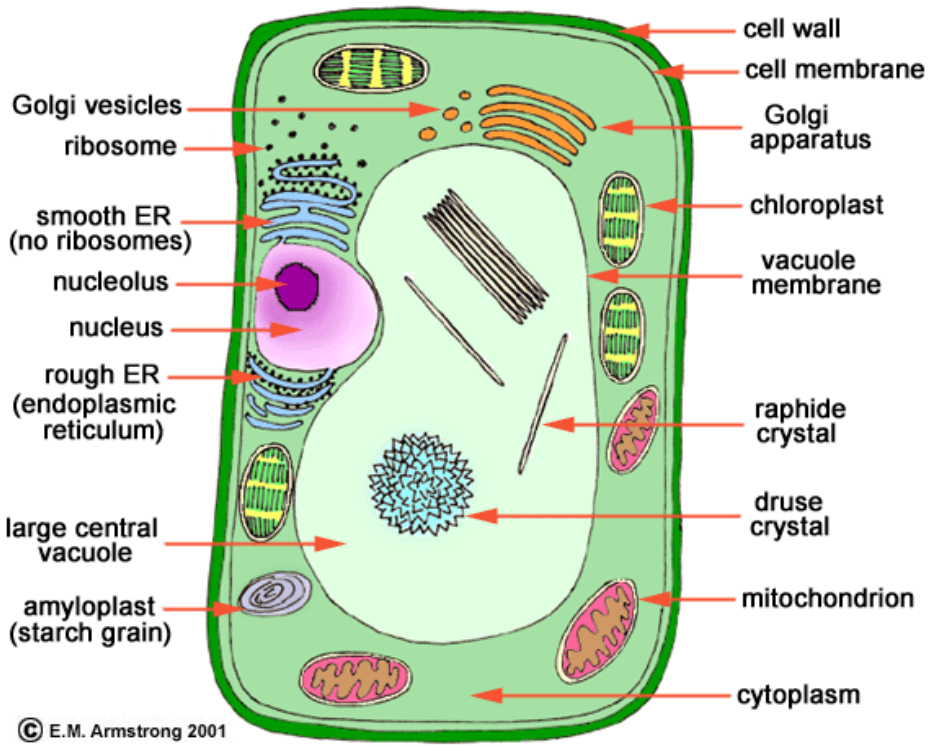
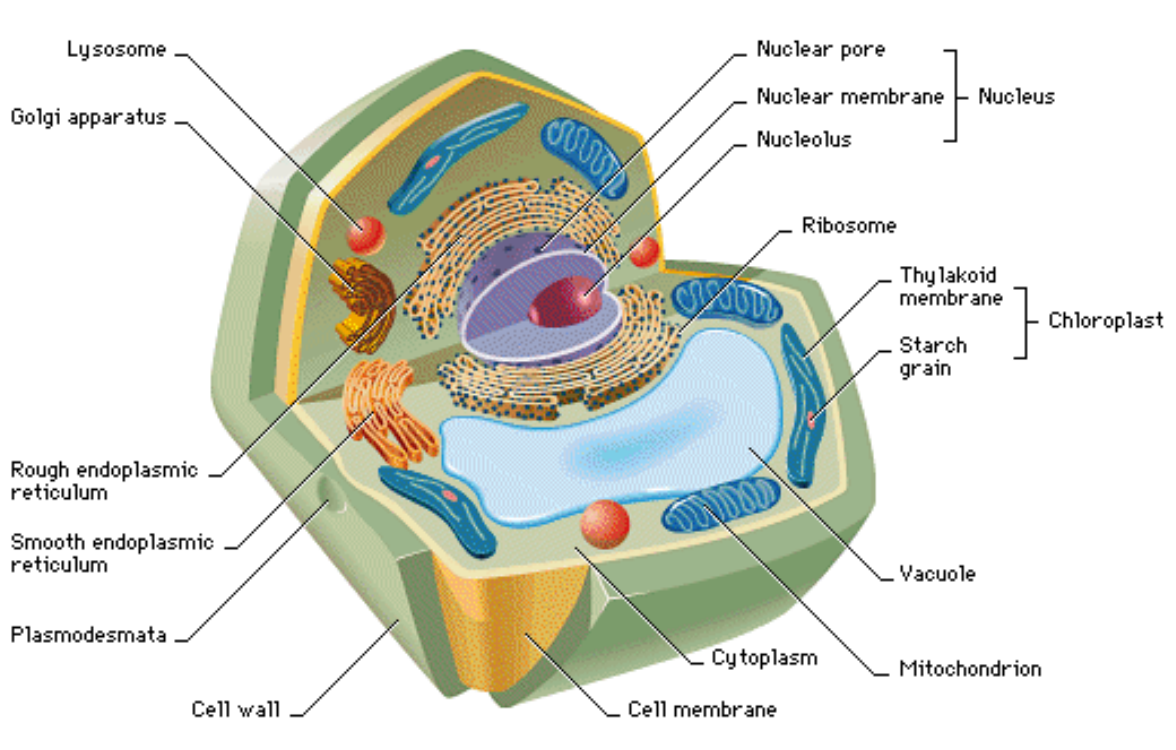
# Unit 6




