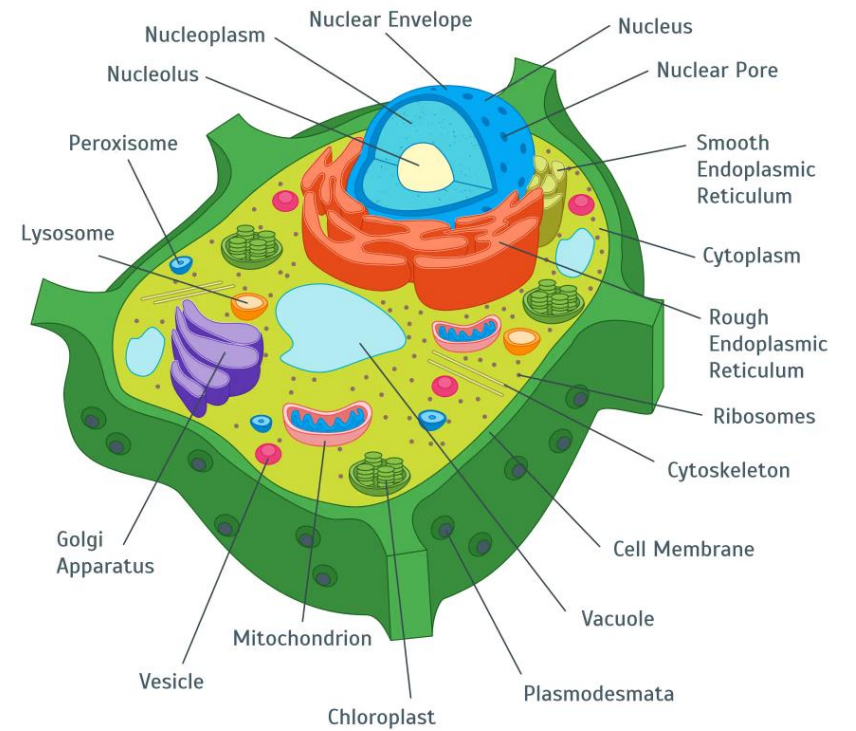


PLANT CELL

CELLULAR COMPONENTS & PROCESSES





What is Life?

Life is a characteristic that distinguishes objects that have self-sustaining biological processes, other things are classified as inanimate

Properties of life

- Cellular structure (unit of life)
- Metabolism (perform function) الأيض
- Movement (intracellular)
- Homeostasis التوازن الداخلي
- Organization التعضي
- Growth (enlargement) النمو
- Adaptation / Evolution (long term adaptation) التأقلم
- Behavior (response to stimuli) الاستجابة للمستحث
- Reproduction (avoid extinction) التكاثر
- Pass on their traits to offspring (heredity)

The cell theory states:

1. The cell is the basic unit of structure and function of all living things.

الخلية هي الوحدة الأساسية للبنية والوظيفة لكل الكائنات الحية.
2. All living things are composed of one or more cells.

تتكون جميع الكائنات الحية من خلية واحدة أو أكثر.
3. All cells come from pre-existing cells.

كل الخلايا تأتي من خلايا سالفة (موجودة مسبقا).
4. The cells of all living things carry on similar chemical activities.

مماثلة. خلايا جميع الكائنات الحية تؤدي أنشطة كيميائية
5. All cells carry on their metabolic activities in organelles.

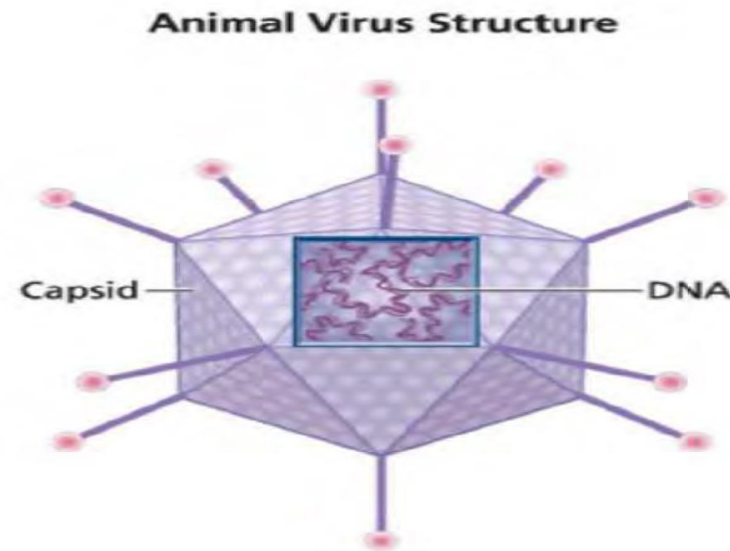
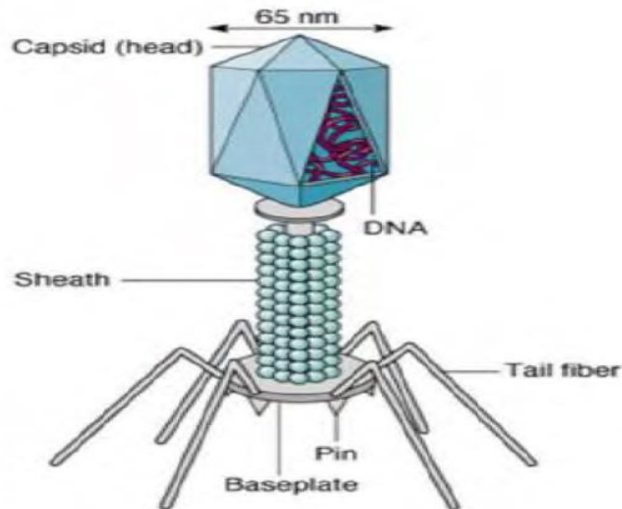
جميع الخلايا تؤدي أنشطة أيضية في العضيات.

A virus and a prion are not considered cellular nor living organisms because of their simplicity (only Nucleic acid surrounded by a protein coat in the case of a virus or only a single strand of protein in the case of a prion). Neither exhibit characteristics of life unless they are in a host cell and cannot replicate outside the host cell.

prion (proteinaceous infectious particle)

لا يعتبر الفيروس والبريون كائنات حية خلوية بسبب بساطة تركيبها (فهي حمض نووي محاطة بغطاء من البروتين في حالة الفيروس ، أو فقط شريط واحدة من البروتين في حالة بريون). ليس لها خصائص الكائنات الحية إلا إذا كانت في الخلية المضيفة (العائلة) ولا يمكن ان تتضاعف خارج الخلية المضيفة.

