

# The Cell

Structures and Functions

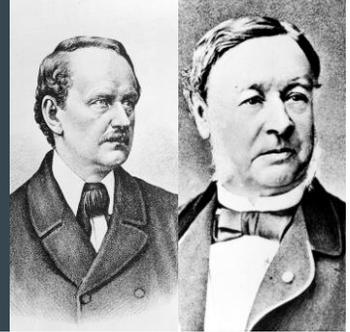
## What is Cell Theory?

Scientific theory that describes the properties of cells

Formulated in 1839

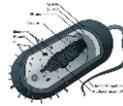
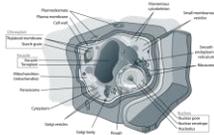
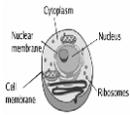
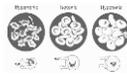
The theory states that cells are the basic unit of structure in *all* organisms

The theory is credited to Matthias Schleiden and Theodor Schwann



## Why Are Cells so Special?

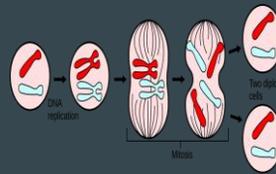
Cells are the smallest working units of all living things



## Where do Cells Come From?

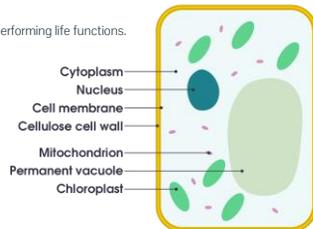
All cells come from preexisting cells that have reproduced through cell division

According to the theory of evolution, the very first cell spontaneously arose through motionless chemicals on planet Earth over 4 billion years ago.



## Definition of a Cell

A cell is the smallest unit capable of performing life functions.



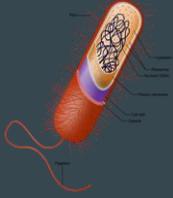
## Two Types of Cells

Prokaryotic

Eukaryotic

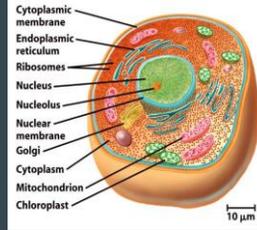
## Prokaryotic

Single-celled organisms  
 Example: Bacteria  
 Has very few internal (inside) structures surrounded by membrane



## Eukaryotic

Contain organelles surrounded by membranes  
 Has a nucleus



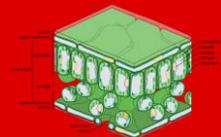
### Typical Animal Cell

### Typical Plant Cell

# Cell Structure and Function

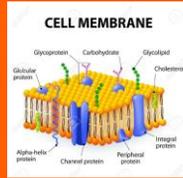
## Cell Wall

Are in plant cells NOT animal cells  
 It is the outer layer of the cell  
 It is rigid, strong, and stiff  
 Made of cellulose



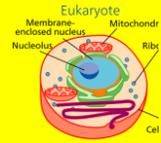
## Cell Membrane

- In BOTH plant and animal cells
- Protects the cell
- Let's objects enter and exit the cell
- Location: Around the cell



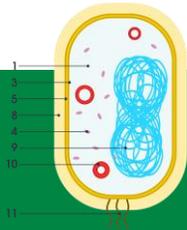
## Nucleus

- In BOTH plant and animal cells
- Large and Oval shaped
- Control center of the cell
- Holds the genetic information of the cell
- Location :  
→ Inside the cell



## Cytoplasm

- In BOTH plant and animal cells
- Clear, thick, and jelly like
- Holds all organelles in the cell
- Location:  
In the cell / Flowing through the cell



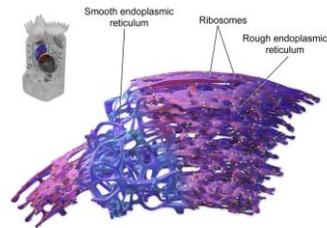
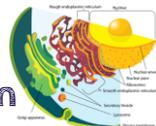
## Chromatin & Chromosomes

- In BOTH plant and animal cells
- Contains genetic information and traits
- Location: In the nucleus



## Endoplasmic Reticulum

- In BOTH plant and animal cells
- Is a network of tubes and membranes
- Transports materials and sends messages to all parts of the cell
- Two types: smooth and rough (has ribosomes)
- Location: Attaches from cell membrane to nuclear membrane



**Endoplasmic Reticulum**

## Ribosome

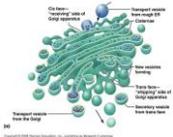


- In BOTH plant and animal cells
- Makes proteins
- Small and circular in shape

**Location:**

- In cytoplasm
- Attached to E.R.

