BioV 400
Mycology

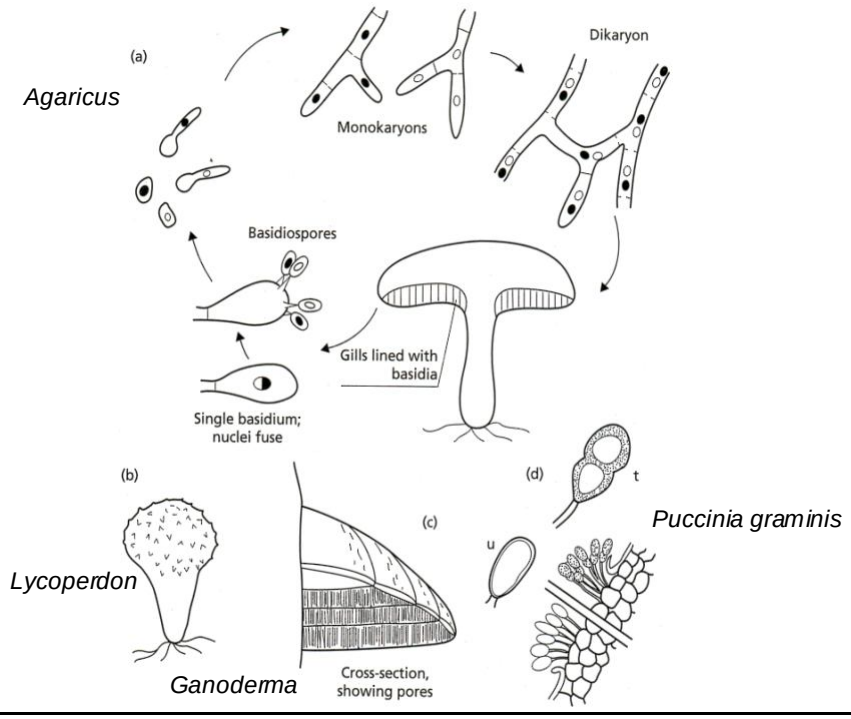
Handout 3

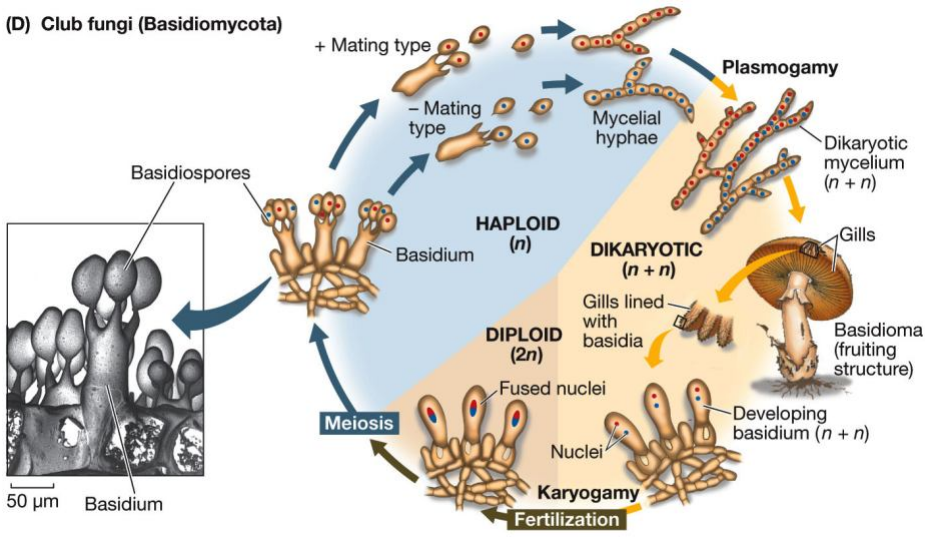
True fungi: Basidiomycota

- Named for characteristic sexual reproductive structure → basidium
- Hyphae (with dolipore septa) or yeasts
- Asexual reproduction through hyphae
  - Asexual spores rare in most groups
- Sexual reproduction by fusion of compatible hyphae → basidiospores on basidia
  - Basidiospores → spores formed externally on a club shaped sexual structure → basidium

Basidiomycota

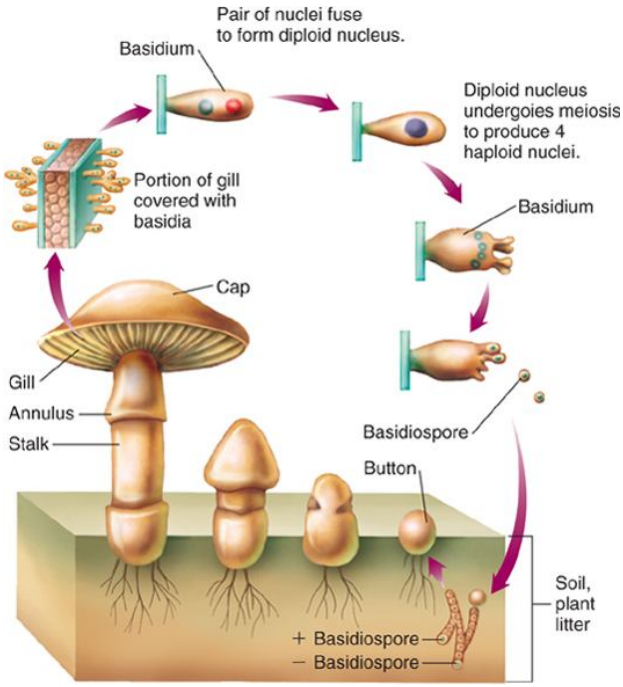
- **Most familiar fungi (mushrooms, toadstools, puffballs, rusts, and smuts)**
- **Mycelium made up of monokaryotic hyphae is called primary mycelium**
- **Fusion of different mating types forms dikaryotic → secondary mycelium**
- **Examples**
  - ***Cryptococcus* → causes opportunistic respiratory and CNS infections in AIDS patients**
  - ***Amanita* → Mushroom → lethal toxins to humans**
  - ***Claviceps purpurea* → ergot toxin in wheat and rye**