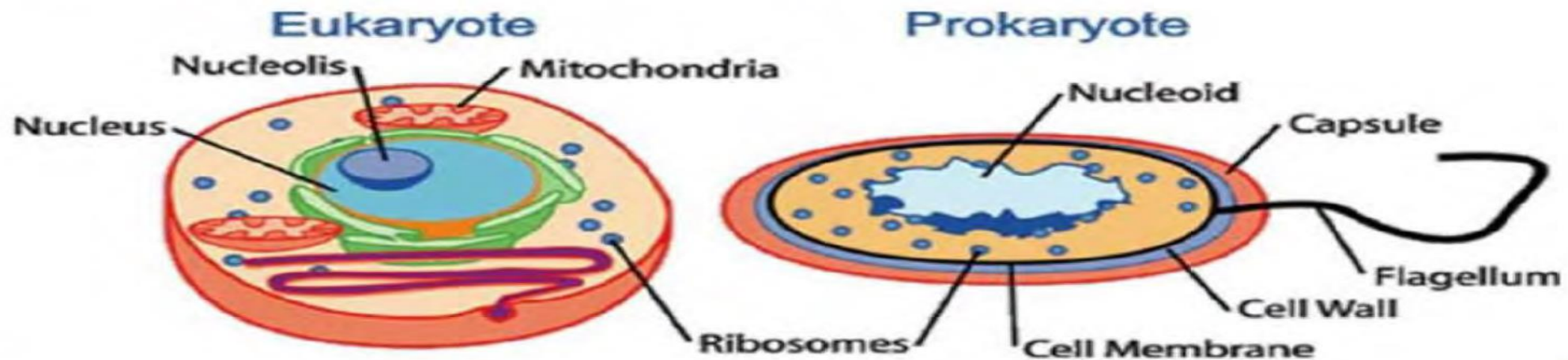
بريون (عبارة عن جسيمات بروتينية معدية)



There are two types of cells:

1. **Prokaryotic**- cells that DO NOT have a well-defined NUCLEUS or other cell ORGANELLES
2. **Eukaryotic**- cells have a NUCLEUS with nuclear membrane & cell ORGANELLES

دائية النواة – خلايا ليس لها نواة واضحة المعالم ولا عضيات خلوية أخرى
نقيقية النواة – خلايا لديها نواة مع الغشاء النووي وعضيات خلوية

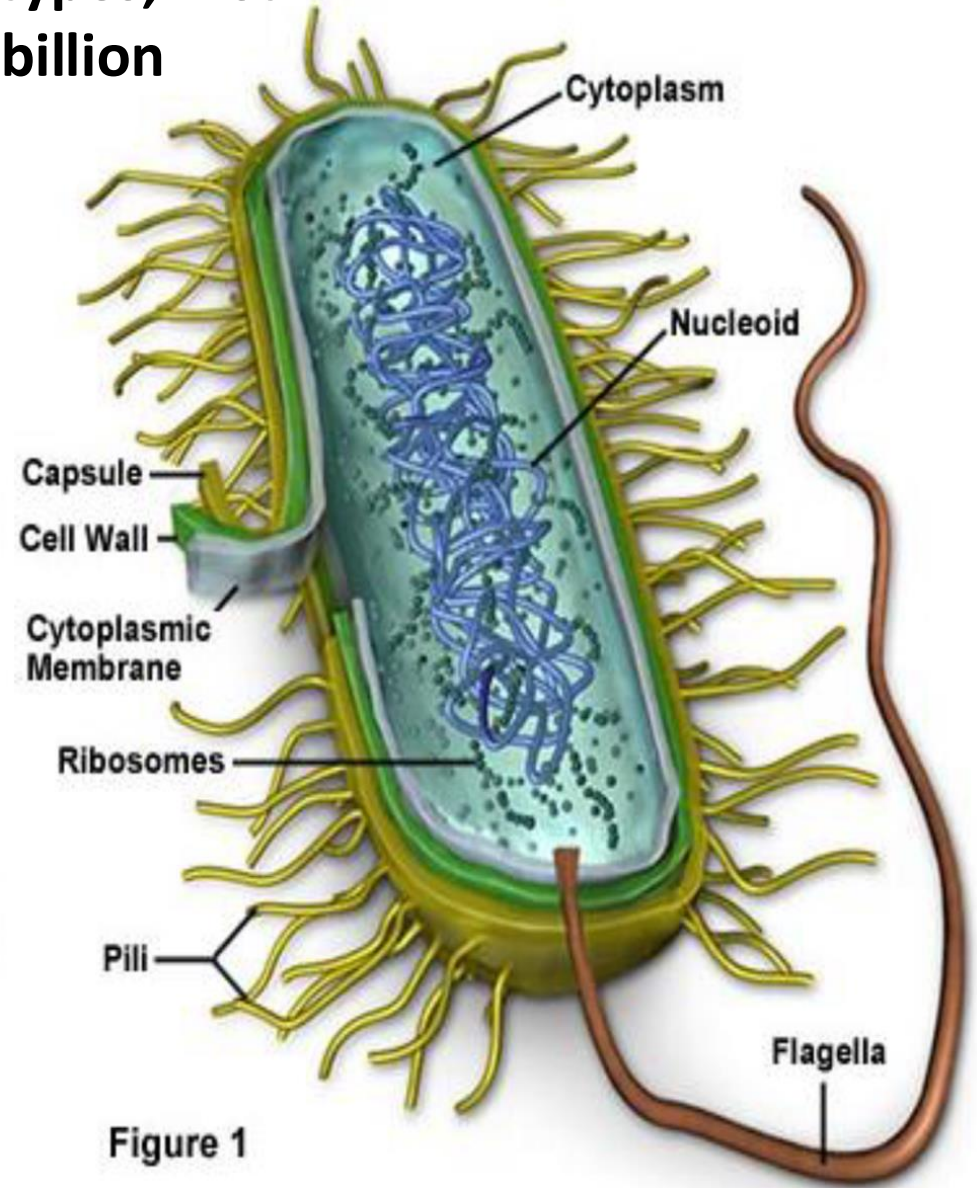


Prokaryote cells

Oldest of cell types, first appeared 3.5 billion years ago.

1. Cells that do not contain a nucleus.
2. DNA is not contained in an internal structure.
3. Have a cell membrane.
4. Do not have membrane-bound organelles.
5. Generally smaller and simpler than eukaryotic cells.
6. Can live in hostile environments. Halophiles and thermophiles that are archeabacteria.
7. Very diverse in their metabolic process: **obligate aerobes** (require O_2), **obligate anaerobes** (killed by O_2), and **facultative anaerobes** (can survive with or without O_2).

