

Unit 1: Energy for Life

- Where did life come from?
- Our understanding is based on what we see and can explain.
- In Europe in the 1500s, people saw dead meat, then saw maggots on the meat.
- So they thought dead cows make maggots somehow.



Abiogenesis vs. Biogenesis p.6

- **Abiogenesis (spontaneous generation)** – The idea that small living things are produced by non-living things.
- **Biogenesis** – The idea that living things come from other living things.
- Abiogenesis was the main idea for a long time because people didn't understand where small organisms came from.
- They didn't understand that there were organisms too small to see.
- This made it hard to develop effective treatments for disease.
- E.g. If you buried a cow's head in the ground and left it for a while, then sawed off a horn, bees came out.

Question

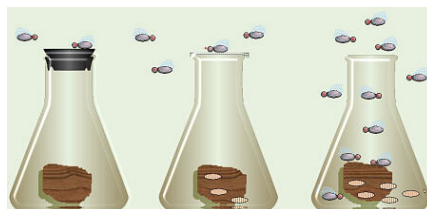
- How would someone from Europe 500 years ago, explain where these bees came from?
- Where do you think they came from?

Abiogenesis vs. Biogenesis

- Beginning in the middle ages, experiments were done to see if abiogenesis or biogenesis was correct.- -

Francesco Redi– 1668. People thought that rotting meat turned into maggots. Redi put some meat into a closed container and let it rot.

No flies could lay eggs, so no maggots developed
What hypothesis did this support?



- **John Needham**– 1748. He boiled beef broth and seals it in a jar. When he opens the jar later he found microorganisms.

What hypothesis did this support?

<http://www.youtube.com/watch?v=WiGFoYBRYTA>

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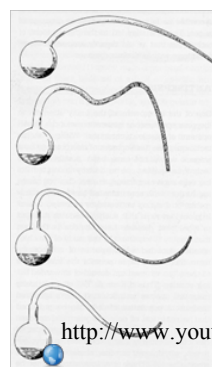
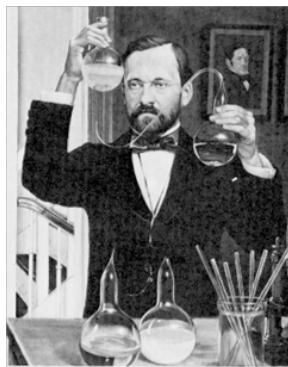
- **Louis Pasteur** – 1860. After a lot of debate, Pasteur basically disproves spontaneous generation.

He boiled beef broth in special containers that would allow air to get in, but not microorganisms.

He did not find any microorganisms in his flasks.

His work supports the idea that all cells come from other cells.

What hypothesis did this support?



The Cell Theory p. 7 - 10

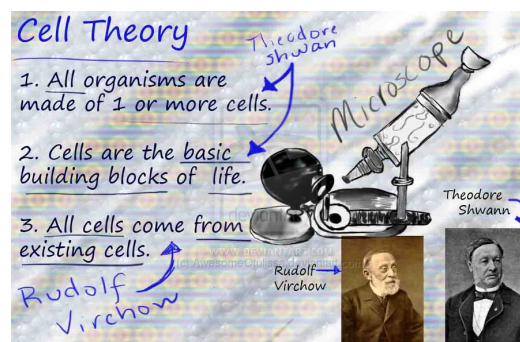
- Our understanding of cells as the basic unit of life originated with a series of scientific discoveries.

- **Robert Hooke** – 1666. Describes the small parts of tree bark he sees with his microscope as “cells.”

- **Antony van Leeuwenhoek** – 1667. Makes powerful microscopes. Easier to see microorganisms.

The Cell Theory

- **Matthias Jacob Schleiden** – 1838. Suggests all plants are made of cells.
- **Theodor Schwann** – 1839. Suggests all animals are made of cells.
- **Rudolph Virchow** – 1858. Cells come from cells. Cells form tissues, which form organs, which form organisms.
- **Louis Pasteur** – 1860. His experiments support Virchow's. Cells come from other living cells, not non-living things.



