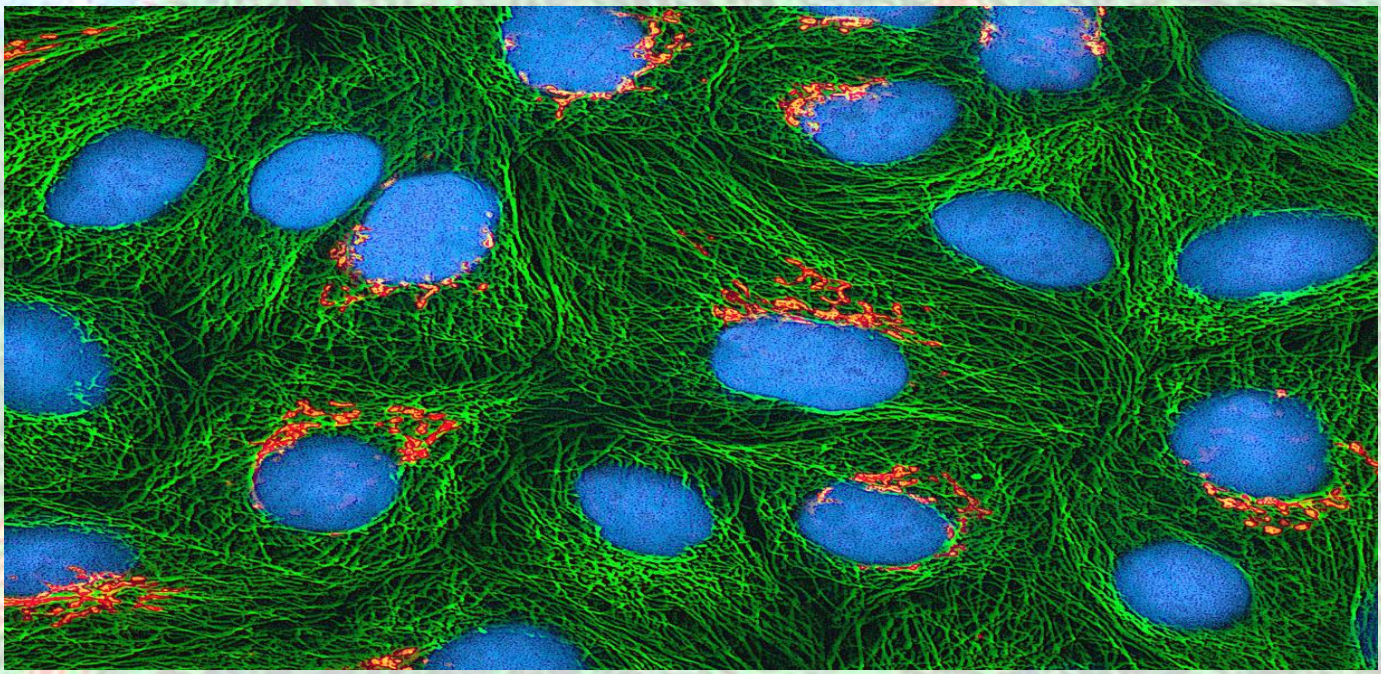
The Villablanca Connection

UNIT 2:

CELLS



“Every living thing is made of cells, and everything a living thing does it is done by the cells that make it up.”
L.L. Larison Cudmore.

Unit 2: Cells.
Biology and Geology 1º ESO
Villablanca Connection

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Unit 2: CELLS.

1. What are cells?

There is another very important characteristic of the living beings we can find in the Earth: They are all formed by one or more cells. Somehow, life on this planet depends on the existence of these little life units. So it is possible to define “living being” as an organism that is formed by one or more cells. From this point of view we classify the organisms as **unicellular** and **multicellular** organisms.
There exists a whole division in biology to study cells specifically. It is called **cytology**. Cytologists study both the structure and the functioning (=physiology) of the cell and it is amazing how so different living beings have cells so similar.
There are three characteristics that are always present in the structure of any cell:

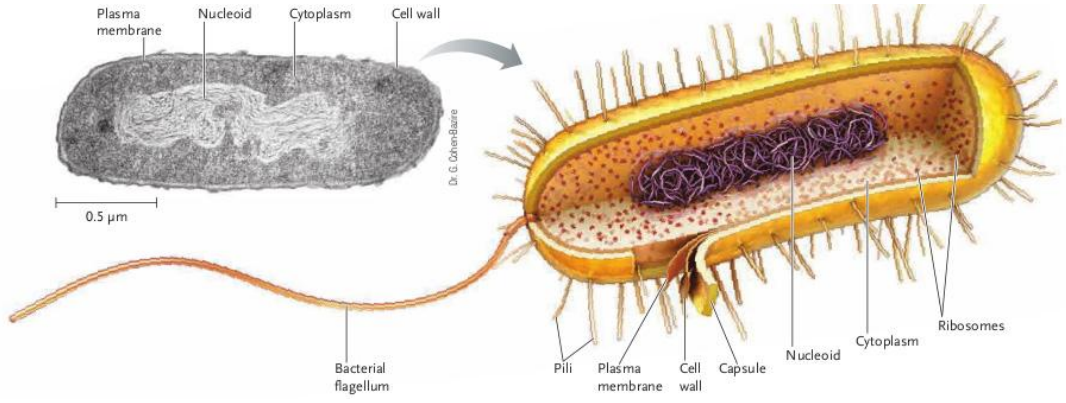
- The **plasmatic membrane** (=plasma membrane), that is a very thin and elastic external cover that delimitates the cell from the outside.
- The **cytoplasm**, which is a gelatinous substance inside of the cells where some **organelles** can be found.
- The **DNA**, which can be directly disperse in the cytoplasm or enclosed in a big organelle called nucleus. The function of this DNA or **genetic material** is directing all the functions of the cell and controlling its activities.

Cytologists have found out that every living thing in the planet is formed by very few cell types. In fact there are only two main kinds of cells in the biosphere: the **prokaryotic** and the **eukaryotic** cells, depending mostly if the DNA is directly in the cytoplasm or if it is enclosed into the nucleus.

2. Prokaryotic cells.

- The DNA is placed directly in the cytoplasm (=they do not have a nucleus).
- They are the smallest and simplest cells.
- They are supposed similar to the first living things that appeared on the Earth about 3800 million years ago.
- They never form multicellular organisms.
- They are everywhere. In fact they form the most successful living beings of the planet, but they are difficult to see as they are microscopic organisms.
- They do not have organelles, with the exception of the **ribosomes** as this is where proteins are biosynthesized (=”produced by biological means”).
- They can perform either autotrophic or heterotrophic nutrition.
- Externally to the plasmatic membrane there is always another cover called **cell wall** and, in some cases, there is even a third one called **capsule**.
- Some have one or more flagella to move.
- All the organisms with prokaryotic cells group together in the Monera kingdom and their most important representatives are the bacteria and the cyanobacteria.

This is the aspect of prokaryotic cells when using a potent microscopy:

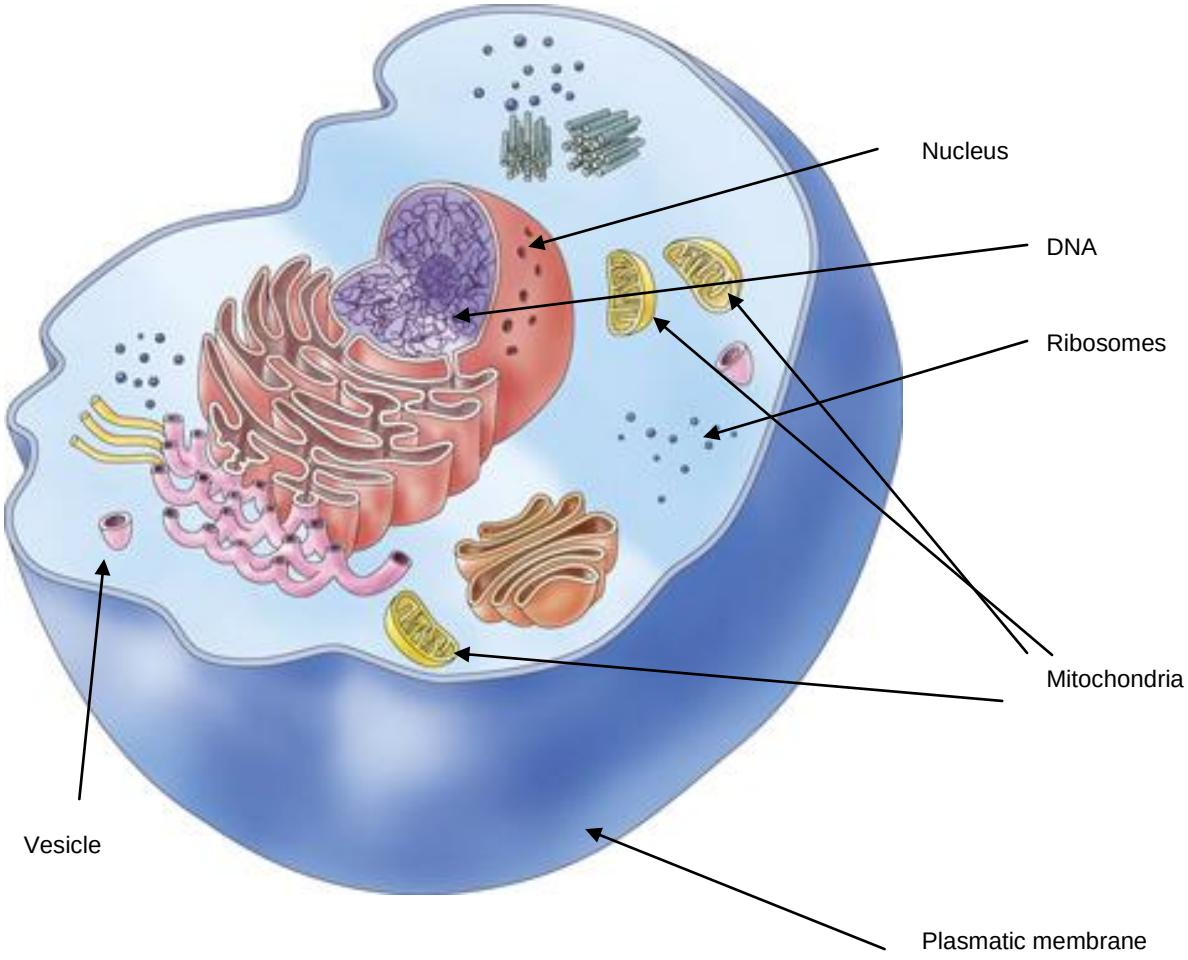


You can find a lot of drawings and pictures if you look up “bacteria” in the internet.

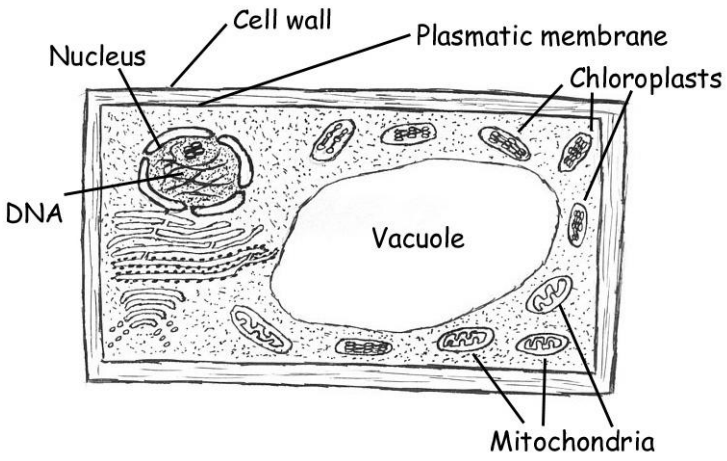
3. Eukaryotic cells.

- The DNA of these cells is always inside a big organelle called **nucleus**.
- They are bigger and more complex than prokaryotic cells.
- They appeared more recently in evolution. There are eukaryotic cells since about 2000 million of years. They evolved from ancient prokaryotic cells.
- We can find unicellular living beings with this kind of cell but, more amazing, all multicellular organisms are formed by this type of cells.
- All of them have **ribosomes** and many other more complex organelles in the cytoplasm. For instance, they all have **mitochondria**, the organelles where the energy required for the cell is produced.
- Some eukaryotic cells have heterotrophic nutrition but there are others with autotrophic nutrition thanks to the existence of specialized organelles called **chloroplasts**.
- There are two major types of eukaryotic cells: the animal-like eukaryotic cells and the plant-like eukaryotic cells.

