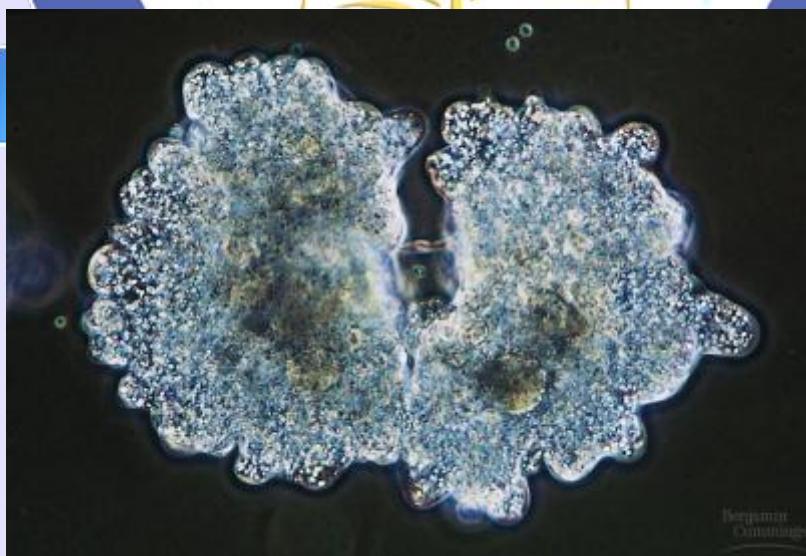
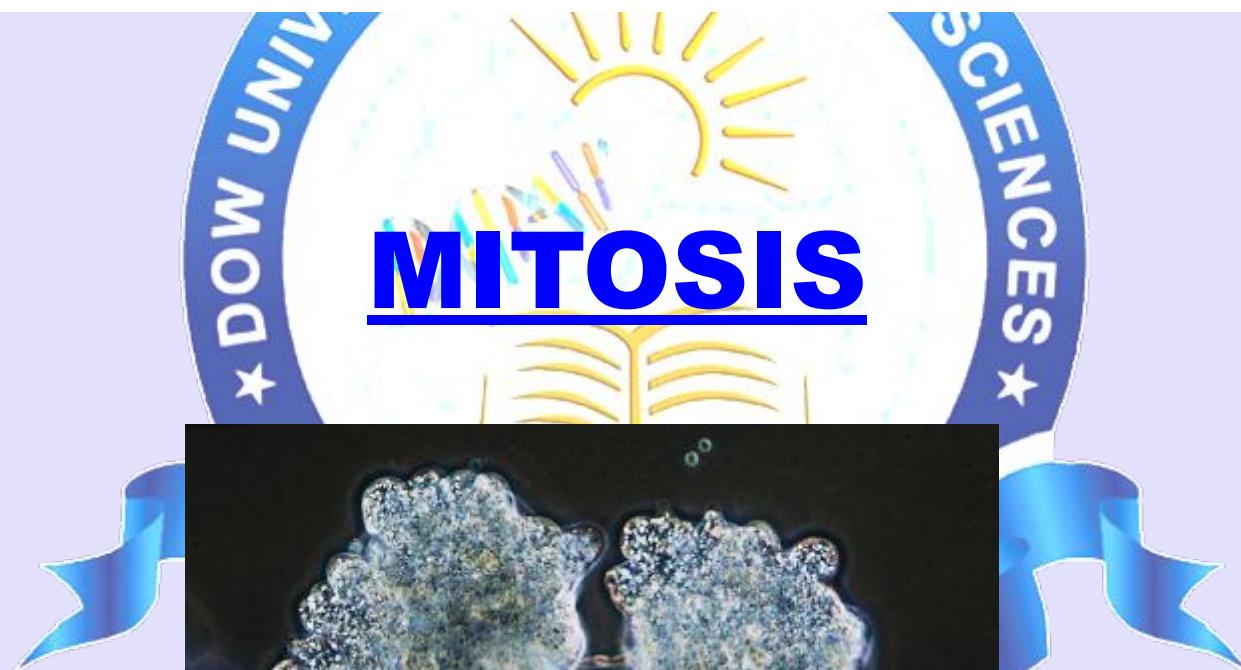


