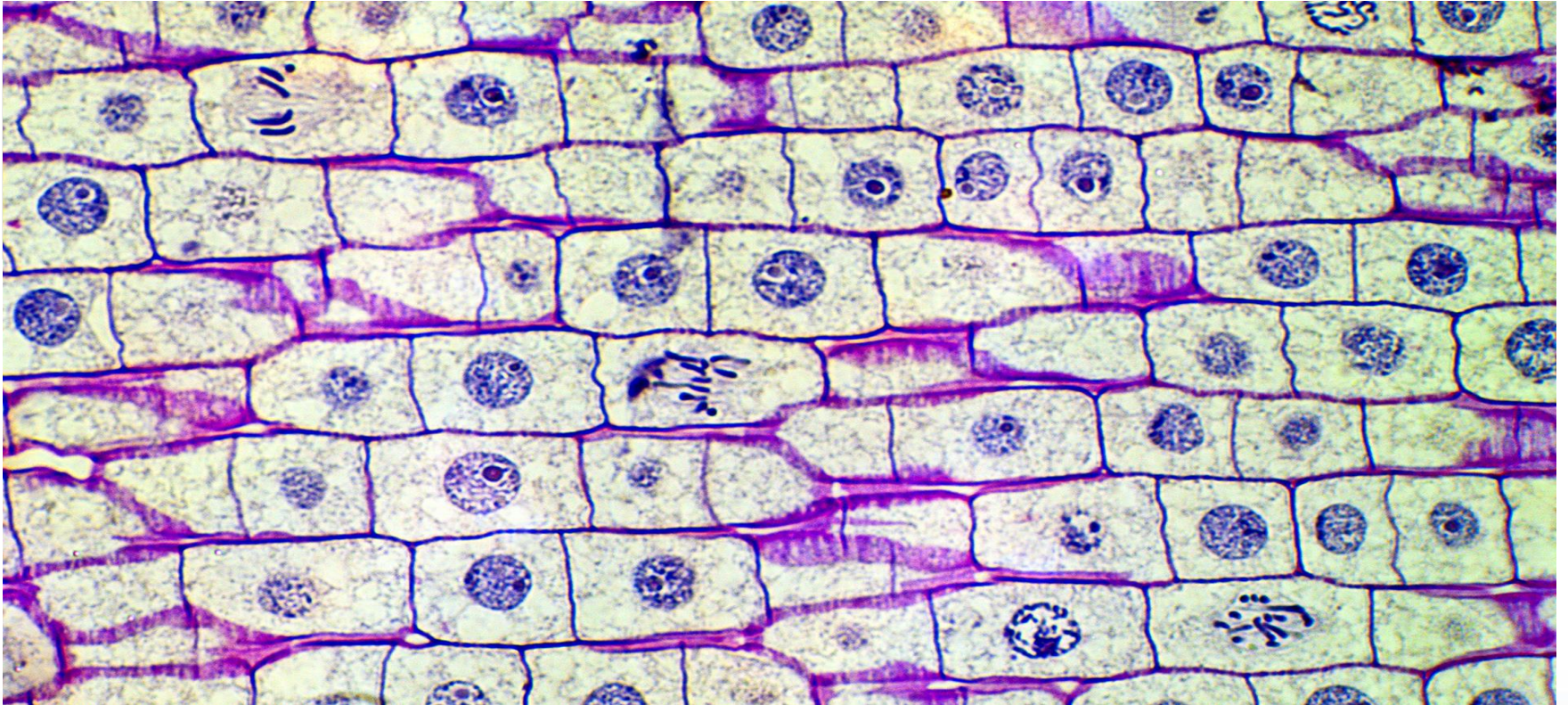


Chapter 11: Cell Growth & Division

Lesson 2: The Process of Cell Division



Onion cells undergoing mitosis

Cell division

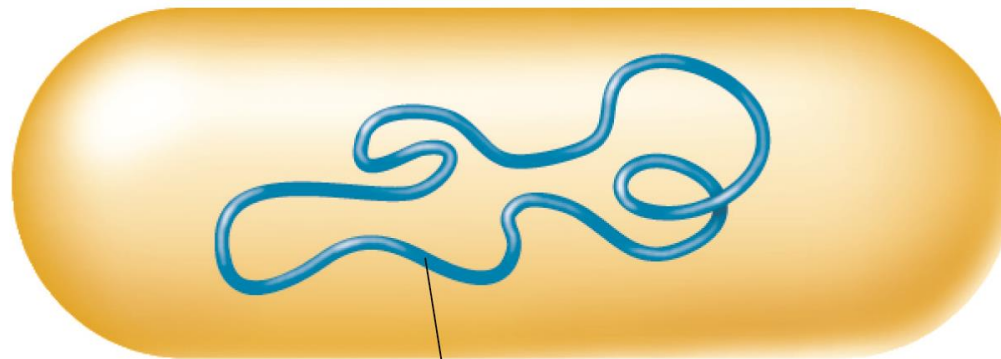
- Small children grow larger every year.
- A broken bone or cut on the skin come from your body going through cell division to heal your ailments.
- Red blood cells live for about 4 months in your circulatory system then get replaced with new cells.
- Daily wear and tear of your skin are replaced daily by new cells through cell division.

Chromosomes

