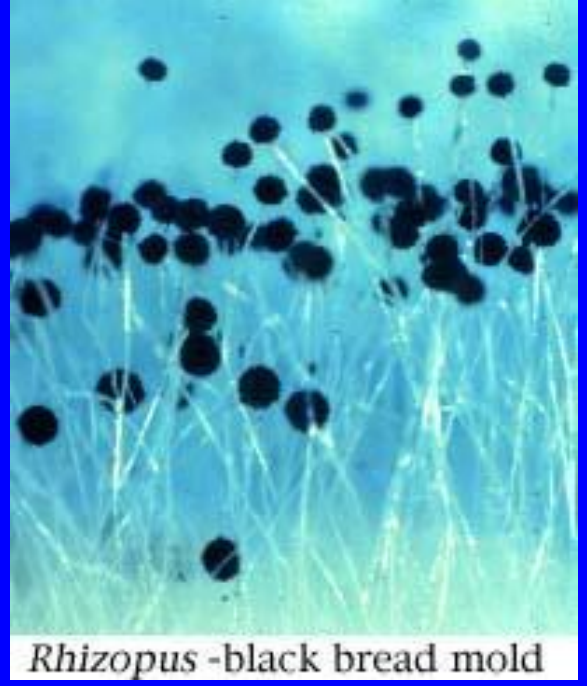
- Types of Fruiting Bodies:
  - Basidia
  - Sporangia
  - Ascus





Sporangia





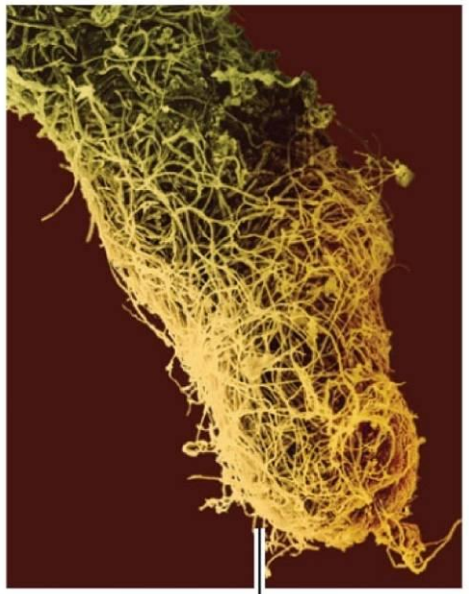
Rhizopus -black bread mold

Each spore that germinates can be the start of a hypha and a mycelium. Stalked reproductive structures (sporangia) may develop on many of the hyphae and produce asexual spores. After the spores germinate, each may be the start of still another extensive mycelium.