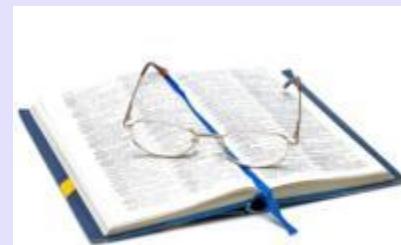
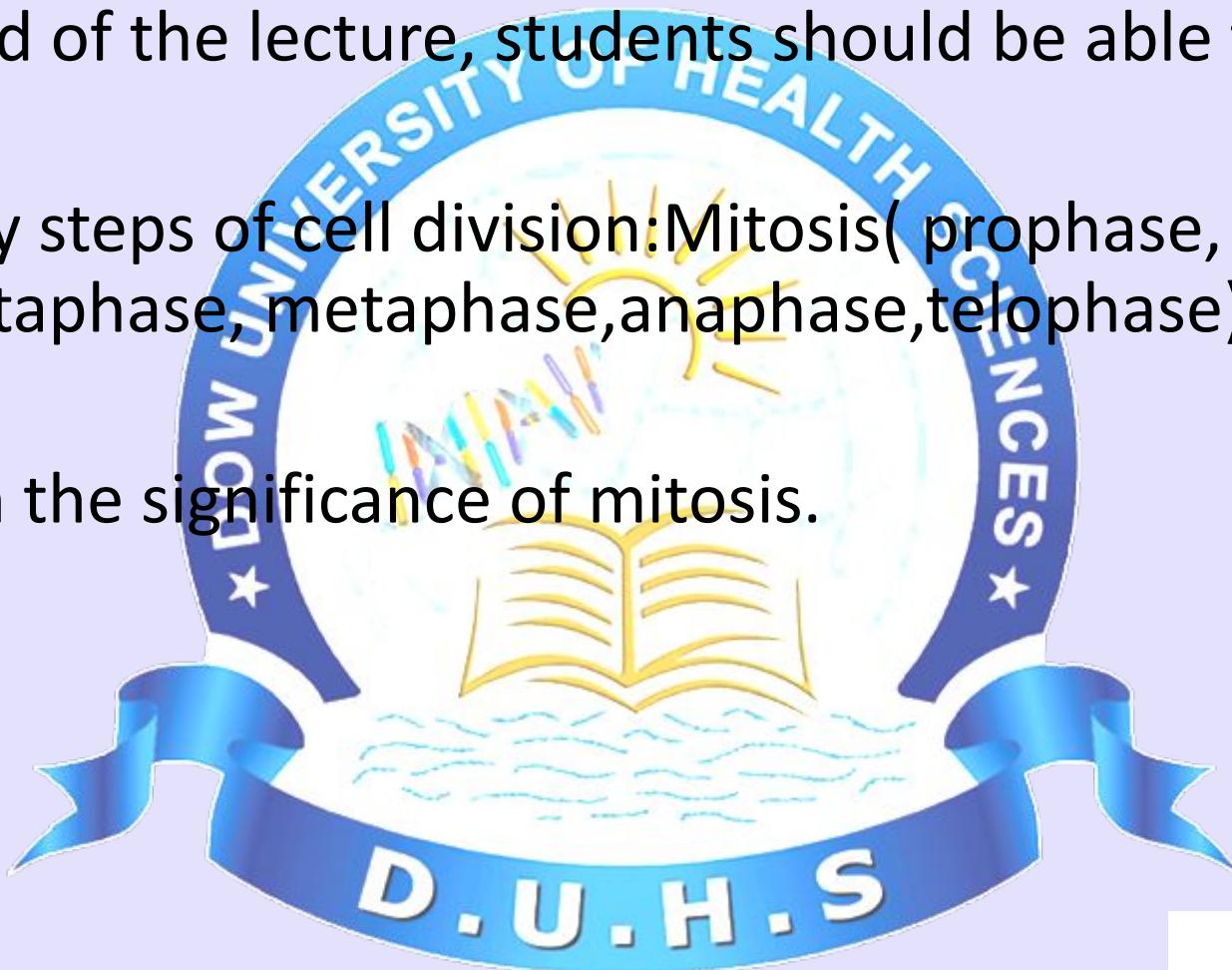
بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



LEARNING OBJECTIVES

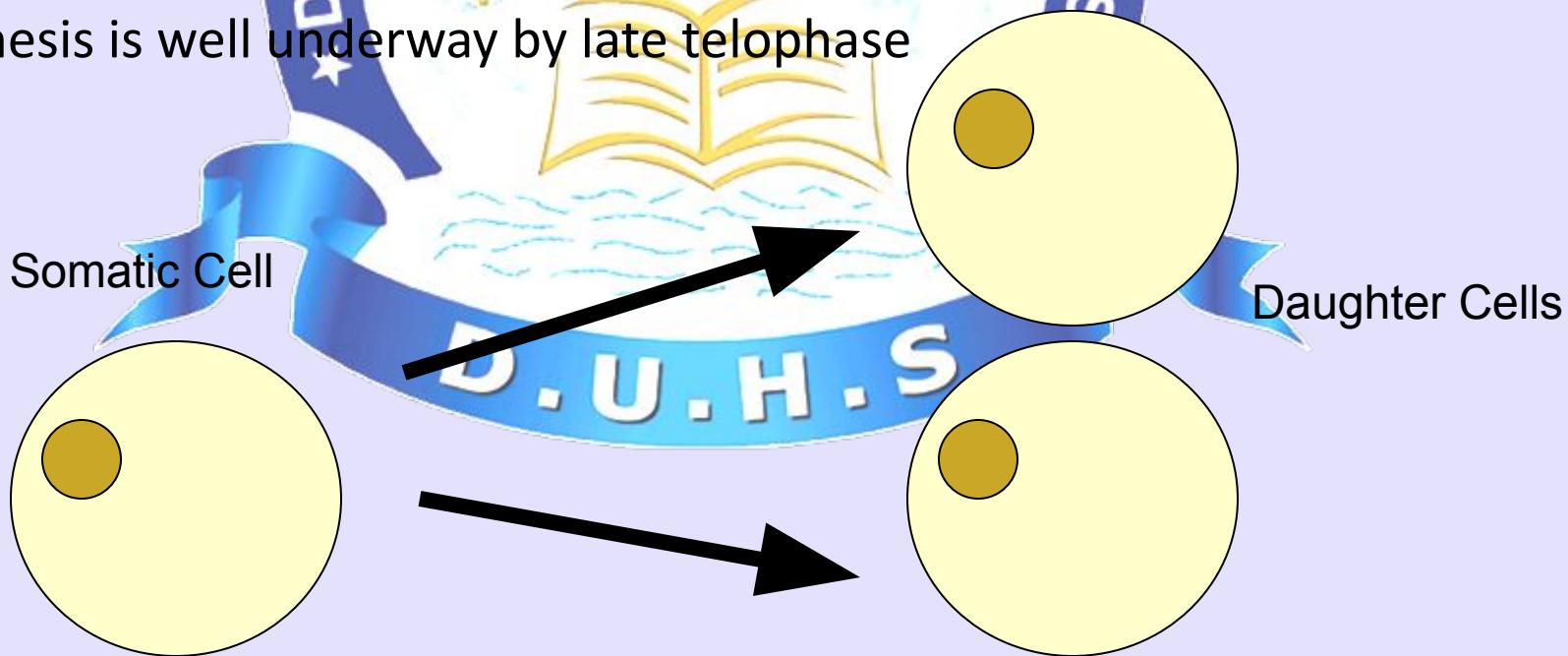
At the end of the lecture, students should be able to:

- Identify steps of cell division: Mitosis(prophase, prometaphase, metaphase, anaphase, telophase)
- Explain the significance of mitosis.



