

Genomes

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What is a genome?

i Official definition

The National Human Genome Research Institute defines a **genome** as the complete set of DNA in an organism.

A **genome** is “all the DNA” — but *all the DNA in what system?*

Eukaryotic cells can contain **more than one genome** (nuclear + mitochondrial, and chloroplast in plants).

! Avoid a common confusion

- “**Genome**” = all DNA in the system being discussed
- “**Nuclear genome**” = all DNA in the nucleus
- “**Mitochondrial genome**” = all DNA in mitochondria
- “**Chloroplast genome**” = all DNA in chloroplast

Eukaryote: DNA is in compartments

In the Eukaryotic cell on the left there are membrane-bound organelles including:

- A **nucleus** (holds most DNA)
- **Mitochondria** (have their own DNA)

The prokaryotic cell on the right lacks organelles (more on that later).

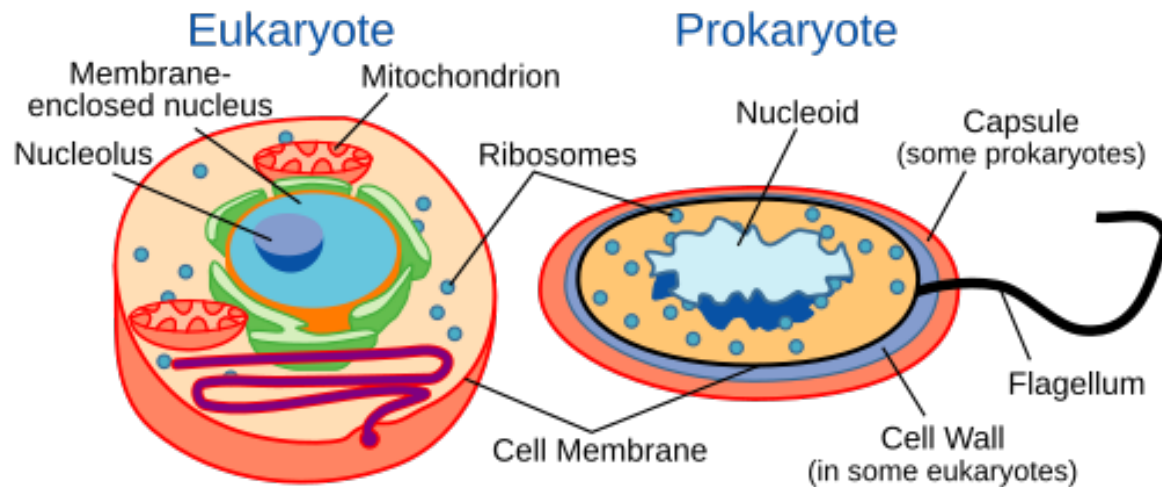
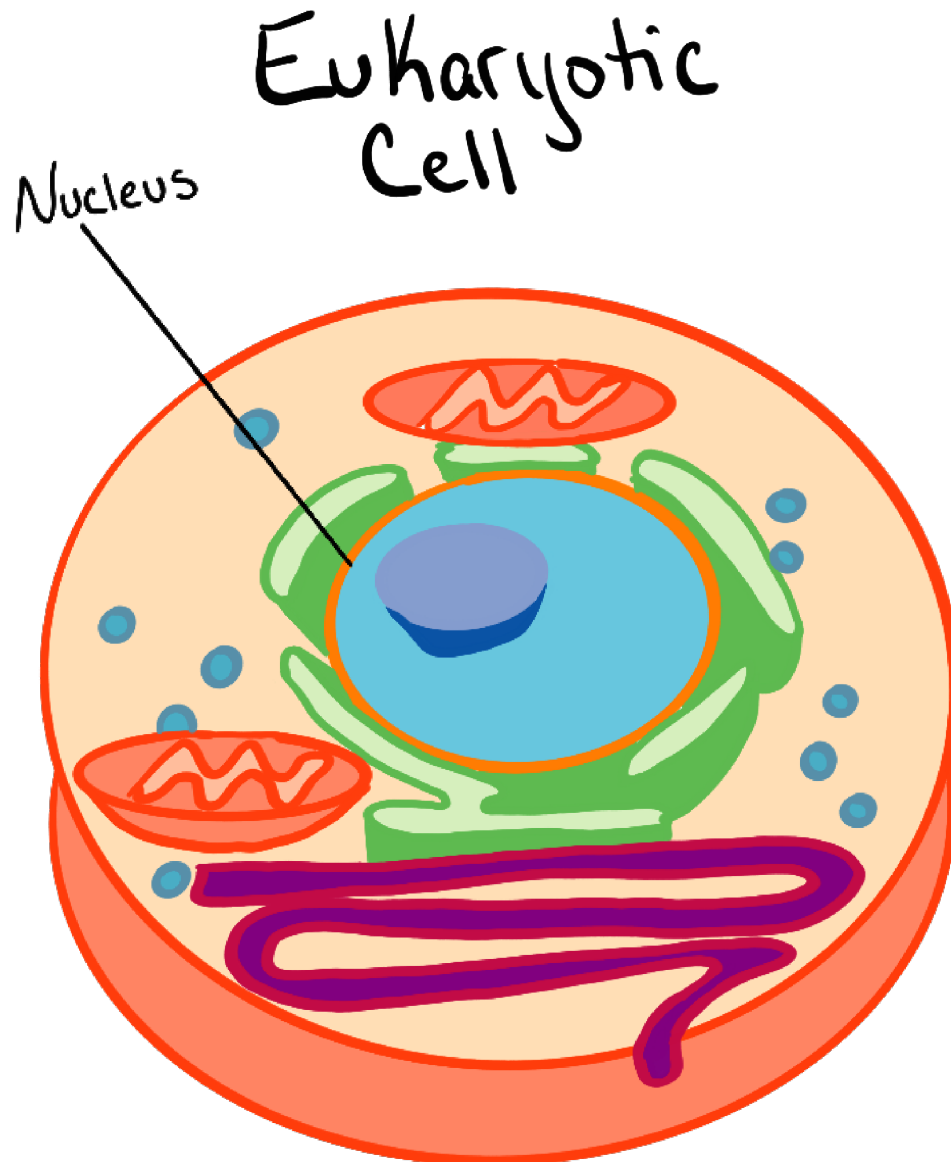


