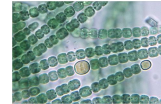
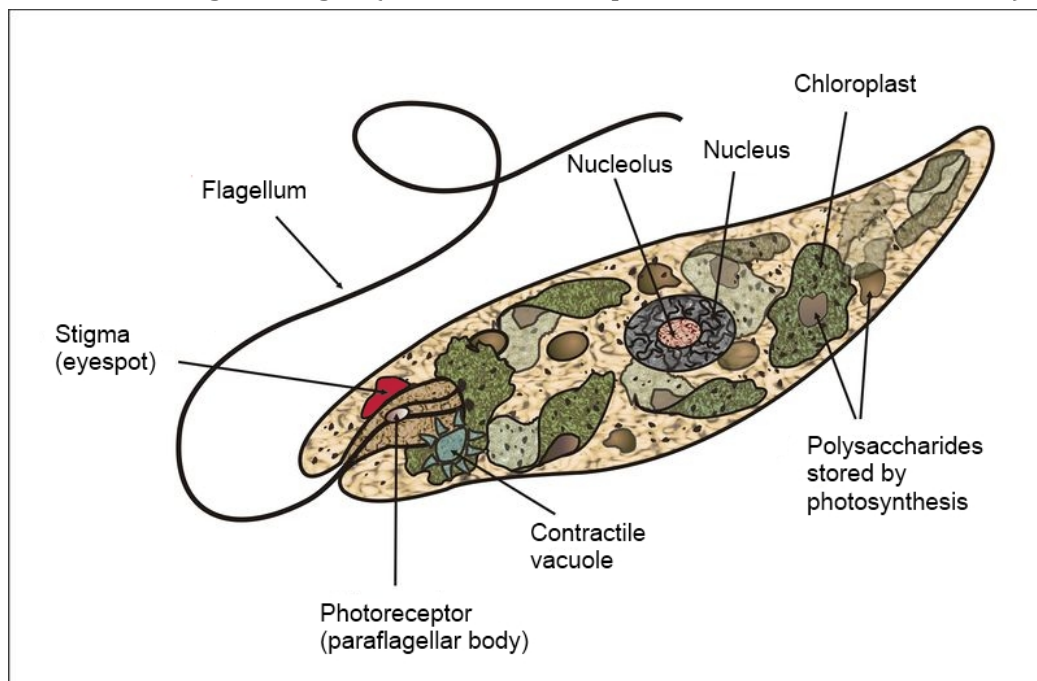


Systematics Handout

- Bacteria
 - Prokaryotic, branched hydrocarbons, peptidoglycan cell wall, one type of RNA polymerase, f-Met as initiator amino acids, rare introns, operons, no histones, circular chromosome (with origin of replication, have cytoskeletal components, no organelles, diverse food sources, gram positive- membrane then thick peptidoglycan layer, gram negative- membrane, polysaccharide layer, periplasmic space, lipopolysaccharide
 - Agrobacterium
 - Gram negative, rod shaped, causes tumors and is used in gene transfer, T-plasmid
 - Anabaena
 - Filamentous cyanobacteria
 - Have cells called heterocyst used to fix nitrogen to ammonium using nitrogenase enzyme (molybdenum and iron complexes), thicker than normal cell walls, don't have photosystem II, must not be exposed to oxygen(see brown colored cells in image)
 - Nitrogen is exchange with other cells in filament for carbohydrates.
 - May appear to have secondary walls, convoluted single membrane though
 - Bacillus
 - Gram-positive, rod shaped, obligate for facultive aerobes, produce dormant endospores(dehydrated thick membrane enclosed shells) when under stress(anthrax)
 - Escherichia
 - Gram-negative, rod shaped, facultative anaerobe, do not produce spores, live GI tracks (Vitamin K source), gamma protobacteria, O157:H7 cause disease(due to transduction), extremely quick generation time(10 minutes), used extensively biomedically, Michigan experiment
 - Rhizobium
 - Gram negative, motile rod shape, form nodule in legume roots the fix nitrogen through infection threads (see Campbell diagram), alpha protobacteria
 - Salmonella
 - Gram negative, rod-shaped, motile, gamma protebacteria, causes typhoid fever, produce hydrogen sulfide
 - Streptomyces
 - Gram-positive actinobacteria, thin filaments, primary source of antibiotics and antifungals, any antibody ending mycin(Streptomycin for example), and others, tetracyclin
 - Have high GC content genomes
- Archaea