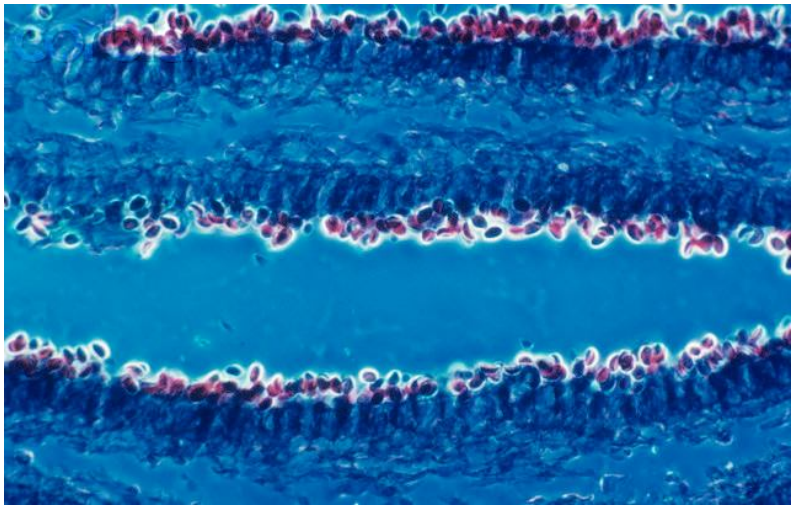


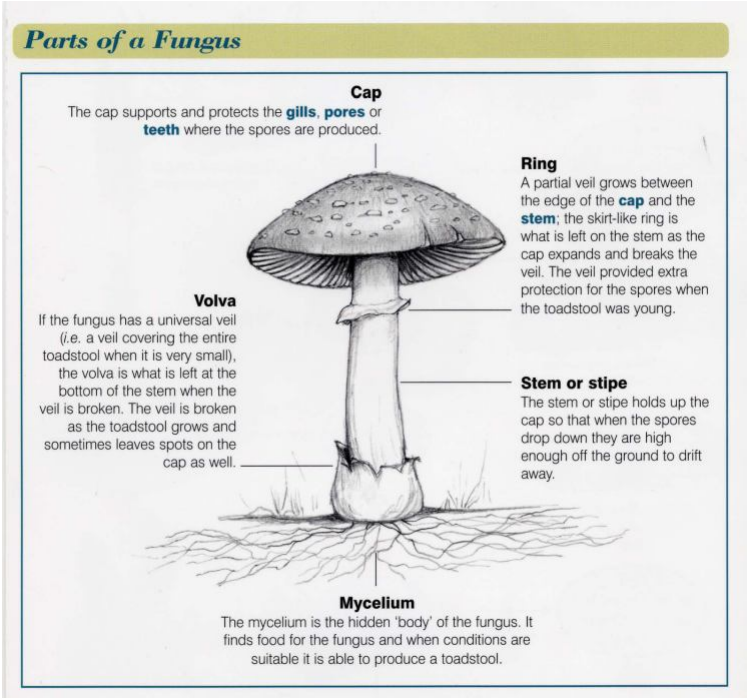
Basiodiomycota

- *Agaricus, Ganoderma, Lycoperdon, Puccinia*
- **Life cycle of Agaricus: hyphae of two monokaryons fuse → dikaryon → fruitbody (basidiocarp, toadstool) → basidia → fusion of nuclei and mieosis → basidiospores → germination into somatic hyphae (monokaryons)**