- The first thing that happens before cell division is the cell makes a complete copy of its genetic information
- **Chromosomes:** threadlike structure of DNA and protein that contains genetic information
 - Bundled packages of DNA
 - In eukaryotes, chromosomes are found in the nucleus
 - In prokaryotes, chromosomes are found in the cytoplasm

Chromosomes

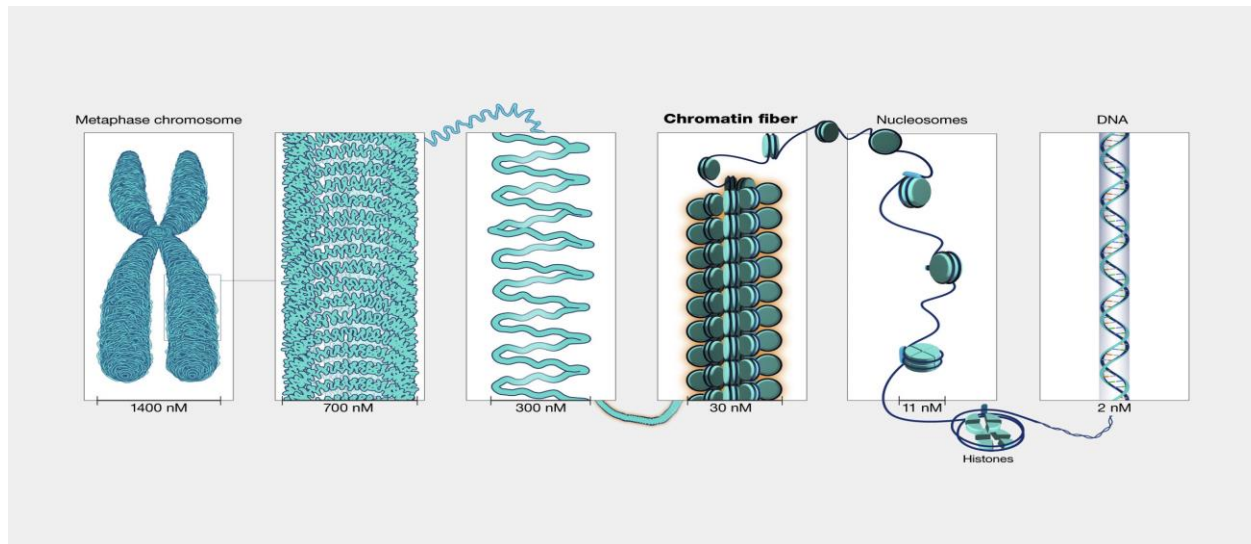
- Remember, prokaryotic cells lack a membrane-bound nuclei where the DNA should be located.
- In prokaryotic cells, DNA is packaged into a single, circular chromosome.
- Think of it in terms of a 300-m rope stuffed into your school backpack.