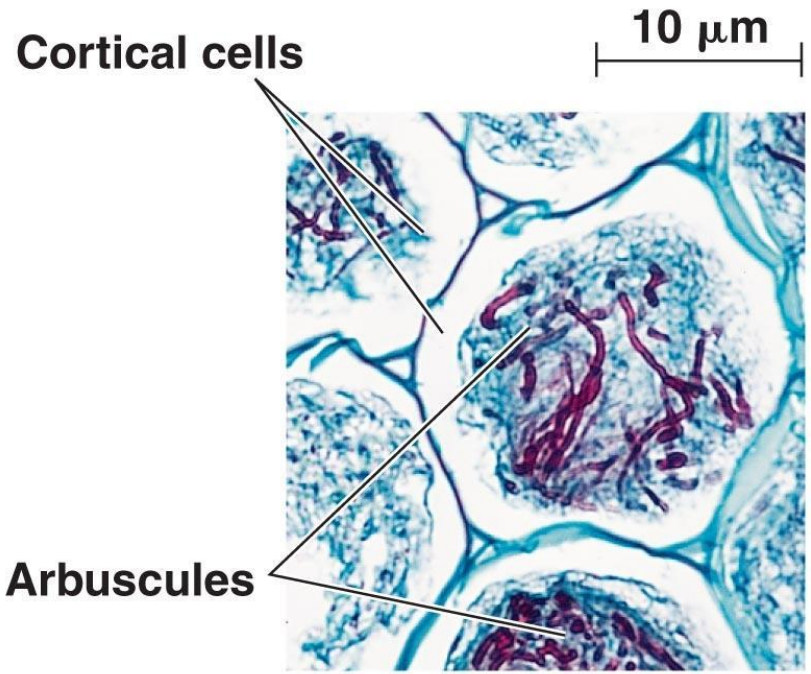
Classification by Nutrition

- **Saprobes**
  - Decomposers
  - Molds, mushrooms, etc.
- **Parasites**
  - Harm host
  - Rusts and smuts (attack plants)
- **Mutualists**
  - Both benefit
  - Lichens
  - Mycorrhizas

Fungal Lifestyles



(a) Ectomycorrhizae



(LM, stained specimen)

