

KINGDOM FUNGI

FUN GUY?





The super mushrooms used in Mario are based on a fungi named *Amanita Muscaria*. They make the user feel as though they are growing in size. This effect was also referenced in *Alice in Wonderland*.

KINGDOM FUNGI

An Overview

- ▶ Form & Function
 - ▶ Filamentous bodies
 - ▶ Nutrients digested externally and absorbed from other organisms
 - ▶ Reproduce asexually & sexually
- ▶ Economic, Ecological, and Health Impacts
 - ▶ Symbiotic, decomposers, disease causing, food producing

Overview Con't

► Classification

► Zygomycota – *The Zygote Fungi*

- Reproduce by forming diploid zygospores

► Ascomycota – *The Sac Fungi*

- Form spores in a saclike case called an ascus

► Basidiomycota - *The Club Fungi*

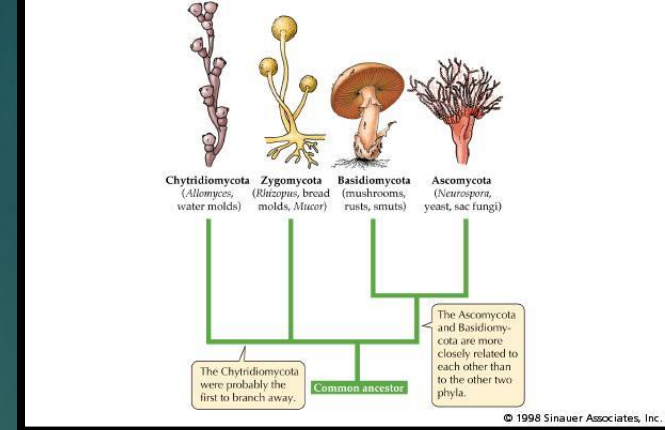
- Produce club shaped reproductive structures called basidia

► Deuteromycota - *The Imperfect Fungi*

- Seem to reproduce only asexually

► Oomycota - *The Egg Fungi*

- Very different from other fungi



FUNGAL FORM & FUNCTION



- ▶ Hyphae = microscopically thin filaments that interweave into mycelium
- ▶ Hyphae are multinucleated cells or, cells connected by septa that cytoplasm can flow thru
- ▶ Dominant Haploid fungal bodies
- ▶ Cell walls of Chitin
- ▶ Non-mobile → filaments grow rapidly

NUTRIENTS – OVERVIEW

- ▶ HETEROTROPHIC
- ▶ SAPROBES = breakdown nutrients stored in the bodies/wastes of other organisms
- ▶ PARASITIC – feed off living organisms and cause disease
- ▶ SYMBIOTIC – mutually beneficial relationships with another organism
- ▶ PREDATORY – attack and kill other organisms