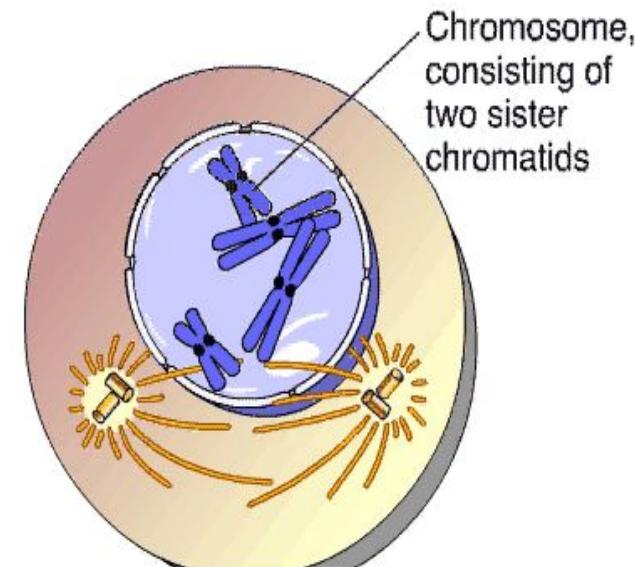
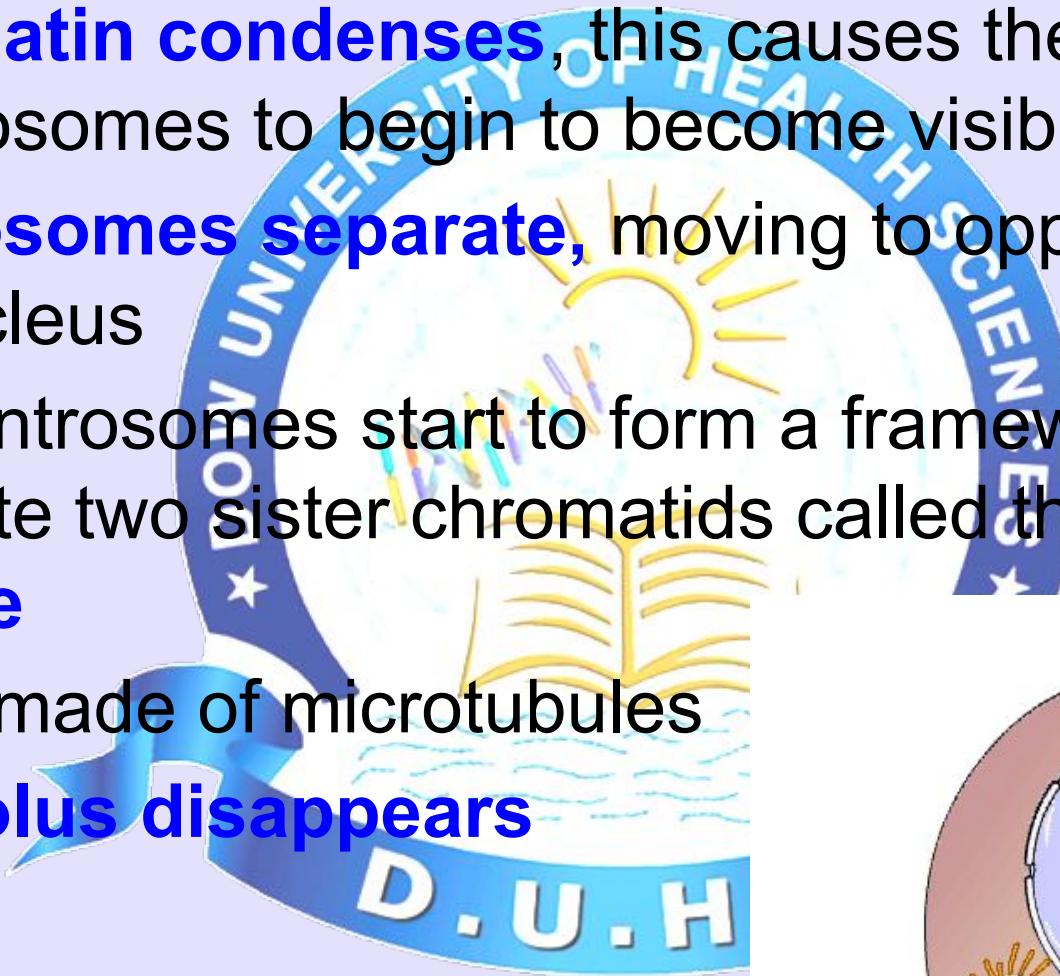
MITOSIS

- Division of **somatic cell** into **two identical daughter cells**.
- Mitosis is conventionally divided into five phases:
 - Prophase
 - Prometaphase
 - Metaphase
 - Anaphase
 - Telophase
- Cytokinesis is well underway by late telophase



