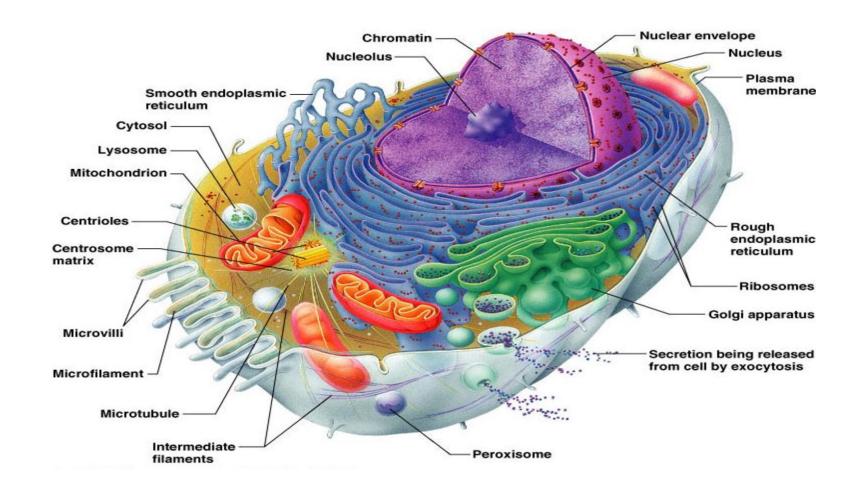
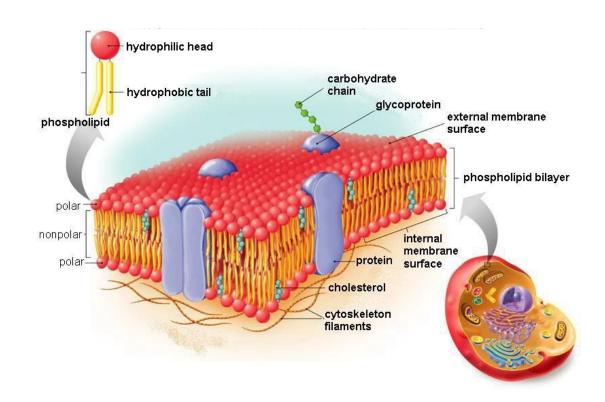
Prof. Sabrina Pricl A.Y. 2022-2023

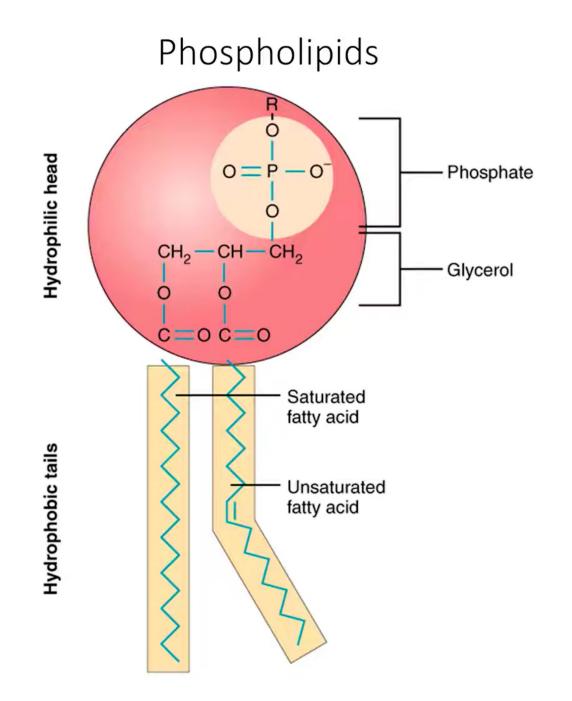
Lesson 7 Cellular organization



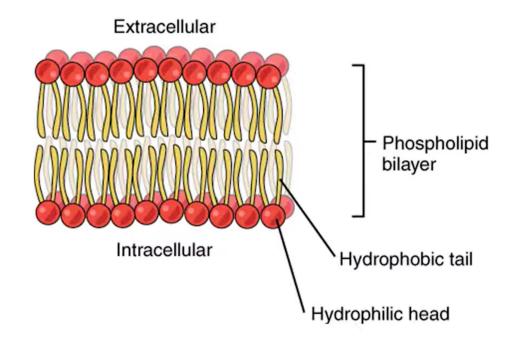
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- Cells are surrounded (protected) by a plasma (or cell) membrane = highly hydrophobic amphipathic lipid bilayer