Chromosome

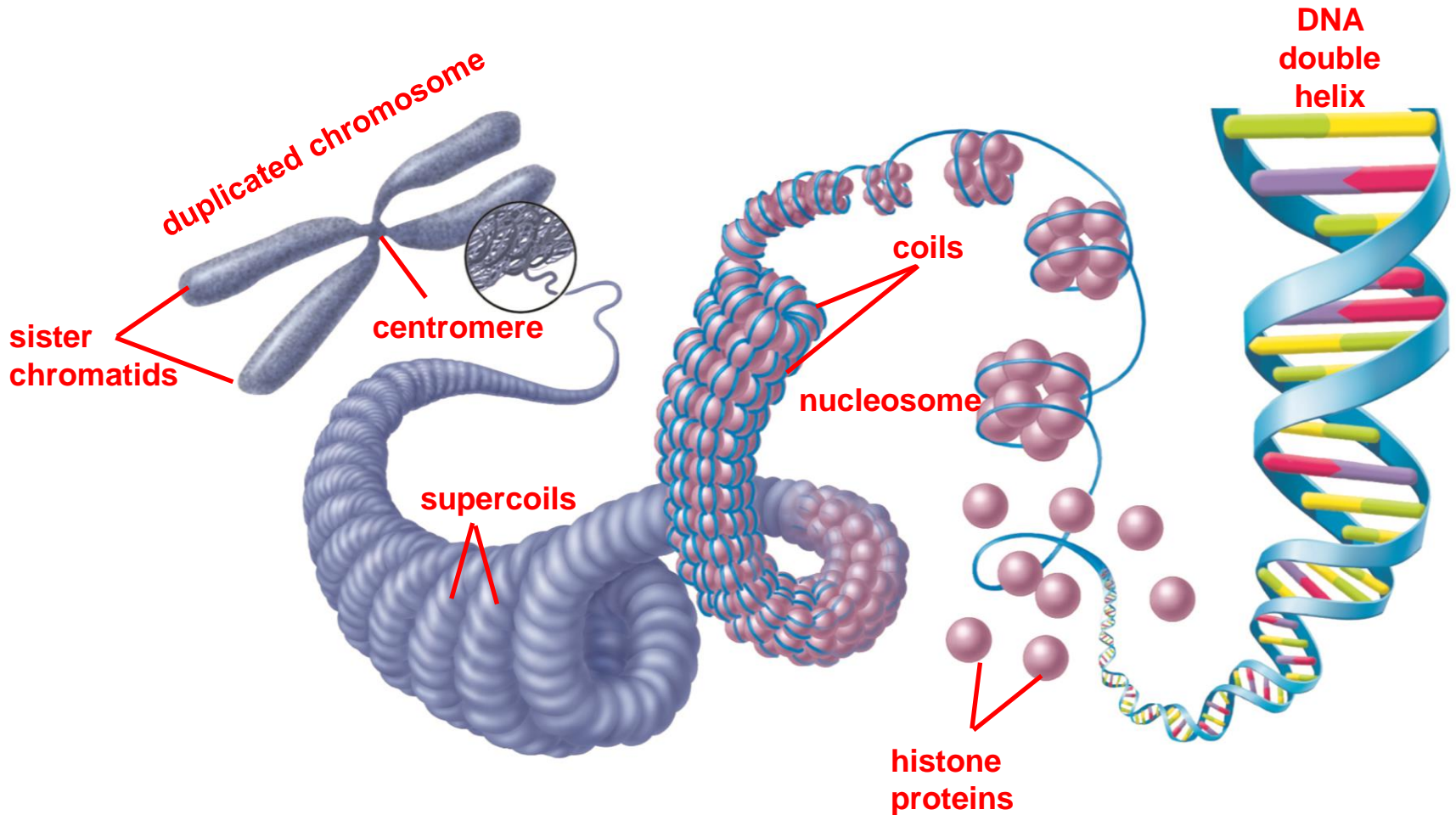
Chromosomes

- In eukaryotic cells, there is generally more DNA and multiple chromosomes
 - Fruit flies = 8 chromosomes
 - Humans = 46 chromosomes
- In eukaryotic cells, the DNA is tightly bound to proteins called histones. This complex DNA and protein is referred to as chromatin
 - **Chromatin:** substance found in eukaryotic chromosomes that consists of DNA tightly coiled around histones
 - The “X” shape you see in textbooks is actually a duplicated chromosome with supercoiled chromatin