Figure. A eukaryotic cell has a nucleus and organelles a prokaryotic cell does not (more on that below). Image Source: Science Primer (National Center for Biotechnology Information). Vectorized by Mortadelo2005., Public domain, via Wikimedia Commons

Nuclear genome: DNA inside the nucleus

- DNA is stored inside a **membrane-bound nucleus**
- This DNA is packaged and organized (later: chromosomes)



ure. The nucleus houses most DNA in eukaryotic cells.

Fig-

Mitochondrial genome: DNA inside mitochondria

- Mitochondria contain many **small circular DNA molecules**
- The mitochondrial genome is distinct from the nuclear genome

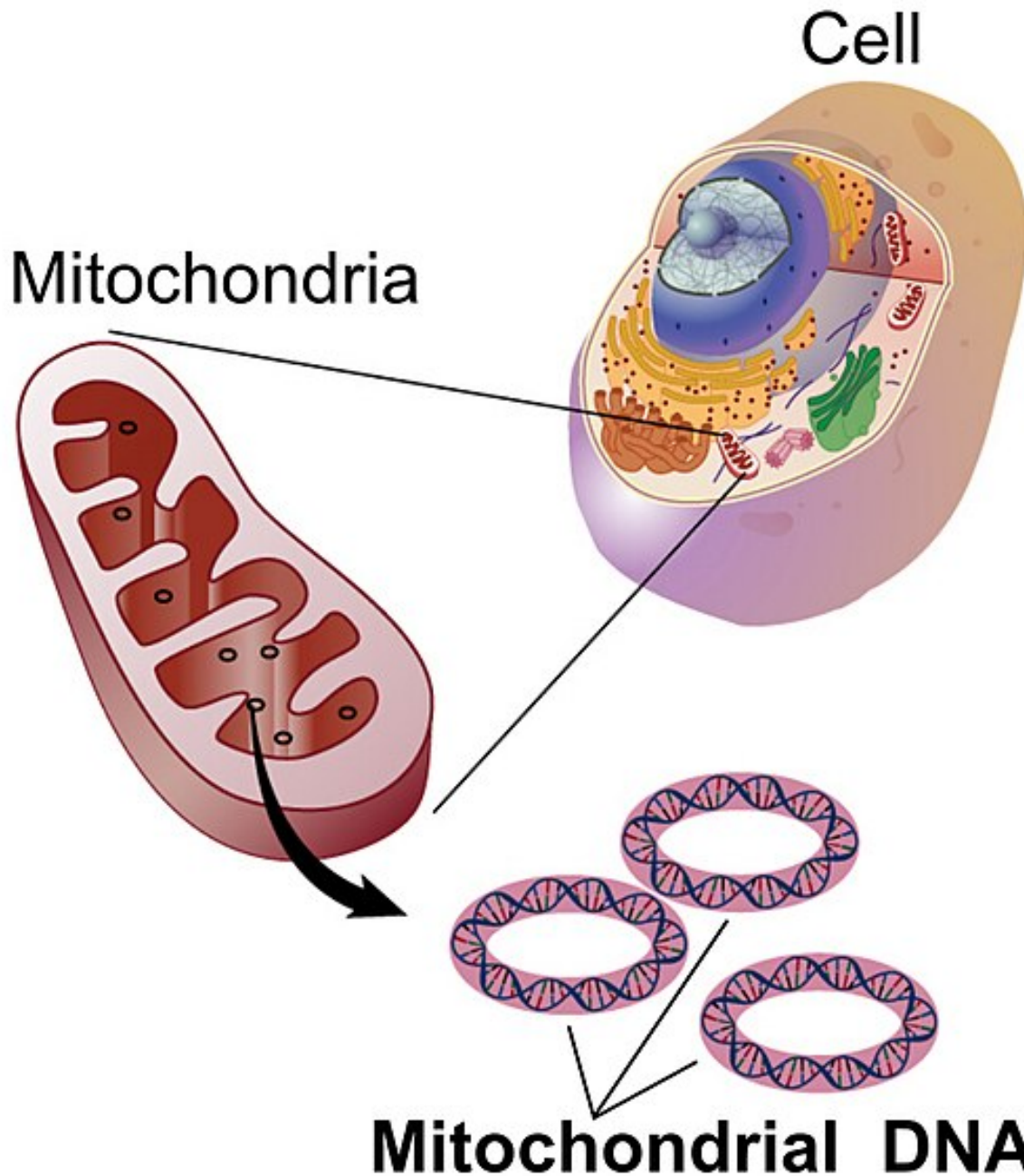


Figure. Magnification of the mitochondria from an animal cell and a depiction of mitochondrial circular DNA. Image Source: National Human Genome Research Institute, Public domain, via Wikimedia Commons

Chloroplast genome: DNA inside chloroplasts (plants/algae)

- Chloroplasts (the organelles that perform photosynthesis) also contain their own DNA
- Like mtDNA, it is typically **circular**