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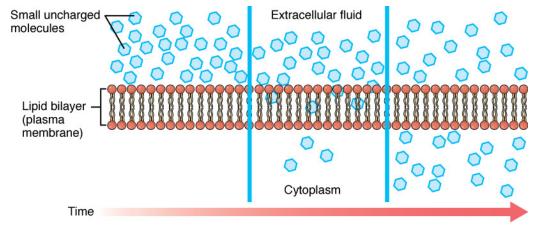


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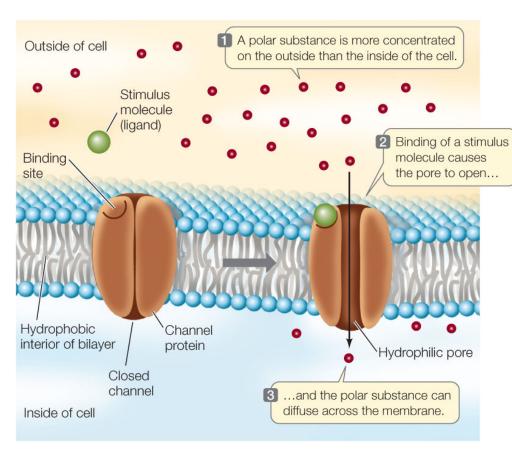


Phospholipid membrane (lipid bilayer)

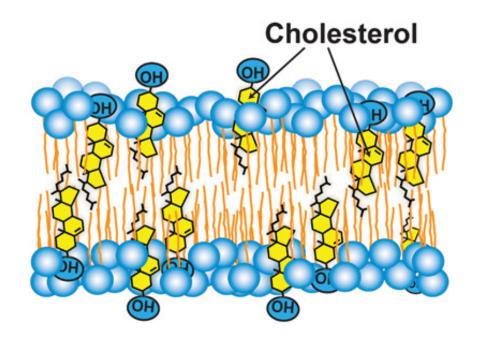
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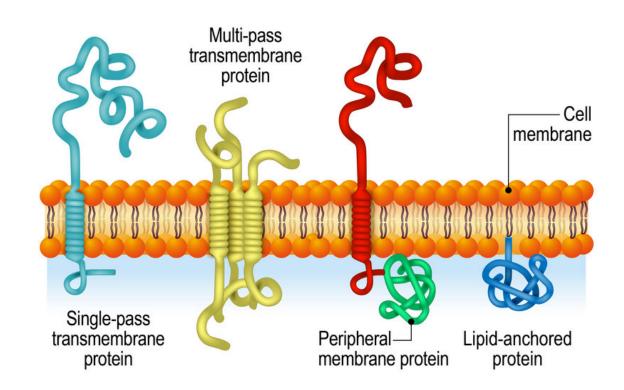
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- Particular structures like channels or pores allows polar molecules in & our the plasma membrane



- Cholesterol a steroid (lipid)
 - → membrane fluidity



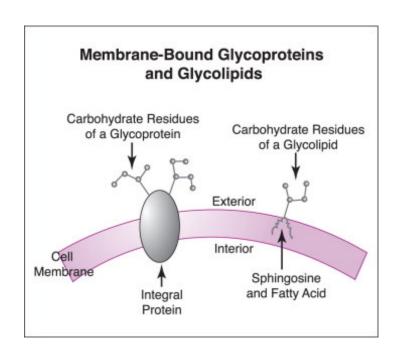
- Cholesterol a steroid (lipid) → membrane fluidity
- Membrane proteins
 - Integral proteins = span the entire width of the phospholipidic bilayer
 - Peripheral proteins = loosely bound to the exterior or interior membrane surfaces
- Both integral and peripheral proteins may serve as:
 - Enzymes
 - Structural attachments for the fibers of the cytoskeleton
 - Part of the cell's recognition sites