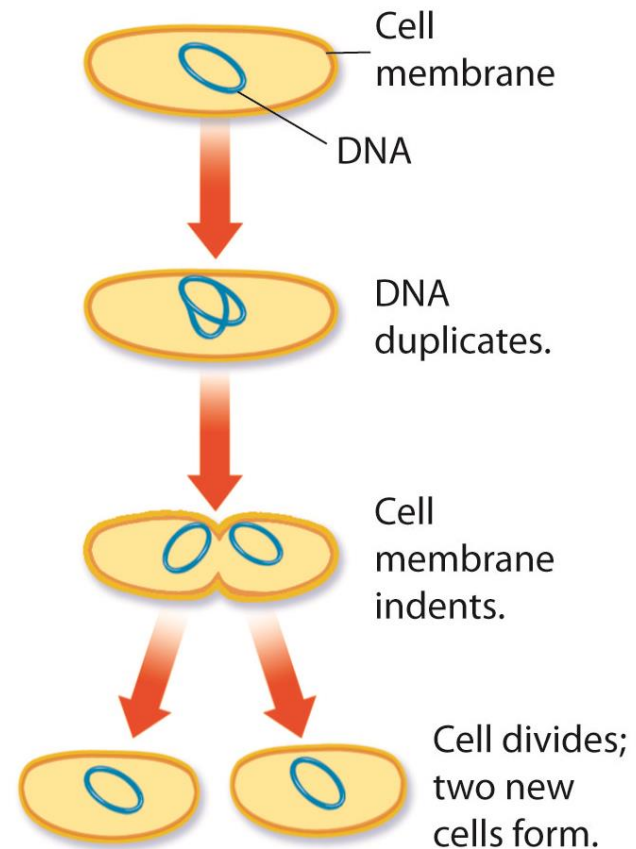
Chromosomes

In eukaryotic cells, DNA is packaged into multiple chromosomes.



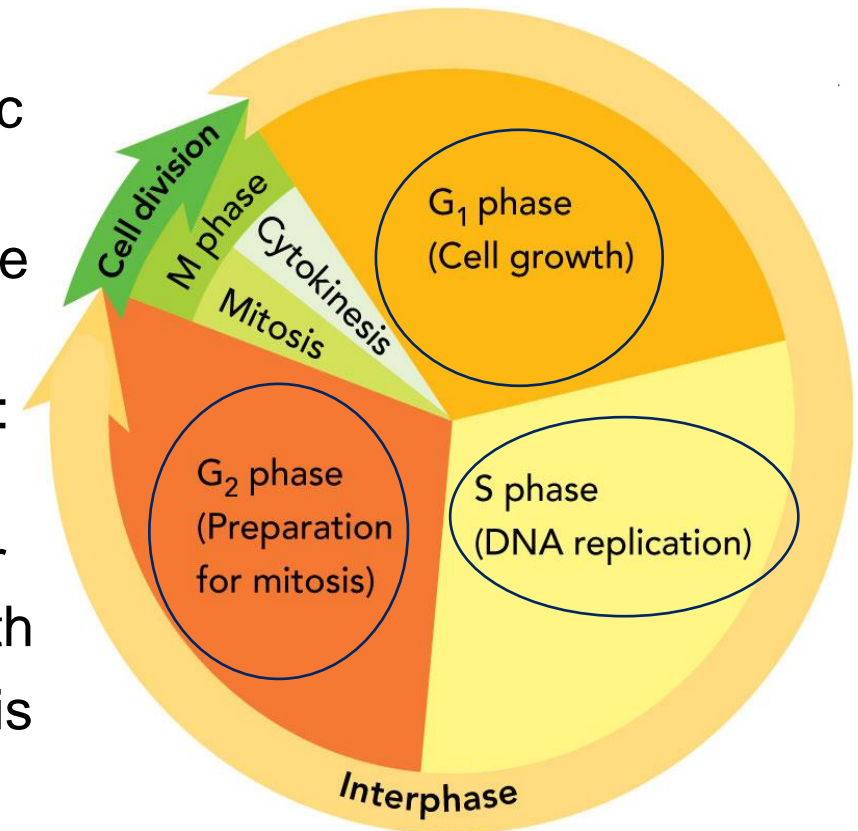
Prokaryotic Cell Cycle

- **Cell Cycle:** series of events in which a cell grows, prepares for division, and divides to form two daughter cells
- Prokaryotes undergo binary fission a form of asexual reproduction
- Takes place very rapidly
- Scientists are just beginning to understand how the cycle works
- DNA is replicated (copied) and the cell divides
- Binary fission results in two genetically identical cells.