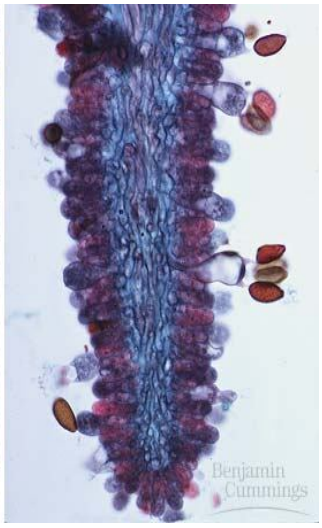


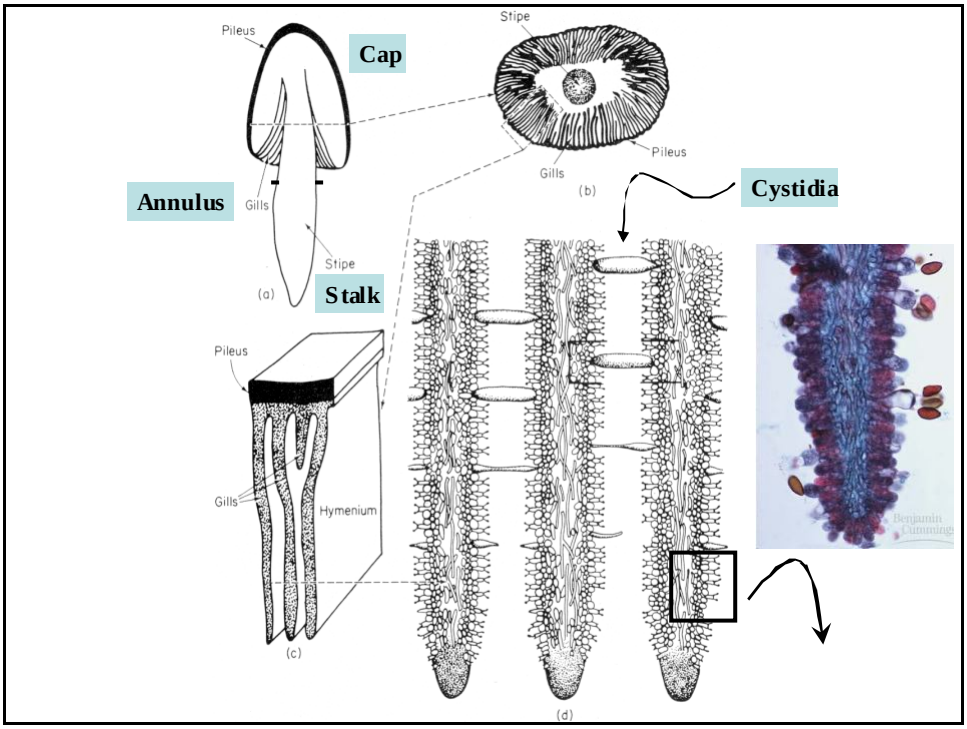
Basidiospores on the gills of the Inky Cap Mushroom