Example: **Bacteria**

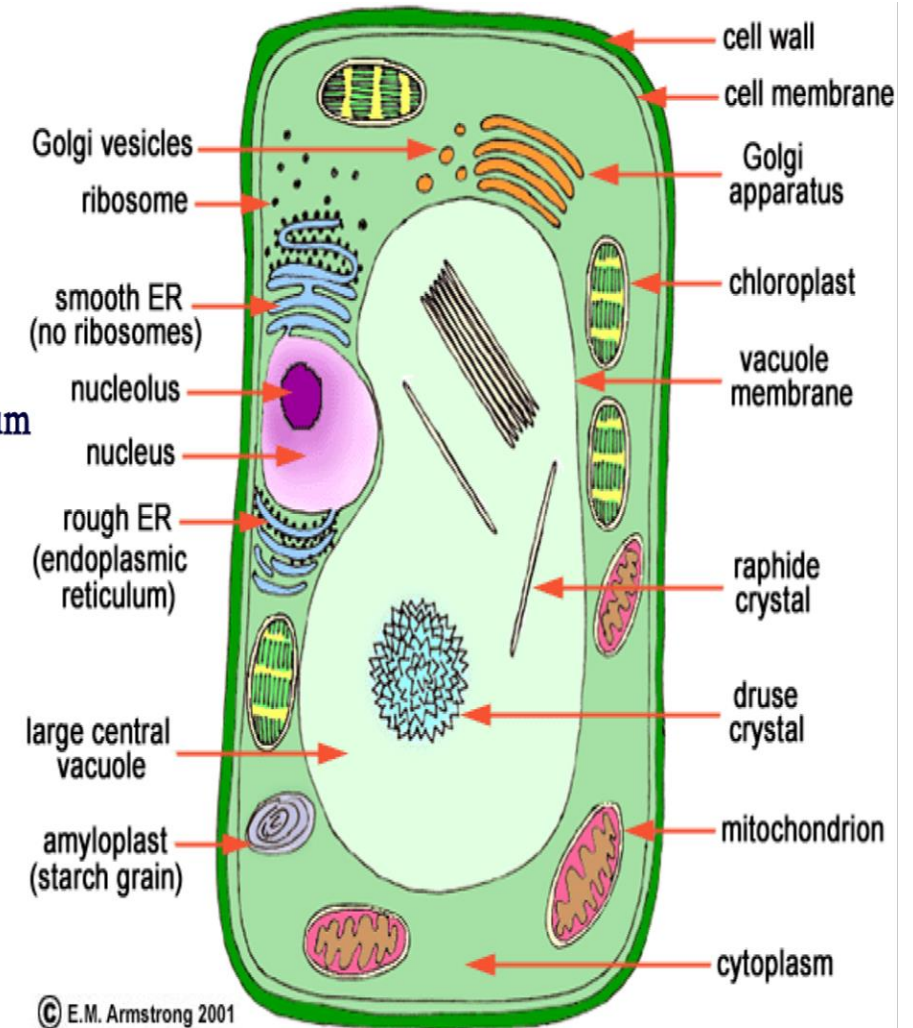


Eukaryote cells

1. Eukaryotes are organisms that have a nucleus in each cell.
2. The nucleus contains that cell's DNA.
3. Have a cell membrane.
4. Generally larger and more complex than prokaryotic cells.
5. Have complex membrane bound organelles (mitochondrion, chloroplast, Golgi apparatus, etc.)
6. Many eukaryotic cells are highly specialized.
7. Examples: Plants, animals, fungi, and protists.

First appeared in the fossil record 1.5 billion years ago.

- Plasma Membrane
- Nucleus
- Ribosomes
- Nucleolus
- Endoplasmic Reticulum
- Golgi Bodies
- Lysosomes
- Plastids
- Chloroplasts
- Mitochondria
- Vacuoles
- Microtubules
- Cytoplasm



Cell wall consists of:

(1) Middle lamella – mostly pectin, cements adjacent cells together

الصفحة الوسطى معظمها بكتين ، تدعم وتربط الخلايا المتجاورة

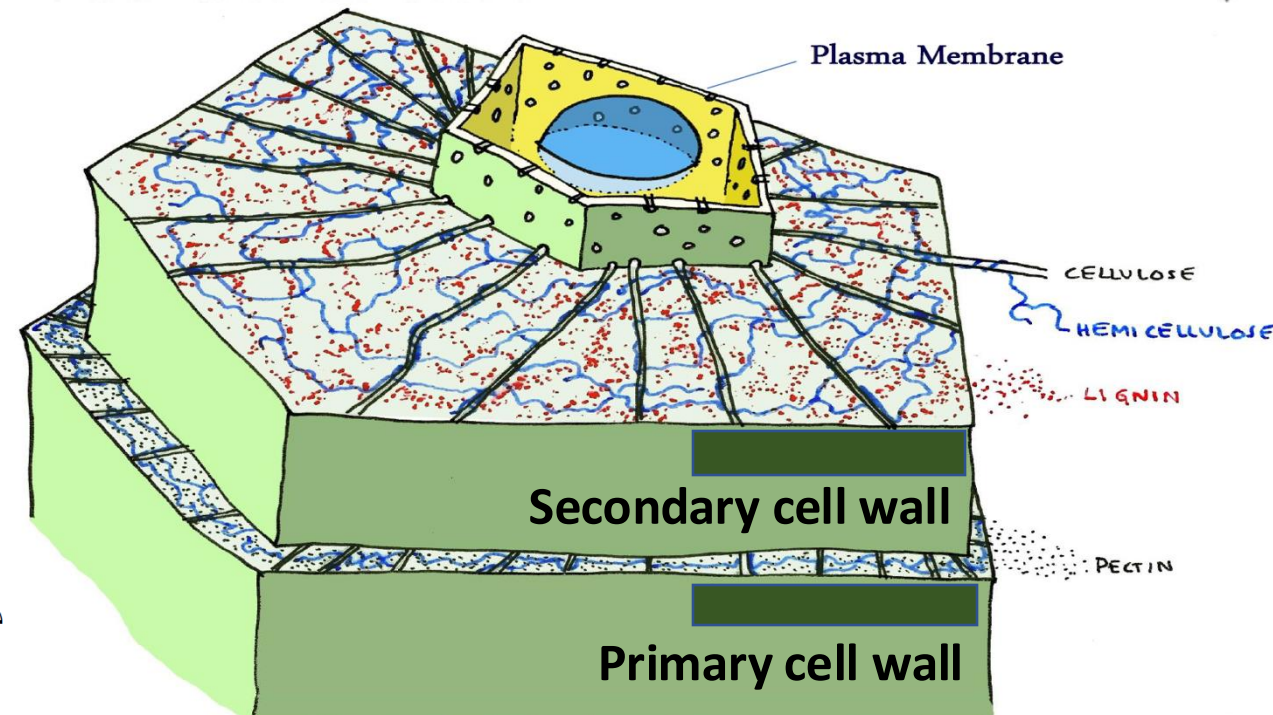
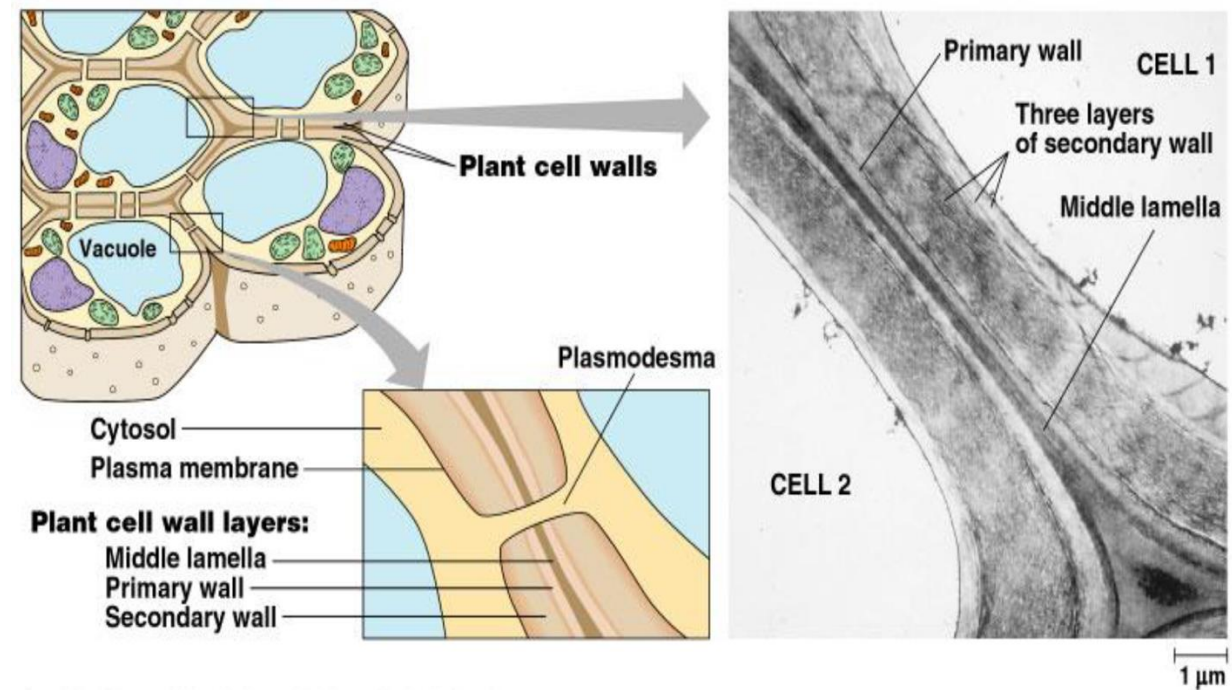
(2) Primary cell wall

الجار الخلوي الابتدائي

- Found in all plant cells في جميع الخلايا النباتية
- Cellulose matrix with hemicellulose, proteins, pectin, lignin, cutin, and wax. حشوة سليولوز مع هيميسيلولوز ، والبروتينات
- Characteristic of undifferentiated cells or ones that still are growing يميز الخلايا غير المتمايزة أو التي لا تزال تنمو

(3) Secondary cell wall

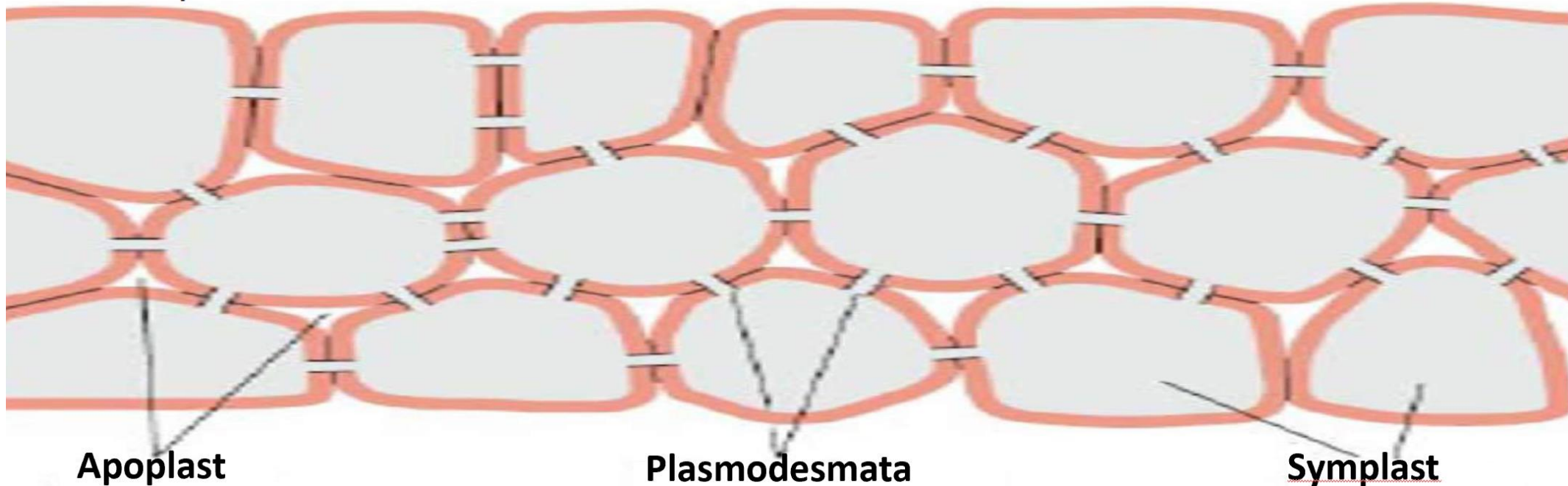
- Just inside primary cell wall مبطن لجدار الخلية الابتدائي من الداخل
- Characteristic of mature cells يميز الخلايا البالغة (الناضجة)
- Comprised of hemicellulose and lignin مكون من هيميسيلولوز واللجنين



Connections between Cells:

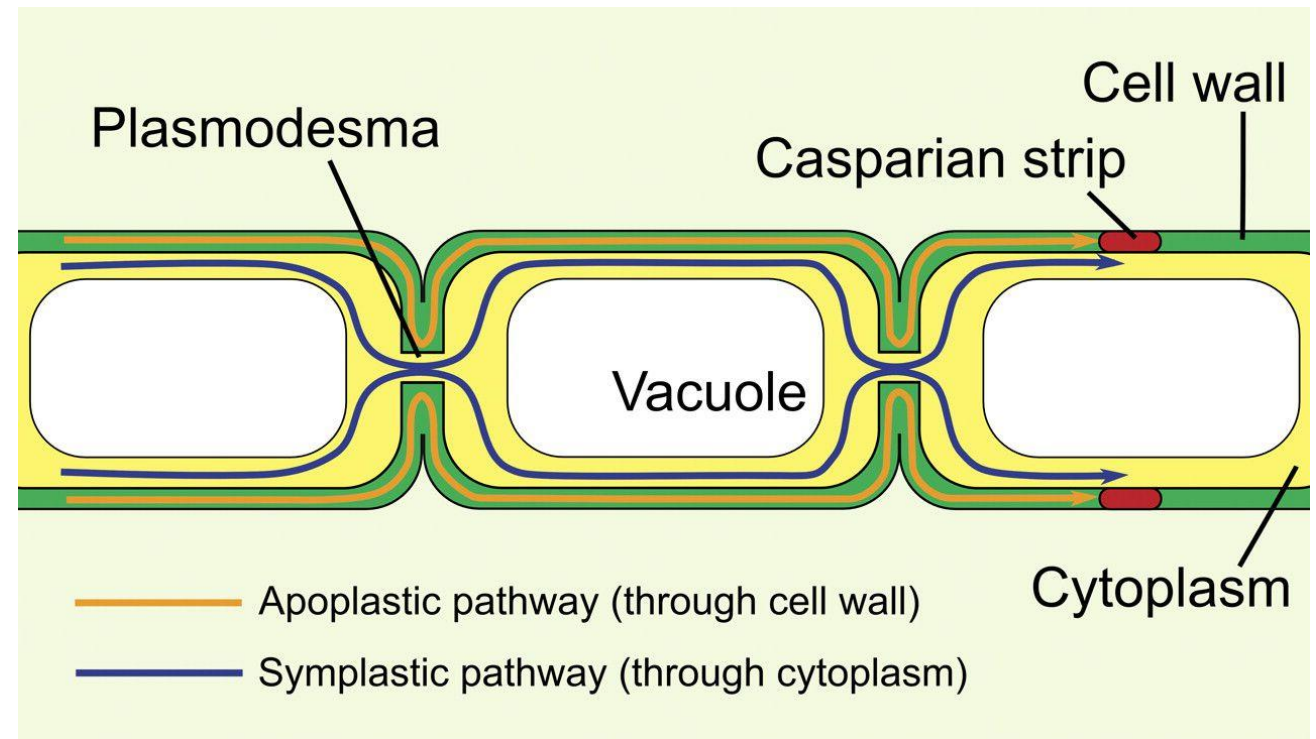
Plasmodesmata (singular form: plasmodesma)

are intercellular organelles found only in plant and algal cells. The plasmodesmata consist of pores, or channels, lying between individual plant cells, and connect the symplastic space in the plant. They can also be termed as "bridges" between two plant cells.



Apoplastic movement is the passive, relatively fast transport of water and solutes through non-living components like cell walls and intercellular spaces, bypassing the plasma membrane.

In contrast, **symplastic** movement is a slower, controlled process where water and solutes travel through the cytoplasm of interconnected cells, moving from cell to cell via channels called plasmodesmata.



Cell Membrane or Plasma Membrane

- The cell membrane's function is to form a **barrier between the cell's inner and outer environment**. It is **selectively permeable** meaning that it allows certain materials to pass through and prevents the movement of other through it.

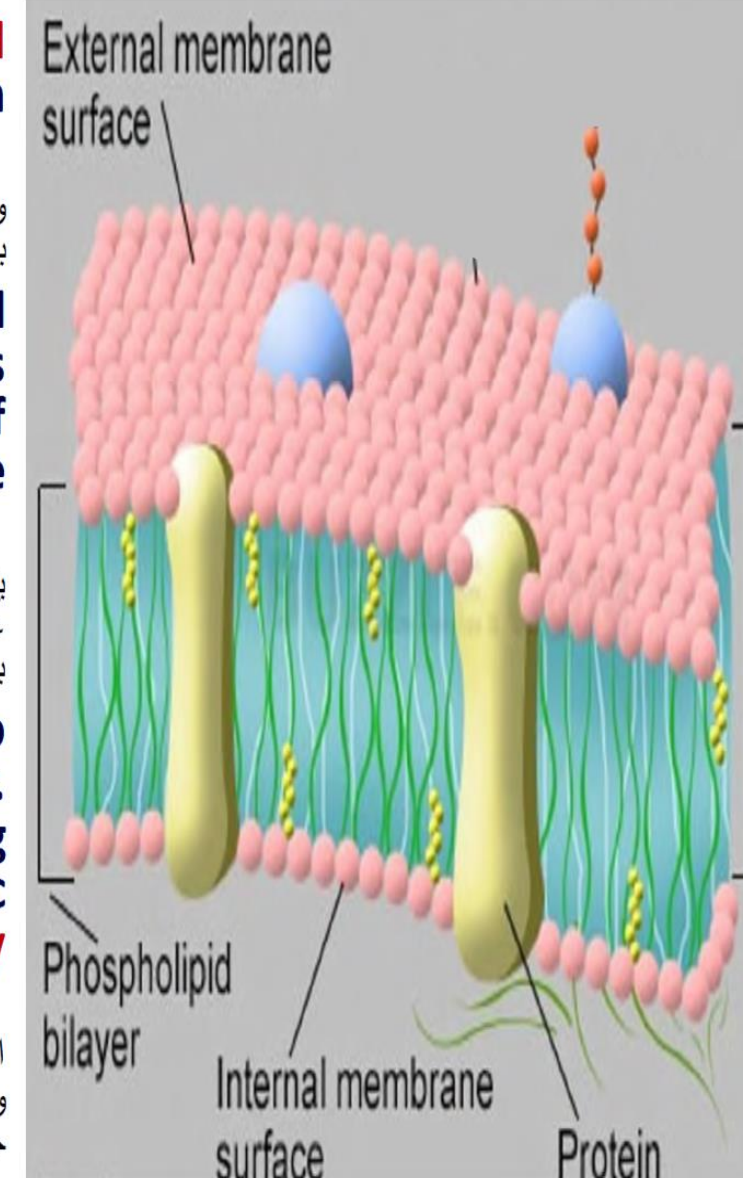
وظيفة غشاء هي تشكيل حاجز بين البيئة الداخلية لخلية و البيئة الخارجية. ومن مميزاته النفاذية الاختيارية حيث يسمح لبعض المواد بالمرور ويمنع بعضها من خلاله حسب حاجة الخلية.