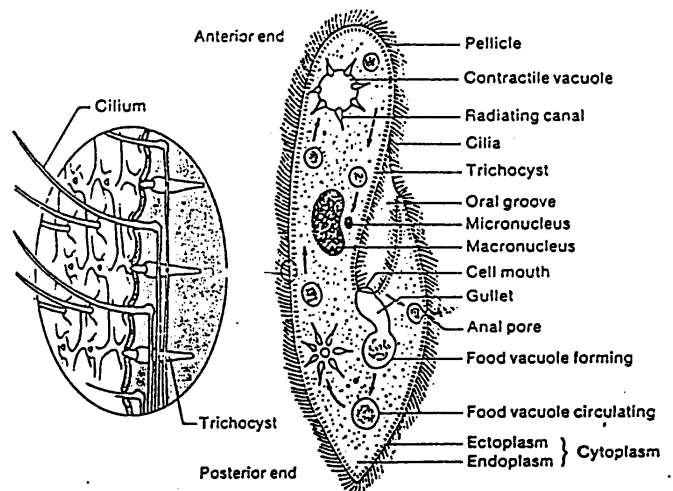


- Prokaryotic, lack peptidoglycan in cell wall, are always gram positive(thick cell wall), Met is initiator amino acid, branched hydrocarbons in membrane, ether linkages, include many extremophiles, introns and histones, circular chromosomes
- Halobacterium
 - Aerobic, require high salt concentrations, motile, rods or cocci, pump potassium ions to balance osmotic balance, red or purple(bacteriorhodopsin which is a proton pump)
- Methanobacterium
 - Anaerobic, non-motile, use carbon dioxide to oxidize hydrogen gas to make methane, rod shaped, found in GI track
- Thermoplasma
 - Facultative anaerobes, respire using sulfur and organic carbon, high temperature and acidity, lack cell wall, flagellated, heterotrophic
- Sulfolobus
 - Very self sufficient, can grow lithoautotrophic by using sulfur or chemoheterotrophically by using sulfur to oxidize carbon
 - High temp and acidity, need sulfur as final electron acceptor, thrive in volcanic springs, flagellated
- Protists
 - Protists are typically ignored in USABO, however things may appear, especially regarding ciliates(don't panic over the sheer amount of information!)
 - Euglenozoa
 - Euglena
 - possess chloroplasts through secondary endosymbiosis of green algae (thus their chloroplasts have three membranes)



- no cell wall, but pellicle made of protein
- pyrenoids store paramylon (carbohydrate similar to starch)
- Trypanosoma
 - Posses a kinetoplast; dense DNA granule in mitochondrion(Looks like a sickle shape), obligate
- (Phaeophyta)
 - Brown algae
 - Possess xanthophyll called fucoxanthin, giving distinctive color
 - Body called a thallus with holdfast “root” stipe “Stem”
 - Pneumatocysts provide buoyancy(Sargassum)
- Bacillariophyta
 - Diatoms
 - Enclosed in silicon-based cell wall called a frustule
 - Sexual reproduction involves formation of an auxospore(formation of smaller and smaller cells inside frustule before breaking frustule)
 - Four-membraned chloroplasts(all stremenophiles)
- Apicomplexa
 - Intracellular animal parasites
 - Apicoplast- four membrane plastid involved in host cell penetration
 - Sporozoites infect a host replicating in cells to produce merozoites which infect other cells
 - Plasmodium
 - Infect the blood cells from sporozoites from which merozoites infect liver.

