All bacteria are single-celled organisms (something that’s alive).
* Can belong to Kingdom Bacteria or Archae.
  * Archae live in nuclear reactors, geysers, and hot pots found at Yellowstone, etc.
* Bacteria are found everywhere.

Sources: Pictures 1 & 2 - University of California at Davis; Picture 3 - New Zealand Electronic Tech Center
Come in three shapes.
* Round (coccus [plural cocci])
* Rod (bacillus [plural bacilli])
* Spiral (spirillum)

Some bacteria are **consumers**.
* **Consumer** - must find and consume food to survive [animal-like].

Some bacteria are **producers**.
* **Producer** - a living thing that makes its food from simple substances and sunlight [plant-like].

**Beneficial** uses of bacteria.
* Provides nitrogen for plants.
* Fixes the soil (changes the nitrogen to a form the plant can use).
* Get minerals from ores.
* Used to make plastics and laundry detergents.
* Help make antibiotics.
* Food production.
  * Yogurt
  * Sauerkraut
  * Pickles
  * Olives
  * Chocolate
  * Cheese
  * Soy Sauce

**Harmful effects of bacteria.**
* **Cause Diseases** (<1% of bacteria cause diseases)
* Three ways to get disease.
  * Through air (breathe in).
  * Through touch.
  * Eating contaminated food.

**Examples of bacterial diseases.**
* Dental caries (cavities).
* Strep throat.
* Salmonella.
* Typhoid fever.

Source: Learning with Online Exercises in Soil Science
- Causes disease in farm animals.
- Causes metal to rust and wear away.

- How to treat/prevent diseases.
  - Vaccinations.
  - Antibiotics.
  - Wash hands after using bathroom or whenever dirty.
  - Cook food properly.
  - Store food properly.
  - Cover mouth when sneezing, coughing.

**Protozoans (Protozoa/Protista)**

- **All** are single-celled organisms.
  - Found in water.
  - Can be consumer or producer.

- **Major types of protozoan.**
  - **Amoeba**
    - Is the simplest form of protozoan.
    - Moves using psuedopods (False feet).
    - Has no set shape.
    - Clear.
    - Is a consumer.
    - Eats algae, bacteria, other protozoan, dead plant or animal matter.
  - **Euglena**
    - Oval shaped.
    - Is green.
      - Is a producer.
    - Can also be a consumer.
    - Moves using a whip-like flagellum (flagella plural).
  - **Paramecium**
    - Oval shaped.
    - Translucent.
    - Moves using cilia (hair-like structures around body)
    - Consumer.
    - Eats algae, bacteria, other protozoan, dead plant or animal matter.
Spirogyra
- Simple plant.
- Producer.
  - Has no form of movement. Only moves with the flow of the water.

Harmful effects of Protozoans.
- Cause diseases
  - Example - giardia (diarrhea and abdominal pain)
  - Don’t drink untreated water.

Algae
- Plant-like
  - Primarily green
    - Can also be brown or red.
  - Produce 50% of the oxygen we breathe.
  - Primary source for organisms living in water.
  - Range from single-cell to 100 meters long.
  - Live in water.

Benefits of algae.
- Used in ...
  - livestock feed.
  - cosmetics.
  - prescription drug production.
  - identifying possible environmental problems.
  - food production.
    - Sushi.
    - Ice cream.
    - Pudding
    - Salad dressing.
    - Syrup.
      - Primarily used as a thickener.

Harmful effects of algae.
- Algal blooms.
  - Certain types of algae grow rapidly.
  - Grow large enough to form visual patches.
Fungi (fungus singular)

* Consumer.
  * Eat by absorbing food.
    * Get food from soil, wood, decaying organic (once living) matter, and living plants/other organisms.
  * Can be from single-celled to largest organism alive.
  * Can’t move.
* Decomposers.
  * Feeds on and breaks down dead plant or animal matter.
* Examples.
  * Mushrooms.
  * Truffles.
    * A mushroom like fungus that grown underground; primarily found in Europe; a highly valued food.
  * Lichen
    * Fungus often found as white or yellow patches on old walls, etc.

* Benefits of fungi.
  * Used to make chemicals used in manufacturing.
  * Produce antibiotics (example - penicillin).
  * Clean the environment.
  * Food production.
    * Cheese
    * Mushrooms
    * Yeast
    * Truffles
    * Soy sauce

* Harmful effects of fungi.
  * Causes 70% of all crop diseases.
  * Diseases in humans.
    * Respiratory (lung) diseases (example - pneumonia).
    * Athlete’s foot.
    * Ringworm (makes a raised round circle that looks like it was caused by a worm).
Highlights in the History of the Study of Microorganisms

★ Microorganisms not known until 1670’s.
★ Had to have a microscope first.
★ Invented in 1595 by Zacharias Janssen
★ Was considered a toy for the rich.

★ Anton Van Leeuwenhoek 1670’s
★ Improved the microscope so much he’s considered the father of the microscope.
★ First looked at water under a microscope
★ Discovered small animals.
★ Called them “animalcules” (small animals)
★ Probably were bacteria

★ Edward Jenner 1790’s
★ Developed the first vaccine
★ Noticed that milk maids who had cowpox did not get smallpox
★ Injected cowpox in volunteers
★ They did not get smallpox

★ Ignaz Semmelweis and Oliver Wendell Holmes 1840’s
★ Women were dying after giving birth from Child Bed Fever
★ Semmelweis and Holmes suggested washing hands between patients
★ When hands were washed, Child Bed Fever almost vanished.

★ Joseph Lister 1860’s
★ Many patients got sick and died after operations.
★ Lister proposed disinfecting operating room and instruments between operations.

★ Louis Pasteur 1860’s
★ People believed life arose “spontaneously.”
★ Mice came from grain bags.
★ Pasteur proved that life had to come from existing life.
★ Proposed that germs caused disease.
Develop pasteurization.
  • Rapidly heating something to kill germs.

 Robert Koch 1880's
  • Germs cause disease

 Sir Alexander Fleming 1928
  • Discovered the "miracle drug" penicillin

"Doctor, doctor, will I be able to play the violin after the operation?"
"Yes, of course..."
"Great! I never could before!"

Doctor: Did you take the patient's temperature?
Nurse: No. Is it missing?

Doctor: Does it hurt when you do this?
Patient: Yes.
Doctor: Well, don't do that.

Nurse: Doctor, there is an invisible man in your waiting room.
Doctor: Tell him I can't see him now. Next.