

# THE CELL

Cells: The Fundamental Units of Life  
all organisms are made of cells

## CHARACTERISTICS of ALL CELLS

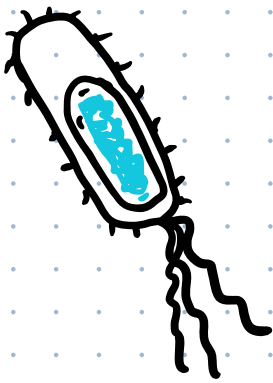
- Plasma Membrane
- Cytosol (semi-fluid in cells)
- Chromosomes → carry genes
- Ribosomes → make proteins

## CHROMOSOMES

prokaryotic ○  
eukaryotic ∴

## TWO TYPES of CELLS

### Prokaryotic



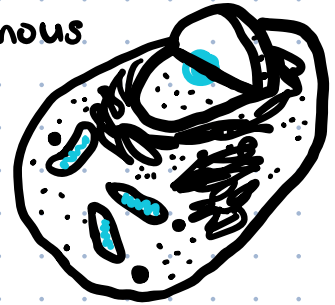
- no nucleus
- unbound DNA in the nucleoid
- no membrane bound organelles
- cytoplasm bound by the plasma membrane

### Eukaryotic

DNA in a nucleus bound by a membranous nuclear envelope

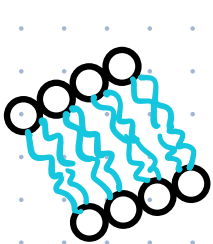
membrane-bound organelles

cytoplasm in the region between membrane and nucleus



## PARTS of the CELL ... endomembrane system (inside the membrane)

**Plasma Membrane:** selective barrier that allows oxygen, nutrients, and waste made of a **lipid bilayer**



**Nucleus:** contains most of the DNA in a eukaryotic cell  
↳ organized into **chromosomes**



**nuclear envelope** - double membrane surrounding the nucleus and separating it from the cytoplasm

**nucleolus** - located within the nucleus, site of ribosomal RNA synthesis

**Ribosomes:** particles of ribosomal RNA and protein (carry out protein synthesis)

**free ribosomes** - make proteins for the cell itself

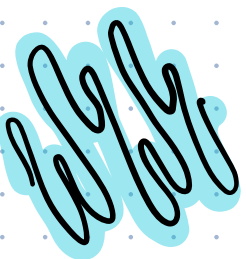
**bound ribosomes** - stuck to a membrane and only make proteins for that organelle




**Endoplasmic Reticulum:** accounts for more than half of the total membrane in many eukaryotic cells

**Smooth ER** - lacks ribosomes, synthesizes lipids, stores calcium ions, metabolizes carbs, detoxifies drugs + poisons

**Rough ER** - surface studded with ribosomes, create glycoproteins, distribute transport vesicles, membrane factory for cell



**Golgi Apparatus:** consists of flattened membranous sacs, or **cisterna** modifies products of ER, manufactures polysaccharides, sorts & packages materials into **transport vesicles**



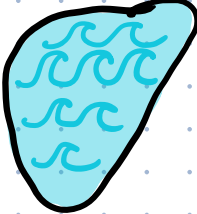
**Lysosomes:** membranous sac of hydrolytic enzymes that can digest macromolecules, hydrolyze proteins, fats, polysaccharides, and nucleic acids, some can engulf another cell by **phagocytosis** (forms food vacuole), lysosome can recycle its own organelles via **autophagy**

**Vacuoles:** a cell may have 1 or many, derived from golgi apparatus + ER

**Food Vacuoles** - formed by phagocytosis in protists

**Contractile Vacuole** - found in many freshwater protists, pumps out water

**Central vacuole** - found in many mature plant cells, hold organic compounds and water



**Mitochondria:** sites of cellular respiration, a metabolic process that uses oxygen to generate **ATP**

smooth outer membrane

inner membrane folded into **cristae** (for ATP synthesizing)

• **intermembrane space**

• **mitochondrial matrix**



**Chloroplasts:** found in plants and algae, contain chlorophyll, and are sites of photosynthesis

part of organelles called **plastids**

three membrane layers

• **Thylakoids** - membranous sacs, stacked to form granum

• Inner & outer membrane

• **Stroma** - fluid between inner membrane and thylakoids

**Mitochondria + Chloroplasts similar to Bacteria**

- double membrane

- free ribosomes and circular DNA molecules

- grow + reproduce "somewhat" independently in cells

- evolved through endosymbiosis of bacteria (mitochondria) or cyanobacteria (chloroplasts)



\* endosymbiotic theory ... structures work together, one inside the other

**Cytoskeleton:** network of fibers extending throughout the cytoplasm organizes cell structure gives it shape forms highways for transport

- microtubules - flagella, cilia
- microfilaments - cell shape, cell division
- intermediate filaments - organelle anchorage

## Extracellular Components and Connections

- animal cells lack cell walls but are covered by an elaborate extracellular matrix (ECM)
  - made of glycoproteins such as collagen
  - ECM proteins bind to receptor proteins in the plasma membrane called integrins
  - Functions of the ECM: support, adhesion, movement, and regulation
- the cell wall of a plant is an extracellular structure that helps protect the plant cell, maintain its shape, and prevent excessive uptake of water
  - made of cellulose fibers in polysaccharides and protein
  - have channels, plasmodesmata, that allow water and small solutes to pass from cell to cell

## Animal Cell Junctions

intercellular junctions: where cells, tissues, organs, or organ system interact and communicate through direct physical contact

- tight junctions, membranes of neighboring cells are pressed together
- desmosomes (anchoring) fasten cells together into strong sheets
- gap junctions (communicating) provide cytoplasmic channels between adjacent cells