Mutualists: Mycorrhizae

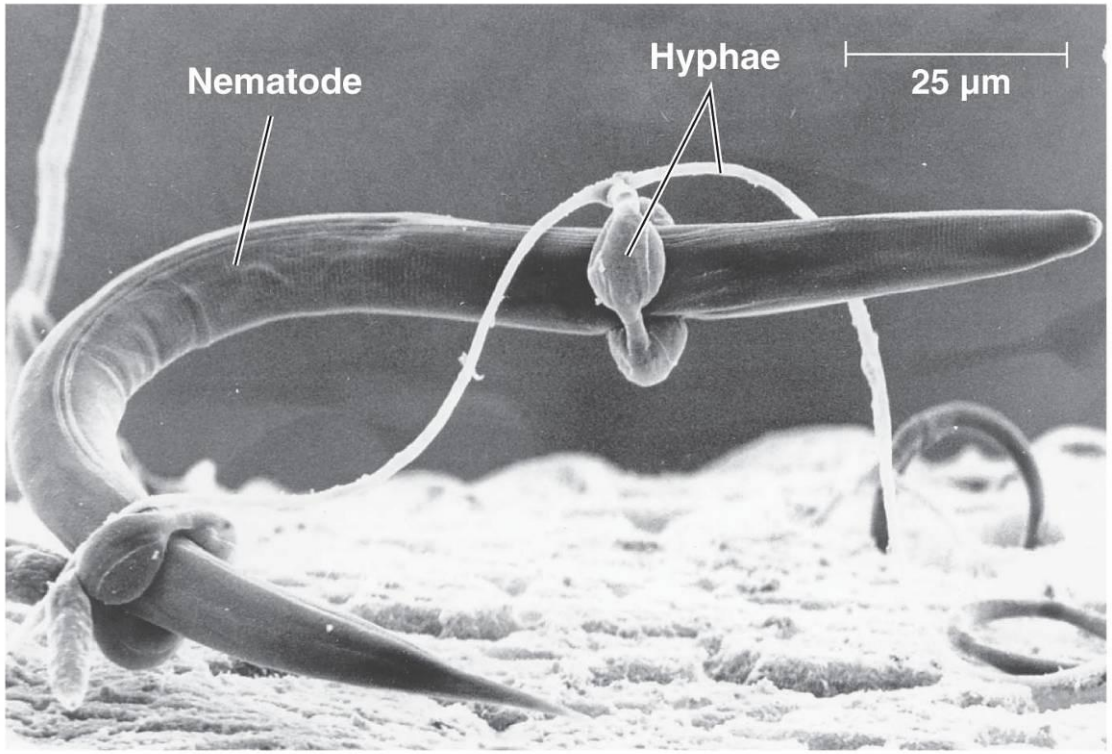
Fungal Lifestyles

(a) Corn smut on corn

(c) Ergots on rye

Parasites

Fungal Lifestyles



(a) Hyphae adapted for trapping and killing prey

Predators

Fungal Lifestyles

Mutualists: Lichens

Photo Credit: Field Biology Student, 360 Overlook 2005

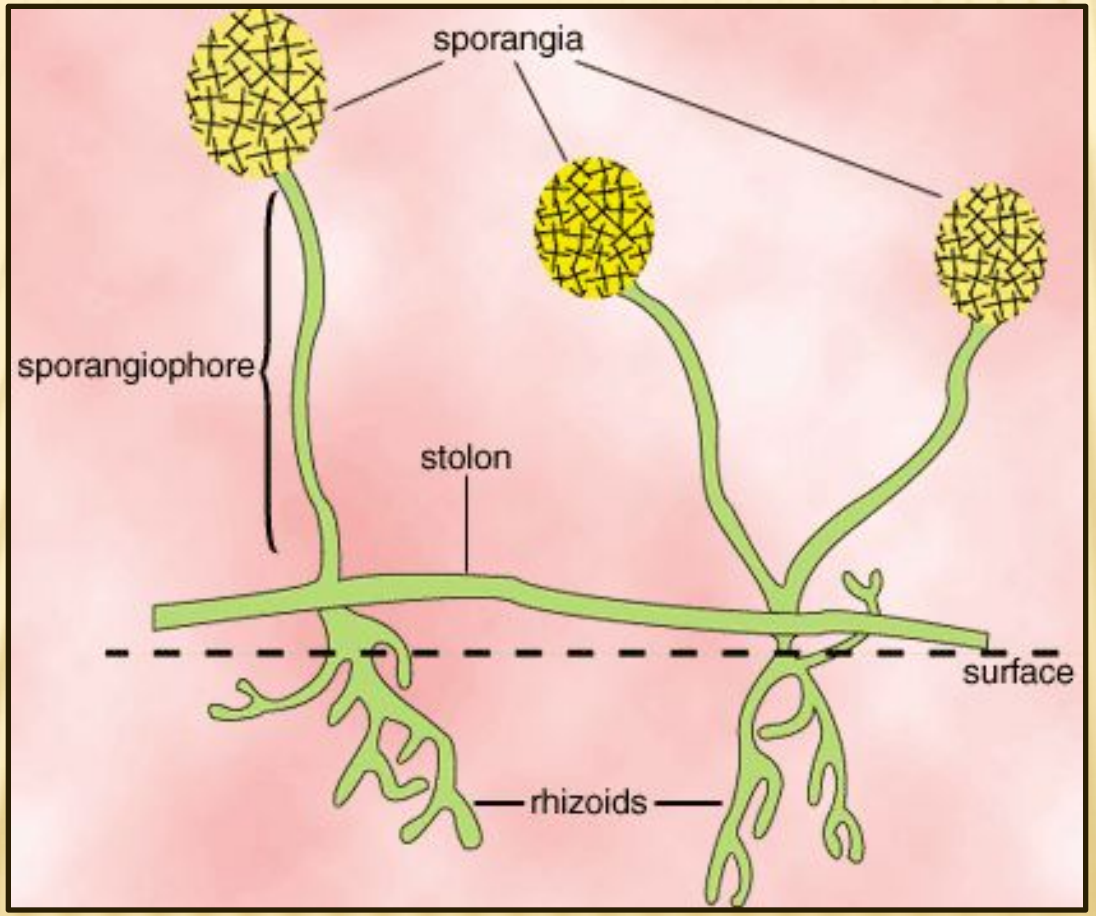
Fungal Lifestyles

Saprobes = Decomposers

MAJOR GROUPS OF FUNGI

- **Basidiomycota** – Club Fungi
- **Zygomycota** – Bread Molds
- **Chytridiomycota** – Chytrids
- **AM Fungi** - Mycorrhizas
- **Ascomycota** – Sac Fungi
- **Lichens** – Symbiosis (algae & Fungi)