3.1. Animal-like eukaryotic cells.



3.1. Plant-like eukaryotic cells.



You can look up in the Internet other pictures and drawings of eukaryotic cells.

Activity 16.
Write in your notebook the differences between prokaryotic and eukaryotic cells focusing specially in:
a) which one appeared first
b) size and complexity
c) position of the DNA
d) organelles present
e) living beings that have them

Activity 17.
What kind of nutrition do we find in animal-like eukaryotic cell and plant-like eukaryotic cell? How do you know?

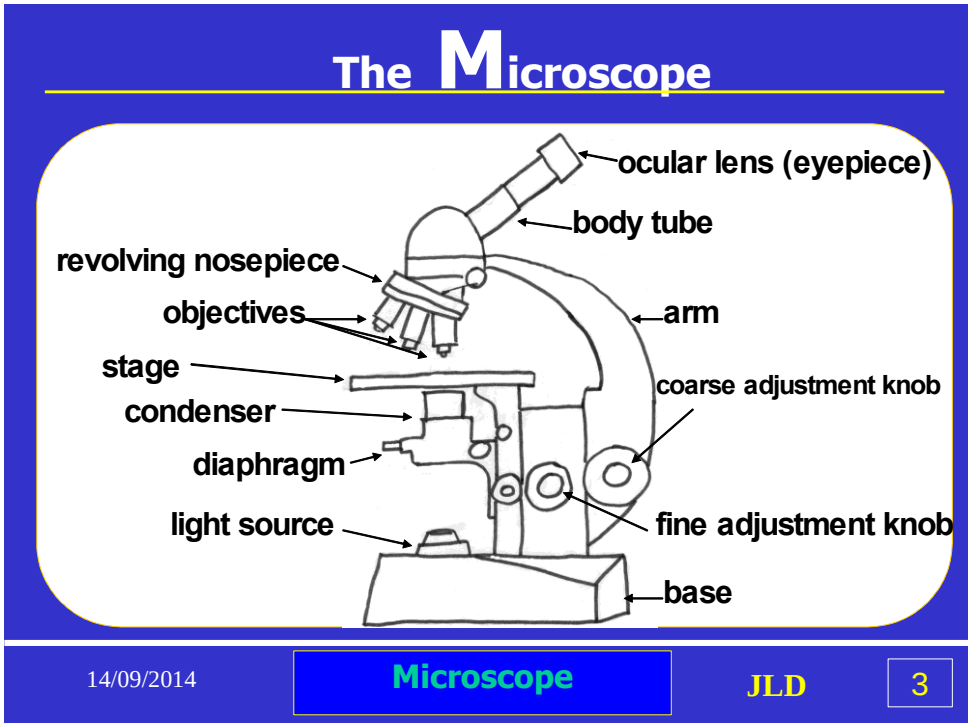
Activity 18.
Write the words “present” and “absent” to fill this table:

	Plasmatic membrane	**Cellular wall**	**Nucleus**	**Vacuoles**	**Mitochondria**	**Chloroplasts**
Prokaryotic cell						
Eukaryotic animal-like cell						
Eukaryotic plant-like cell						

Activity 19.
Write in your notebook which type of cell can we find in:
a) a mosquito
b) a horse
c) an oak tree
d) an onion
d) the bacteria that human use to produce yogurt
e) the cyanobacteria that filled the atmosphere with oxygen 2000 million years ago
f) the virus of the influenza (this is a tricky question)
g) the muscles of your body

4. The microscope.

Cells are always very small. Their size is measured in "**micrometers**" (=0,000 001 m or 0,001 mm). This is the reason why we cannot see the amazing microscopic world surrounding us. The tool that scientists use to detect and study the microscopic organisms is the microscope. There are many types of microscopes. The optic microscopes that we can find in our school laboratory are enough to see most of the eukaryotes microorganisms or the cells of the plants and the animals. The size of these cells is about 4 to 100 micrometers. But bacteria and cyanobacteria are smaller (some of them less than 1 μm) and to see them we may have to use an electron microscope that allows a magnification of up to 1 000 000 times.



This is a drawing of the optic microscope that you can find in a school laboratory. See how many different parts and components form this precise device. The slide is place on the stage and while you look through the ocular lens you have to focus the image with the coarse and fine adjustment knobs. To be an expert in using the microscope is something that takes a lot of practise and dedication.