## Cytology

## (The Study of Cells)

***Levels of Organization of Living Things:***

1. Cell
   Smallest basic unit of structure in living things.
2. Tissue
   Group of similar cells working together.
   ex: muscle tissue, nerve tissue
3. Organ
   Group of similar tissues working together.
   ex: heart, brain
4. Organ system
   Group of similar organs working together.
   ex: circulatory system (heart, arteries, veins, capillaries, blood).
   ex: digestive system (esophagus, stomach, small intestine, large intestine, liver, pancreas).

# Organelles of the Cell

The term "***organelle"*** means "tiny organ".

Nucleus- "brain" of the cell.

Cytoplasm- Jelly-like goo that fills the cell.

Ribosomes- Make proteins

Endoplasmic Reticulum- "highway system" of the cell for transporting nutrients and waste.

Golgi Body or Golgi Apparatus- "packager" of the cell.

Vacuole- Large in plants, Small in Animals. Used for storage.

Organelles of the Cell

Mitochondria- In both plant and animal cells, but more in animals.
"Power house" of the cell. Where energy is produced.

**Nuclear Envelope/Nuclear Membrane**- Surrounds the nucleus, controls what goes in and out of the nucleus.

**Cell membrane**- Controls what goes in and out of the cell.

***Lysosomes***- Only in animals, "suicide sacs", In charge of patrolling the cell and getting rid of the "bad" stuff.

***Chloroplast***- Only in plants, makes the plant green. Contains chlorophyll, which allows photosynthesis to take place.

***Cell Wall***- Only in plants, provides plants a rigid structure.

# Diagram of the Cell

- Have a title at the top.
- Select ***either*** a plant cell or an animal cell.
- Label the organelles, with a brief description (I would use the description from the notes, not the textbook).
- Should be colored, or nicely shaded if that is your thing!

# ***The Microscope:***

***Microscope:*** views “small” things (micro=small)
***Telescope:*** views “far” things (tele=far)

# ***History of the Microscope:***

***Zacharias Janssen***:

Spectacle maker, made first compound microscope in 1590.

Great magnification, poor resolution (blurry image).