ZYGOMYCOTA



ZYGOMYCOTA

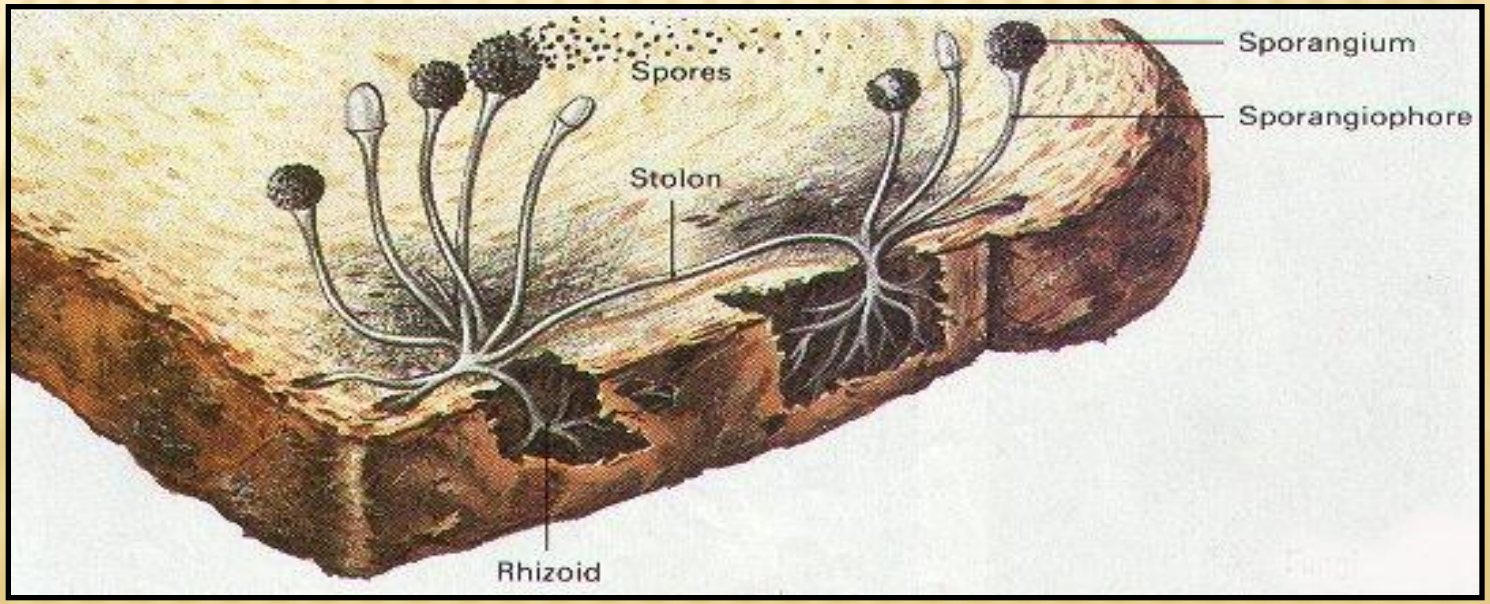
- Called the **sporangium fungi**
- Commonly called **molds**
- Also includes **blights**
- Hyphae have no cross walls **(aseptate)**
- Grow rapidly
- Includes bread mold ***Rhizopus stolonifer***

***Rhizopus* on strawberries**

Tomato Blight

ZYGOMYCOTA

- Asexual reproductive structure called **sporangium** atop **sporangiospores** make **spores**
- **Rhizoids** anchor the mold & release digestive enzymes & absorb food
- **Stolons** connect the fruiting bodies



USES FOR BASIDIOMYCOTA

- Some are used as food (mushrooms)
- Others damage crops (rusts & smuts)

