RAMA UNIVERSITY

www.ramauniversity.ac.in

# FACULTY OF ENGINEERING &TECHNOLOGY
# DEPARTMENT OF BIOTECHNOLOGY

# Doctrine of spontaneous generation

**Doctrine of Spontaneous generation:** It states that living organisms can originate from inanimate objects.

Other common examples of spontaneous generation were that dust creates fleas, maggots arise from rotting meat, and bread or wheat left in a dark corner produces mice, scorpions can be created by placing basil between two bricks and leaving them in the sun.

This concept was so compelling that it persisted until late into the 19th century.

## Origin of idea of spontaneous generation:

The Greek philosopher Aristotle (384–322 BC) was one of the earliest recorded scholars to articulate the theory of **spontaneous generation**, the notion that life can arise from nonliving matter.

**Aristotle** proposed that life arose from nonliving material if the material contained *pneuma* ("vital heat").

As evidence, he noted several instances of the appearance of animals from environments previously devoid of such animals, such as the seemingly sudden appearance of fish in a new puddle of water.

About 40 B.C. (70-19 B.C.) gave direction for artificial propagation of bees.

In 17$^{th}$ century, John Needham (1713-1781) and Felix Archimede Pouchet (1800-1872) are the main proponents of spontaneous generation.

Jan Baptista **van Helmont**, a seventeenth century Flemish scientist, proposed that mice could arise from rags and wheat kernels left in an open container for 3 weeks.

## Controversies and debunking the myth of spontaneous generation:

There were many takers for theory of sponatneous generation till 19th century.

They were unsatisfied with any types of experiments disproving theory of spontaneous generation.

These controversies were finally put to rest by Louis Pasteur by his classic experiment involving swan necked flask. He boiled broth to sterilize it.

His design allowed air inside the flasks to be exchanged with air from the outside, but prevented the introduction of any airborne microorganisms, which would get caught in the twists and bends of the flasks' necks.

If a life force besides the airborne microorganisms were responsible for microbial growth within the sterilized flasks, it would have access to the broth, whereas the microorganisms would not. He correctly predicted that sterilized broth in his swan-neck flasks would remain sterile as long as the swan necks remained intact. However, should the necks be broken, microorganisms would be introduced, contaminating the flasks and allowing microbial growth within the broth. Pasteur proved that it was the organisms in the dust that were growing in the broth  Figure 1 shows the diagram of  Louis Pasteur swan neck experiments.