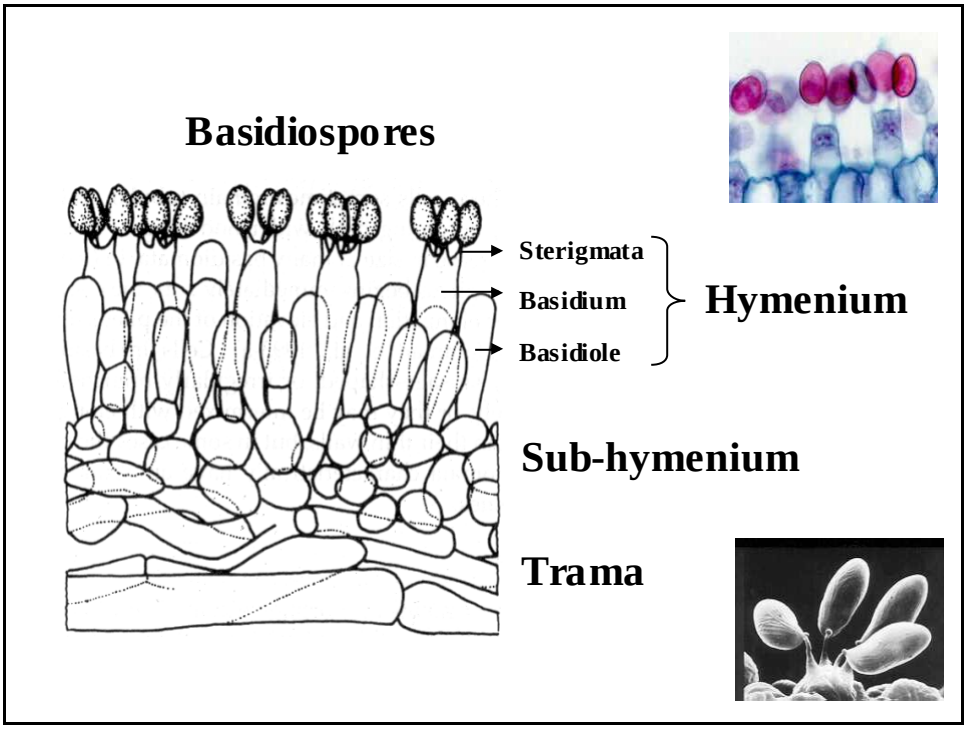


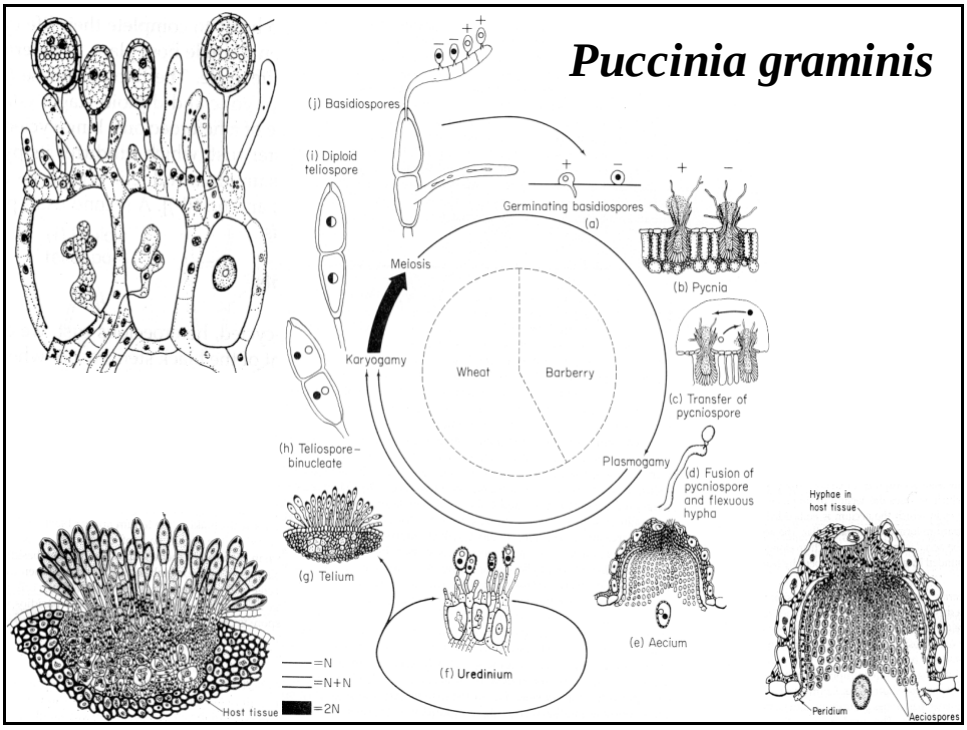


Fruiting body: basidiocarp

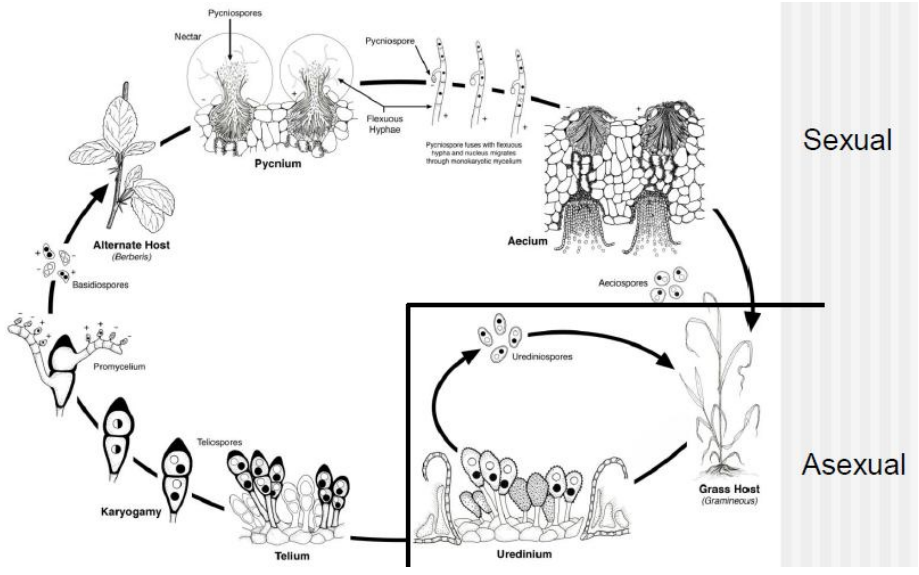



Pileus
Cap
Stipe
Pileus
Gills
(b)
Annulus
Gills
Cystidia
Stipe
Stalk
(a)
Pileus
Gills
Hymenium
(c)
(d)