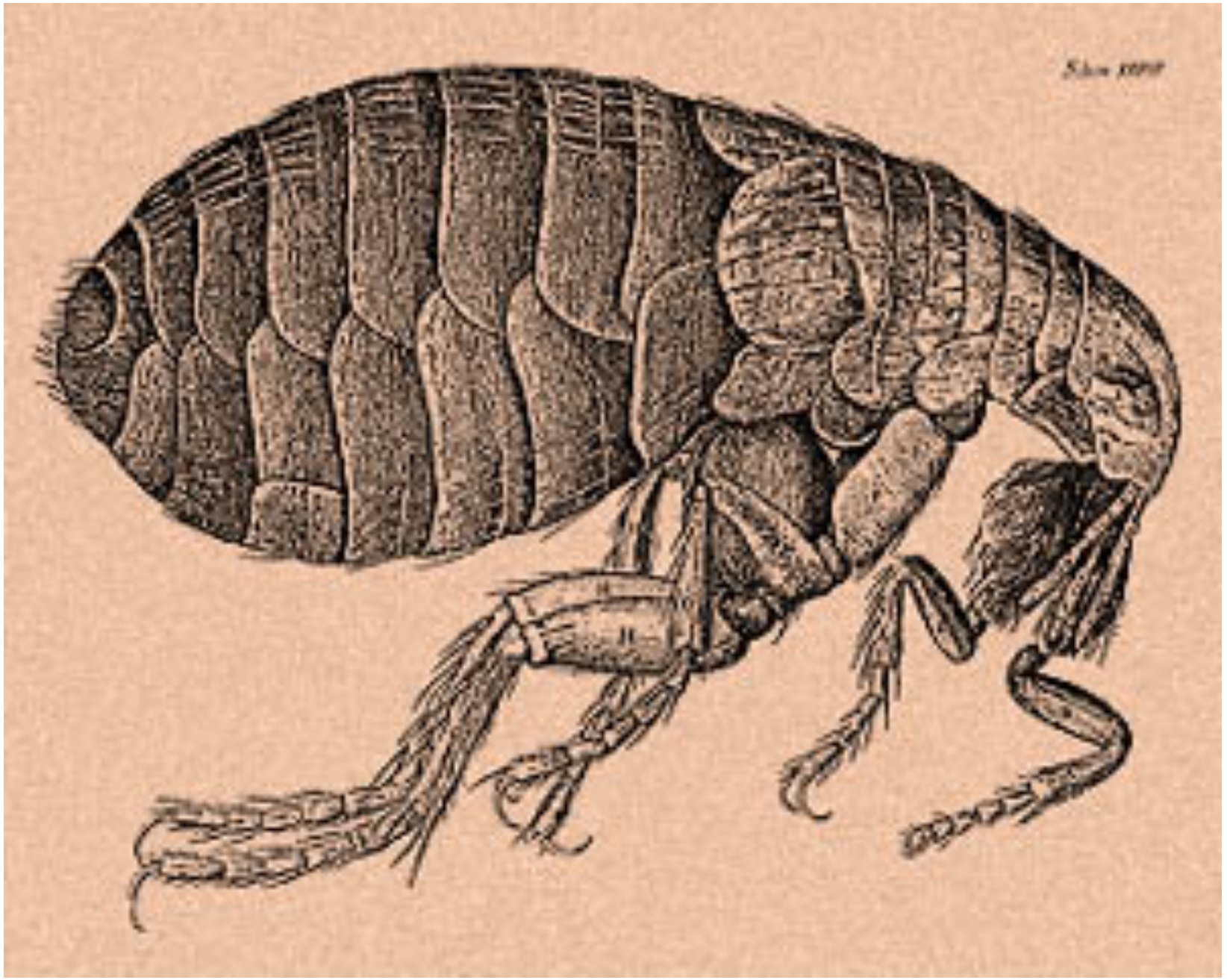
***Anton van Leeuwinhoek***:

1600's: Made simple microscope (1 lens) that could get up to 300x.

1st to see:

Living cells, bacteria, capillaries, "animicules" (protists), etc.