NUTRIENT ABSORPTION IN FUNGI

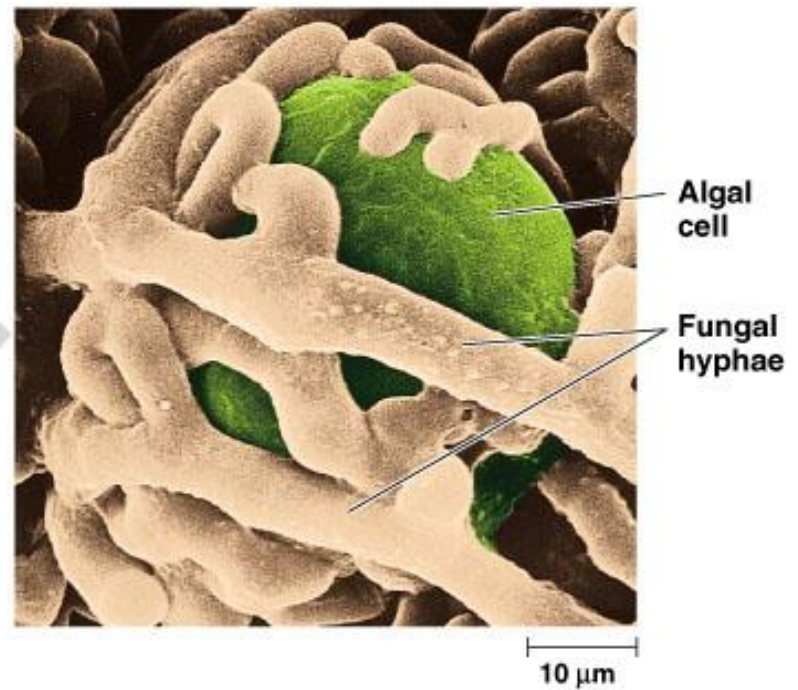
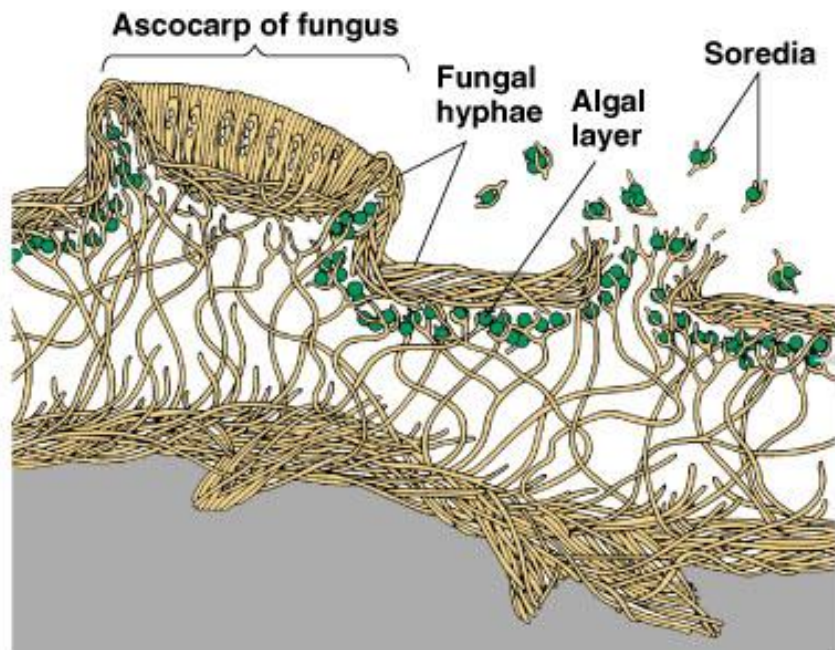
- ▶ Resemble that of bacteria since they have cell walls preventing ingestion of food
- ▶ Must secrete enzymes outside their bodies that digest complex molecules into smaller subunits that can be absorbed
- ▶ The filaments of hyphae are only one cell thick → v. large surface area → secrete enz. And absorb food.

FUNGI AS DECOMPOSERS

- ▶ Incalculable contribution to ecosystems that without them would result in nutrients remaining locked away → ecosystem collapse
- ▶ Extra cellular digestion releases nitrogen, phosphorus, carbon absorbed by plants
- ▶ Provides food for small insects