Basidiospores
Sterigmata
Basidium
Basidiole
Hymenium
Sub-hymenium
Trama

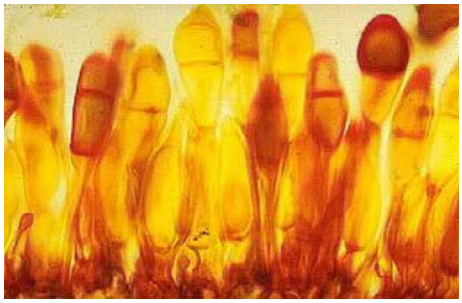


Puccinia graminis life cycle

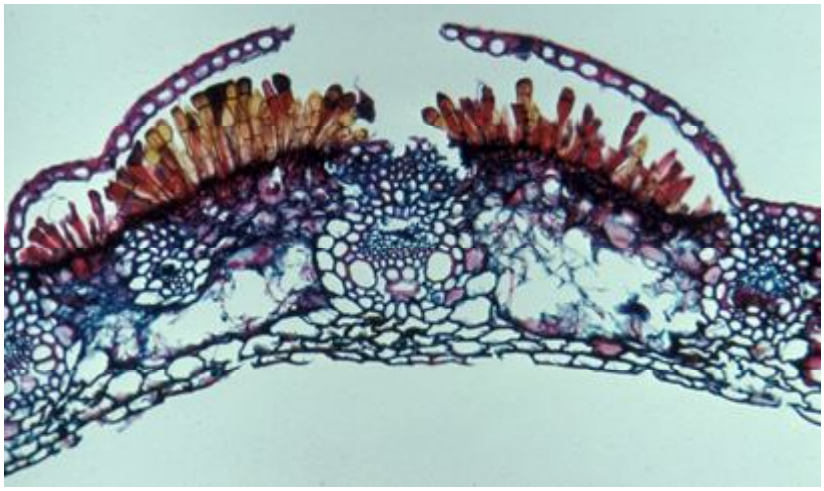


Uredium and Urediospores

Telium and Teliospores

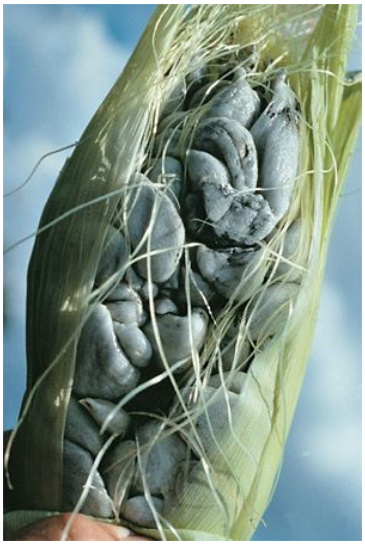


Telium and Teliospores



Corn Smut

- **Basidiocycete hyphae infection**
  - **Sounds terrible: decreases crop yields**
  - **Tastes delicious!: Huitlacoche "Raven's excrement" is made of the spore filled reproductive structures**



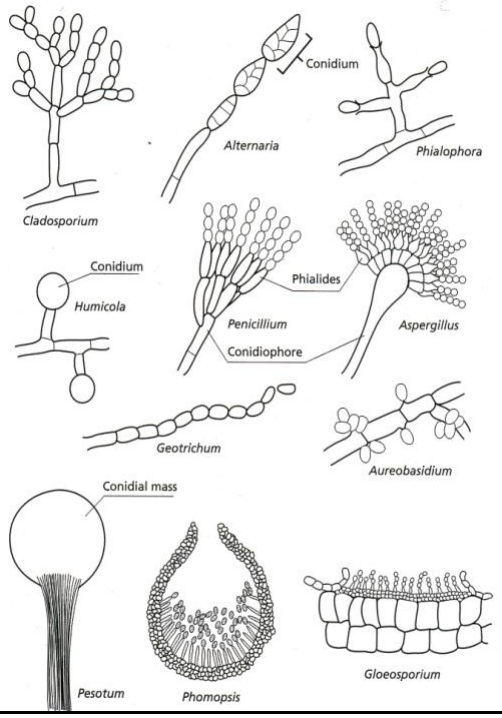
True fungi: Deuteromycota

- **Septate hyphae or yeasts**
- **Sexual reproduction absent or unknown**
- **Asexual reproduction by non-motile spores or conidia**

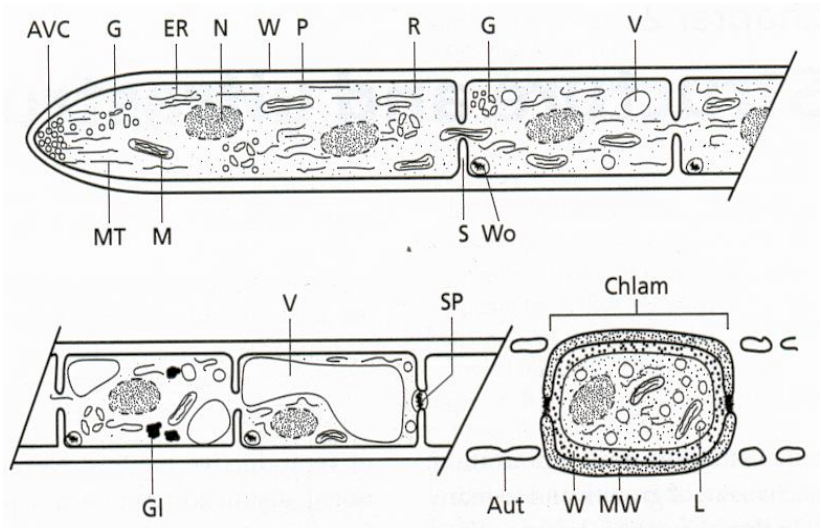
  Conidia are formed in many ways but never by cytoplasmic cleavage in a sporangium

