

Lecture 1, Chapter 1

Microorganisms have existed on earth for

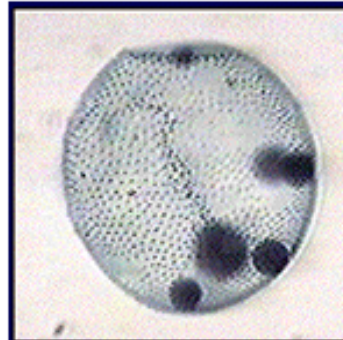
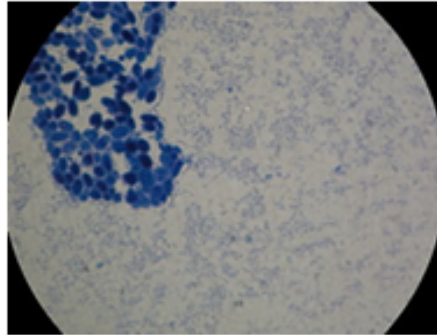
However, it was not until 1673 that

used a handmade microscope to view, and extensively describe, these tiny creatures which he called “*animalcules*”. This is often considered the birth of the study of microbiology.

Microbiology: The study of life forms and agents that are

Figure 1.11

Life Forms



Agents



Figure from SISSA

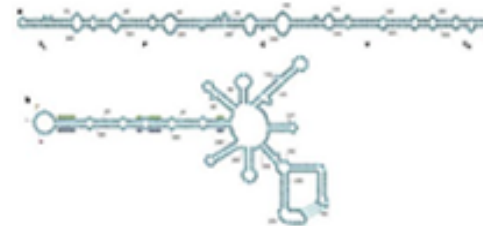


Figure from Merry Youle (ASM)

I. The Origin of Microorganisms

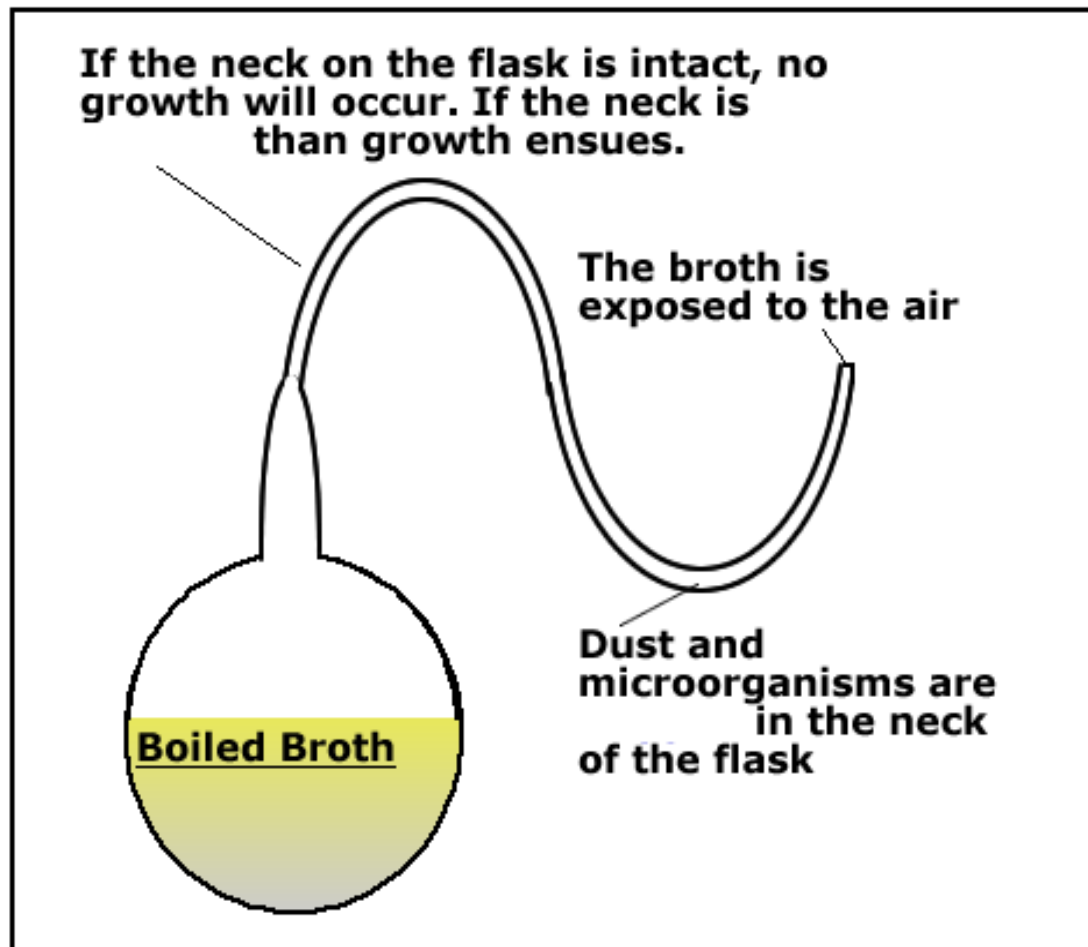
A. **Spontaneous generation** - the idea that organisms can arise spontaneously from nonliving material.

B. Experiments to disprove spontaneous generation and prove **biogenesis**
= all life arises from other living things of the same kind.