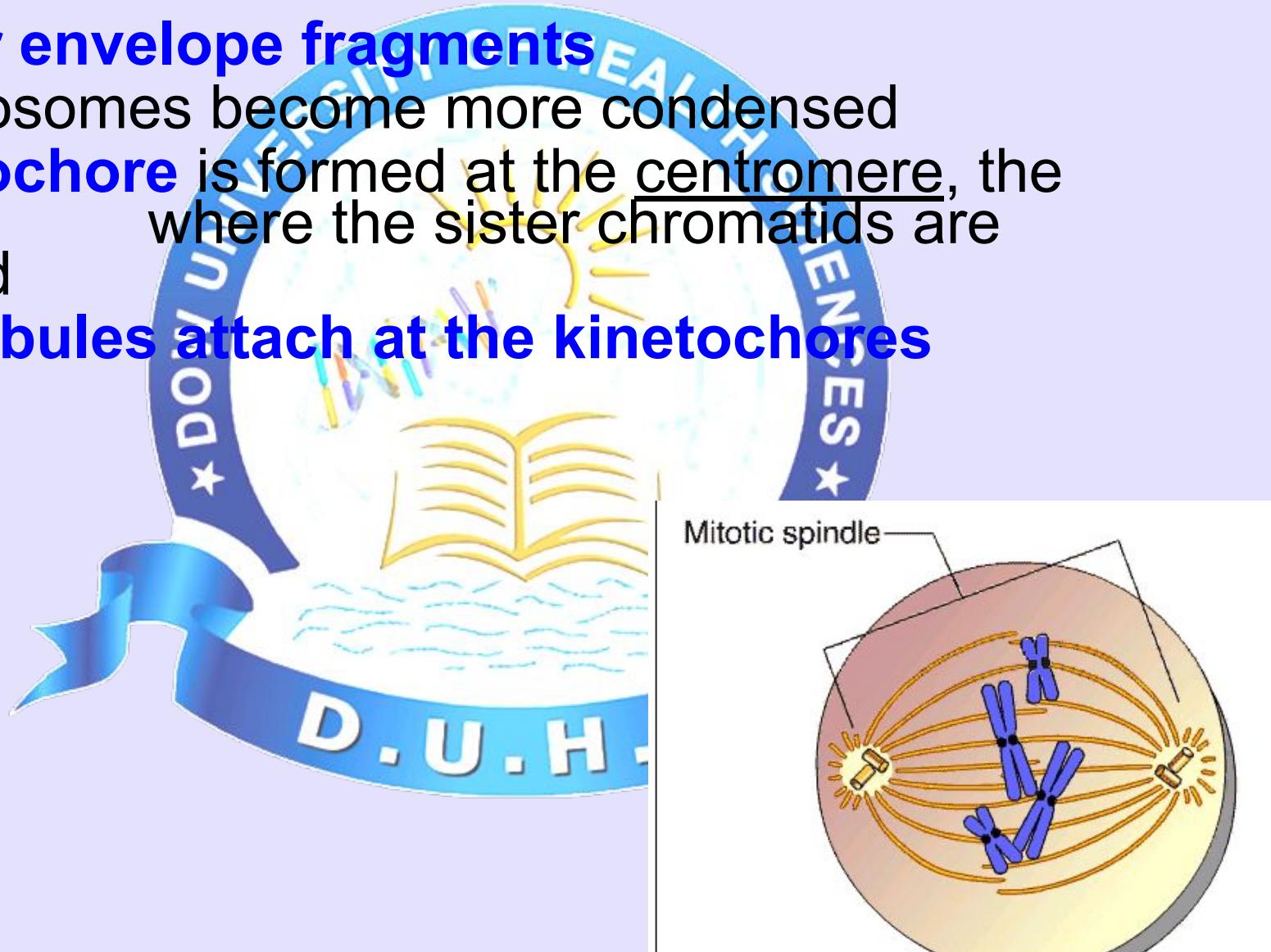
PROPHASE

- **Chromatin condenses**, this causes the chromosomes to begin to become visible
- **Centrosomes separate**, moving to opposite ends of the nucleus
- The centrosomes start to form a framework used to separate two sister chromatids called the **mitotic spindle** that is made of microtubules
- **Nucleolus disappears**



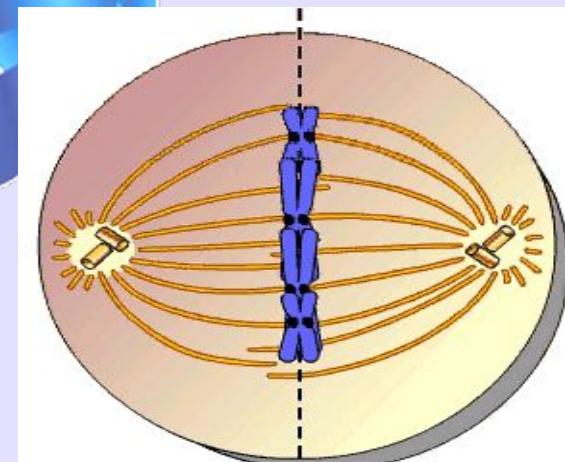
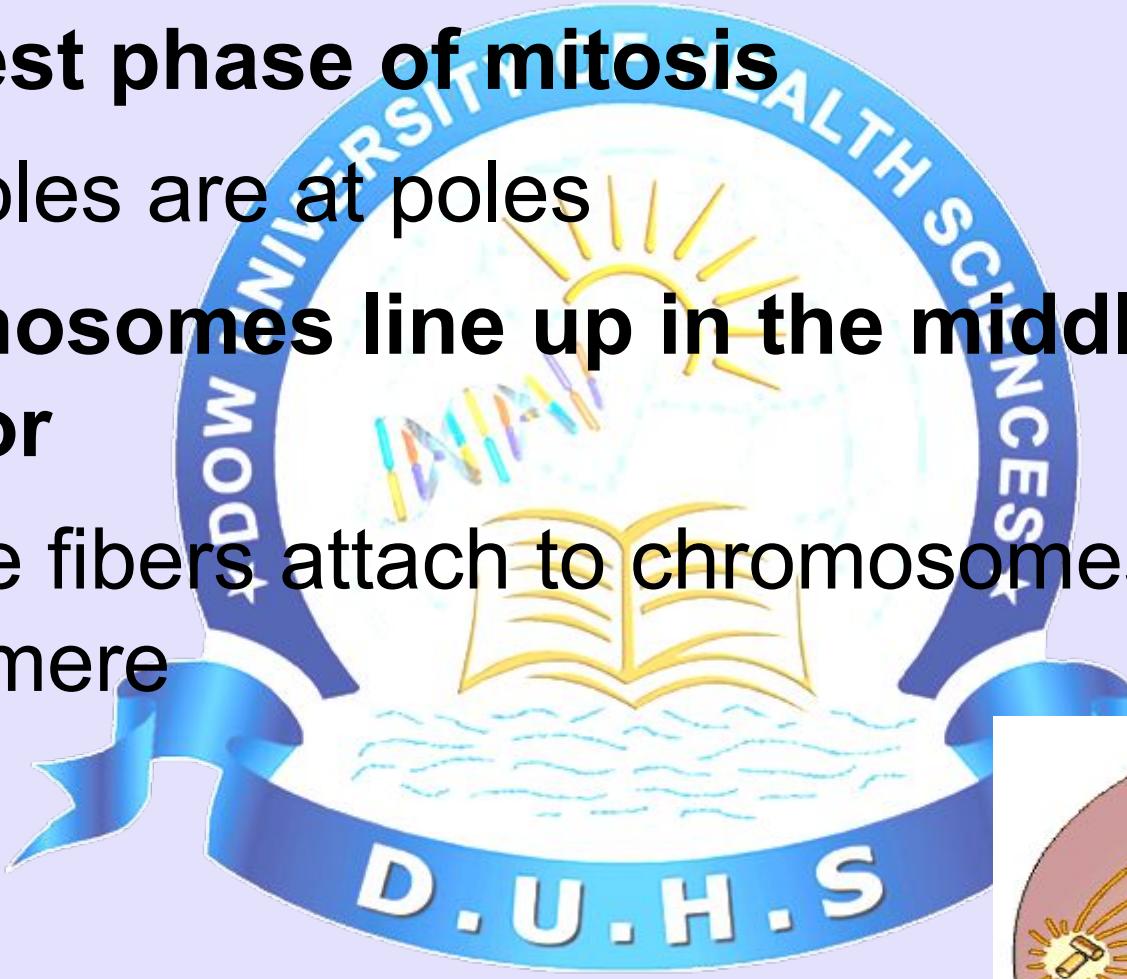
PRO-METAPHASE

