Archaea and Monera

Almost all unicellular organisms fall into one of these three groups; Archaea, Monera and Protista.

Archaea and Monera are single celled **prokaryotic** organisms.

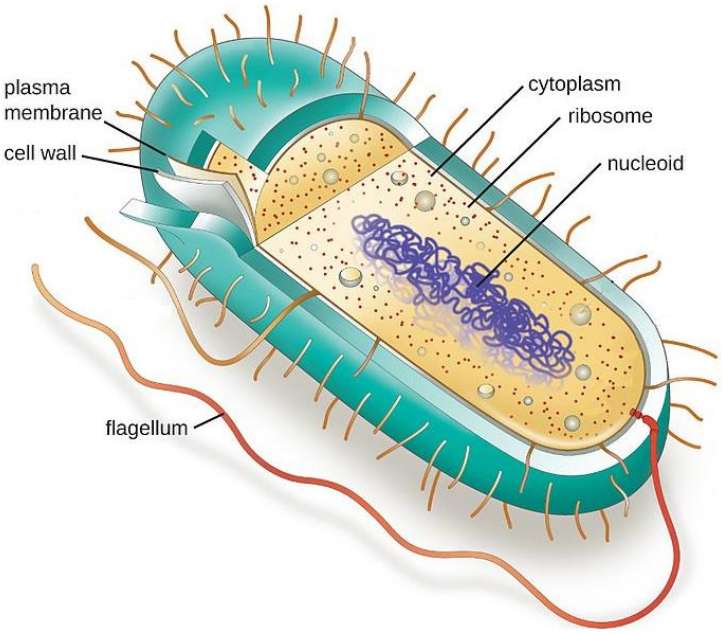
Protists are mainly single celled **eukaryotic** organisms that are often grouped and referred to as plant-like, animal-like, or fungus-like.

Recall from Unit 1

Prokaryotic cells – have no nucleus and membrane bound organelles and are smaller.

Eukaryotic cells - have nucleus and membrane bound organelles and are larger.

Archaea



Archaea are microscopic **prokaryotic** single celled organisma that are quite different than bacteria. Even their name ("archaea" meaning "ancient") implies that they are a very ancient life form thought to have been around for 3.5 billion years when the earth was a harsh inhospitable environment (FYI the earth itself is 4.5 billion years old).

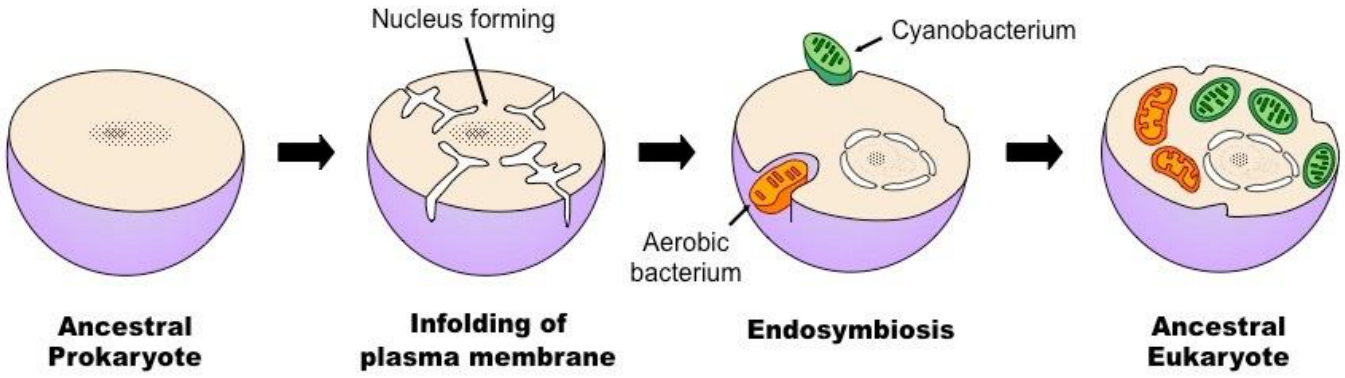
Originally "normal" bacteria and Archaea were classified into one kingdom (Monera) because they are both comprised of prokaryotic cells (the other four kingdoms are all comprised of eukaryotic cells).

However recent genetic gene sequencing and biochemical studies suggest that Archaea are actually significantly different than "normal" bacteria and thus belong in their own unique grouping.