- Ciliates
 - Posses a diploid micronucleus and polypoid macronucleus binary fission and conjugation
 - Know the how conjugation/life style works!
 - Have organelles called trichocysts that release hair in response to stimuli



- Diatoms
 - Two flagella, one transverse and the other longitudinal
 - Lack histones, nucleosomes
 - Haploid
 - Weird reproductive cycle
 - Ceratium(horn shaped)
- Rhodophyta

- Red Algae
- Color due to phycoerythrin
- Floridean starch as energy store (more highly branched than amylopectin)
- Extremely complex alternating of generations
- Lobose Amoebozoa
 - Differential flow of cytoplasm
 - Actin-based pseudopodia
- Eumycetozoa
 - Slime molds
 - Myxogastria
 - Plasmodial slime molds
 - Life cycle
 - Single-celled haploid
 - Extended diploid multinucleate form called plasmodium
 - Dictyostelia
 - Cellular slime molds
 - Aggregate into multiorganismic pseudoplasmodium
 - Macrocyt formation also
- Fungi
 - Chitin walls, generally haploid, generally ignored in USABO
 - Zygomycota
 - Walls made out of chitosan
 - Mucor (molds)
 - Makes a zygosporangium, resistant diploid reproductive structure
 - Ascomycota
 - Sexual reproduction which involves the formation of asci
 - Each ascus has eight ascospores (meiosis then mitosis)
 - Tissue layer containing asci is called the hymenium
 - Lichens usually have ascomycetes
 - Penicillium
 - *Saccharomyces* (yeast)
 - *Claviceps* which causes ergot infections
 - Basidiomycota
 - Long heterokaryotic state (like Ascomycota)
 - Clamp connections to coordinate division
 - Form basidia
 - *Agaricus*
 - Rusts
- Animals
 - Go through Campbell's! Following will have animals not covered well in Campbell's—otherwise, pretty much everything in the animals chapters are important
 - Aves
 - Paleognathae
 - Most basal birds, can't fly *Stuthio* (ostrich)

These problems were created by Yilun Du and Varun Mangalick and are the intellectual property of them and their biology tutoring business, Study of Life. If you have any questions, email us at studyoflife.info@gmail.com

- Galloanserea
 - Waterfowl/fowl
 - Gallus(chicken)
- Neoaves
 - All other birds
 - Columba(dove)
 - Passer(sparrow)
 - Apus(Swift)
- Mammalia
 - Monotremata
 - Lay eggs
 - No corpus callosum
 - Have cloaca
 - Extant species lack teeth
 - Ornithorhynchus(platypus)
 - Marsupialia
 - Premature viviparous birth; young are carried in pouches
 - Macropus(kangaroos)
 - Eutheria
 - Most contain corpus callosum
 - Xenarthra(sloths, armadillos, anteaters)
 - Lowest metabolic rate of eutherian
 - Bradypus
 - Lagomorpha(rabbits)
 - Four upper incisors(rodents have two)
 - Herbivorous(rodents are omnivorous)
 - Lepus(hares, jackrabbits)
 - Rodentia
 - Includes 40% of mammal species
 - Constantly growing incisors
 - Rattus (Rats)
 - Primates
 - Large brains
 - Forward facing, stereoscopic binocular eyes
 - Pan(chimpansees)
 - Chiroptera
 - Bats
 - Eulipotyphla
 - Hedgehogs, moles, shrews
 - Sorex(Shrew)
 - Carnivora
 - Zygomatic arch
 - Bears, dogs, cats
 - Panthera, Canis

- Cetartiodactyla
 - Cataceae(whales, dolphins)+Artidactyla(even toed animals)
 - Sus, Cervus, Giraffa, Camelus, Bison, Orcinus, Balaenoptera
 - Perissodactyla(odd toed animals)
 - Walk mainly on third toe
 - Non-ruminants
 - Tapirus, Equus, Rhinoceros
 - Proboscidea
 - Elphants and hyraxes
- Insects(Just know the families and names for now)
- Thysanura(Silver Fish)
 - Wingless
 - Long flat body, simple mouthparts
 - Unique life style
 - Unspecialized chewing mouthparts
- Odonata-Dragonflies
- Blatteria-Cockroaches(Thick forewings called tegmania)
- Isoptera- Termites
- Orthoptera – Grasshoppers
- Phthiraptera – Lice
- Hemiptera – Stink bugs
- Siphonaptera – Fleas
- Coleoptera – Beetles
- Hymenoptera – Bees
- Lepidoptera – Butterfly
- Diptera- Flies, mosquito