This is the picture of the optic microscope of a school laboratory. You can look up for pictures and drawings of electron microscopes in the Internet.

5. The cell theory.

Biologists call “the cell theory” to the fact that all living organisms are made of, at least, one cell. Scientific theories are very useful because they allow us to make predictions. In this particular case the cell theory allows us to state that if a new living being is discovered anywhere in this planet it will be made of one or more cells. For more than a hundred years scientists have been looking for organisms without cells but we have not found out one yet.

As cells are so small, they were not discovered until very powerful lenses were available to build a microscope. The first person who described unicellular organisms in a book was a Dutchman called **Leeuwenhoek** who used a magnifying glass to look into a drop of water. He could not believe what he saw there. He wrote about “animacules” (=”tiny animals” in Latin) moving and swimming and feeding… like a town in miniature.

Then, it took some time before an Englishman called **Robert Hooke** invented the word “cell” after looking at the aspect of a thin layer of cork with a microscope that he devised.

In the nineteen century **Schleiden**, **Schwann** and **Virchow** established that both animals and plants were made by millions of cells which were able to perform the three vital functions. They saw that in multicellular organisms the cells group together to perform similar functions forming **tissues**.

On the other hand, Biologists do not consider that viruses are living beings. They are not made of cells and they do not perform the three vital functions, although the can reproduce when they infect a living cell of an organism.

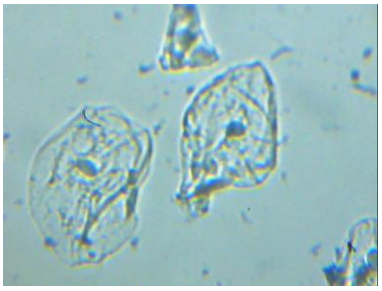
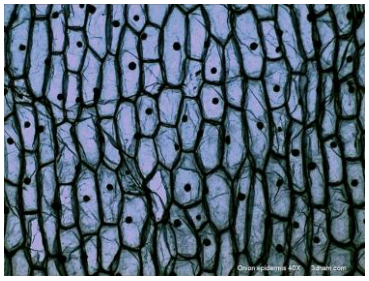
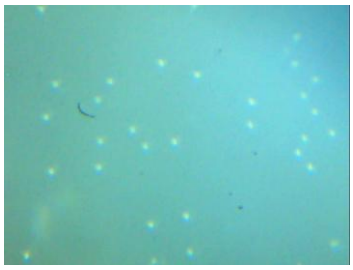
Activity 20.

Answer the following questions:

a) Which types of microscopes are used to study the smallest of the unicellular living beings?
b) Who was the man who invented the word “cell”?
c) What is a micrometer (=µm)?
d) How can we focus the image in a microscope?
e) If you were able to discover a living being without cells you would win the Nobel price, why?
f) What is the name of the organelle that produces the energy in a eukaryotic cell?
g) Where is the chlorophyll in a plant-like eukaryotic cell?
h) What is the difference between a unicellular organism and a multicellular one?
i) What are the ribosomes and where do we find them?
j) What is a tissue?

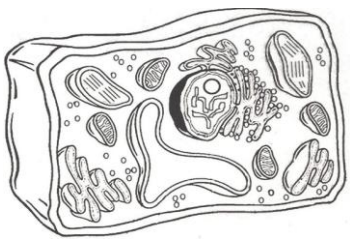
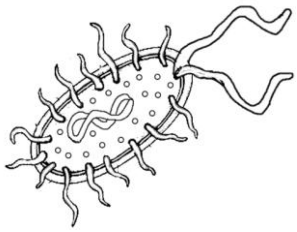
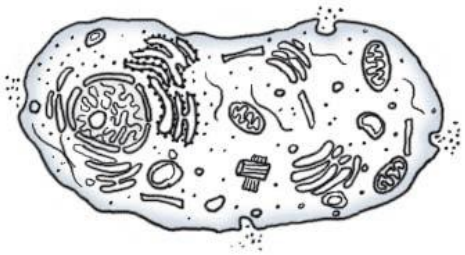
Activity 21.

Classify these cells:

Activity 22.

Copy in your notebook, write the names of the different structures and color them.

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