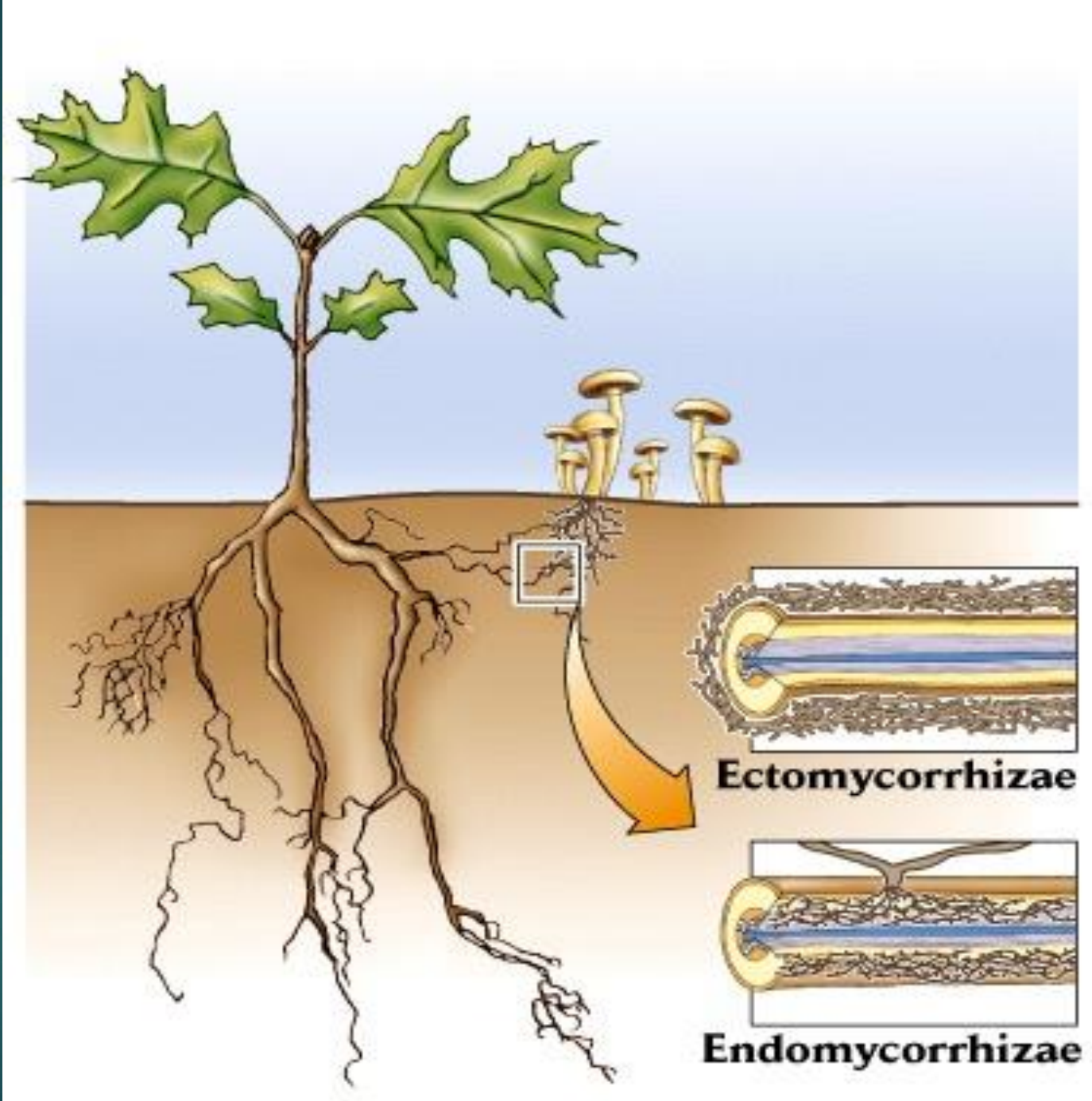
SYMBIOTIC RELATIONSHIPS OF FUNGI = Lichen

- ▶ LICHENS = FUNGI LIVING WITH ALGAE OR BACTERIA
- ▶ Algae provides food, fungus provides support and protection from dehydration
- ▶ Some are 4000 years old
- ▶ Approx. 20,000 species of lichen



SYMBIOTIC RELATIONSHIPS OF FUNGI = Mycorrhizae

- ▶ MYCORRHIZAE = SYMBIOSIS BETWEEN FUNGI AND PLANT ROOTS
- ▶ Over 5000 species found in 80% of plant roots
- ▶ Fungi digests and absorbs organic nutrients and water from soil passing directly to root cells
- ▶ Plant pass sugar from photosynthesis to Fungi
- ▶ Dramatic Decline recently!