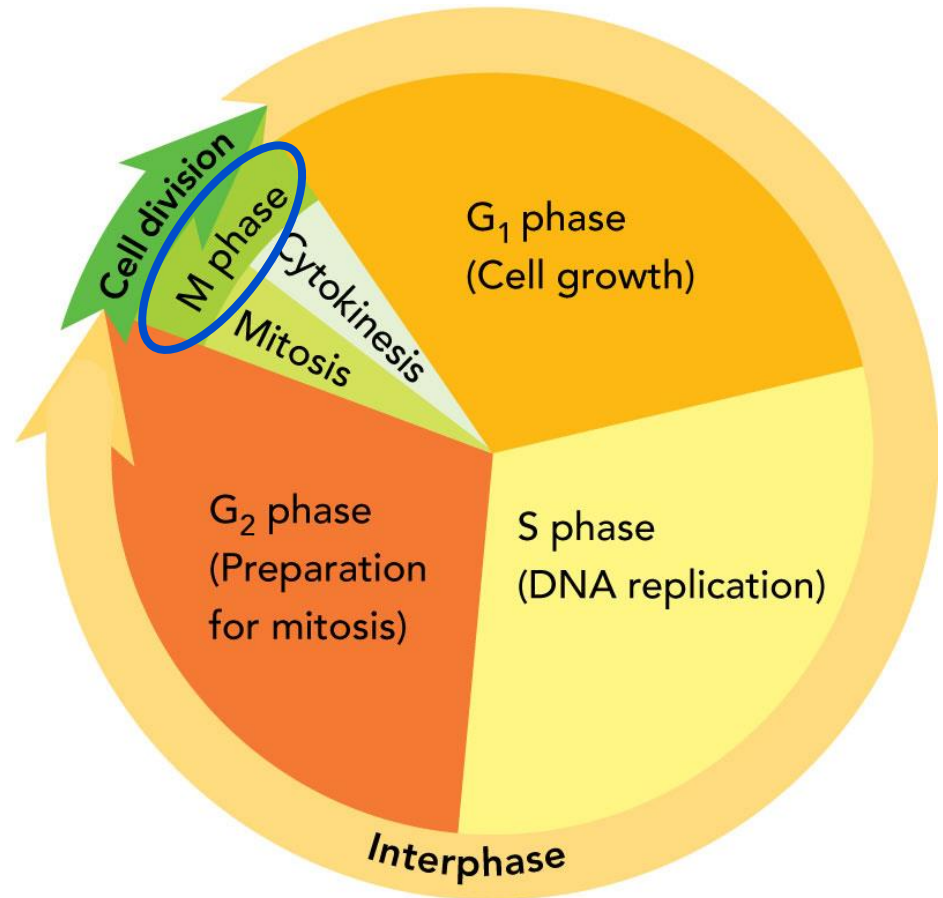
Eukaryotic Cell Cycle

- Eukaryotic cells have a more complex cell cycle than prokaryotic cells.
- **Interphase:** period of the cell cycle between cell divisions
- Eukaryotic cell cycle has 4 stages: G_1 , S, G_2 , and M
 - G_1 and G_2 – the “G” stands for gap – periods of intense growth
 - S – the “S” stands for synthesis
 - Cells do most of their growing during the G_1 phase
 - At the end of the S phase, the cell contains twice as much DNA
 - G_2 is the shortest phase and many molecules are produced