The Cell Theory

- This led to our modern cell theory, which states:
 1. The smallest unit of life is the cell.
 2. All living things are made up of cells.
 3. All cells come from pre-existing cells.

Review

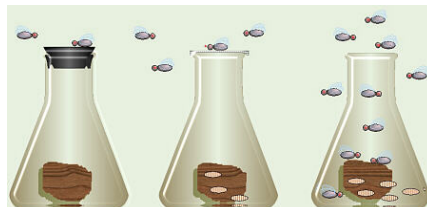
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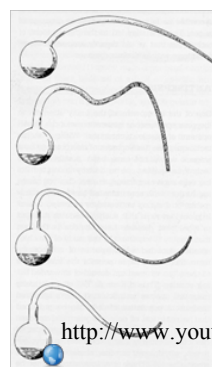
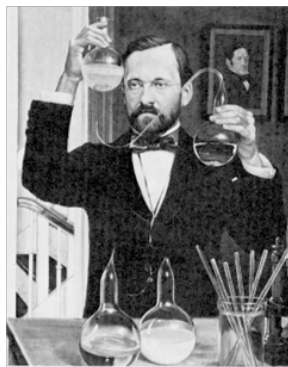
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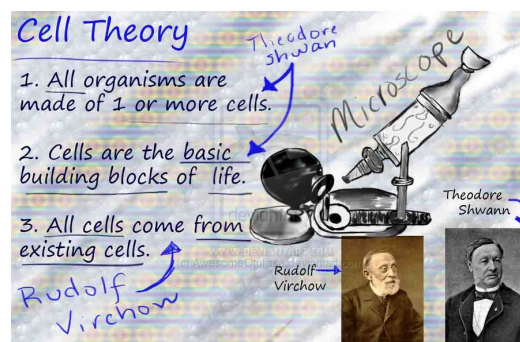
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Types of Microscopes p.20

- There are four major types of microscopes:
 1. **Compound light microscope**
 - This is the type we have used most often.
 - It is used for looking at thin sections of small objects.
 2. **Stereomicroscope**(or Dissecting microscope)
 - This is used for looking at larger objects in 3D.
 - It does not have the inversion problems of a compound light microscope. “e” looks like “e”

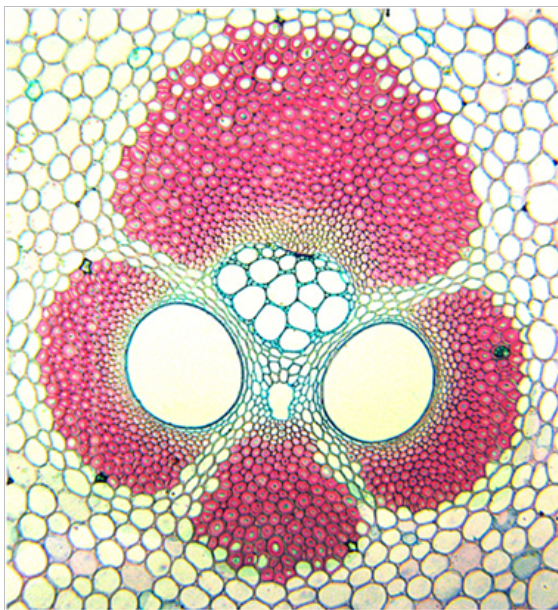
Types of Microscopes

3. **Transmission electron microscope**(TEM)
 - This is used for looking at very thin sections at very high magnifications.
 - Specimens must be embedded in plastic and cut very thin first.
4. **Scanning electron microscope** (SEM)
 - This is used for looking at the outer surface of very small objects.
 - Specimens must be coated in metal (i.e. gold) first.

Questions:

- Which type of microscope would be best for looking at each of these specimens?

