# History

# How have we learned so much about cells?

- Science starts with observations and questions
- Questions get answered and that leads to more questions
  - Science builds on itself
- As technology changes, science can answer even more complex questions

# What do we know about life and cells?

<u>The Cell Theory</u>

1. All living things are composed of cells
2. The cell is the basic unit of organization in living things
3. Every cell arises from another cell

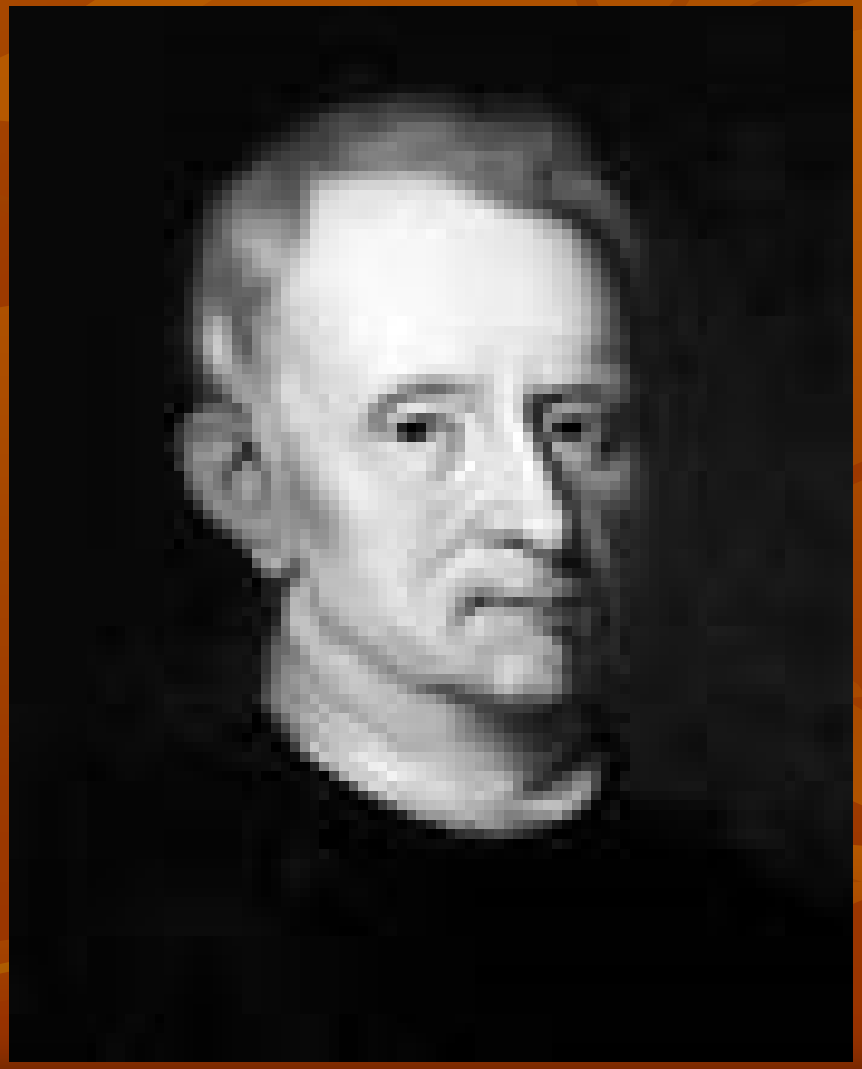
# Important pioneers in the study of cells

- As we learn look for:
  - Major discoveries
  - How one discovery leads to another
  - How technology improves

# When did we learn about cells?

# Robert Hooke

- http://www.ucmp.berkeley.edu/history/hooke.html



- Hooke observed individual plant cells

# Antonie van Leeuwenhoek

- http://en.wikipedia.org/wiki/Antonie_van_Leeuwenhoek

# The cell theory

- About 200 years passed before scientists began to organize the observations of Hooke and van Leeuwenhoek into a unified theory.