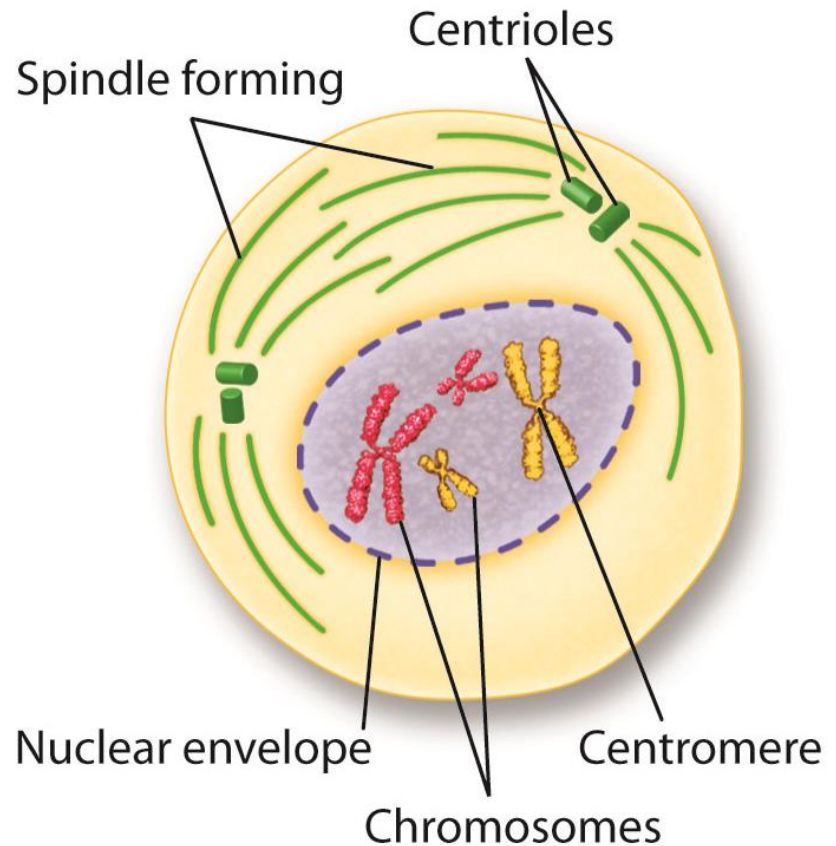
M Phase

- Cell division occurs during M phase.
 - 2 daughter cells are produced here
 - “M” stands for mitosis
- **Mitosis:** part of eukaryotic cell division during which the cell nucleus divides
 - 1st stage
- **Cytokinesis:** division of the cytoplasm to form two separate daughter cells
 - 2nd stage
- Can last from a few minutes to several days



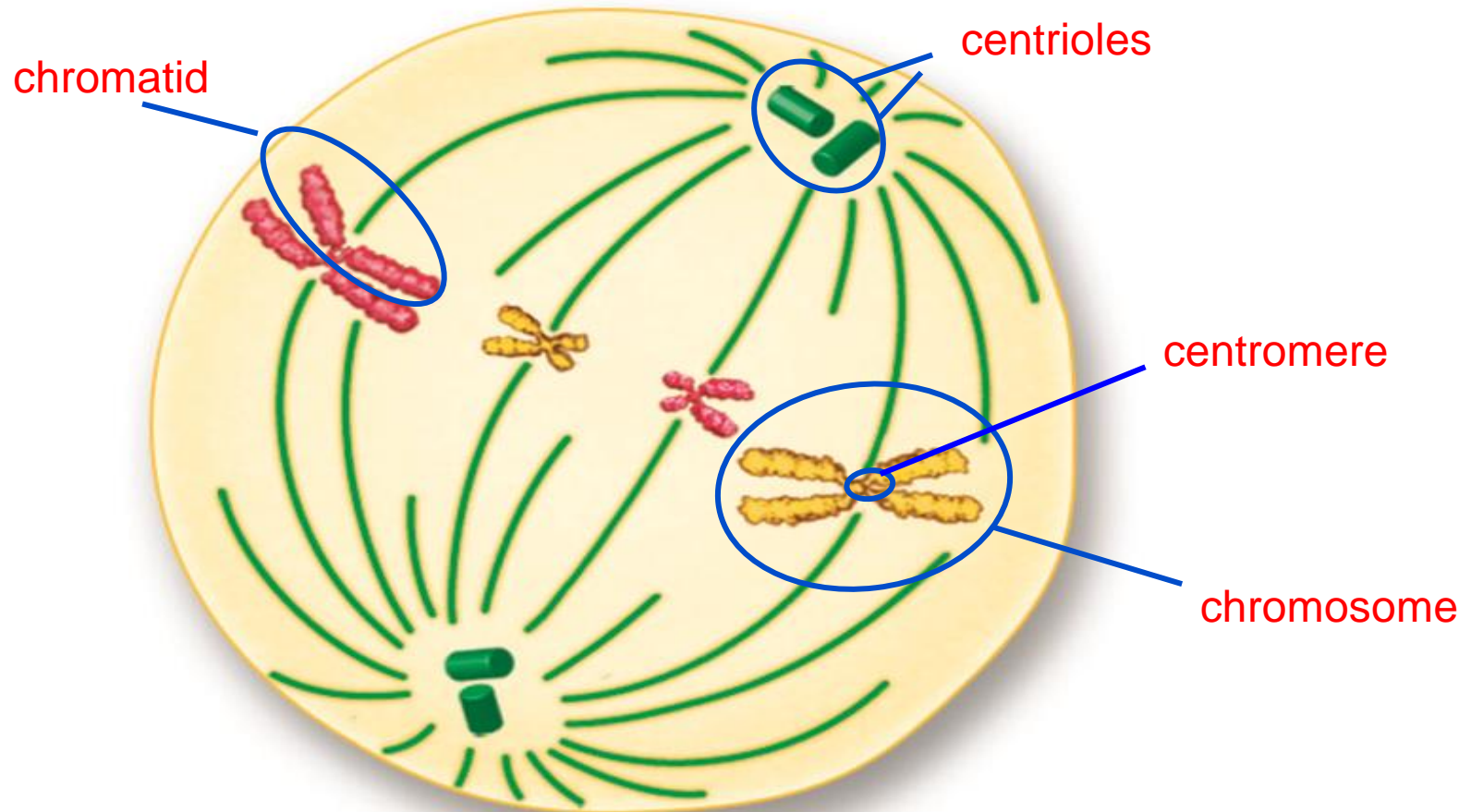
Prophase

- The nucleus condenses and chromosomes become visible. The spindle begins to form.
- **Prophase:** first and longest phase of mitosis in which the genetic material inside the nucleus condenses and the chromosomes becomes visible
- **Chromatids:** one of two identical “sister” parts of a duplicated chromosome
- **Centromere:** region of a chromosome in which the two sister chromatids attach
- **Centrioles:** structure in an animal cell that helps to organize cell division
 - The centrioles move towards opposite ends, or poles
 - Plant cells lack these