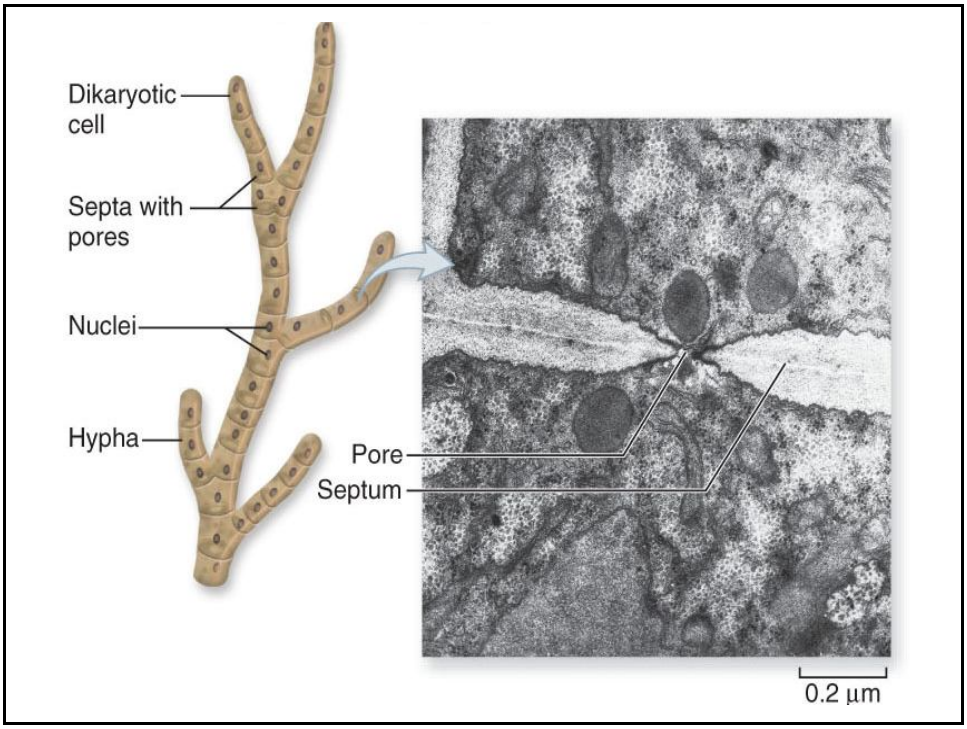
Deuteromycota

- **Not known to produce sexual spores**
- **Reproduce asexually**
- **Catch-all category for unclassified fungi**
  - ***Pneumocystis carinii***
    - **Causes pneumonia in AIDS patients**
    - **Leading cause of death in AIDS patients**
    - **Originally classified as a protozoan**
  - ***Candida albicans***
    - **Causes yeast infections of vagina in women**
    - **Opportunistic infections of mucous membranes in AIDS patients**