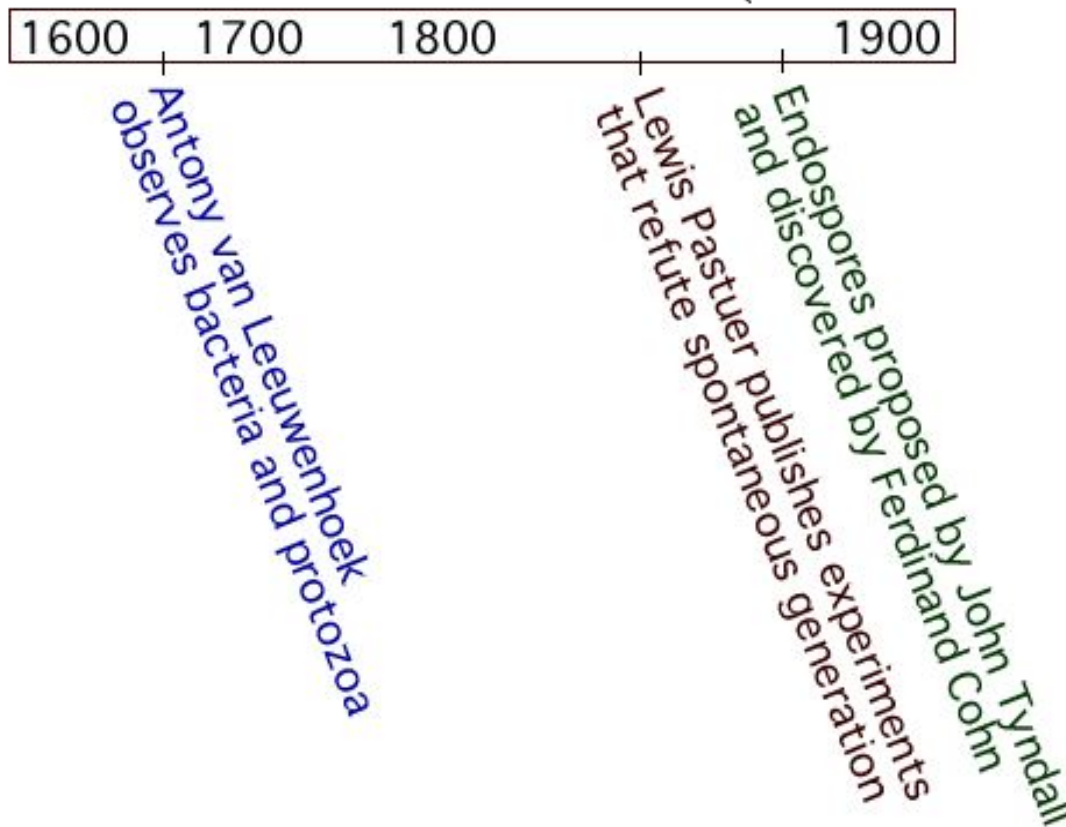
1. Late 1600s - Francesco Redi shows that meat cannot putrefy if covered in gauze. This experiment showed that the worms found on the rotting meat **came from the air**.

2. Many experimenters show that when a nutrient solution is sealed in a flask and boiled, **no life grows**. However, proponents of spontaneous generation remained as they agreed that **heat** was necessary for spontaneous generation.

3. Mid 1800s - builds a swan-necked flask in which nutrient broth can be boiled and However, all bacteria and dust from the air settle in the bend of the flask's neck. The broth will



4. Some still refused to give up the idea of spontaneous generation because they were . 1876 - John Tyndall explains these inconsistencies when he shows that . He concluded that some microorganisms could exist in two forms: A cell that's killed by boiling and one that is . Later that year Ferdinand Cohn discovered the heat-resistant forms of bacteria (now called).



*It was later in 1876 that Robert Koch established the connection between *Bacillus anthracis* and anthrax (Koch's postulates).

Koch's Postulates:



II. Microbiology: Applications and Effects

A. Essential environmental activities of microorganisms

1. Convert atmospheric nitrogen into forms of nitrogen that
2. Replenish atmospheric
3. materials that no other organisms can degrade.

B. Economic Applications

1. wine, bread, soy sauce, yogurt, buttermilk, cheese and pickles.
2. Food
3. Bioremediation - microorganisms can be used to such as TNT and oil.
4. Produce useful products such as , amino acids and insecticides.

C. Genetic Engineering = Introduction of genes

to give it new features or abilities.

1. Microorganisms can be engineered to produce , blood clotting factors, and enzymes that dissolve blood clots.
2. Microorganisms can be modified to produce against diseases like gonorrhea and malaria.
3. Bacteria can be used to genetically engineer plants so they become resistant to .
4. Advances in may allow widespread use of viruses to transfer genes to patients in order to treat genetic diseases.

What is one scientific or philosophical question that surrounds genetic engineering?

D. Medical Microbiology = The study of disease-causing
() microorganisms.

1. At the the major
causes of death were infectious diseases.

2. Although many diseases have been eradicated,
microorganisms still present a serious threat to humans.

a. We must battle newly emerging diseases such as

b. Because of international travel, choices not to
vaccinate and immunosuppressed patients, many

c. Many chronic diseases, such as peptic ulcers, are
being shown to be caused by

d.

3. Most microorganisms are . In fact, microorganisms cover our body surfaces and line our intestinal tract. These bacteria are normal flora and they by competing with pathogenic microorganisms.

E. Microorganisms as subjects for study

*Microorganisms make wonderful model organisms. They are