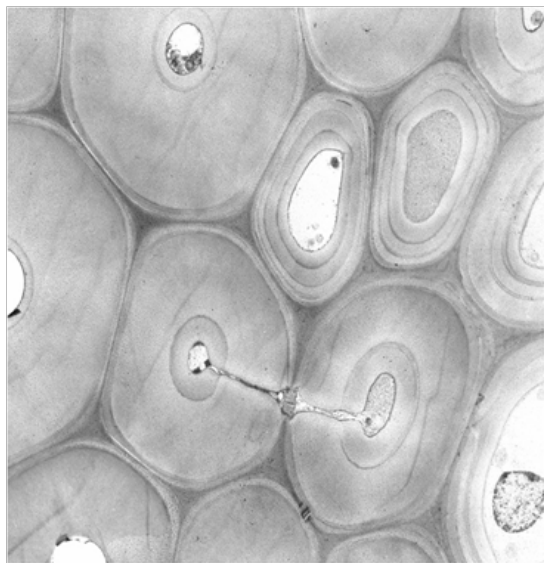
Cells in a plant stem?



Compound Light

Detailed examination of bone cells?

TEM

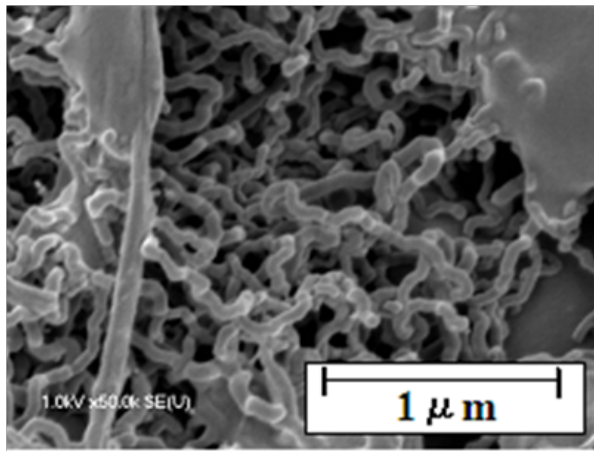


3D view of a plant stem?

Stereoscope

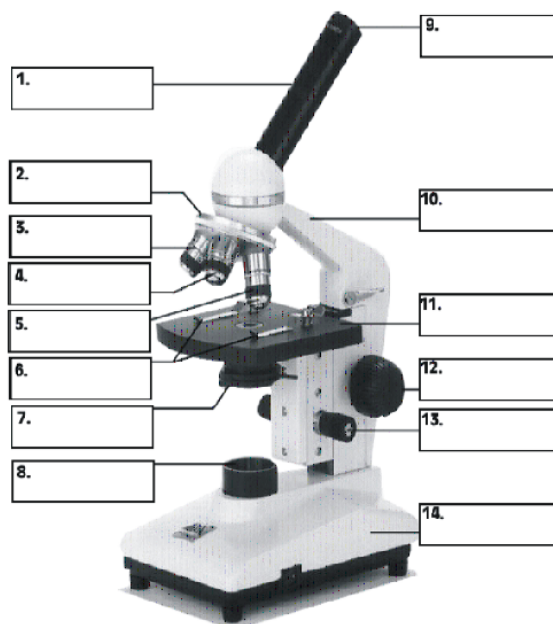


3D view of bacteria SEM in a lung



Challenge

- Fill in the parts of the microscopes using the diagram on page 16 of your text.

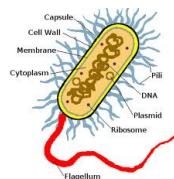


Review

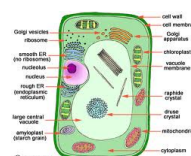
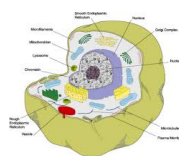
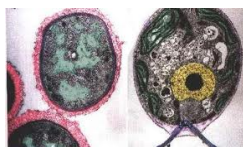
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Components of Cells p. 23 - 33

- The two major types of cells are:
 1. **Prokaryotic cells**– These have no organelles.
E.g. Bacteria.
These cells are considered less complex and more ancient.

