

Cell: The Unit of Life

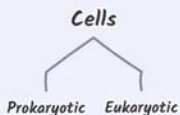
one boundary, one nucleus or none, and everything else inside

Cell theory

- Schleiden (1838), Schwann (1839): all plants, animals are made of cells, the basic unit of life
- Rudolf Virchow (1855) added: cells arise only from pre-existing cells, ruling out spontaneous generation
- modern addition: life originates from the cell, every organism begins as a single cell

Prokaryotic vs eukaryotic, the split

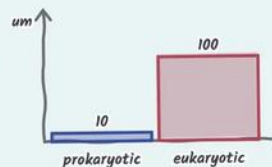
Prokaryotic



the one split every cell falls on either side of: a true, membrane-bound nucleus, or none at all

- no nuclear membrane: DNA lies free in the cytoplasm as a nucleoid
- most membrane-bound organelles are absent
- usually smaller: roughly 1 to 10 micrometres

Eukaryotic



the top of each stated size range, in micrometres (um):
prokaryotic cells up to about 10, eukaryotic up to about 100

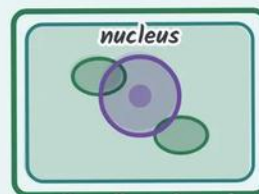
- a true nucleus, bound by a nuclear membrane
- a full set of membrane-bound organelles
- usually larger: roughly 5 to 100 micrometres

The prokaryotic cell: wall, extras, ribosomes

- a rigid cell wall outside the membrane, usual in prokaryotes; chemistry differs, bacteria vs archaea
- some add a glycocalyx outside the wall: loose slime layer, or a firm capsule
- flagella (if present) give motility; pili and fimbriae help attachment to surfaces or cells
- one large circular DNA in the nucleoid; some bacteria add small plasmids, useful in genetic engineering
- prokaryotic ribosomes: smaller than eukaryotic, scattered in the cytoplasm, sometimes on the plasma membrane
- reserve material stored as inclusion bodies: free in the cytoplasm, no membrane around them

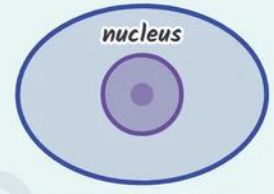
Eukaryotic cells, plant and animal

- both eukaryotic: share a true nucleus, most organelles, similar internal organisation
- plant cell adds a rigid cellulose wall and usually plastids; animal cell has neither



cell wall + plastids

a squared-off wall around the membrane, plastids inside: the plant cell's two extras



plasma membrane

no wall at all, just a rounded plasma membrane: the animal cell plan

What every cell still shares *

- a plasma membrane, selectively permeable, controlling what moves in and out
- cytoplasm: the ground substance where the cell's metabolic reactions happen
- ribosomes, the site of protein synthesis, in both prokaryotic and eukaryotic cells