ASEXUAL & SEXUAL REPRODUCTION OF FUNGI

BASIS OF PHYLA DIVISIONS




SIMPLIFIED ASEXUAL REPRODUCTION

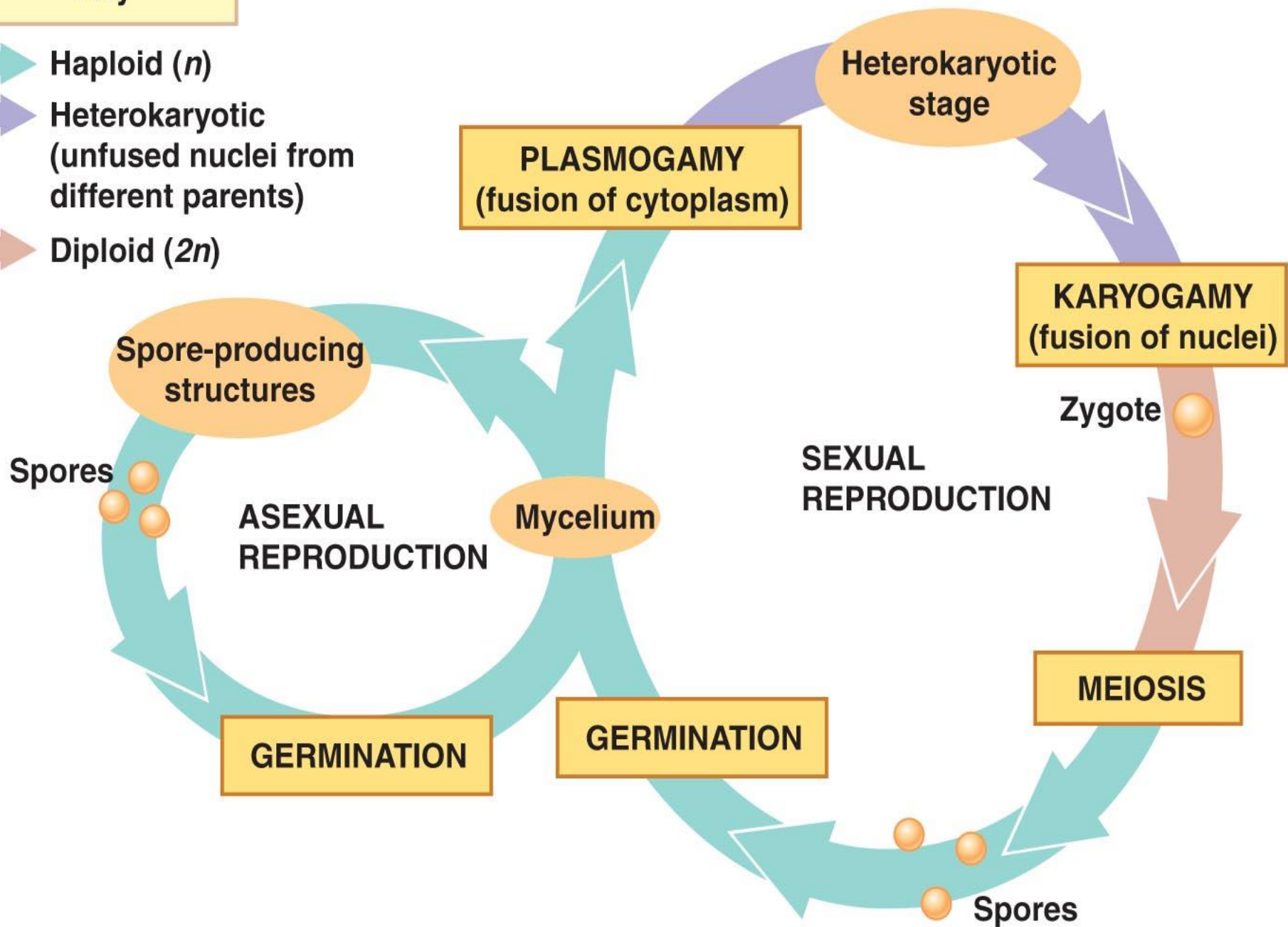
- ▶ Mycelium break into pieces → each grows into individuals
- ▶ Many reproduce both sexually & asexually thru spores = small resistant structures are made in special part of fungi above ground that disperse and produce new fungi
- ▶ Haploid spore cells are produced by mitotic division of haploid fungal cells → mitosis → identical new haploid mycelium

SIMPLIFIED SEXUAL REPRODUCTION

- ▶ Two haploid nuclei of compatible mating types fuse = diploid zygote
- ▶ Zygote undergoes meiosis → haploid spores
- ▶ Spores are dispersed and germinate, divide mitotically → new haploid mycelium
- ▶ Can produce up to 5 trillion sexual spores at a time

Key

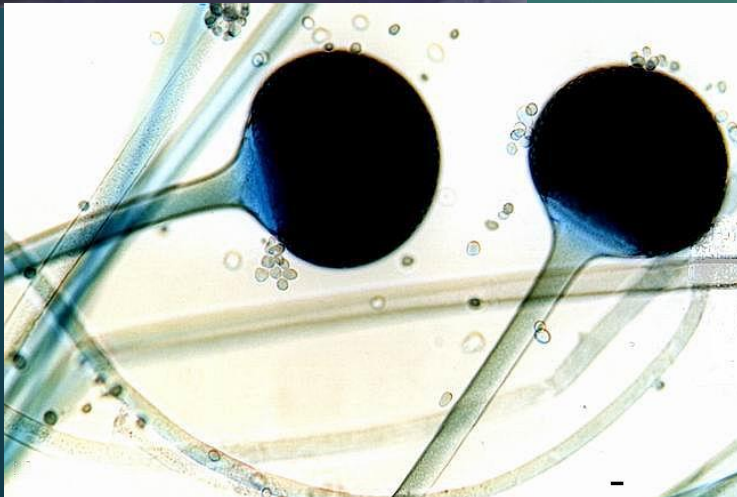
-  Haploid (n)
-  Heterokaryotic (unfused nuclei from different parents)
-  Diploid ($2n$)