# Matthias Schleiden

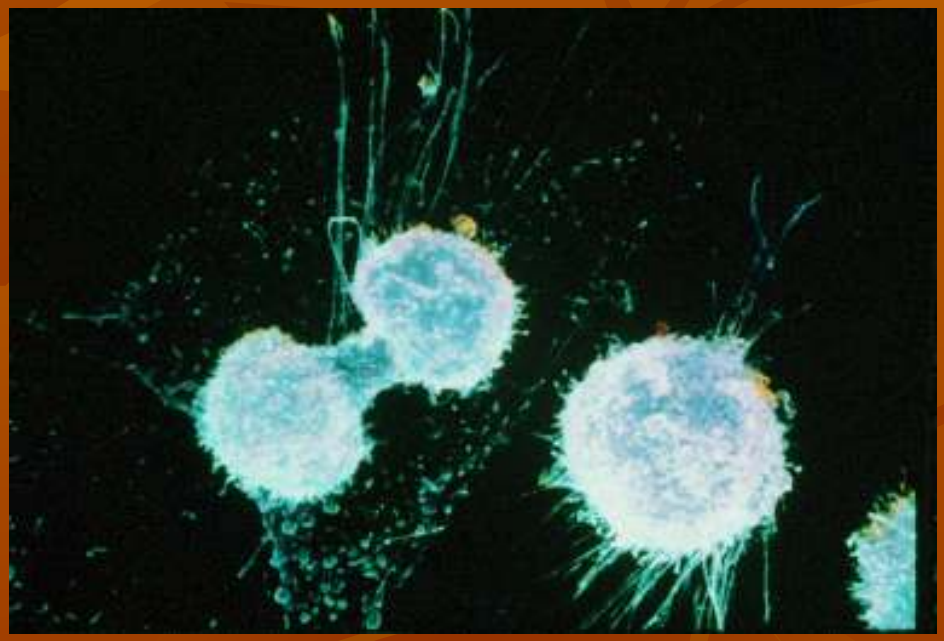

- http://en.wikipedia.org/wiki/Matthias_Jakob_Schleiden

# Theodor Schwann

- http://en.wikipedia.org/wiki/Theodor_Schwann

# Rudolph Virchow

- http://en.wikipedia.org/wiki/Rudolf_Virchow



# Cell Theory

- The observations of these three scientists, taken together, are known as the Cell Theory

<u>The Cell Theory</u>

1. All living things are composed of cells
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# Louis Pasteur

- Other scientists made discoveries that supported the cell theory
- http://en.wikipedia.org/wiki/Louis_Pasteur

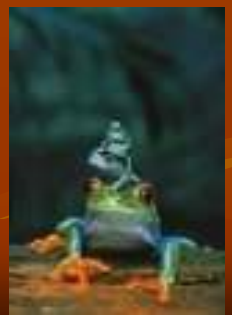
# Spontaneous Generation

- States that living organisms are created from non-living matter
- This theory was believed back in Aristotle's time (4th Century BC)

# Spontaneous Generation Cont.

- It was common “knowledge” that simple organisms like worms, beetles, frogs, and salamanders could come from dust, mud, etc., and food left out, quickly “swarmed” with life.

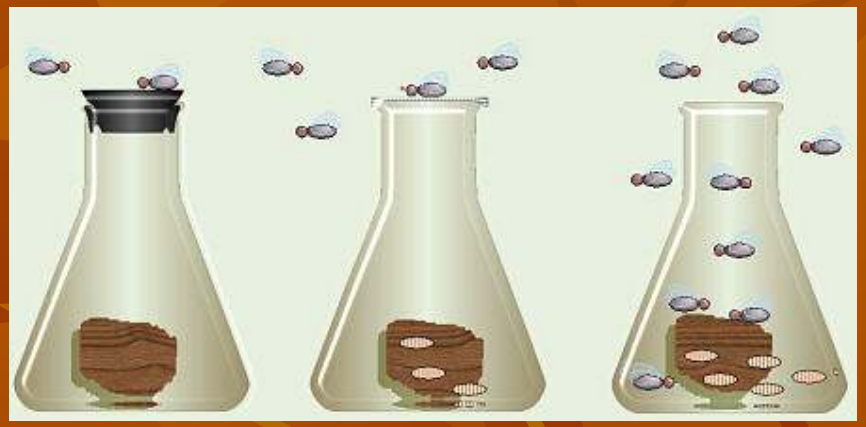
- Example
- **Observation:** Every year in the spring, the Nile River flooded areas of Egypt along the river, leaving behind nutrient-rich mud that enabled the people to grow that year's crop of food. However, along with the muddy soil, large numbers of frogs appeared that weren't around in drier times.
  - **Conclusion:** It was perfectly obvious to people back then that muddy soil gave rise to the frogs