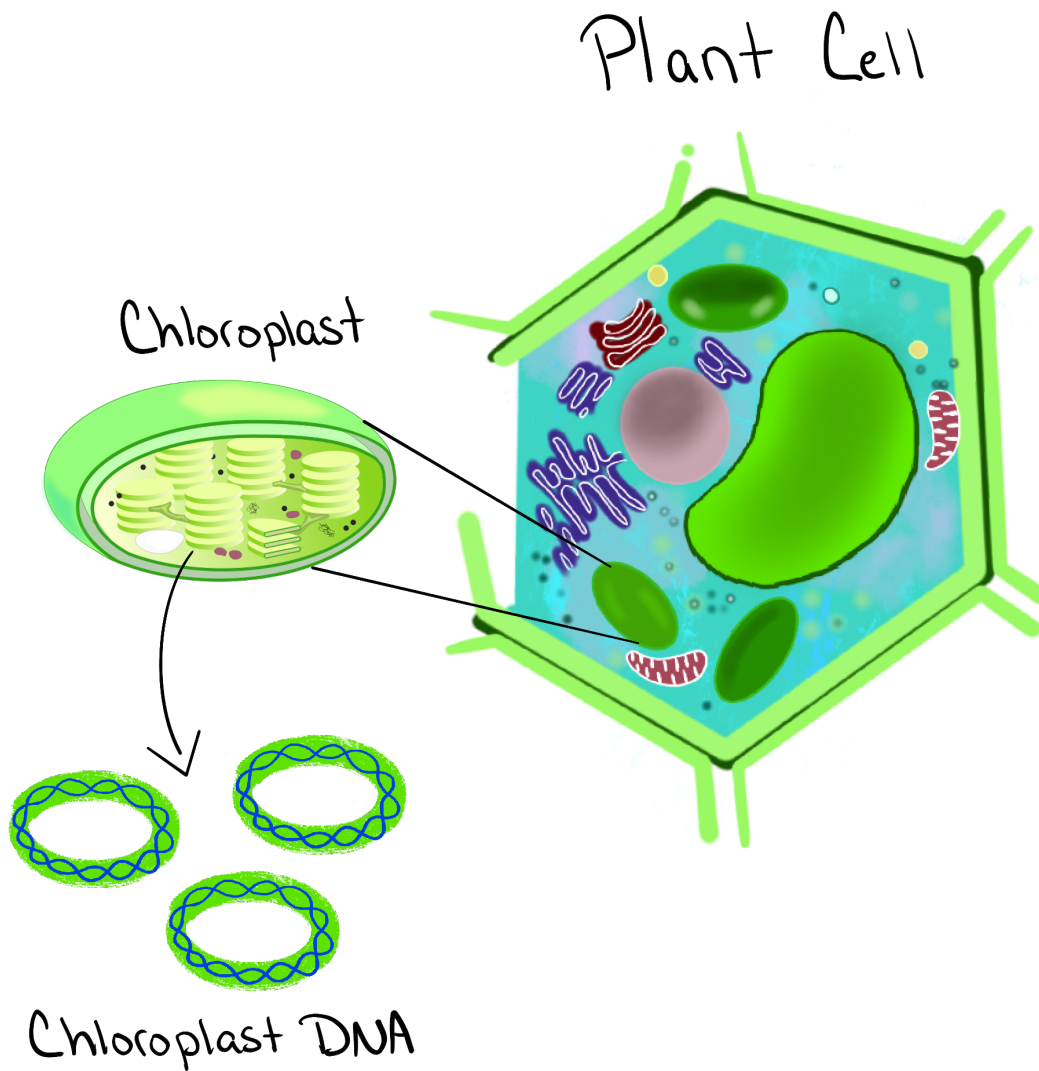


Fig-
ure. A plant cell, a chloroplast, and circular chloroplast DNA.

Prokaryote: no nucleus, DNA is in the nucleoid

A prokaryotic cell doesn't have membrane-bound organelles. It has:

- No nucleus
- DNA concentrated in a **nucleoid region**
- Often small extra DNA circles (**plasmids**)

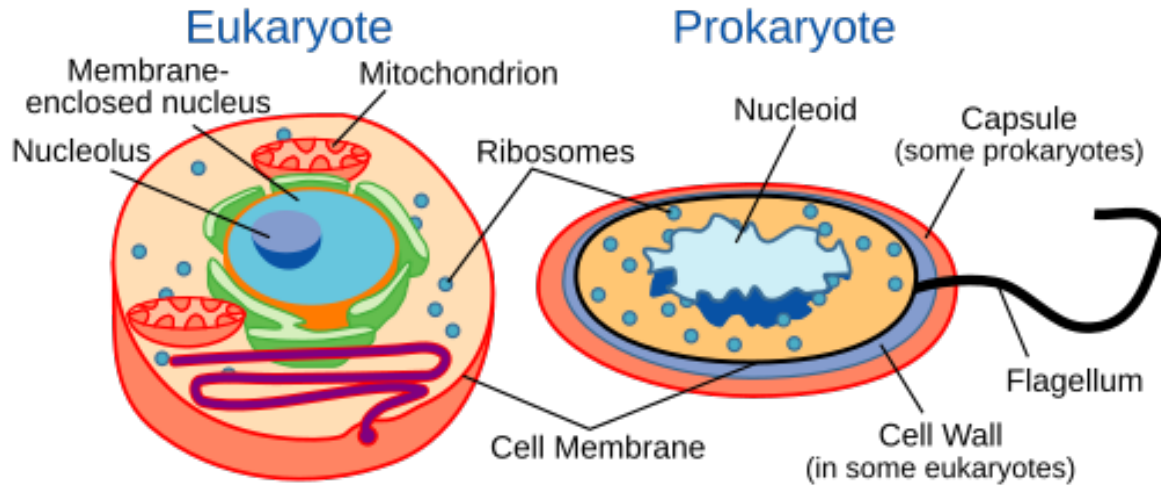


Figure. Eukaryotic cell on the left, Prokaryotic cell with nucleoid DNA on the right. Image Source: Science Primer (National Center for Biotechnology Information). Vectorized by Mortadelo2005., Public domain, via Wikimedia Commons