- **Nuclear envelope fragments**
- Chromosomes become more condensed
- A **kinetochore** is formed at the centromere, the point where the sister chromatids are attached
- **Microtubules attach at the kinetochores**



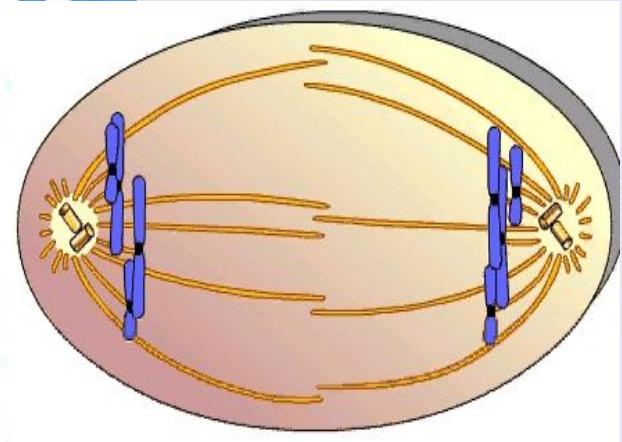
METAPHASE

- Shortest phase of mitosis
- Centrioles are at poles
- Chromosomes line up in the middle along equator
- Spindle fibers attach to chromosomes on the centromere



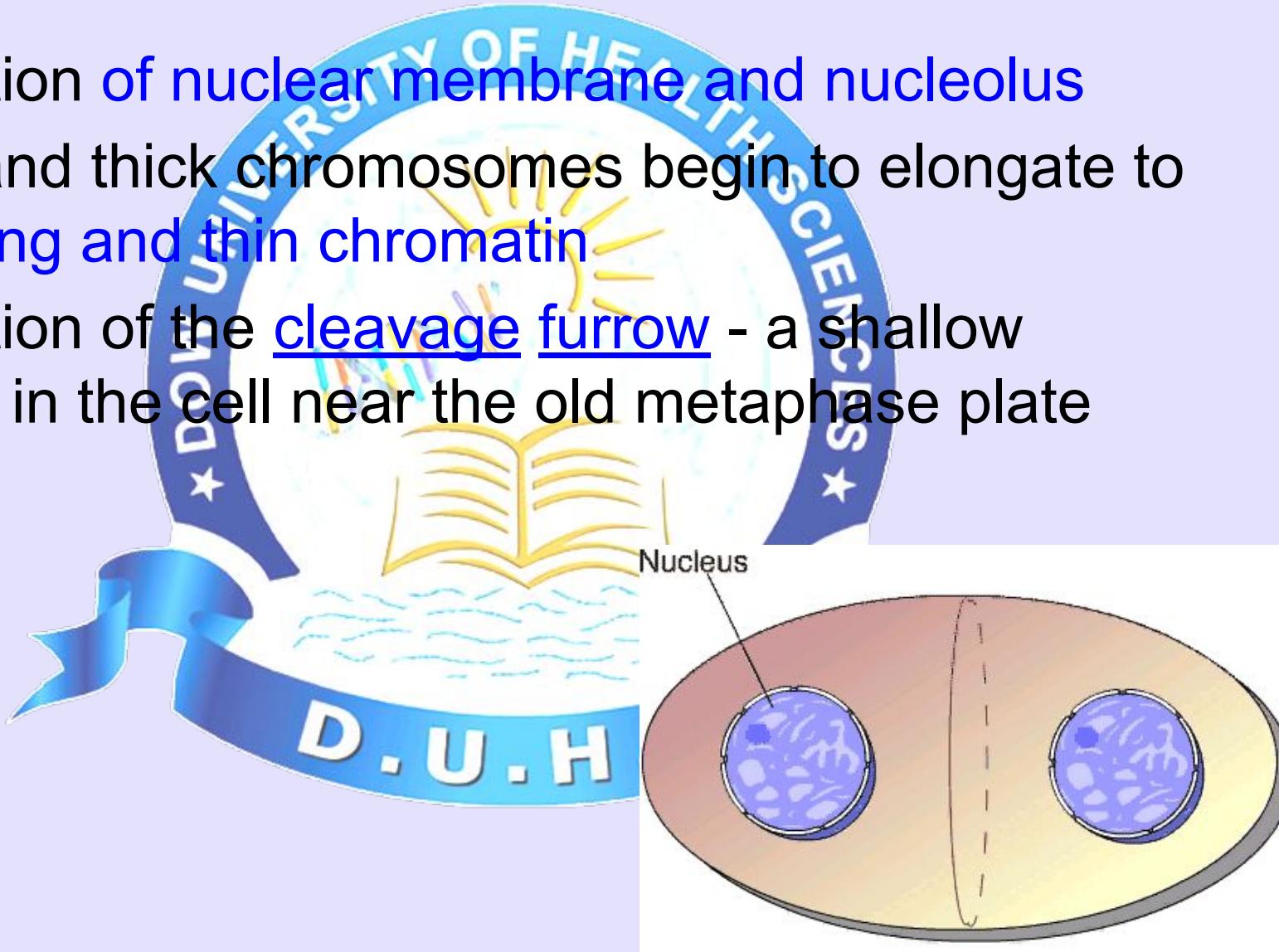
ANAPHASE

- Each centromere splits making two chromatids free
- Each chromatid moves toward a pole
- Cell begins to elongate, caused by microtubules not associated with the kinetochore