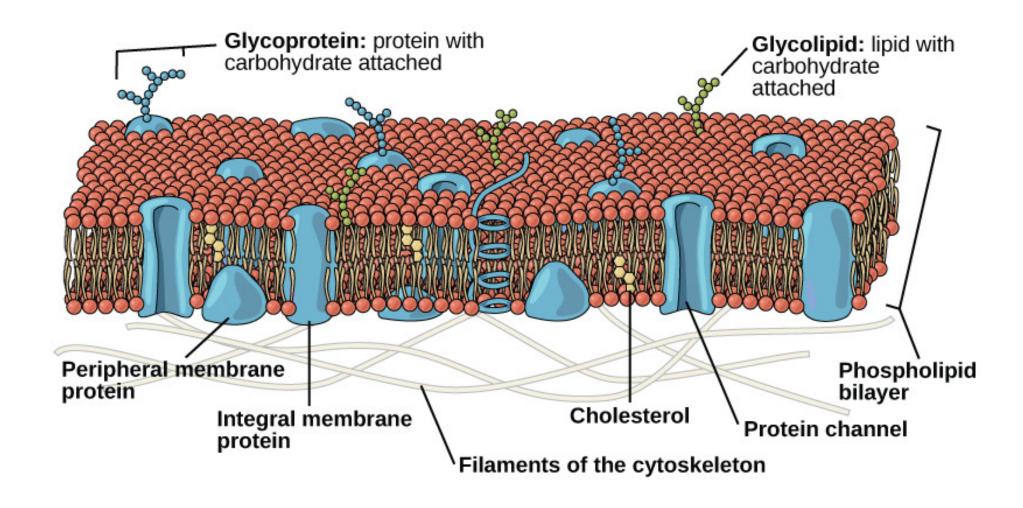
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Carbohydrates

- always found on the exterior surface of cells
- always bound to:
- proteins → glycoproteins
- lipids → glycolipids
- Along with peripheral proteins, carbohydrates form specialized sites on the cell surface that allow cells to recognize each other

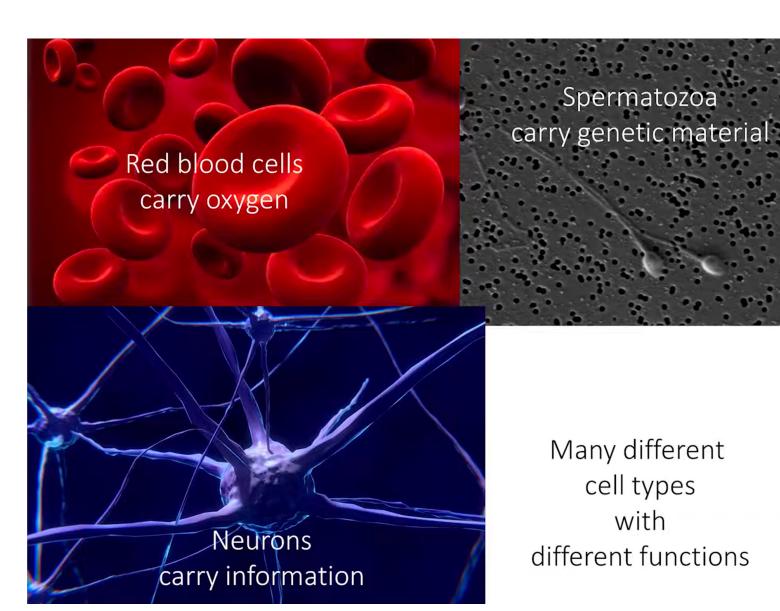


The fluid mosaic model



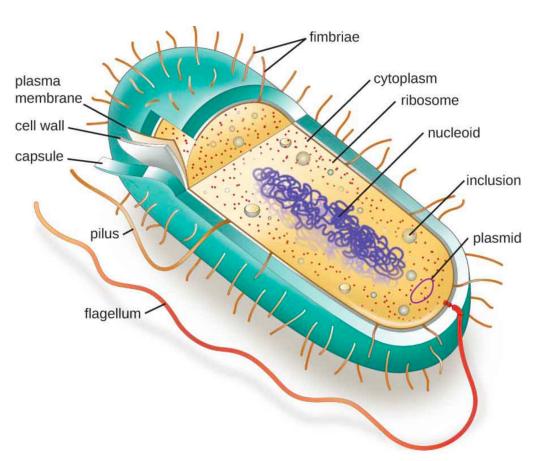
Cell types

- There are about 200 different types of cells in a human body
- Each human cell type has a different
 - structure
 - size
 - shape
 - function (and organelles)