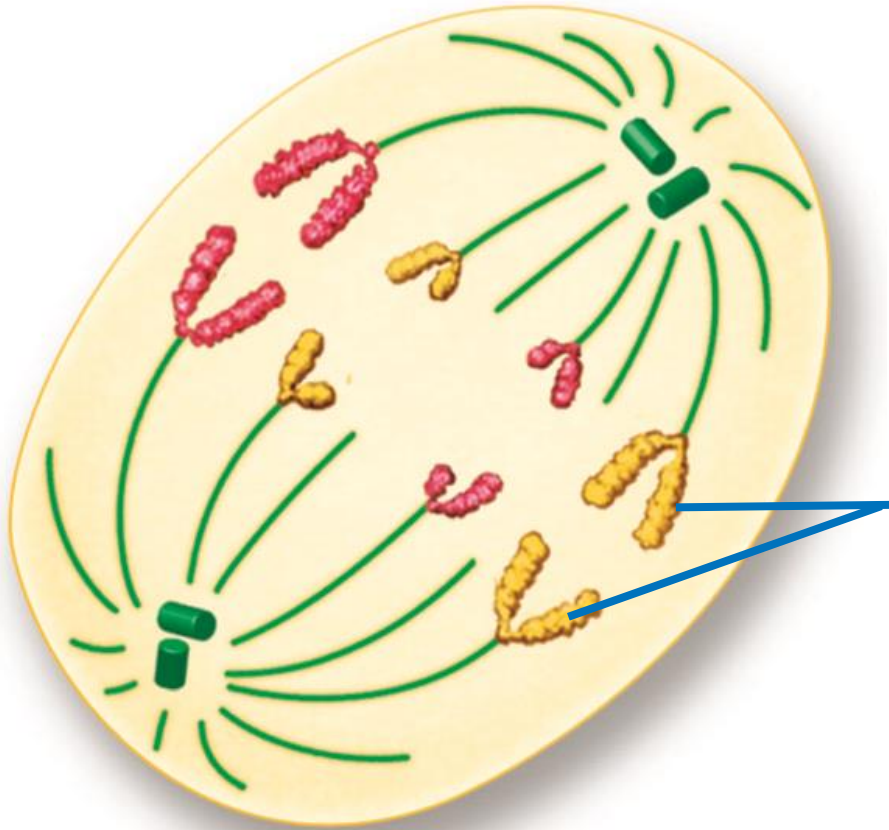
Metaphase

- Chromosomes line up at the center of the cell.
- **Metaphase:** phase of mitosis in which the chromosomes line up across the center of the cell