- **Observation:** In many parts of Europe, medieval farmers stored grain in barns with thatched roofs (like Shakespeare's house). As a roof aged, it was not uncommon for it to start leaking. This could lead to spoiled or moldy grain, and of course there were lots of mice around.
  - **Conclusion:** It was obvious to them that the mice came from the moldy grain.

- If meat was left out usually over time it would spoil and maggots would begin to grow and develop. Many people who believed in spontaneous generation thought that raw meat produced maggots.
- Therefore, several people widely held that maggots arose spontaneously in rotting meat

- They didn’t realize that there were flies who laid eggs which led to maggots
- After testing this theory it was concluded that only flies could produce other flies!



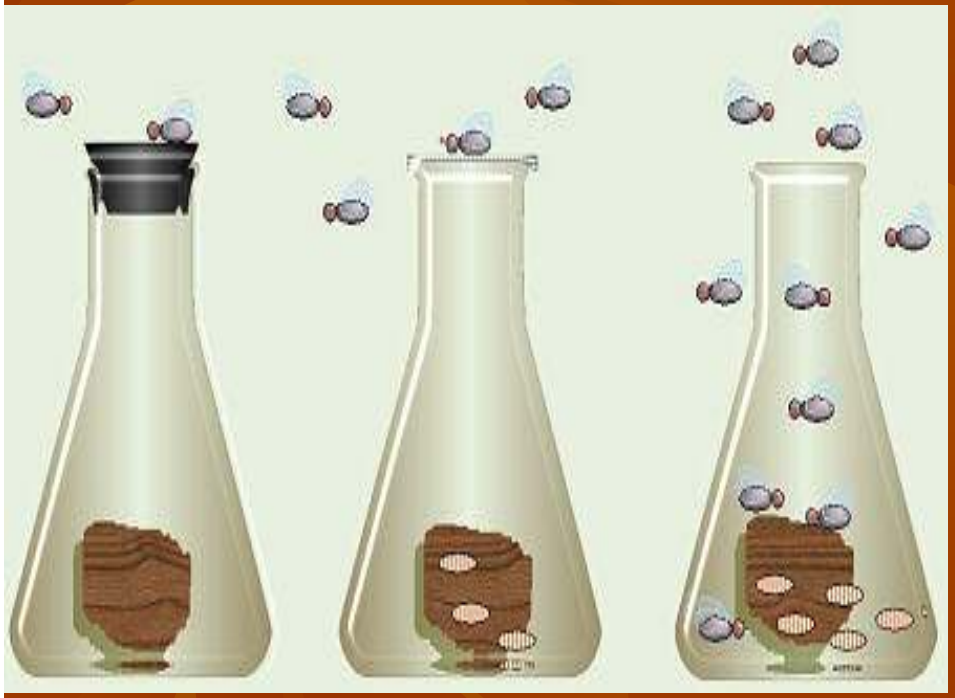
# Louis Pasteur

- The theory of spontaneous generation was finally laid to rest in 1859 by the young French chemist, Louis Pasteur. He boiled meat broth in a flask, heated the neck of the flask in a flame until it became pliable, and bent it into the shape of an S. Air could enter the flask, but airborne microorganisms could not - they would settle by gravity in the neck.

# Louis Pasteur Cont.

- As Pasteur had expected, no microorganisms grew. When Pasteur tilted the flask so that the broth reached the lowest point in the neck, where any airborne particles would have settled, the broth rapidly became cloudy with life. Pasteur had both refuted the theory of spontaneous generation and convincingly demonstrated that microorganisms are everywhere - even in the air.

# Louis Pasteur



- How was this idea finally disproved?