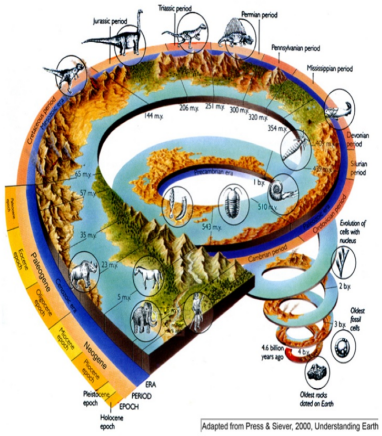
Evolution and the History of Life

Big Questions: How do we know what we know about the past?
What can our past tell us about the future?



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Examine the fossil placed on your table.
What do you notice about it?

How old do you think it is?

What kind of organism was it (plant, animal, etc.)?

What can you tell about that organism
just by looking at it?

What can't you tell just by looking at it?

What are some questions you have about it?

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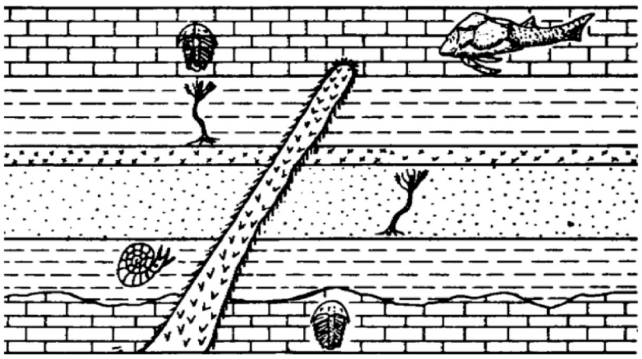
Examine the diagram below, which shows fossils in layers of rocks. (The bricks represent rocks.)
Which layer do you think is the most recent? Which layer do you think is the least recent? Discuss this with your group and come to a decision.
One of the rock layers cuts through the others. Do you think this is more recent or less recent than the layers it cuts through? Discus this with your group and come to a decision.



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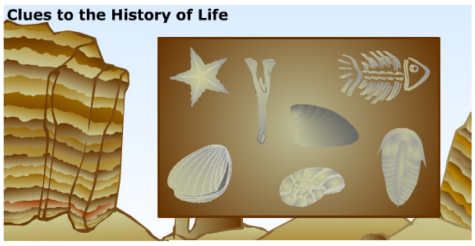
How can you tell how old something is?



1. Relative dating: Compare it to a similar group, then compare it to other groups that go chronologically.

Ex. I know that Joe Student from Banneker and Jane Student from SWW are both ninth graders. I know that they are close in age to students in ninth grade across the city. I know that ninth graders are older than 8th graders and younger than 10th graders, so Joe and Jane should be about the same age.

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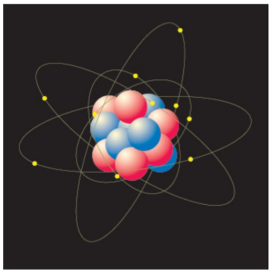
2. Absolute Dating

Atoms have nuclei made of protons and neutrons.

Atoms of the same element have the same number of protons.

Atoms of the same element can have different numbers of neutrons.

We call these alternative forms **isotopes**.



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Ex. Most carbon atoms have 6 protons and 6 neutrons, but some have 6 protons and 7 or 8 neutrons.

Carbon-12 Carbon-13 Carbon-14

The carbon with 7 neutrons is named Carbon-13, because its atomic mass is 13 (6 protons + 7 neutrons).

The carbon with 8 neutrons is named Carbon-14, because its atomicmass is 14 (6 protons + 8 neutrons).

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Some isotopes are unstable. They can lose protons andneutrons from their nuclei, breaking down into other elements. This is called being **radioactive**.

Isotopes break downin predictable ways: they take a set amount of time to break down into other elements.

We can use this predictable break down to determine the age of rocks and fossils.