## Golgi Body



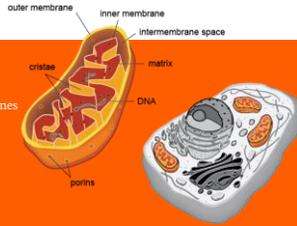
They receive proteins and newly formed material from the E.R, package them, and distribute them to other parts of the cell or outside of the cell

The golgi body is like the mailroom of a cell

Looks like a fan in the ceiling

**Location:** Found next to the Endoplasmic Reticulum

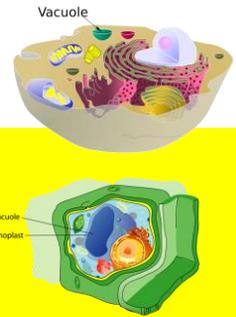
## Mitochondria



- In BOTH plant and animal cells
- Bean shaped with inner and outer membranes
- Makes energy/ powerhouse of the cell
- Breaks down sugar into energy

**Location:** In cytoplasm

## Vacuole



Are large in plant cells, but there are few

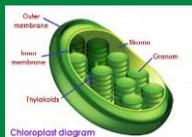
Are small in animal cells

Fluid filled sacs

Stores food, water, and wastes

**Location:** in cytoplasm

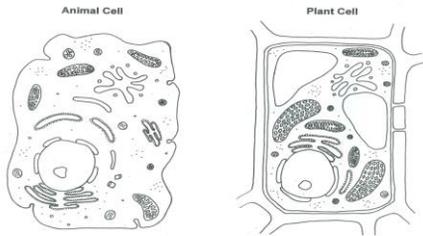
## Chloroplasts



- ONLY in plant cells
- Contains chlorophyll
- Makes plants green
- Traps light energy from the sun
- Light Energy - Chemical Energy
- Where photosynthesis occurs

## How is the Structure of Living Things Organized?

- Many similar cells make tissues
- Many groupings of tissues make organs
- Several organs make an organ system
- Many organ systems make an organism



### KWL- Period 6

- How many cells are in a human body, and how many cells die in our bodies everyday?
  - There are about 50 trillion cells in the human body, and
- Why are we continuous and our cells aren't?
  - While our cells are constantly replenishing, the things we eat, and expose our bodies to (toxin) destroy our DNA, this eventually causes our cells to stop reproducing and we eventually die.
- Why do we keep growing when our cells are dying and do we grow as fast when we get older?
  - When we are growing cells are being added to our bones, making them larger and stronger, as we get older they stop adding to bone growth.
- Why do cells come together to form living organisms?
  - A cells primary function is to survive, since they are organized structures they can come together to form tissues, organs, and organisms as a means of survival.

What happens to cells when they get burned?

It dies and if your skin gets burned, the cells grow back causing your burn to heal.

What happens to skin cells when they die off?

30,000 or so scales of skin flake off your body every minute. Right now, they're collecting on the pages of this book, on your clothes, on whatever piece of furniture you're sitting on, and so on. Over the course of a year, you lose about a pound of the stuff. Once your skin leaves your body, it's known by another name: *dust*.

How did cells evolve?

A photosynthetic bacteria in theory utilized H2S to convert CO2 to organic molecules

How are there not mutations of cells all over our bodies?

### KWL - Period 3

- What's the biggest cell?
  - Ostrich eggs are the largest cells found in nature. The whole egg consists of one single cell that can weigh up to 5 pounds
- What are cells composed of?
  - 7% of a cell is water the rest of the cell is composed of lipids, proteins, and carbohydrates
- How do cells function?
  - A cells main function is to survive, it does this by all the organelles within it working together
- How they reproduce?
  - Mitosis and Meiosis
- What's the smallest cell?
  - Mycoplasma, which is a form of bacterium
- How do they clean out viruses if viruses are smaller than them?
  - Cells have garbage disposal systems that 'clean up' the cell. Lysosomes also can gobble up viruses.

Can cells grow or shrink?

Yes, fat and muscle cells can grow and shrink

Do cells link together?

Yes, cells can link together through junctions.

How do cells die?

Infection, poisoning, over-heating, lack of oxygen

How many cells are in the human body?

Around 50 trillion

What was the first kind of cell?

A bacteria called heterotrophic anaerobes

What is the longest living cell?

The longest living cells in humans are stem cells and brain cells

What is the shortest living cell?

White blood cells in humans

How long do cells typically live?

### KWL- Period 2

- Are cells living?
  - Yes, because they are the smallest unit making up a living organism, thus they are alive
- How many cells are in our body?
  - Around 50 trillion
- How many cells in the body are replaced everyday?
  - 50-70 billion per day
- All the different types of cells?
  - There are too many to name, but there are about 200 different types of cells in the human body alone

How much thicker is the cell wall than the cell membrane?

The cell wall is between 4-20 micrometers thick and the cell membrane is about 5-10 nanometers wide it's about 8,000 times wider/thicker than a cell membrane

What is the lifespan of a cell?

Depends on the cell, white blood cells only live in the body for a couple of days, while brain cells can live throughout the life of the organism, so there can be some cells up to a hundred years old.

### KWL- Period 1

Q: How long until cells die?

A: Depends on the cell, white blood cells only live in the body for a couple of days, while brain cells can live throughout the life of the organism, so there can be some cells up to a hundred years old.

Q: How big are cells compared to an eyelash?

A: An eyelash is 20 millimeters and an animal cell is 10-30 micrometers and a plant cell is 10-100 micrometers

><http://learn.genetics.utah.edu/content/cells/scale/>

Q: How many cells does a blue whale have?

A: Around 100 quadrillion

Q: How does the Golgi Body package materials

A: The golgi body gathers small molecules and then combines them to make more complex molecules, and it then takes those big molecules and packages them into vesicles. They store these for later use or send them outside of the cell.

Q: What causes a cell wall to get destroyed?

A: Mortar and Pestle (grinding the cell), Beadbeating (ceramic beads are used to crack open cells), freezing, high temperatures, shock waves, enzymes, and chemicals