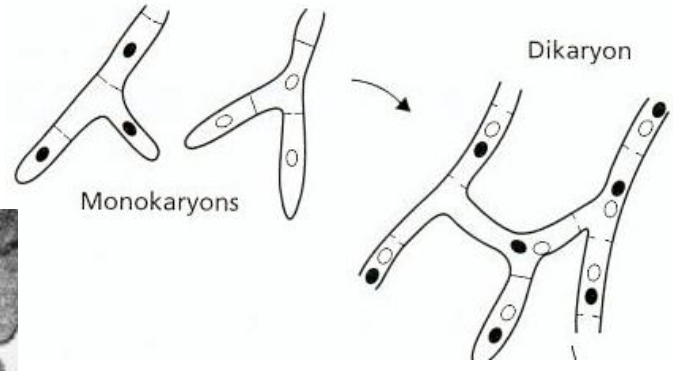


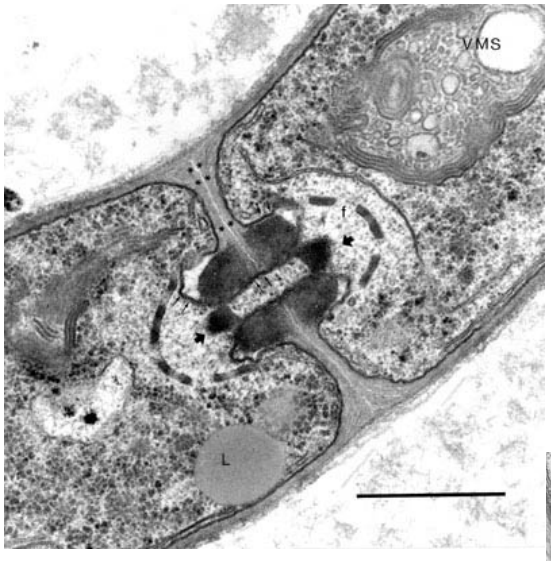
Structure of the hypha



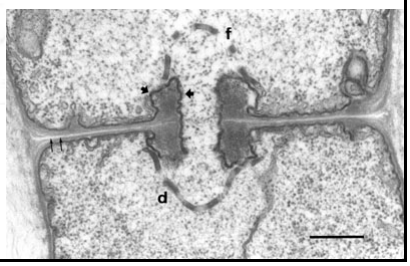


Dolipore septa

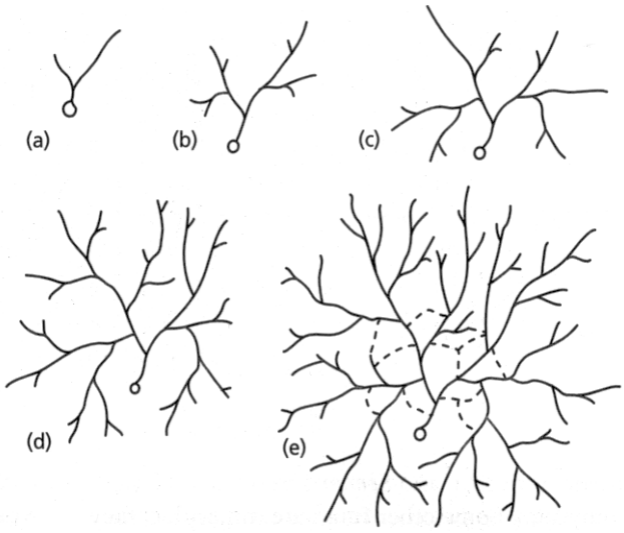




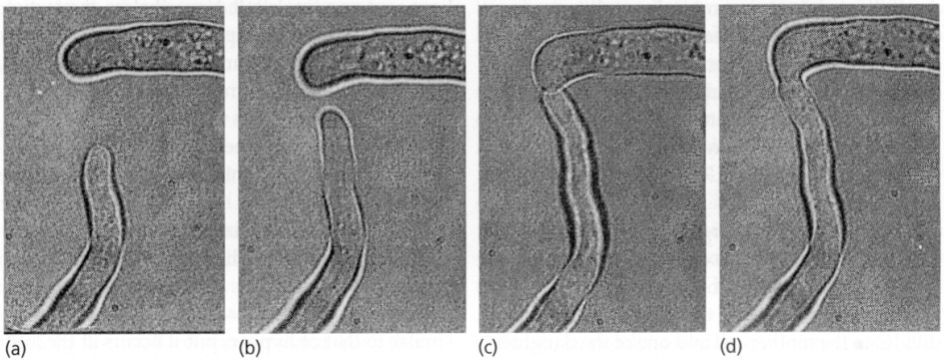
Dolipore septum



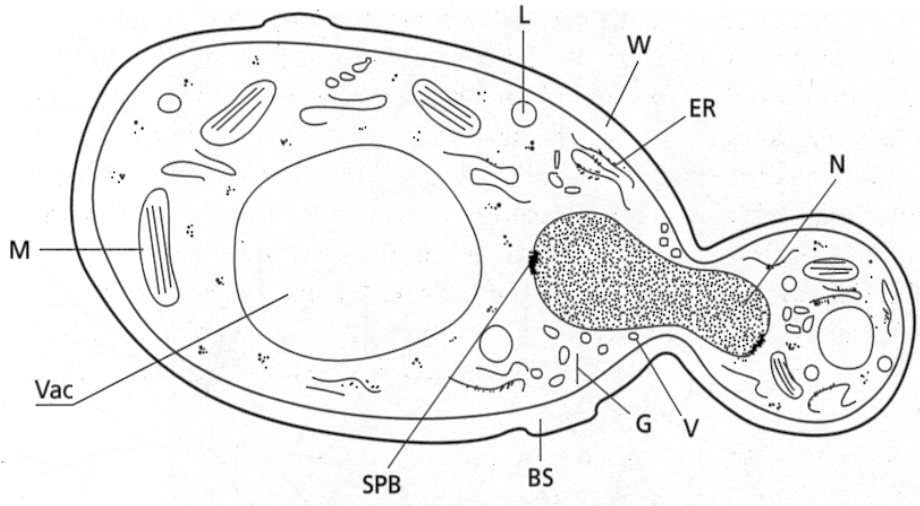
Development of fungal colony



Anastomosis of *Rhizoctonia solani*



Representation of a budding yeast



Fungal reproduction

- **Anamorph= asexual stage**
  - **Mitospore=spore formed via asexual reproduction (mitosis), commonly called a conidium or sporangiospore**
- **Teleomorph= sexual stage**
  - **Meiospore=spore formed via sexual reproduction (e.g., resulting from meiosis), type of spore varies by phylum**

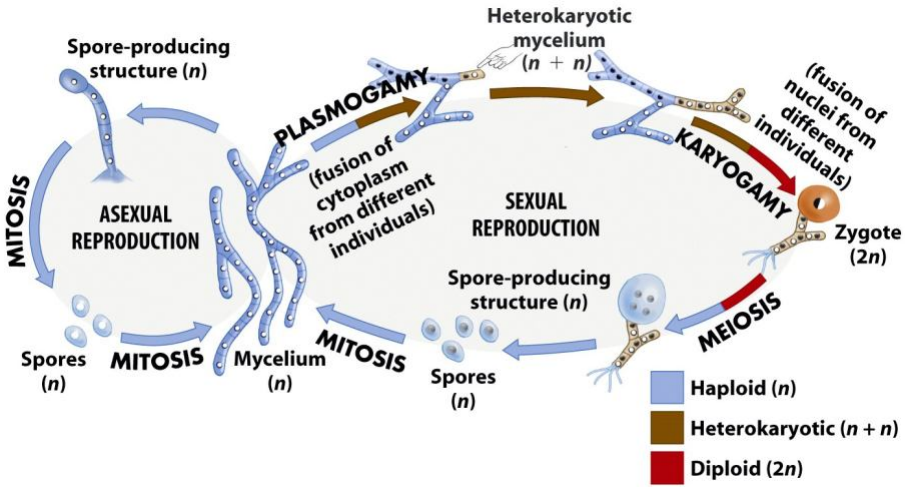
Concept of fungal holomorph

- **Asexual and sexual reproduction may be separated in time and space**
- **The holomorph is the entire fungus → including asexual and sexual stages if both are formed**