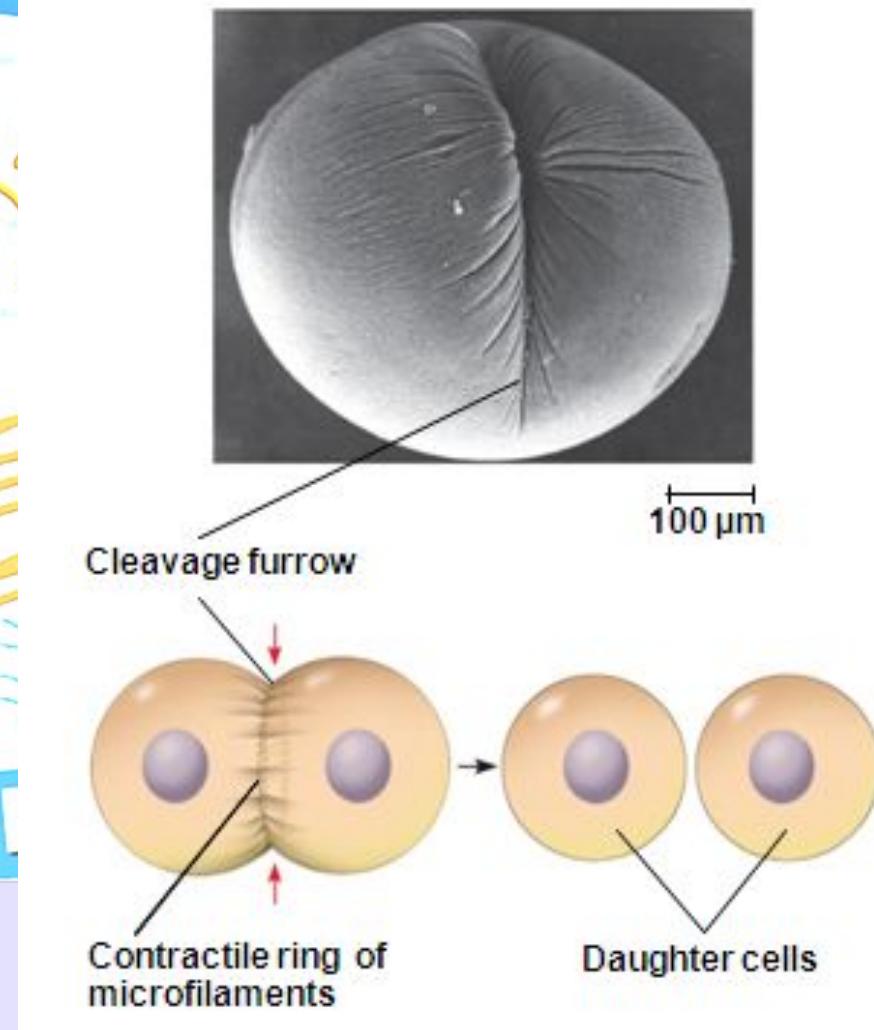
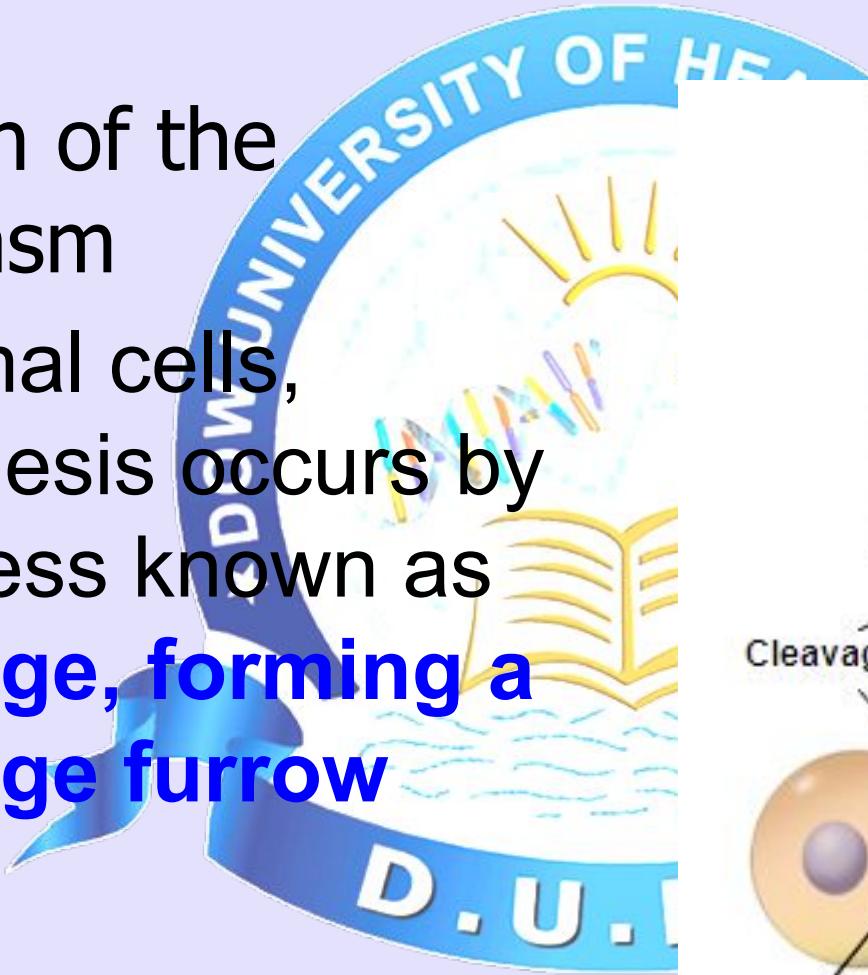
TELOPHASE

- Formation of nuclear membrane and nucleolus
- Short and thick chromosomes begin to elongate to form **long and thin chromatin**
- Formation of the cleavage furrow - a shallow groove in the cell near the old metaphase plate