- It is composed of a **phospholipid bilayer with protein molecules** (integral proteins) embedded within in the bilayer. Some of these proteins pass completely through both layers of phospholipids. There are also other types of molecules such as **cholesterol and carbohydrates** that are associated with the cell membrane's outer surface.

يتألف من طبقتين من الدهون الفوسفورية وجزيئات البروتين (البروتينات المتكاملة) مغمورة في الطبقة الثنائية. بعض هذه البروتينات عابرة تماما من خلال طبقات الدهون الفوسفاتية. وهناك أنواع أخرى من الجزيئات مثل الكوليسترول والكربوهيدرات التي ترتبط بالسطح الخارجي لغشاء الخلية.

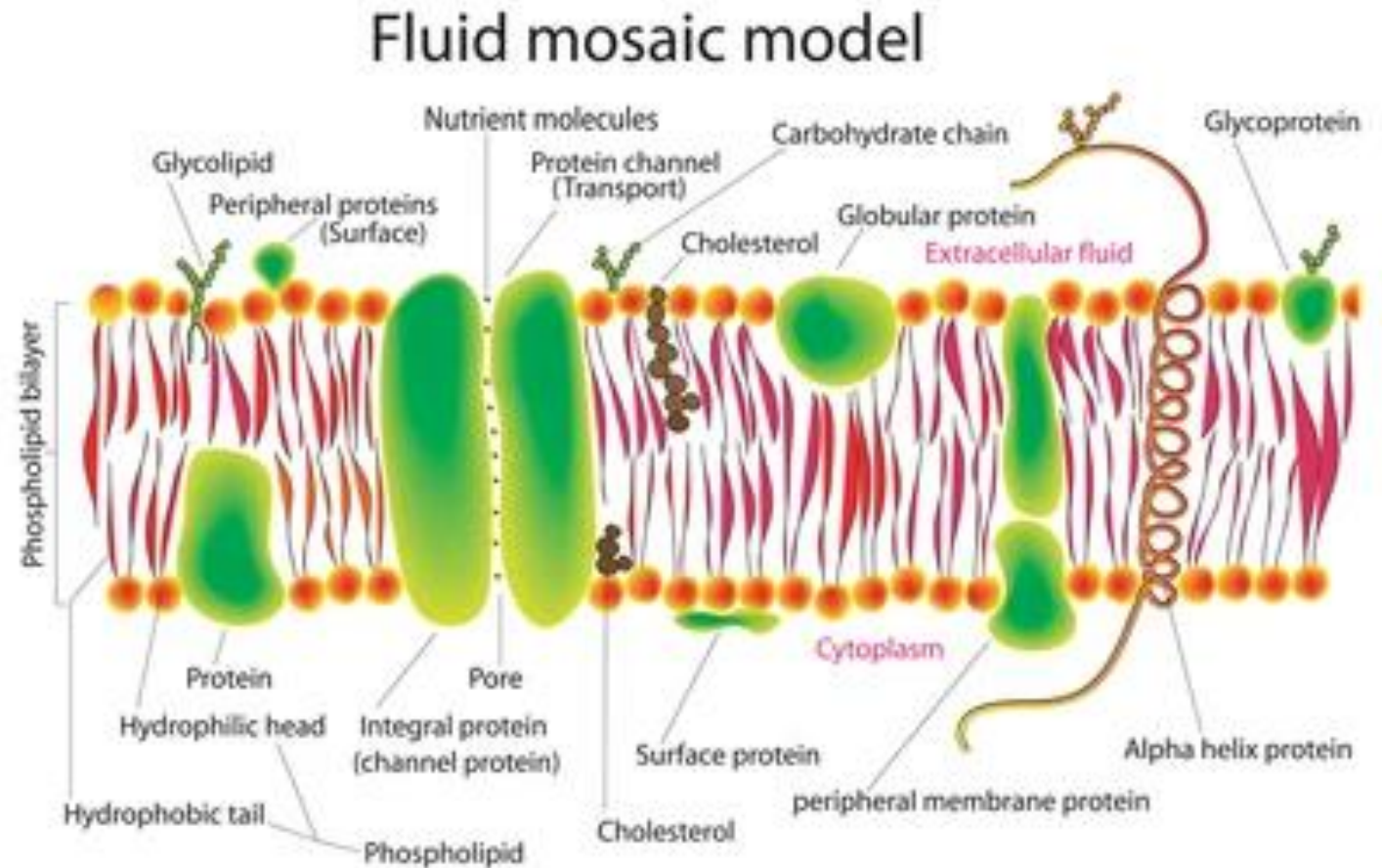
- The **phospholipids and proteins** are not in a **static state**, but have the ability to **move from one location to another** or change positions within the bilayer. Therefore the molecules which make up the membrane are described as being in a **fluid state**. The structure of the membrane is called the "fluid-mosaic model." The membrane is literally a **mosaic of molecules that have the ability to move from area to area on the surface of the membrane**.

الدهون الفوسفاتية والبروتينات ليست في حالة ثابتة، لكن لها القدرة على الانتقال من مكان إلى آخر أو تغيير وضعها داخل الطبقة الثنائية. وتوصف الجزيئات التي تشكل الغشاء بأنها في حالة سائلة. ويدعى تركيب الغشاء بـ "نموذج الفسيفساء السائل". الغشاء عبارة عن جزيئات فسيفسائية لديها القدرة على الانتقال من منطقة إلى أخرى على سطح الغشاء.



The Fluid Mosaic Model

describes the cell membrane as a "fluid" (flexible, moving) "mosaic" (a collection) of phospholipids, proteins, cholesterol, & carbohydrates. Phospholipids form a double layer (bilayer) with their heads facing out and tails in, creating a barrier. Proteins and other molecules are embedded within or attached to this bilayer, resembling a mosaic, and they move laterally, allowing the membrane to be flexible and to regulate what enters and leaves the cell.