Anaphase

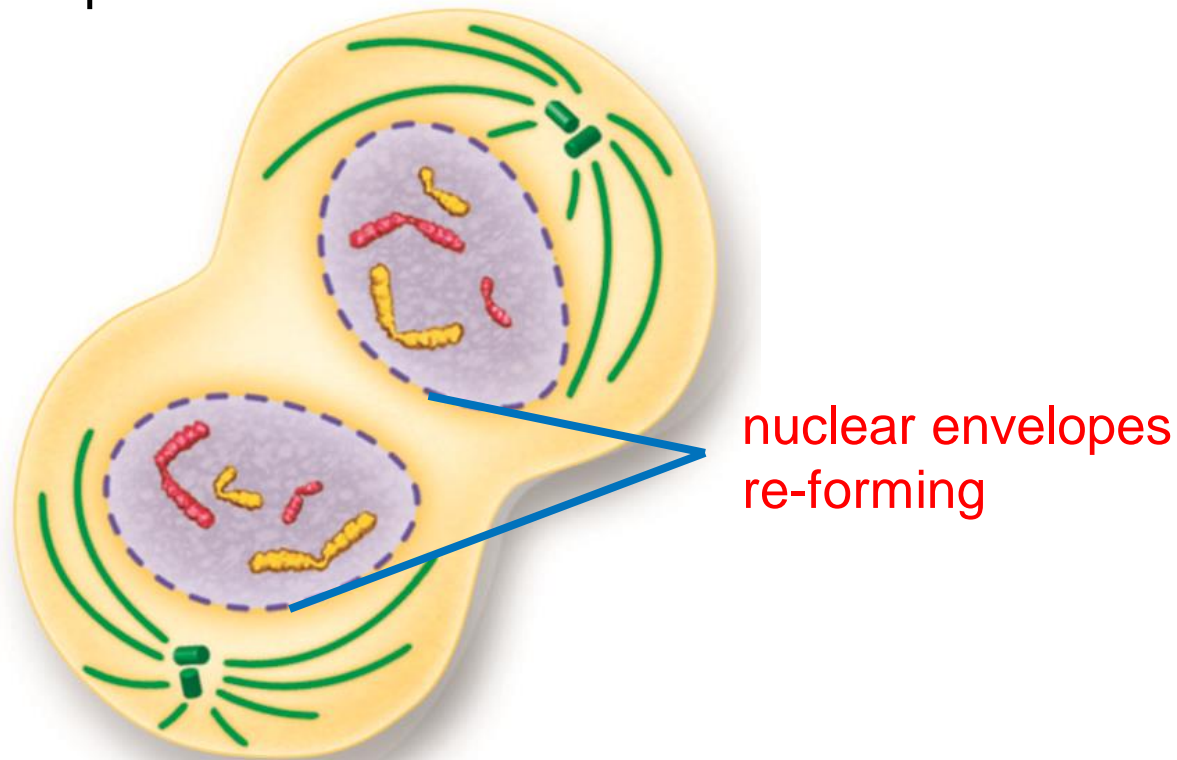
- Chromosomes move toward opposite poles.
- **Anaphase:** phase of mitosis in which the chromosomes separate and move along spindle fibers to opposite ends of the cell
- Anaphase comes to an end when the movement stops, and the chromosomes are separated into two groups



individual
chromosomes

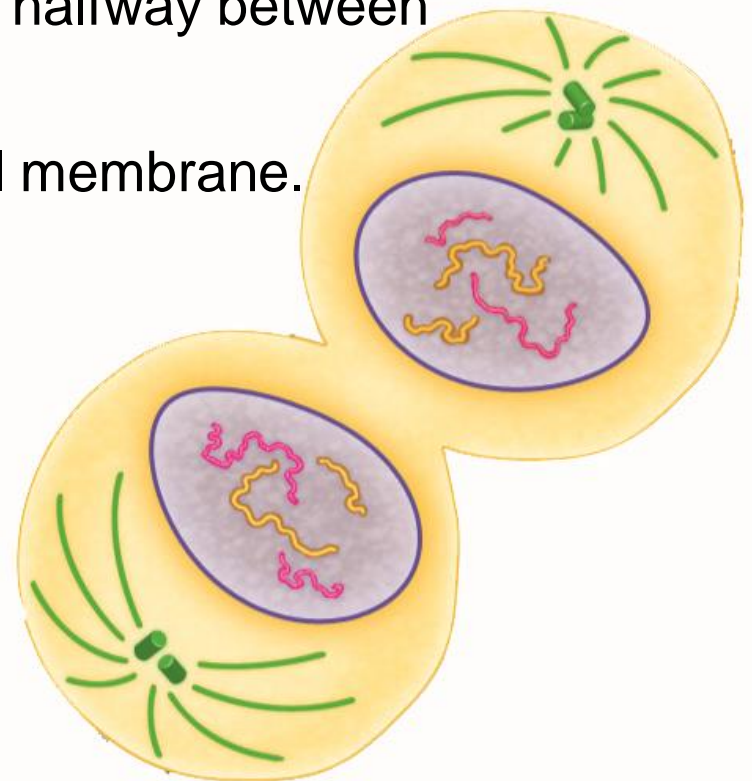
Telophase

- The cell begins to divide into daughter cells.
- **Telophase:** phase of mitosis in which the distinct individual chromosomes begin to spread out into a tangle of chromatin
- Nuclear envelope reforms around each cluster of chromosomes
- Mitosis is complete!



Cytokinesis

- Cytokinesis usually occurs at the same time as telophase
- Completes the process of cell division by dividing one cell into two
- In animal cells, the cell membrane pinches in the center to form two daughter cells.
- In plant cells, the cell membrane is not flexible enough because of the cell wall. Instead, a cell plate forms halfway between the divided nuclei
 - The cell plate develops into the cell membrane.



Mitosis Overview