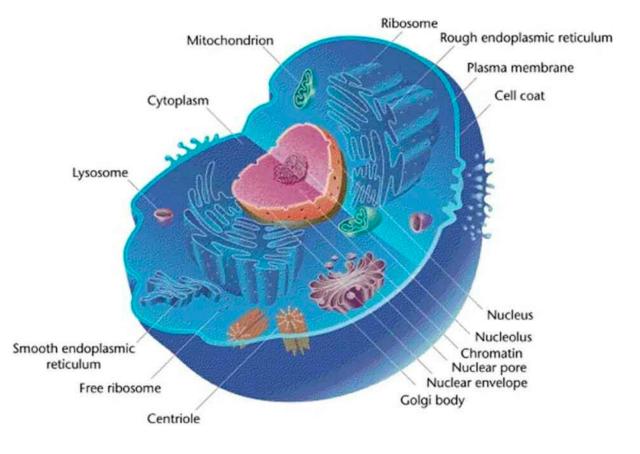


Inside a cell

Prokaryotic cell



Eukaryotic cell

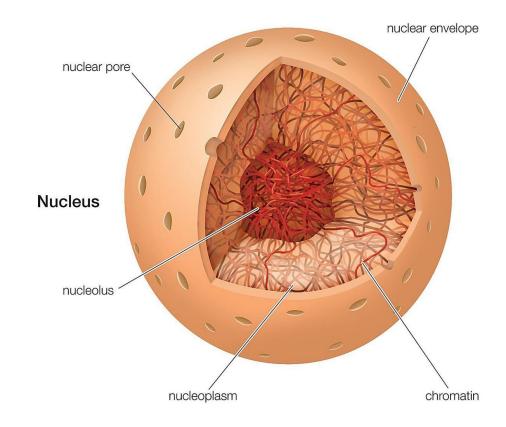


Inside a cell

- Cells are replicating, membrane-bound factories
- Organelles = subcellular structures with specific functions
 - May be membrane-bound themselves

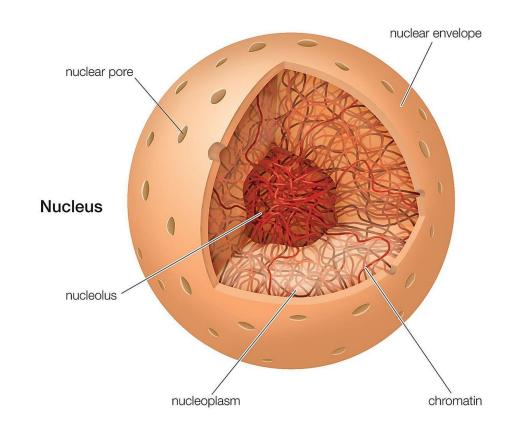
Cellular organelles (eukaryotes)

- Nucleus = repository for genetic information, cell control center
- Nucleolus = r-RNA synthesis, ribosome construction
- Nuclear envelope = an inner and an outer membrane which run parallel to each other
- Nuclear pores = gaps in nuclear envelope
 - \sim 100 nm in real diameter (however due to the presence of central regulatory proteins, the true size of the gap is around 9 nm)
 - control the passage of molecules in&out of the nucleus
 - larger molecules (e.g., big proteins and nucleic acid are unable to pass through these pores → nuclear envelope works to selectively separate the contents of the nucleus from that of the cytoplasm

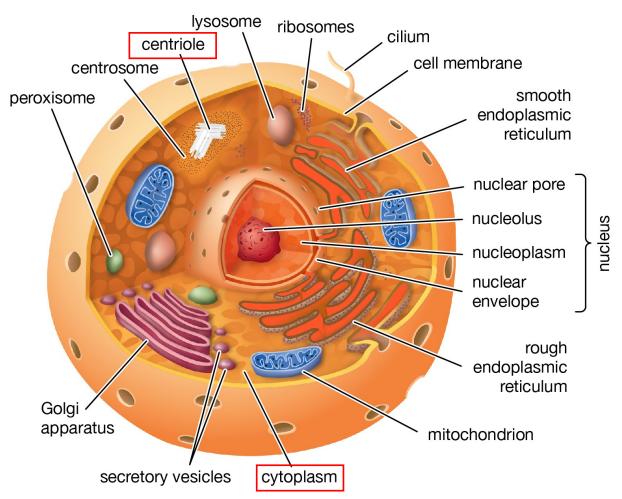


Cellular organelles (eukaryotes)

