Robert Hooke and Anton Van Leeuwenhoek invented the microscope which led to the discovery of bacteria and microscopic life.

Most prokaryotes are generally described as bacteria.
Identifying Prokaryotes

- **Shapes**
  - **Bacilli** - rod shaped
  - **Spirilla** - spiral and corkscrew shaped
  - **Cocci** - spherical shaped

- **Cell Walls**
  - **Gram Positive Bacteria** - thick peptidoglycan walls.
  - **Gram Negative Bacteria** - thinner cell walls inside a lipid layer.

- **Movement**
  - None, flagella, snake movement, gliding
Identifying Prokaryotes

**Releasing Energy**

- **Obligate Aerobes** - require a constant supply of oxygen in order to live. Uses cellular respiration. (Ex: *Mycobacterium tuberculosis*)

- **Obligate Anaerobes** - must live in the absence of oxygen. Uses fermentation. (Ex: *Clostridium bolulinum*)

- **Facultative Anaerobes** - can survive with or without oxygen. Switch between cellular respiration and fermentation. (Ex: *E. coli*)
Growth and Reproduction

- **Binary Fission** - asexual reproduction in which an organism replicates its DNA and divides in half, producing 2 identical daughter cells.

- **Conjugation** - a bridge forms between two bacterial cells, and genes move from one cell to the other. Increases genetic variation.

- **Spore Formation** - in unfavorable growth conditions, many bacteria form spores.
  - An endospore forms when a bacterium produces a thick internal wall that encloses its DNA and some of its cytoplasm.
Importance of Bacteria

- Some are producers, other capture energy by photosynthesis, some are decomposers, and some provide benefits to humans.
  - **Decomposers**- help the ecosystem recycle nutrients. Break down food and human waste in sewage treatment. Help purify water.
  - **Nitrogen Fixers**- convert nitrogen gas into a form that plants can use. Helps produce fertilizer for plants.
  - **Human Uses**- used in the production of food and beverages, breaks down petroleum (clean oil spills), used in genetic engineering and synthesizing drugs, bacteria in the gut produce vitamins for the body.
Warm Up Exercise

- What are the two main kingdoms of bacteria?
- What domain(s) are they in?
Viruses- Chp. 19.2

- **Viruses** - parts of nucleic acids, proteins, or lipids.
  - Can reproduce only by infecting living cells.
  - Typically composed of a DNA or RNA core surrounded by a protein coat, called a capsid.
  - Most viruses are highly specific to the cells they infect.

- **Bacteriophage** - viruses that infect bacteria.
Viral Infection

- **Lytic Infection** - a virus enters a cell, makes copies of itself, and causes the cell to burst.

- **Lysogenic Infection** - a virus integrates its DNA into the DNA of the host cell and the viral genetic information replicates along with the host cell’s DNA. Replicates indefinitely.

- The viral DNA that embeds itself in the host is called a prophage.
Viruses and Living Cells

- **Retroviruses** contain RNA as their genetic information.
- AIDS is a retrovirus.
- Viruses are parasites and depend on other living organisms for their existence, harming that other organism in the process.
Disease in Humans

- **Pathogens** - any disease-causing agent.

Bacteria produce disease in 1 of 2 ways:
- By damaging cells and tissues of infected organisms directly by breaking down the cells for food.
- By releasing toxins (poisons) that travel throughout the body, interfering with the normal activity of the host.

- **Vaccine** - weakened or killed pathogens used to produce immunity to a disease.

- **Antibiotics** - compounds that block the growth and reproduction of bacteria.