ZYGOMYCOTA

THE ZYGOTE FUNGI (COMMON MOLDS)

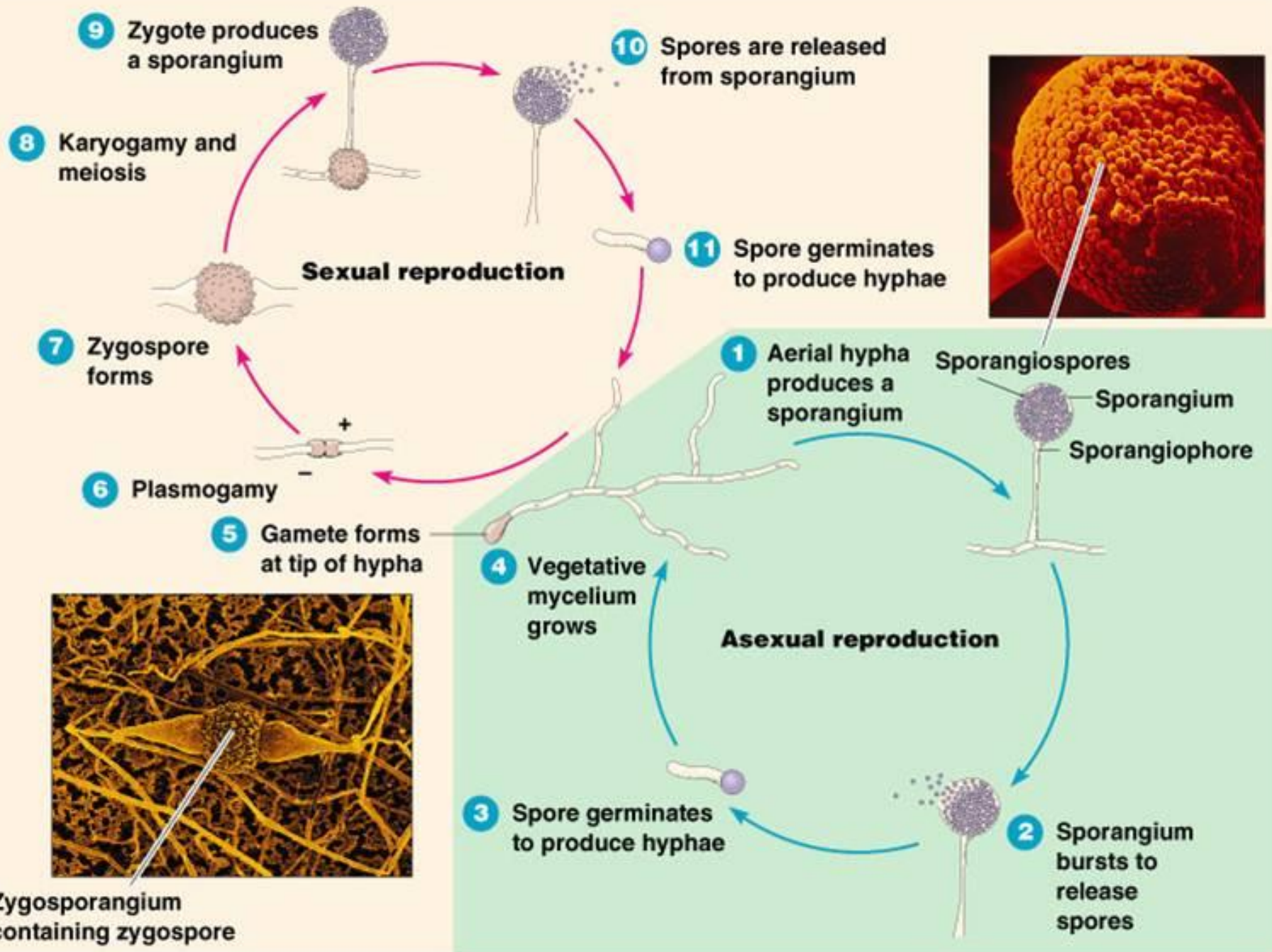
CAN REPRODUCE BY FORMING DIPLOID ZYGOSPORES