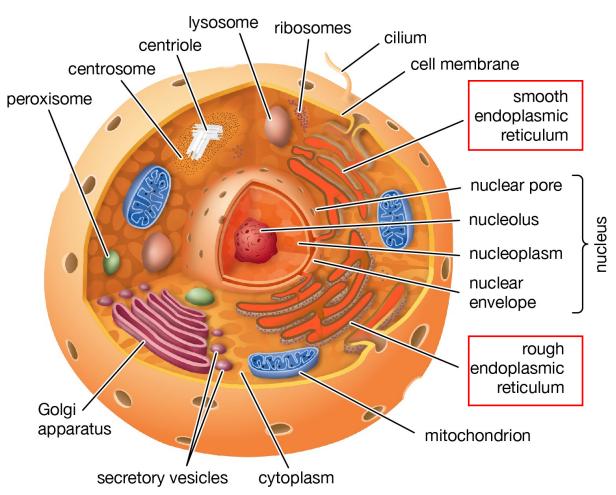
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- Chromatin = DNA complexed with proteins (histones)
 - Histones combined with DNA form nucleosomes
 - a nucleosome describes a segment of DNA associated with 8 histone proteins
 - by associating with histones, DNA is more compact and able to fit into the nucleus



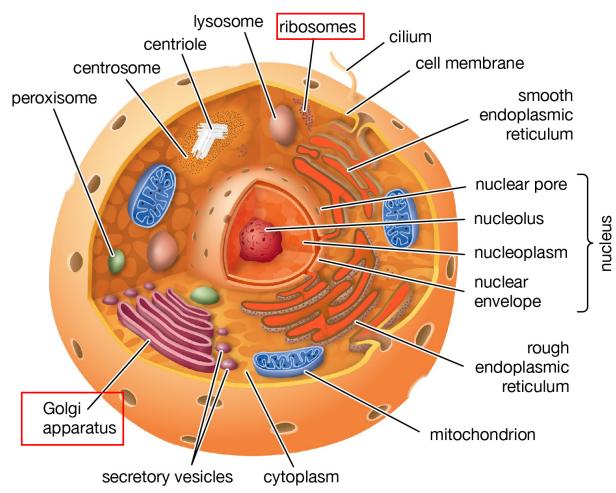
- Everything non-nuclear = cytoplasm
- Centrioles = organize structural components of the cell involved in moving the cell's components during cell division



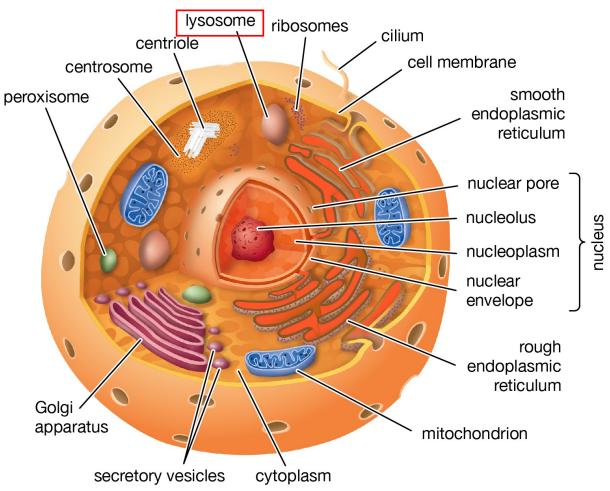
- Endoplasmic reticulum (ER)
- Rough ER (RER)
 - Contains the ribosomes (the protein synthesis machinery)
 - The cell's factory assembly line
- Smooth ER (SER)
 - Shuttles the cell's reaction products to the Golgi apparatus
 - The cell's factory shipping department