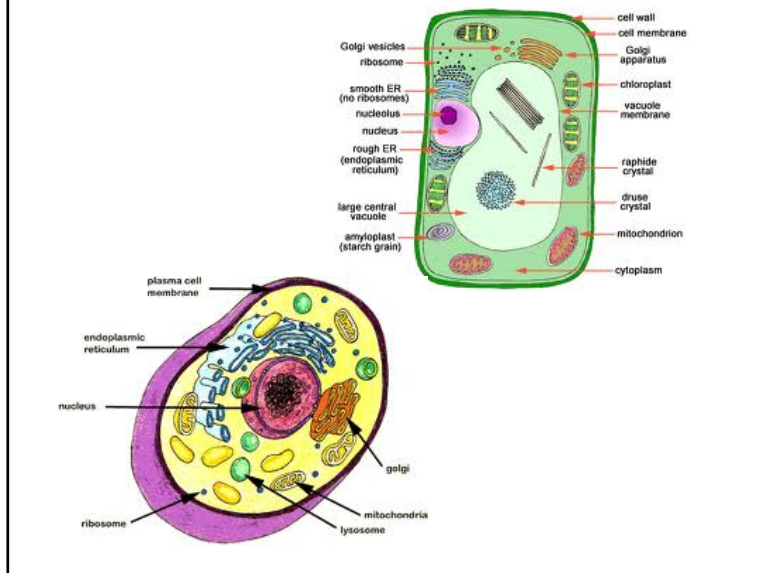


2. **Eukaryotic cells**– These have organelles.
E.g. Human cells.
These cells are considered more complex.



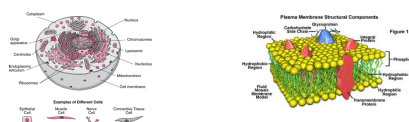
Parts of Cells p. 23 - 33

- Different types of cells can be distinguished by the parts they contain.
- **Organelles** - Specialized *membrane bound* structures within cells that have specialized functions.
E.g. mitochondria help make energy.

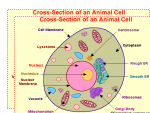


Components of Cells

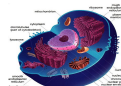
1. **Cell Membrane**- The outer covering of cells. It separates the inside from the outside. It is found in all types of cells.



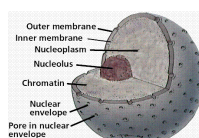
2. **Cytoplasm**- The jelly-like fluid that makes up the bulk the cell. It is found in all types of cells.



3. **Nucleus**- The control centre of the cell. It contains DNA. It is found in only eukaryotic cells.



4. **Nucleolus**- A dark area inside the nucleus that makes ribosomes. It is found only in eukaryotic cells.

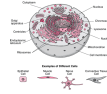


Components of Cells

5. **Endoplasmic reticulum (ER)** - It is found only in eukaryotic cells. There are two types:

Smooth ER - Makes lipids.

Rough ER - Makes proteins.



6. **Ribosome** - Make proteins. It is found in all types of cells.



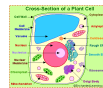
7. **Mitochondria** - Powerhouse of the cell. They break down sugar to make energy for the cell. It is found only in eukaryotic cells.



8. **Chloroplast** - Turn light energy into sugar. They are green. Found only in plant cells.

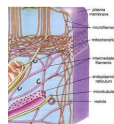


9. **Vacuole**- Large bubble-like organelles used for storage. It is found only in eukaryotic cells.

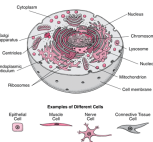


Components of Cells

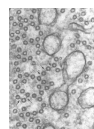
10. **Vesicle** - Small bubble-like transport organelles. It is found only in eukaryotic cells.



11. **Golgi** - Flattened sacs that make carbohydrates and process things made by the ER. It is found only in eukaryotic cells.



12. **Microtubules and microfilaments**- Fibers used to move cell contents and support the cell. They make up the **cytoskeleton** (cell skeleton). Found only in eukaryotic cells.

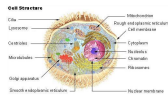


Components of Cells

13. **Cilia** - Small finger-like projections of the cell that are used for movement. Found only in eukaryotic cells.



14. **Lysosome**- A vesicle that is used to digest food. Found only in animal and fungi cells.



15. **Flagellum** - Similar to cilia but larger and more tail like. Usually only one per cell, and used for locomotion. Found only in eukaryotic cells.



16. **Cell wall** - Found outside the cell membrane and used for support. Found in most types of cells except animals.