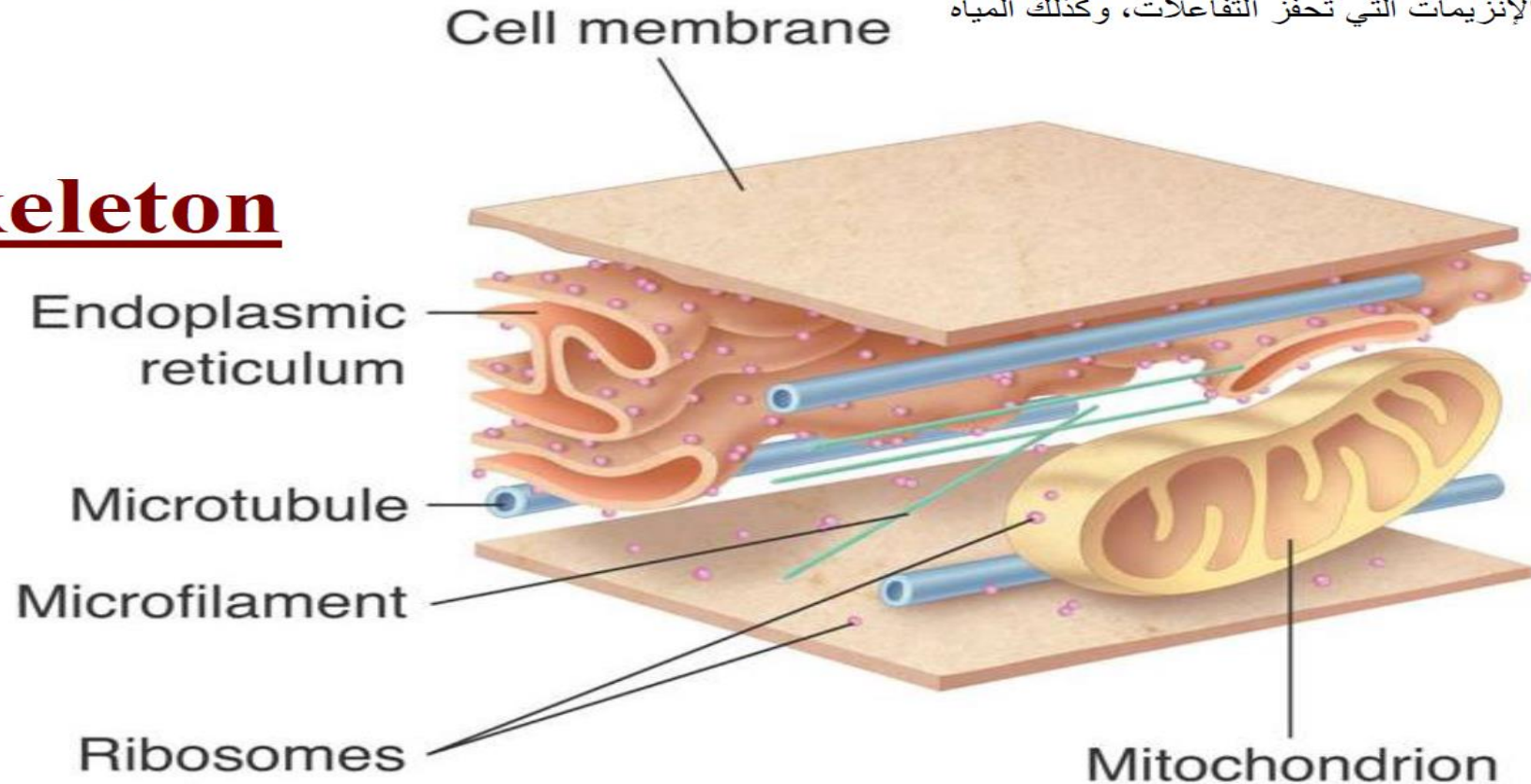


Cytoplasm

A watery solution made of cytosol that contains the **cell organelles**. Cytoplasm includes salts, an assortment of organic molecules, including many enzymes that catalyze reactions, as well as water

محلول مائي مكون من العصارة الخلوية يحتوي على عضيات الخلية. ويشمل السيتوبلازم الأملاح، مجموعة متنوعة من الجزيئات العضوية، بما في ذلك العديد من الإنزيمات التي تحفز التفاعلات، وكذلك المياه

Cytoskeleton



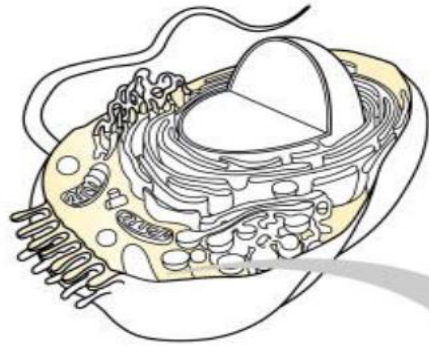
Cytoskeleton

Cytoskeleton:

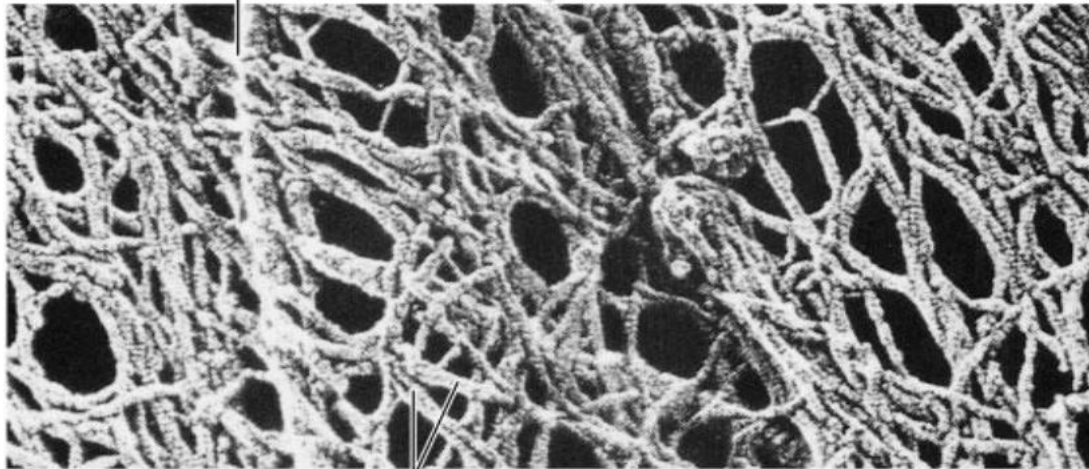
The cytoskeleton is a “framework” that supports the cell membrane and other cell structures within the cytoplasm.