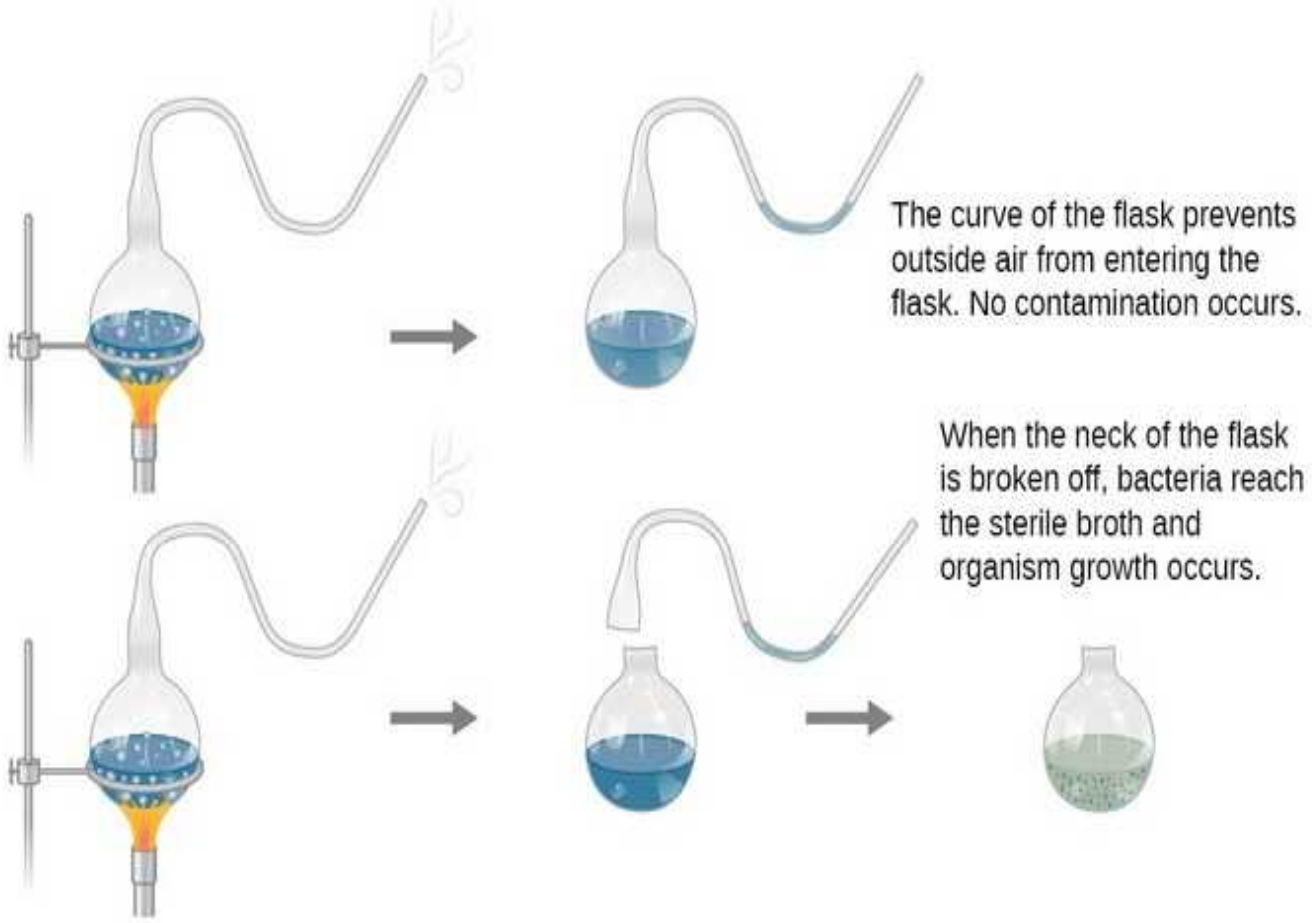


**Figure 3:** Louis Pasteur classic experiments debunking sponatneous generation theory

# Contributions of some of the famous scientist in field of micobiology in 20th century

Louis Pasteur is regarded as one of the greatest saviors of humanity, and was responsible of the discovery of pasteurization.

Pasteur's systematic methods of research, scientific approach and insight revolutionized science.

The volume of his medical achievements marks him as the single most important figure in the history of medicine.

He made numerous discoveries but he is best remembered for his advocation of the germs theory and advancement in the causes and preventions of disease.

## Louis Pasteur: Works and Discoveries

Pasteur's scientific and medical accomplishments include cure for rabies, anthrax, chicken cholera, and silkworm diseases.

He also contributed towards developing the first vaccines and provided logical grounds for fermentation and brewing.

Periodically, we can describe the works and discoveries of Louis Pasteur into three phases:
1847 to 1862 (Pasteur as a physicist and a chemist)
1862 to 1877 (Pasteur as a biologist)
1877 to 1887 (Pasteur as a microbiologist)

## Alcoholic Fermentation

Pasteur's discovery of molecular asymmetry occurred during experimentation on paratartrate crystals.

He discovered that under polarized light, inactive substance became active due to fermentation.

Based on his experiments, he associated fermentation with life which led him from studying molecular asymmetry to contagious diseases through fermentation.

Pasteur laid foundation for all microbiological techniques through his research on lactic and alcoholic fermentation and defined these principles:

All fermentation is caused by a microorganism

There's a particular ferment for every given fermentation

A sterile culture medium is required for ferment growth

Medium has to be seeded with absolute ferment particles