Ex. Black bread mold
Rhizopus stolonifer

ZYGOMYCOTA

- ▶ 600 SPECIES
- ▶ Soft fruit rot, black bread mold
- ▶ Haploid hyphae “mate” fusing nuclei to produce diploid zygospores
- ▶ Zygospores dispersed thru air then undergo meiosis and germinate into structures bearing haploid spores
- ▶ Spores give rise to new hyphae that can reproto asexually by sporangi or sexually fusing and producing zygospores again



ASCOMYCOTA

THE SAC FUNGI

FORM SPORES IN SAC LIKE ASCUS



Ex. Truffles

Morels

Yeast



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ASCOMYCOTA

- ▶ 30,000 SPECIES
- ▶ Some beautiful, others molds, several cause disease, also includes yeasts
- ▶ Asexual Reproduction = spores from in spec. hyphae called conidiophores = conidia = like fine dust

ASCOMYCOTA

▶ Sexual Reproduction

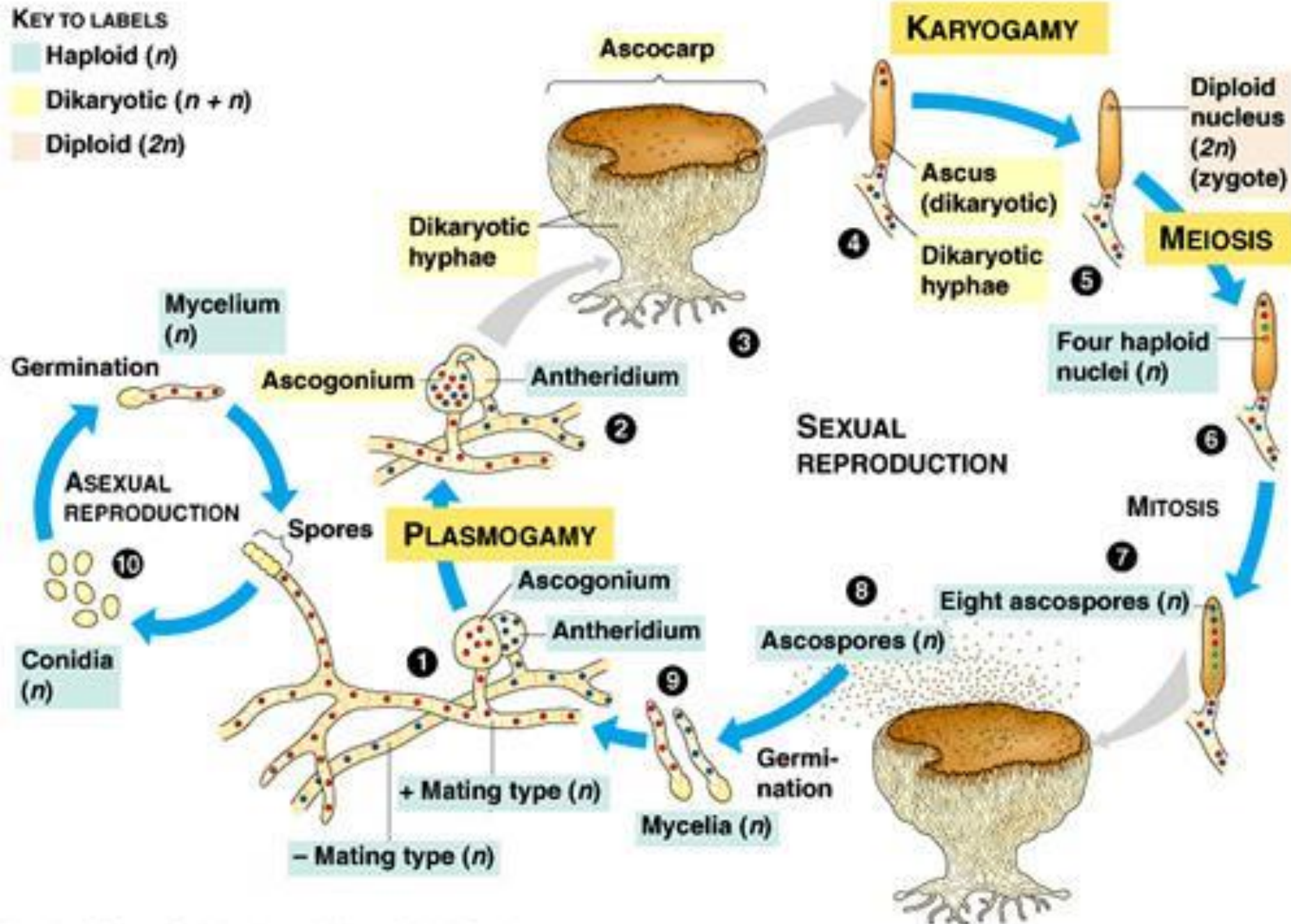
- ▶ Ascus in Ascomycetes fuse with different mating types when gametangia grow together
- ▶ At first the cells have two nuclei but soon fuse becoming diploid zygote
- ▶ The zygote undergoes meiosis and then mitosis producing many ascospores within the ascus which are capable of growing into new organisms