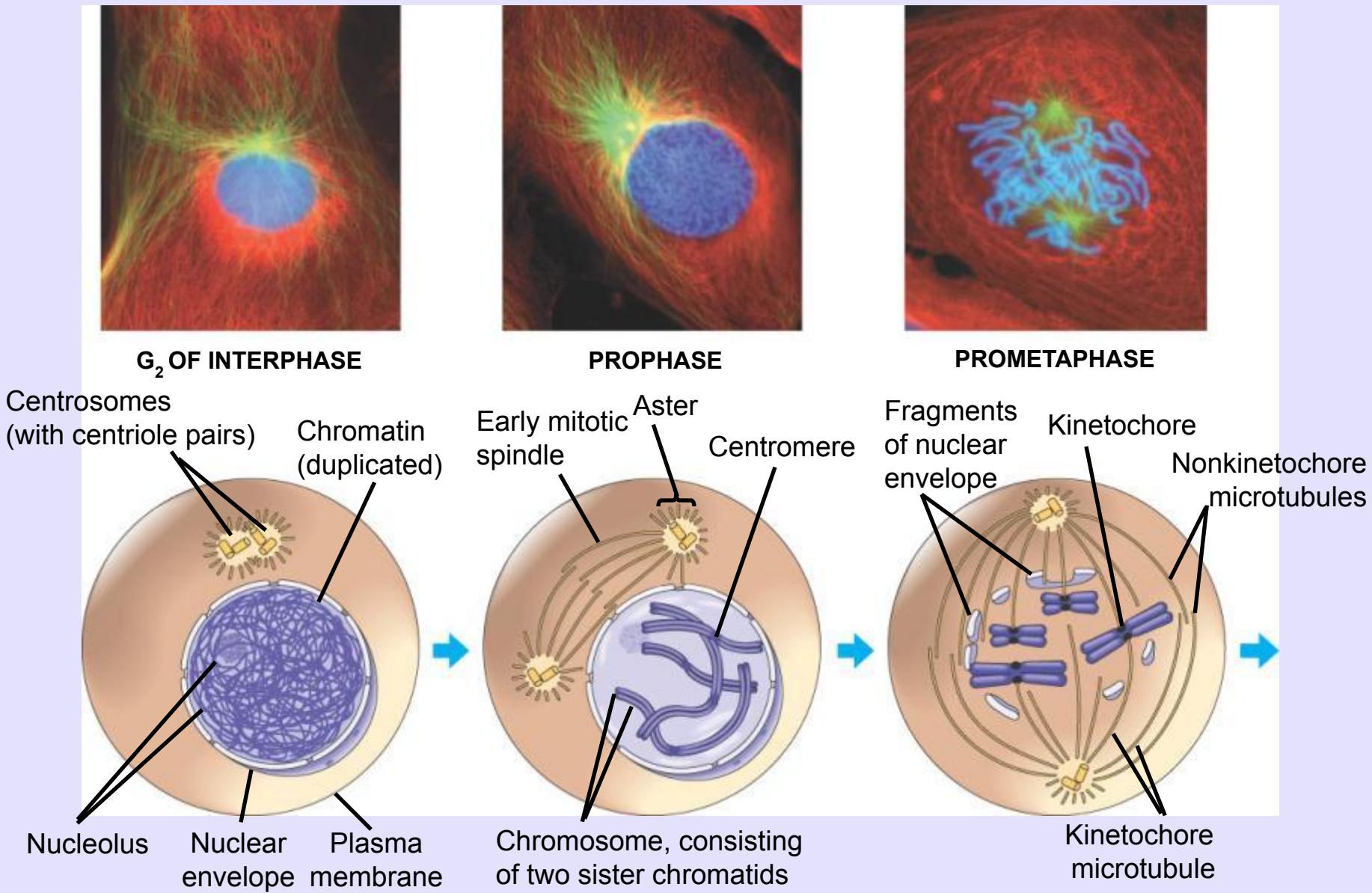


CYTOKINESIS

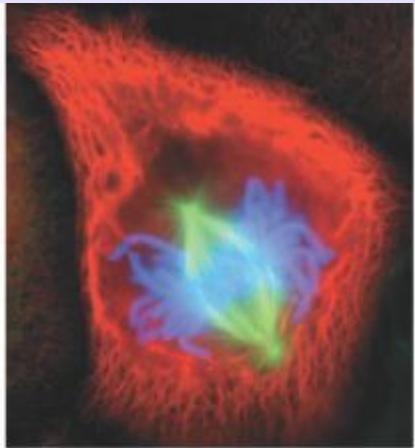
- Division of the cytoplasm
- In animal cells, cytokinesis occurs by a process known as **cleavage, forming a cleavage furrow**