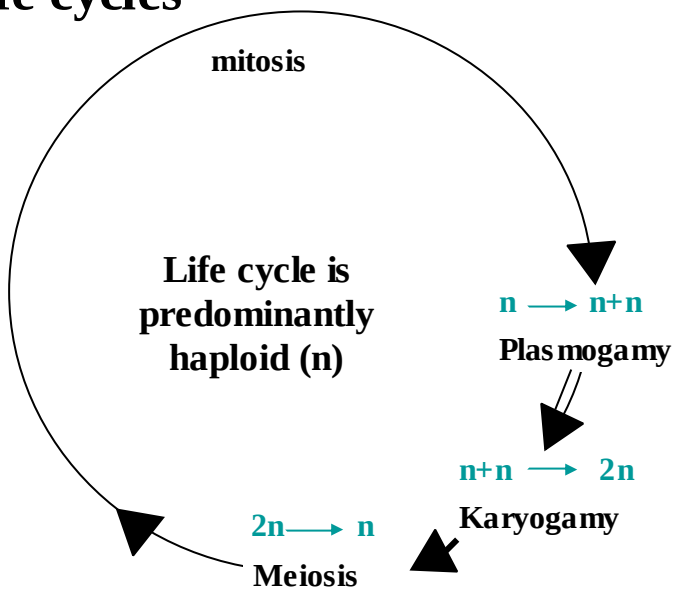
Fungal life cycles

- The vegetative thallus predominates in the life cycle of a fungus
- The thallus may be haploid (1n), dikaryotic (n+n) or diploid (2n) in different groups of fungi
- Ploidy of thallus is determined by the timing of these events in the life cycle:
  - Plasmogamy (cell fusion)
  - Karyogamy (nuclear fusion)
  - Meiosis (reduction division)

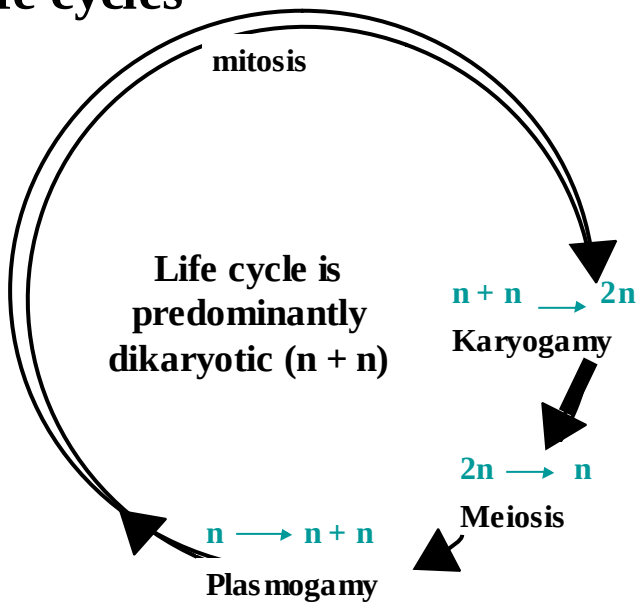
The same sequence of events is common to most fungal life cycle



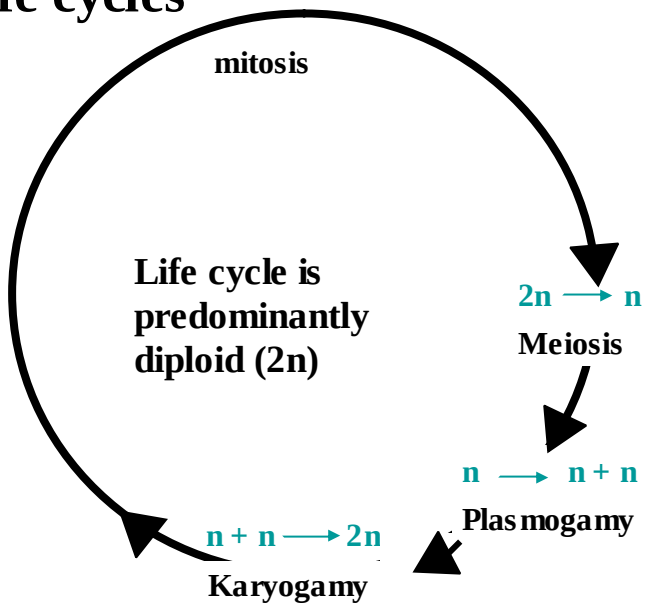
Fungal life cycles



Fungal life cycles

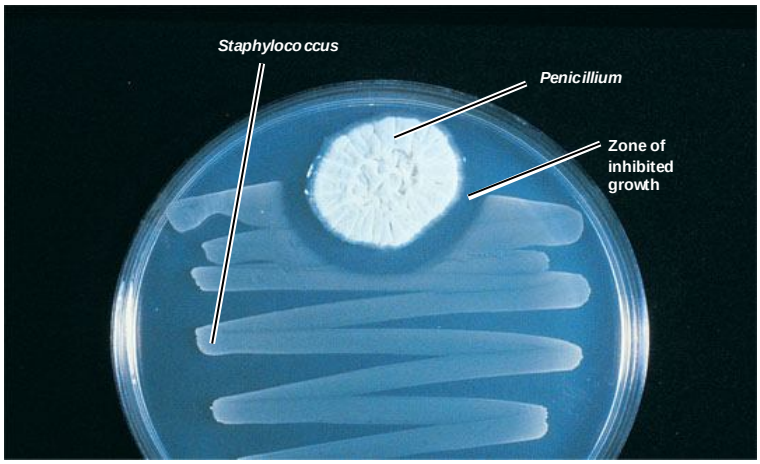


Fungal life cycles



Fungal secondary metabolites

Usage	Product	Fungal source	Application
Medicine	Penicillins	*P. chrysogenum*	Antibacterial
	Cephalosporins	*Cephaolosporium acremonium*	Antibacterial
	Griseofulvin	*P. griseofulvin*	Antifungal
	Fusidin	*Fusidium coccineum*	Antibacterial
	Cyclosporin	*Trichoderma polysporum*	Immuno-suppressant



Penicillin kills bacteria by interfering with their ability to synthesize cell wall