الهيكـل الخلوي:

الهيكـل الخلوي هو "الإطار" الذي يدعم غشاء الخلية وهياكل الخلايا الأخرى داخل السيتوبلازم

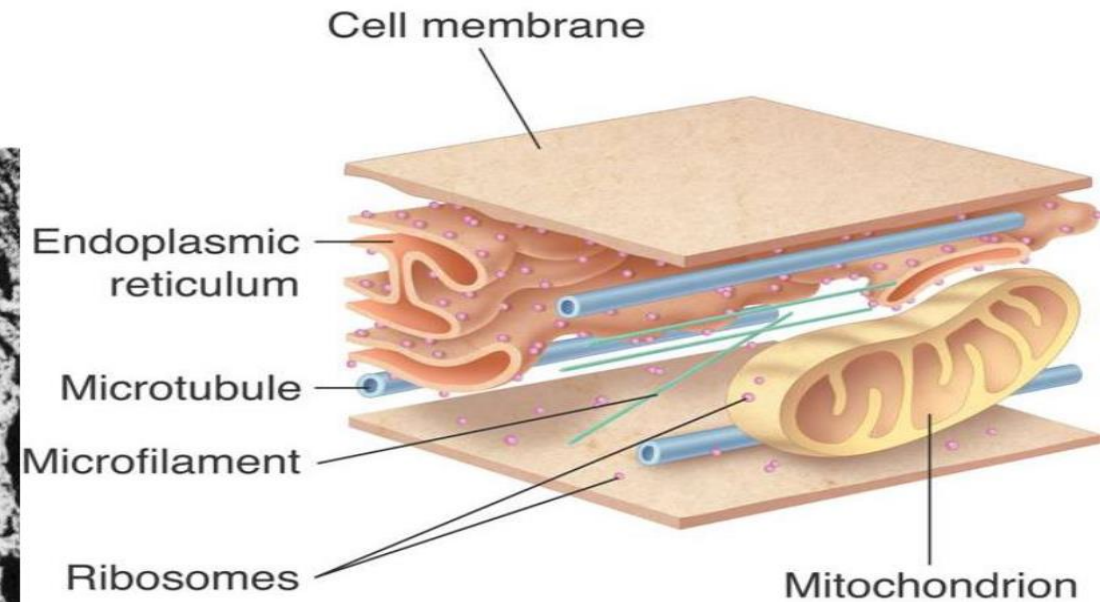


Microtubule



Microfilaments

0.25 μm



Cytoskeleton

- Eukaryotic cells are given their shape and internal organization by the cytoskeleton.
- The cytoskeleton is made up of:
Microfilaments and microtubules

Microfilaments

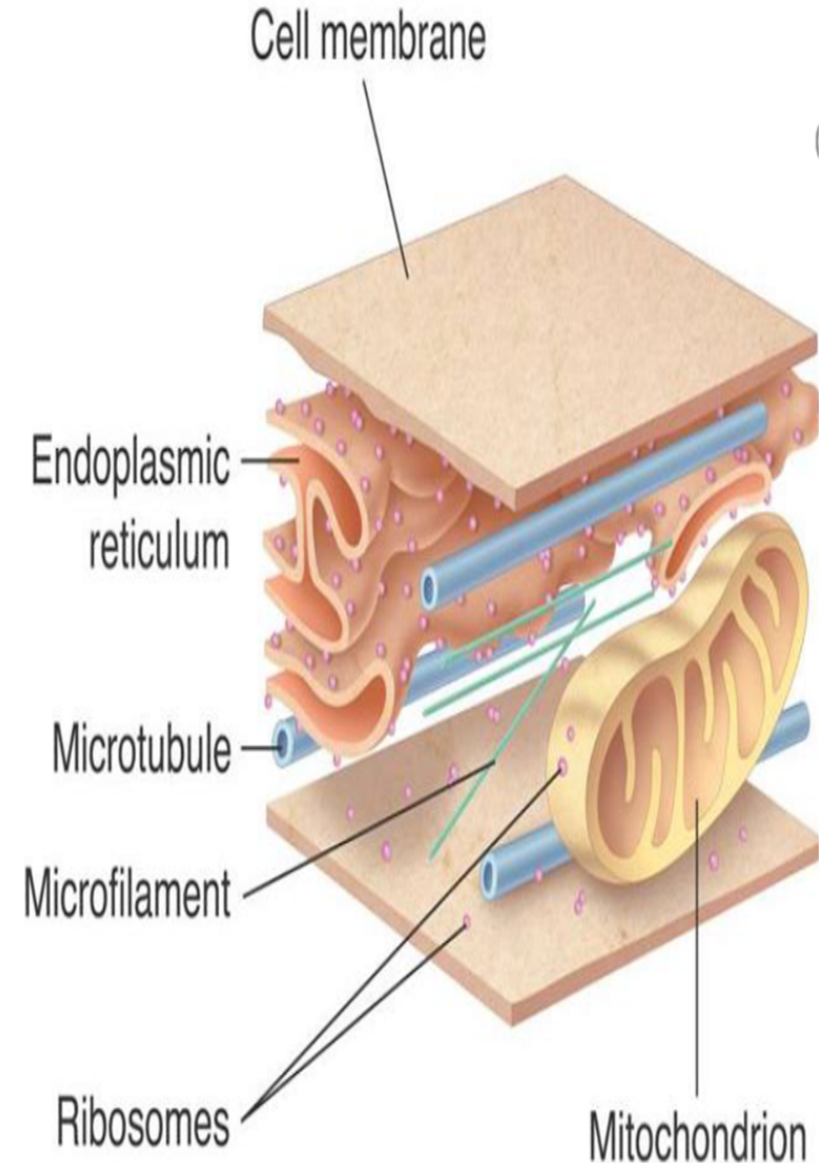
خيوط متناهية الصغر (خيوط الأكتين)

- are threadlike structures made up of the protein actin.
- form extensive networks in some cells.
- produce a tough, flexible framework that supports the cell.
- help some cells move.

Microtubules

الأنابيب متناهية الصغر

- are hollow structures made up of proteins known as tubulins. maintain cell shape.
- are important in cell division.
- build projections from the cell surface-cilia and flagella-that enable some cells to swim rapidly through liquids.



The Nucleus is enclosed in an envelope which is a double membrane structure. It has pore complexes in the membranes which allow the movement of materials in and out of the structure. It contains DNA and proteins in the form of loose threads called chromatin. During mitosis or meiosis the chromatin super coils to form chromosomes. Self duplicating structure divides when the cell divides. The nucleolus is a structure composed of RNA located in the nucleoplasm. There maybe be more than one present and it functions in the production of ribosomes. The overall function of the nucleus is the regulation of cellular activities.

Nucleus