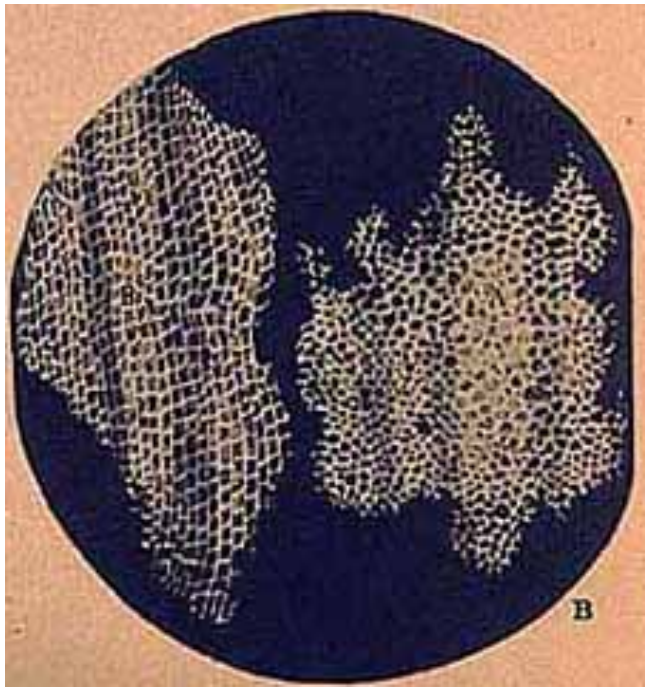
Never shared how he made such quality lenses.



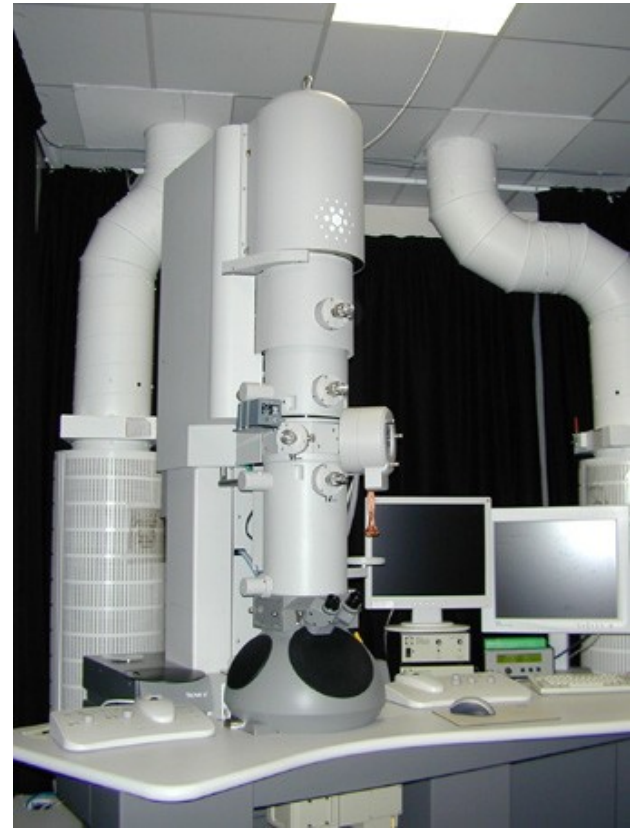
## ***Robert Hooke:***

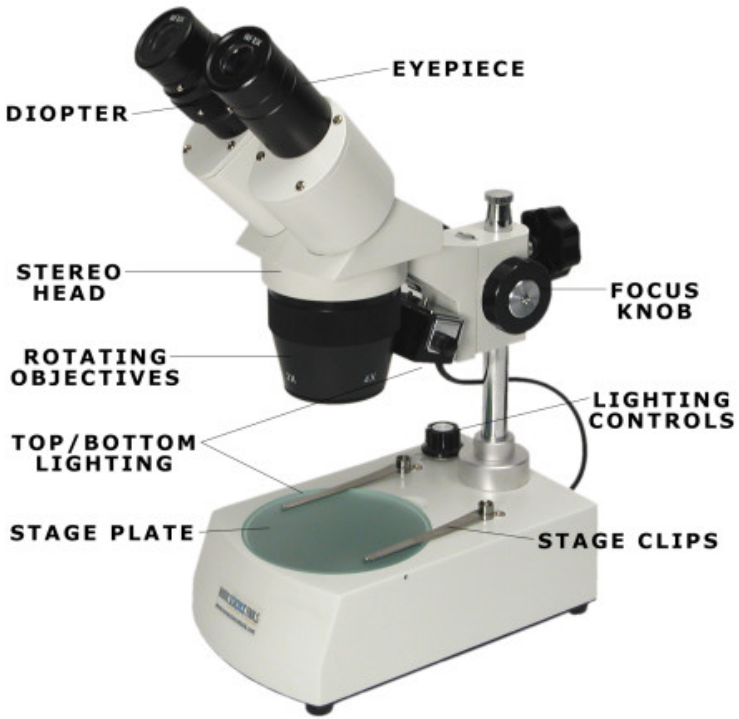
Constructed successful compound microscope (2 lenses).