Isotopes will generally have half their atoms decay - break downinto other elements - within a set amount of time. This is called a **half-life.**

Carbon-14 has a half-life of about 5,700 years - it can only be used to date material about 50,000 years old. Other elements (Potassium-40,Uranium-235, etc.) are used to date older materials.

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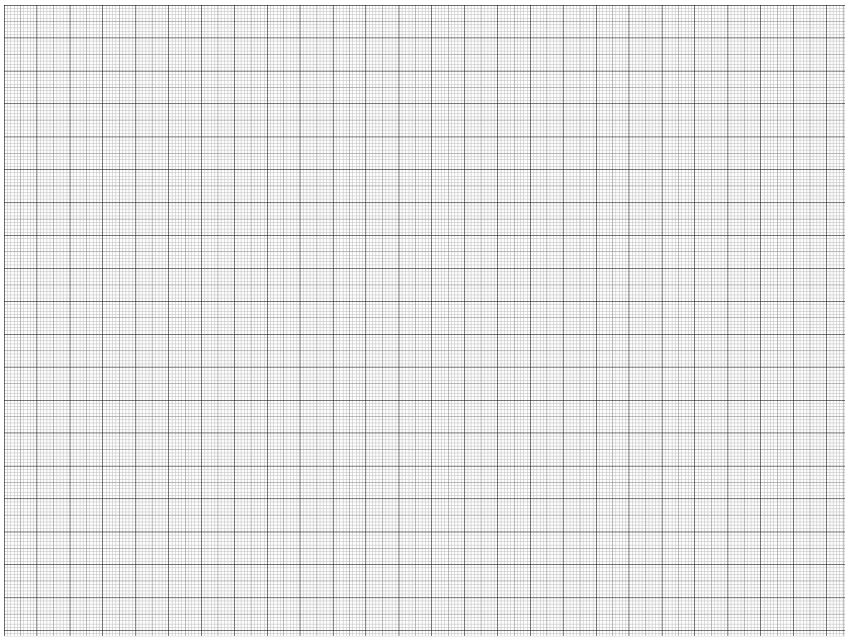

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If you began with 400 pieces of "undecayed" candy, predict how many you think would still be undecayed after 4 rounds of shaking (half-lives)?

A 200
B 100
C 50
D 25
E 13

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If you know that you began with 100 pieces of undecayed candy and now have 13 pieces of undecayed candy (the rest have decayed), how many rounds of shaking (half-lives) do you think have passed?

A 1 half-life
B 2 half-lives
C 3 half-lives
D 4 half-lives
E 5 half-lives

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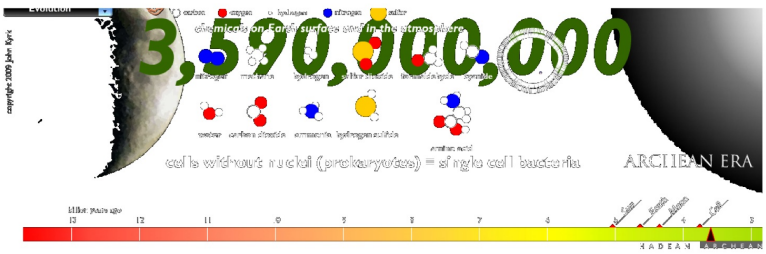
The Origin of Life and the First Cells



The first cells were unicellular prokaryotes - one-celled organisms without membrane-bound organelles or nuclei, a membrane around their DNA.

They probably resembled modern bacteria and later archaea.

For 2.2 billion years they were the only life on earth! They ruled (and still do)!

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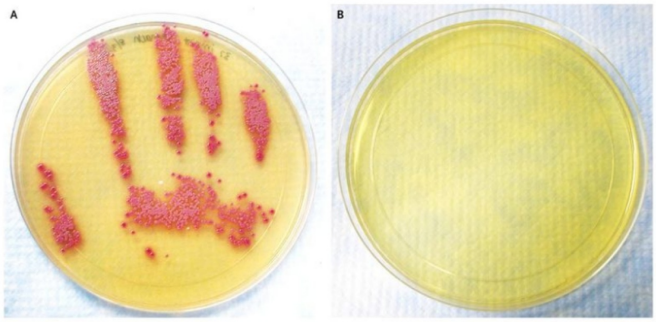
Graphic encouragement to wash your hands!