KEY TO LABELS

Haploid (n)

Dikaryotic ($n + n$)

Diploid ($2n$)



BASIDIOMYCOTA

THE CLUB FUNGI

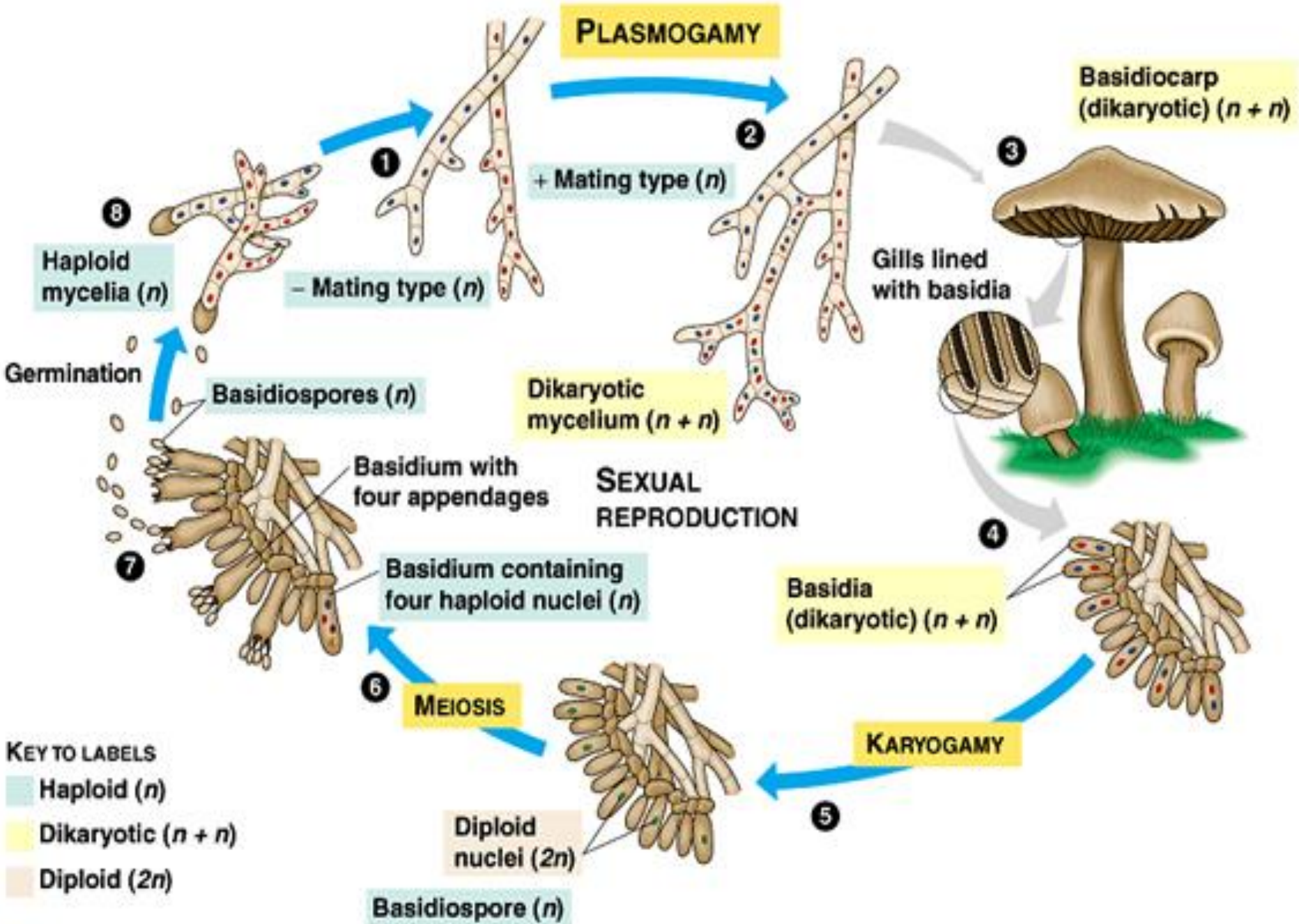
PRODUCE CLUB-SHAPED REPRODUCTIVE STRUCTURE
CALLED BASIDIA

**Ex. Mushrooms,
bracket fungi,
puffballs**



BASIDIOMYCOTA

- ▶ 25,000 species including mushrooms, puffballs and shelf-fungi
- ▶ Sexual Reproduction
 - ▶ Gills of underside of mushroom have basidia → fuse to form diploid zygotes → form haploid basidiospores by meiosis
 - ▶ Disperse and form new Mycelium



DEUTEROMYCOTA

IMPERFECT FUNGI

INABLE TO REPRODUCE ENTIRELY BY ASEXUAL MEANS



DEUTEROMYCOTA

- ▶ 25,000 species including Penicillin, flavoring cheese, ringworm, athletes foot
- ▶ Reproduce asexually only by Conida on Conidiophores



OOMYCOTA

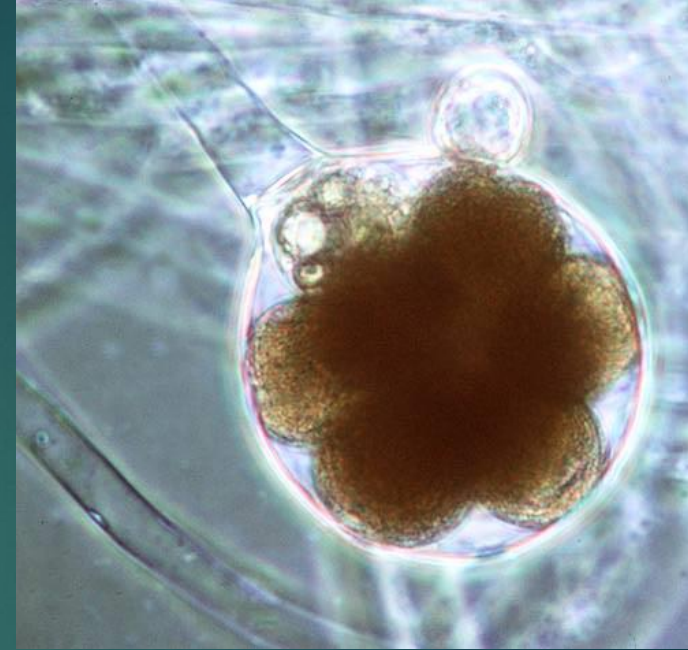
THE EGG FUNGI

VERY DIFFERENT FROM THE OTHERS



OOMYCOTA

- ▶ Cell wall contains cellulose
- ▶ Produce mobile spores
- ▶ Reproduce asexually using flagellated cells called zoospores (require moist conditions)
- ▶ Sexual reproduction = hyphae produce
 - ▶ antheridium → produce flagellated sperm
 - ▶ Oogonium → produce eggsFertilize in oogonium





FUNGAL INGENUITY

SEXY TRUFFLES, SHOTGUNS, AND NEMESIS OF
NEMATODES

The Rare Sexy Truffle



- ▶ Prized food
- ▶ May sell for hundreds if not thousands \$\$\$
- ▶ In the wild they entice animals to dig them up by producing sex attractants and when eaten release their spores which would otherwise been trapped underground



Shotgun Spore Dispersal

- ▶ Bulbs protrude and increase their sugar content causing absorption of water by osmosis then bursts sending the spores up to a meter away



Nematode Nemesis

- ▶ Nematode roundworms found in soil are captured by sticky pods of hyphae
- ▶ One species of fungi actually shoots microscopic harpoon like spores