Coined the term “cell” after observing “tiny rooms” in cork.

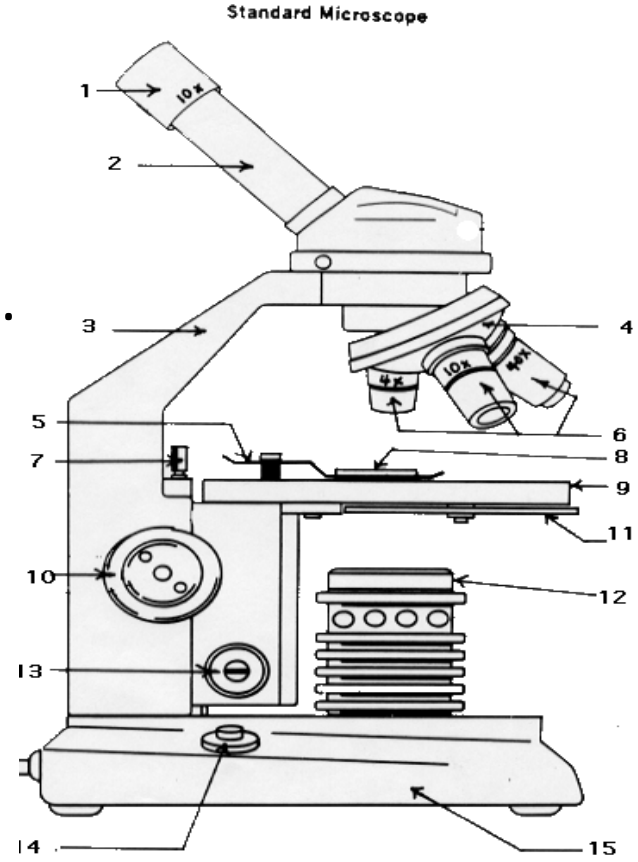
The First Compound Microscope (circa 1595)






# ***Parts of the Microscope***

1. Ocular lens (most of ours are 10x).
3. Arm
4. Revolving nosepiece (holds objective lenses).
5. Stage clip
6. Objective lenses (4x, 10x, 40x)
8. Stage opening
9. Stage (where you place the slide)
10. Coarse adjustment knob (use first when focusing)
11. Diaphragm (adjusts amount of light allowed through).
12. Light source (light or mirror)
13. Fine adjustment knob (always smaller, use after getting “close” with coarse).
15. Base