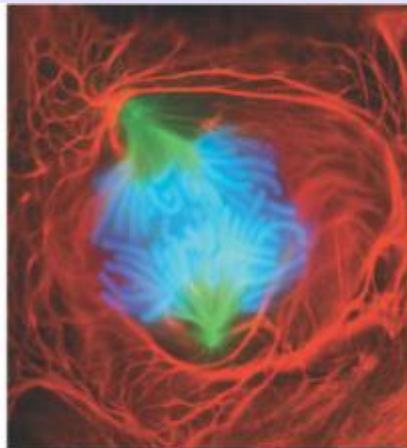
Mitotic Division



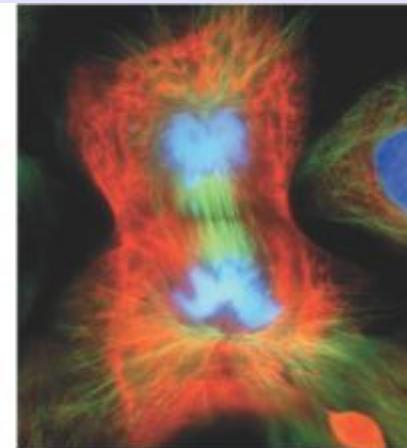
Mitotic Division



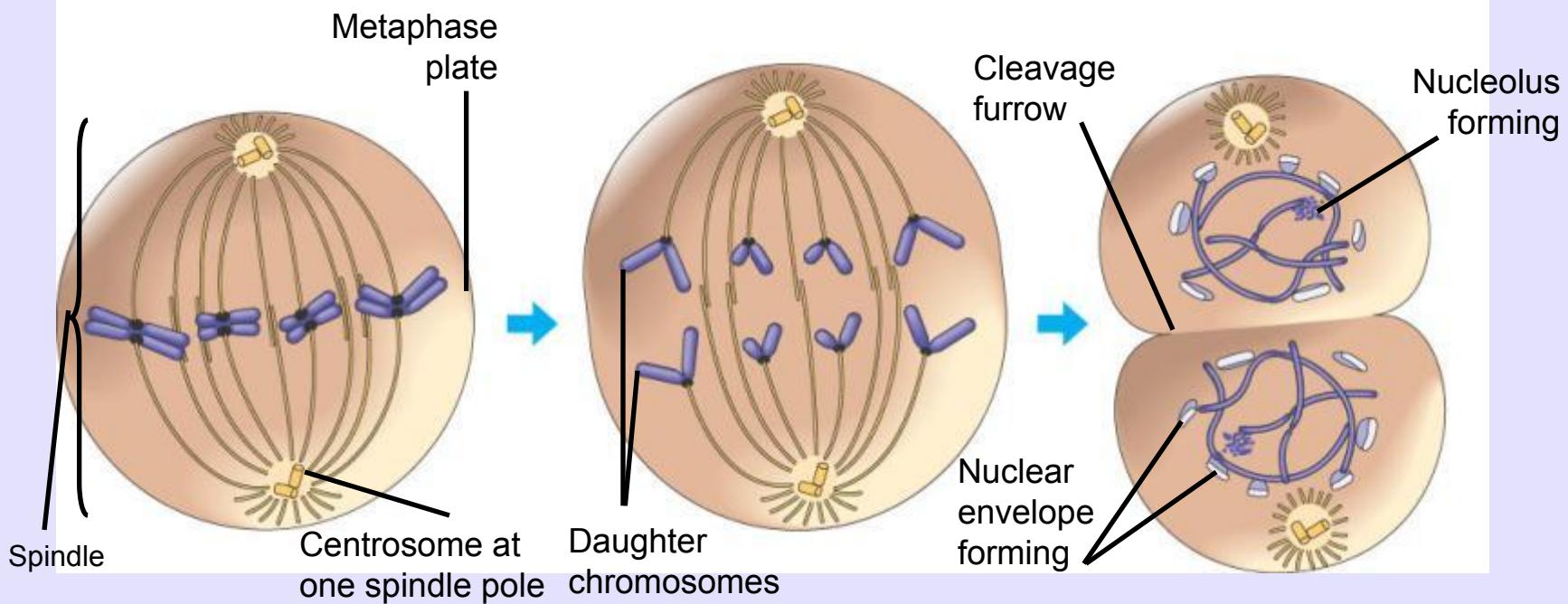
METAPHASE



ANAPHASE



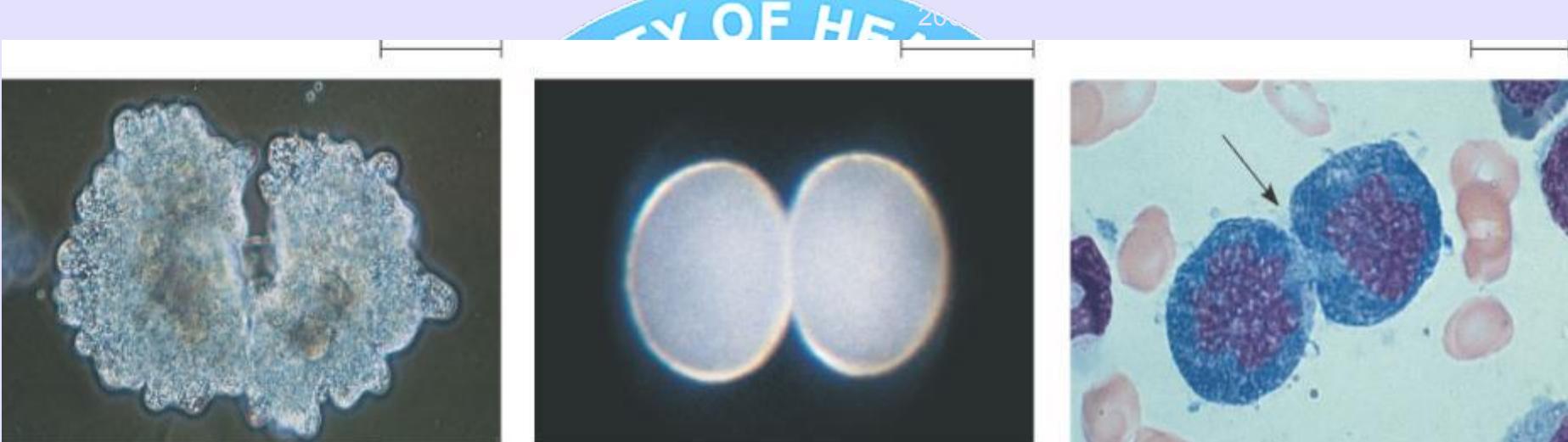
TELOPHASE AND CYTOKINESIS



SIGNIFICANCE OF MITOSIS

- The **continuity of life** is based upon the reproduction of cells, or cell division
- Necessary to overcome **the limitations to Cell Growth** like:
 - DNA “Overload” – there is a limit to the number of proteins a DNA molecule can code for at one time. As the cell gets bigger, it needs more proteins, but, it may have to wait if there's already too many proteins being made
 - Exchange of Materials – there is a limit to the amount of materials a cell can move across its cell membrane. As the cell gets bigger, it needs more food/water to come in AND more waste to move out. Eventually it either starve or poison itself with wastes.
- Cell division is integral part of cell cycle

SIGNIFICANCE OF MITOSIS



a) Reproduction. An amoeba, a single-celled eukaryote, is dividing into two cells. Each new cell will be an individual organism (LM).

b) Growth and development. This micrograph shows a sand dollar embryo shortly after the fertilized egg divided, forming two cells (LM).

(c) Tissue renewal. These dividing bone marrow cells (arrow) will give rise to new blood cells

REFERENCES

- Cell Division- Mitosis: Basic Histology by Junqueira Page # 59-60.