Archaea typically live in and can tolerate very extreme conditions such as deep ocean sulfur vents and volcanic hot springs where they tolerate extreme temperatures, pH, and salt levels. That said, like "normal" bacteria, archaebacteria are found almost everywhere. However, unlike "normal" bacteria, archaea do not appear to cause any disease in humans.

Some Archaea are aerobic (live in presence of oxygen) and some are anaerobic (live in absence of oxygen).

The theory of endosymbiosis suggests that eukaryotic cells may have originally formed when large Archaea engulfed smaller “normal bacteria” and started to utilize them as “organelles” such as mitochondrion and chloroplasts.



Types of Archaea

Halophiles

- live in and require very salty environments that would kill other life forms.
- halophile means lover of salt.

Methanogens

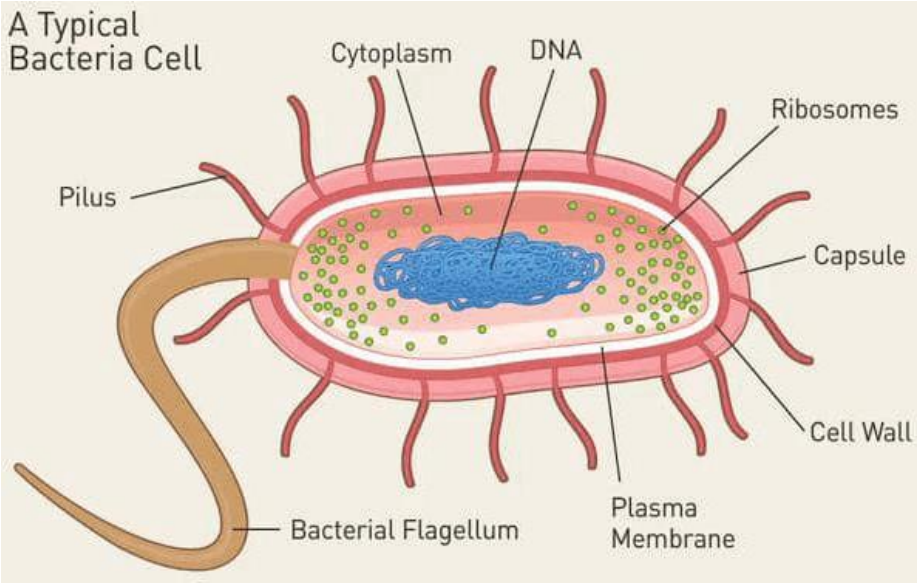
- methane gas generators.
- anaerobic only.
- live in intestines of cows and other ruminants, and even in some humans.
- can also be found in mud and some swamps where methane gas is produced.

Thermoacidophiles

- live in hot and acidic environments.
- temperatures usually around 60℃ but some as high as 113 ℃.
- pH around 2.0 but as low as 0.9 which is extremely acidic.

Monera

Monera are microscopic **prokaryotic** single celled bacteria. Most feed on dead material (decomposers) but some make their own food (autotrophic) while others utilize other non-organic compounds as energy sources. Some have been on earth for 3 billion years.



Some are classified as harmful as they cause disease in both plants and animals (including humans). Some are classified as helpful.

Harmful Examples

Cause disease in various plants including agriculturally important crops such as various grains, fruits, and vegetables.

Cause disease in animals including humans. Refer to our Bacteria PowerPoint for a look at some of the more common bacterial infections that have plagued humanity.

Helpful Examples

Nitrogen fixing bacteria live in association with fugal roots of some plants and help convert nitrogen found in the air into a useful form which can be picked up by plants and used to make amino acids and eventually proteins.

Production of some foods such as some yogurts, cheeses, fermented beverages, sauerkraut.

Production of some antibiotics.

Alexander Fleming was credited with discovering antibiotics in 1928 rather by accident.

Play an important role as decomposers helping return molecules and atoms to the soil where they can again be picked up by plants as nutrients.

Bacteria are often named/classified based on their shape.

Three of the most common shapes are; Cocci, Bacilli and Spirillum.