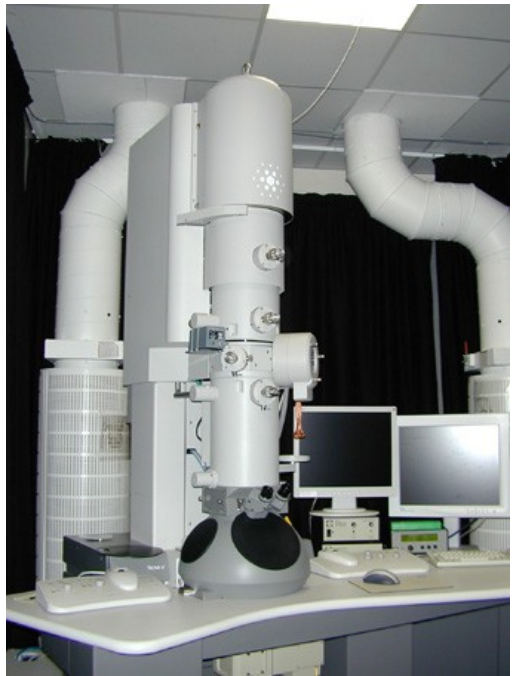
# Types of Microscopes

***Light Microscope:***
Can magnify up to about 1000-2500x at best; typically goes up to about 400x.

**Monocular:** a microscope that has only one ocular (eye) lens.
**Binocular:** a microscope that has two ocular (eye) lenses.
**Dissection microscope:** lower magnification (typically 20x-40x).

***Electron Microscope:***
Uses beam of electrons to project image on screen.

Can magnify 1-2 million times.



# ***Steps to Using the Microscope:***

1. Start with stage down, on low power.
2. Place slide on stage over stage opening.
3. Focus using coarse adjustment then fine adjustment on low power, centering object in view.
4. Without changing the focus, rotate to medium power.
5. Refocus as needed, using coarse adjustment then fine adj., center object again.
6. Without changing the focus, rotate to high power.
7. Use only fine focus on high.
8. When finished viewing, put on _low_ power with the stage down; then remove the slide.

# ***Disease Basics***

Infectious vs. Noninfectious Diseases.

- Noninfectious cannot be spread from person to person.
  - ex: heart disease, stroke, cancer

- Infectious can be spread, in one of four ways.
  1. Contact with infected person (direct contact, sneezing)
  2. Contact with contaminated object (water bottle)
  3. Contact with infected animal (rabies from dog or raccoon, Lyme disease from tick).
  4. Contact with environmental sources (some viruses & bacterial live naturally in food, soil, & water).
     a. Salmonella bacteria live in poultry, eggs, and meat (may cause food poisoning).
     b. Tetnus is a bacteria that lives in soil; step on nail that has been in the dirt, puncture can inject the bacteria into you.

# General Terminology:

- Host: an organism that provides a source of energy/nutrition for another organism.
- Parasite: organism that feeds off another organism, and causes it harm.

We often think of animals/organisms such as ___ticks_____ & __tapeworms____ as being parasites, but viruses, bacteria, and protists often are parasites as well, because they are feeding off of you, and causing you harm.

Viruses are not considered to be living things by most biologists.

Don’t have the two-name scientific names like living things do.

Named in a variety of ways:

a) After the disease they cause (polio virus).
b) After the organism they infect (tobacco mosaic virus).
c) After where first found (West Nile virus).
d) After people associated with it (Epstein-Barr virus that causes mononucleosis, or mono).

Bacteria and Protists would all have scientific names, just like you.

Basic Treatments:

- Vaccine/Vaccination:
  - Given to you before getting the disease.
  - Introduces a dead or weakened form of a virus/bacteria, so your immune system will recognize it in the future.

- Antibiotics:
  - “Anti” means against; “bio” means life.
  - Prescribed after you get sick, kills the microorganisms causing the illness.

Vaccines commonly used to fight viral diseases.
Antibiotics commonly used to fight bacterial diseases, though some also have vaccines available.

# Pandemic and/or Epidemic Assignment

Well, this is kind of timely isn't it?

There have been many diseases over the course of history that would be classified as ***epidemic*** or ***pandemic***. Basically what the term ***pandemic*** means is that you have a disease that:

1. is spread by person to person contact.
2. causes illness, including death.
3. effects a lot of people world wide

An epidemic meets the same criteria, except that it only affects a region or specific part of the world instead of being spread world-wide.

# Pandemic and/or Epidemic Assignment

There have been many epidemics/pandemics throughout history, or just significant diseases.  Examples would include:

- Spanish flu of 1918-19
- Bubonic Plague
- AIDS
- Smallpox