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Take 5-7 minutes with your group to design a hand-washir campaign for SWW.

Your sign should be *persuasive* and *informative!*

You may finish at home if you'd like to find graphics online, etc.

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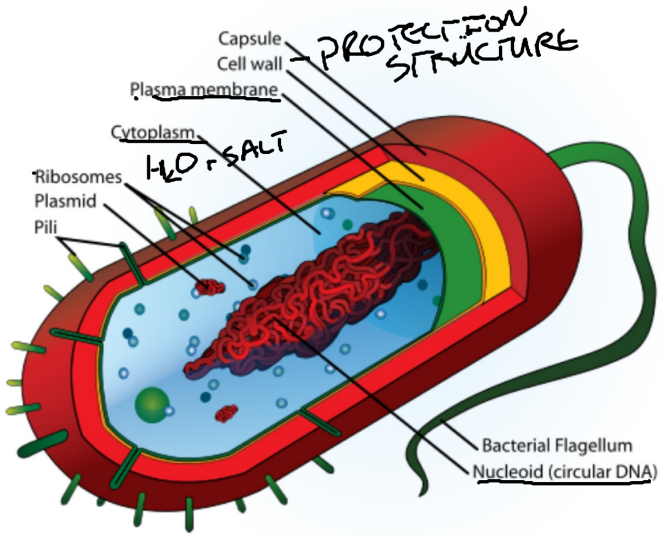
Generalized sketch of bacteria.



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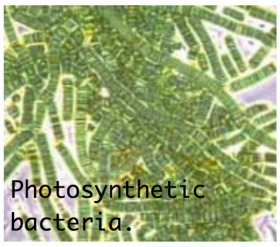

Bacteria come in many shapes, colors, and sizes!

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Most people know bacteria best as "germs."
But our idea of germs is relatively new.

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Germ theory states that microorganisms, including bacteria, cause disease.

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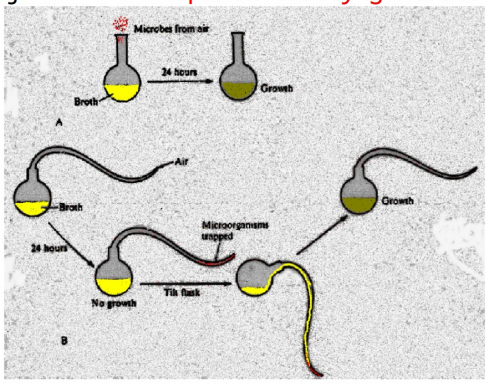
But where do bacteria come from?

Before bacteria were understood, people believed that objects could spontaneously generate life.



Pasteur proved them wrong:
Life could not be spontaneously generated;
it had to come from other life.

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The Yogurt Lab

I.V.?
D.V.?
Controlled variables?
Control groups?
Why do we sterilize?
What does this have to do with Pasteur?
Why do we cool the milk?

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So where did the first life come from?

We don't know! But people have conducted experiments to test how the environment of early earth could produce organic compounds.

The Miller-Urey Experiment

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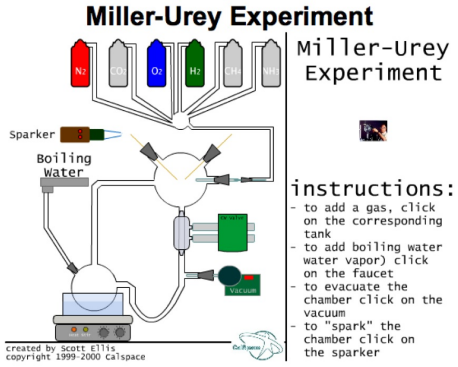

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