Cocci

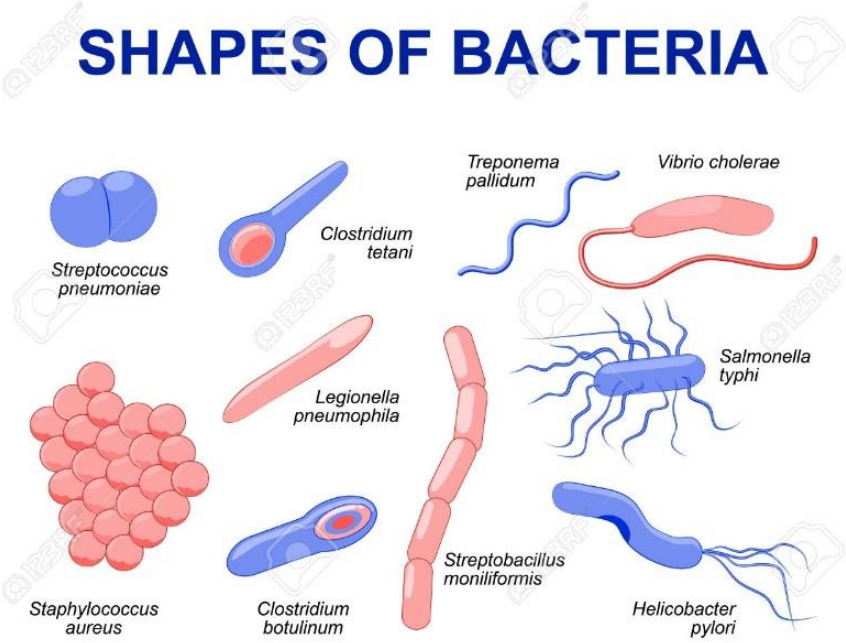
- round.
- exist as singles or clusters.

Bacilli

- rod shaped.
- exist as pairs or chains.

Spirillum

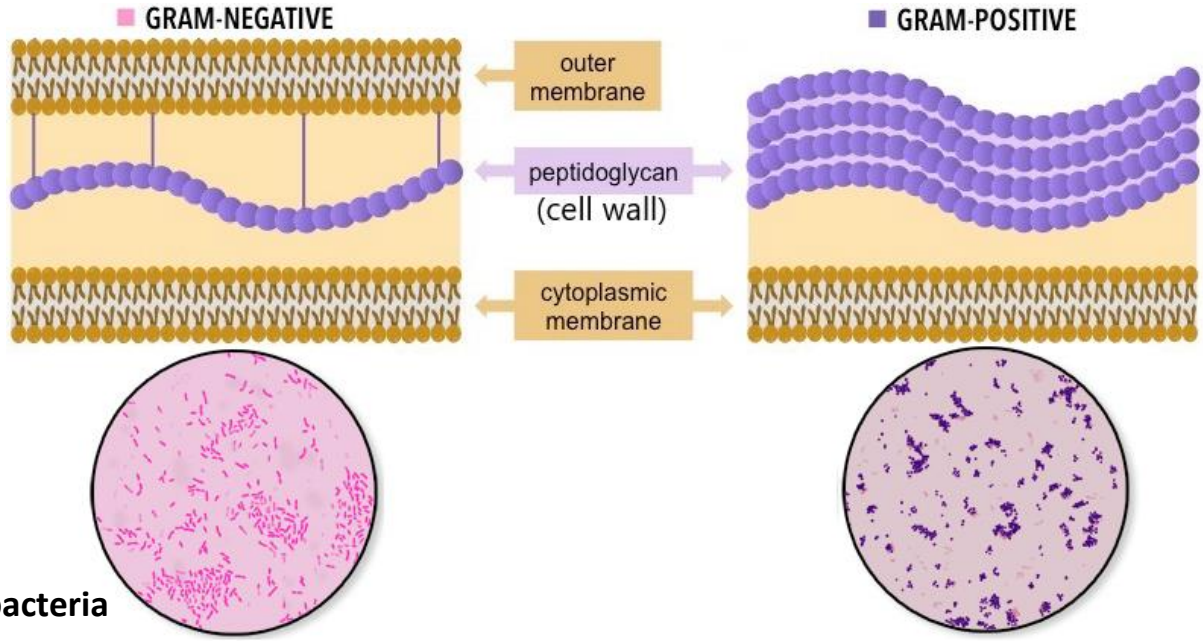
- spiral shaped.
- singles only.



Generally bacteria are classified into two main groups; Eubacteria and Cyanobacteria

Eubacteria

- known as true bacteria.
- often move with flagella.
- **gram-negative** - outer membrane with **thin cell wall**; turns pink when stained.
- **gram-positive** - no outer membrane **thick cell wall**; turns purple when stained.



Cyanobacteria

- known as blue-green algae and are aquatic.
- most are photosynthetic and most contain chlorophyll or other pigments.