Portobello Mushrooms

Corn Smut

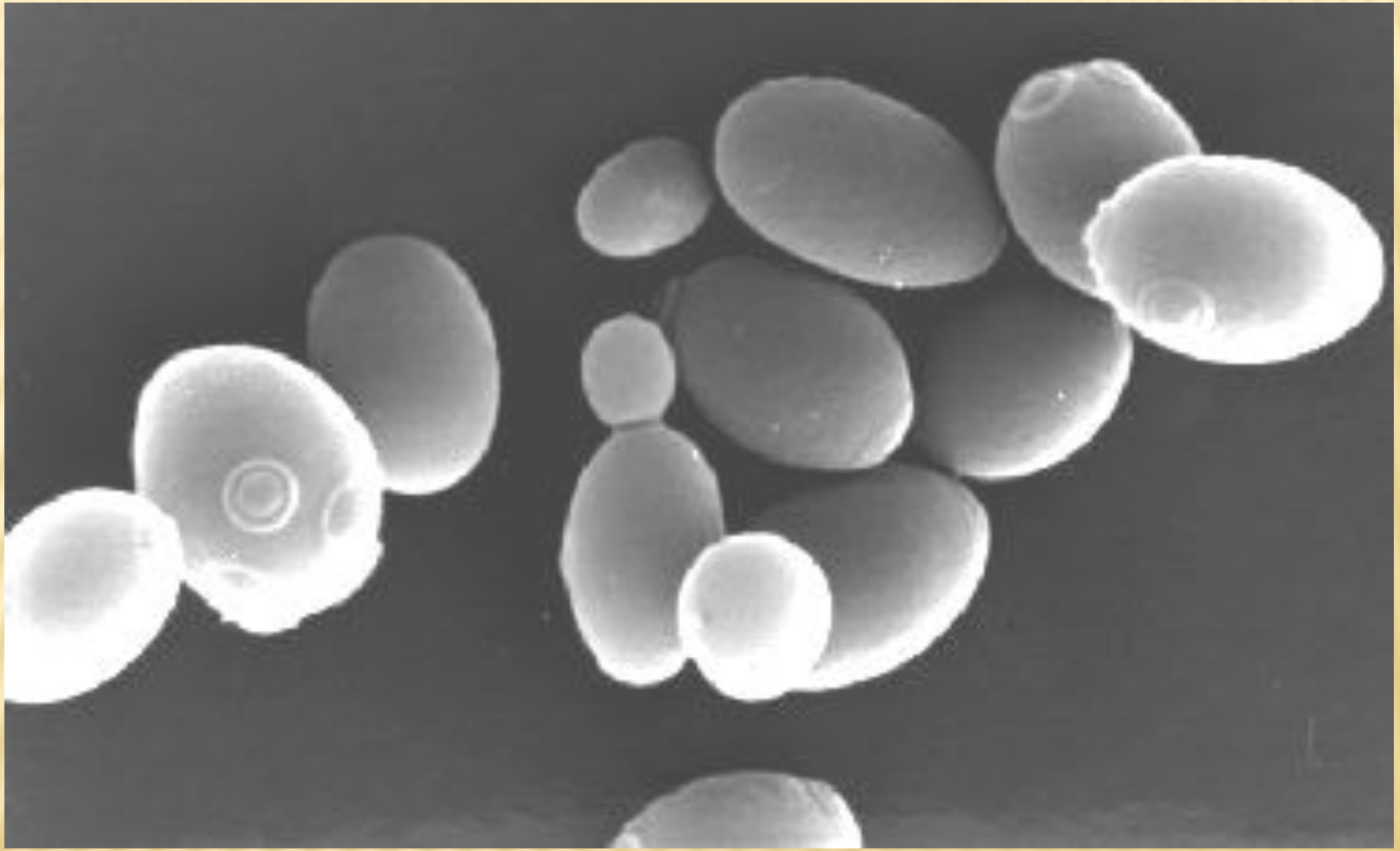
Soybean Rust

ASCOMYCOTA

CHARACTERISTICS

- Called Sac fungi
- Includes Cup fungi, morels, truffles, yeasts, and mildew
- May be plant parasites (Dutch elm disease and Chestnut blight)
- Reproduce sexually & asexually
- Ascus - sac that makes ascospores in sexual reproduction
- Specialized hyphae known as Ascocarps contain the asci

YEASTS BUDDING



Saccharomyces

USES OF ASCOMYCETES

- **Truffles** and **morels** are good examples of edible ascomycetes
- **Penicillium mold** makes the antibiotic penicillin.
- Some ascomycetes also gives **flavor to** certain **cheeses.**
- ***Saccharomyces cerevesiae*** (yeast) is used to make bread rise and to ferment beer & wine.

BASIDIOMYCOTA

- Called Club fungi
- Includes:
  - Mushrooms
  - Toadstools
  - Bracket & Shelf fungi
  - Puffballs
  - Stinkhorns
  - Rusts and smuts

USES FOR BASIDIOMYCOTA

- Some are used as food (mushrooms)
- Others damage crops (rusts & smuts)

Portobello Mushrooms

Corn Smut

Soybean Rust