



because **fungi have cell walls**, and show a **superficial resemblance**, **Fungi were long allied with PLANTS**

in fact they **differ greatly from plants** and are now considered to be more **closely related to ANIMALS**

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(most) plants are autotrophic, but

- **FUNGI ARE HETEROTROPHIC**

animals ingest & then digest, but

- **FUNGI DIGEST & THEN INGEST**

because they are *not* autotrophs,

- **FUNGI ARE NOT LIMITED BY LIGHT**

given this characteristic,

- **FUNGI CAN GROW ANYWHERE**

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FUNGI are **very successful and widespread**

70,000 spp. described; probably **1.5x10⁶**

water-films, soil, in & on living & dead tissues

FUNGI show **diverse nutritional life-styles**; have **diverse ecological & economic impacts**

saprobes *parasites*

predators *symbionts*

despite this diversity, all are **osmotrophs**, feeding by **absorption**; most are **aerobic**

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Fungus taxonomy

is based on the nature of their **reproductive structures**

Zygomycota - zygospore

Ascomycota - ascus

Basidiomycota - basidiospores

Taxonomy does not correspond to gross appearance

"Deuteromycota" - not a natural group

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Ascomycota

includes yeasts *Saccharomyces*




Geopora




cup fungus

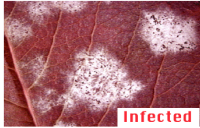
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Ascomycota


black spot




powdery mildew



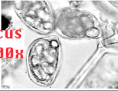
Infected Leaf



Cleistothecium 400x

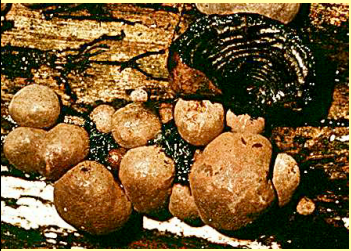


Asci 400x



Asci 1000x


Ascomycota



Daldinia


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Cordyceps




Basidiomycota


Auricularia



Phallus



Tremella



Basidiomycota

Calvatia



Geastrum




Lycoperdon



Basidiomycota

Phlogiotis



Amanita



Ganoderma



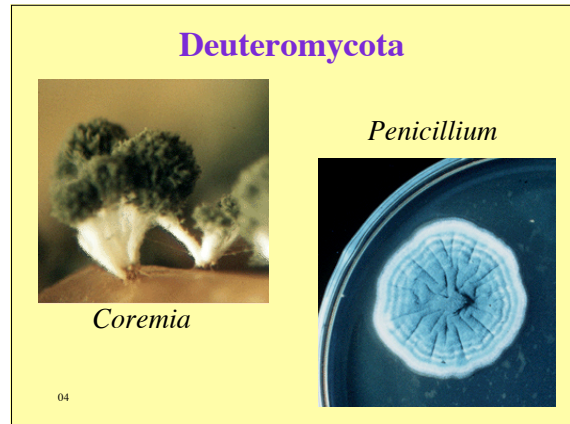
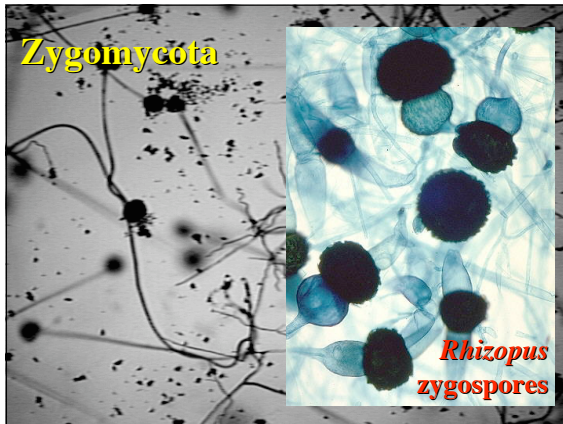
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Zygomycota

Rhizopus



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Synopsis of Fungi

Form

- vegetative body is filamentous - *hyphae*; whole "body" = *mycelium*
- OR**
- vegetative body unicellular - yeasts
- cell walls of chitin - not cellulose
 - cells haploid or dikaryotic
- some form **prominent fruiting bodies** generating wind-borne spores

Reproduction

- mostly sexual; mating-types *conjugate*
- exchange nuclei, which do not fuse, often for much of life of mycelium - *dikaryon*
- eventual nuclear fusion -> zygote -> +/- immediate meiosis -> haploid spores in fruiting bodies - **mushrooms, toadstools**

Development

- **no embryology** - direct development into new haploid hyphae or cells from spores

Saprobies

- feed on dead organic material - *scavengers*
 - major **decomposers**, cycling C, N etc. *(as do bacteria)*
- found in +/- all habitats: water, soils, surfaces
- especially abundant in soils because rich in : organic debris, plant roots (*secreted compounds*)
- therefore **intimate association with roots**

Saprobies

- organic debris very abundant in most systems
 - Temperate forests:** 1-2 tons/acre/year
 - Tropical forests:** ~60 tons/acre/year
- much available even in agri-systems
- all returned as CO₂, **13% by fungi**; global total ~60x10⁹ tons annually
 - fungal decay is two-sided: economic damage; dumps; recycling

Saprobies

fungi are in direct competition with bacteria;
some bacteria prey upon fungi

fungi respond using their chemosynthetic skills;
metabolites secreted into environment which
kill or inhibit bacterial growth

hence, fungi important in development of
antibiotics & bacteriostats e.g. penicillin

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Parasites

- virtually all animals & plants are susceptible
 - they are **major** plant pathogens;
all crop plants can be affected by fungi:
blights, mildews, rusts
 - can have massive impacts - often historic
 - plants can evolve resistance;
fungi respond by castrating hosts

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Parasites

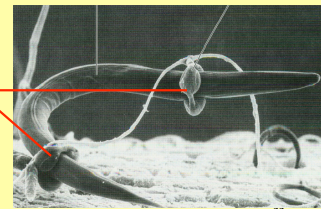
- impact of parasite on host behaviour
and physiology
- direct impact of
secreted chemicals on
nervous system
- ergot of rye;
Salem witches



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Predators

- some soil fungi actually catch live animals
- fungal threads form sticky net
- some e.g. *Dactyella* have
specialised cells
to trap nematodes
as they crawl
through soil



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Symbionts

diverse **symbioses**, often extremely intimate;
probably evolved from parasitism.

symbiosis with Algae - LICHENS

~16,000 spp.; recognised as symbioses in 1868

superficially moss-like; in +/- all habitats;
extremely resistant, except to SO₂
prominent in Arctic; soil formation

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Mycophycophyta - LICHENS



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Symbionts

symbiosis with plant roots

- **MYCORRHIZAE**

>90% plants have them

we shall look at this exceedingly important phenomenon in the **PLANTS** lectures

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Symbionts

several notable animal-fungus symbioses

e.g. **Fungus-garden ants - *Attinae***

ants feed and tend fungus in special chambers

fungus hyphae are sole food of larvae

mutual total dependence

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FUNGI & HUMANS

HARM

rot, decay of foods and goods; direct poisons
disease of humans and domestic organisms

HELP

edible fungi cheese manufacture

Saccharomyces cerevisiae

yeast -> bread, wine, beer, whiskey

Aspergillus - soy sauce

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NEXT CLASS:

The Plants
life by
photosynthesis
on land

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thanks to Tom Volk of
Biology Department
University of Wisconsin - La Crosse
for all the illustrative images.

He has a great fungus site at:

<http://www.wisc.edu/botany/fungi/volkmyco.html>

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