- Ribosomes = cell's organelles in which amino acids are assembled into proteins
 - Contain proteins and nucleic acid subunits
 - Cell factory's strategic department
- Golgi apparatus = Materials produced by the cell are packed into vesicles and sent to other organelles (for metabolism) or to cell membrane (for excretion)
 - Cell factory's postal system

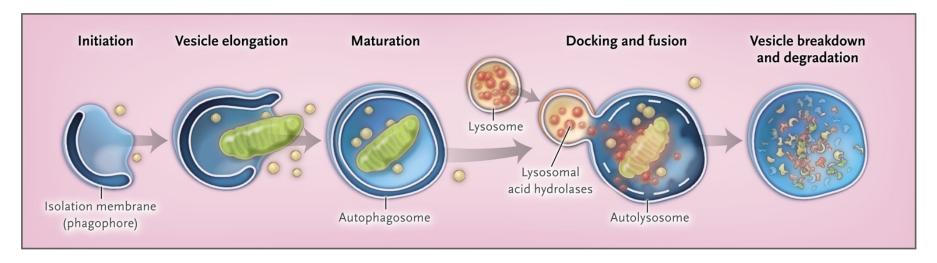


- Lysosomes = breaking down cellular components no longer needed/unwanted substances
 - They also digest dead organelles (autophagy or autodigestion)
 - Can be though of as the call factory's landfill

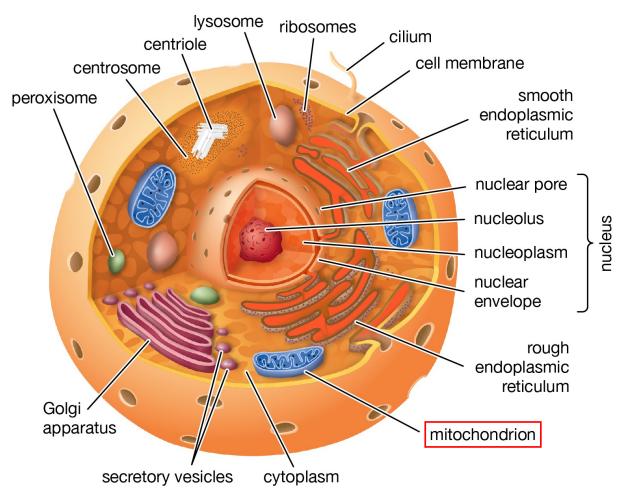


Autophagy

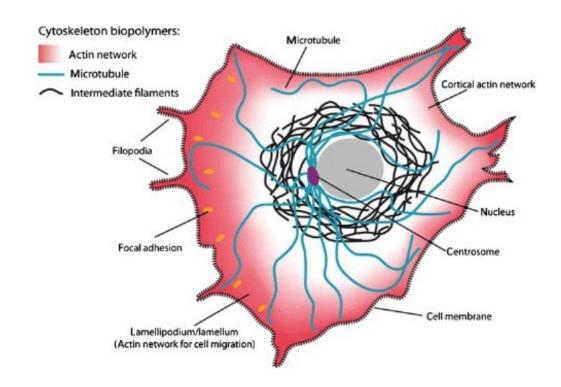
- A cellular self-degradative process fundamental in:
 - balancing sources of energy at critical times in development and in response to nutrient stress
 - housekeeping in removing
 - misfolded or aggregated proteins
 - clearing damaged organelles (mitochondria, ER...)
 - eliminating intracellular pathogens
- Autophagy is generally thought of as a cellular survival mechanism

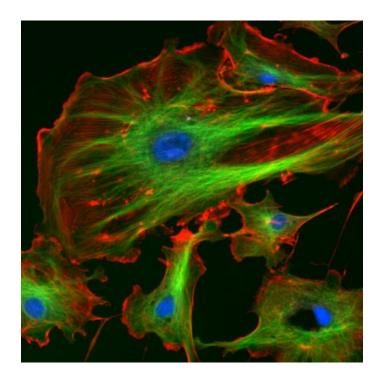


- Mitochondria = the cellular power plants where energy is produced
 - They use food components (mainly carbohydrates) to produce highly energetic molecules (ATP)
 - ATP hydrolysis = energy



 Cytoskeleton = mechanical support, shape, and strength





 Celia, flagella = cellular movement, sensory organelles



