Modern period

1. 1st century

In Antiquity and right up to the 18th century, science was inseparable from philosophy (indeed, science was called natural philosophy) and tightly controlled by religion. With the emergence of astronomy and modern physics, religion's control over science gradually diminished, making science an autonomous and independent field. The transition from medieval science to the Renaissance is often confused with the Copernican revolution. In reality, the Copernican revolution is more akin to the transition between the Renaissance and the Enlightenment, since it took some time for the discovery of heliocentrism to be shared and accepted.

From a scientific point of view, it was astronomy that triggered the changes of this era. After Copernicus, who lived before the Thirty Years' War, other astronomers took up astronomical observations again: Tycho Brahe, then Kepler, who did considerable work on observing the planets of the solar system, and formulated the three laws of planetary motion (Kepler's laws).

However, Kepler still lacked the instrument, the telescope, which, invented in Holland in 1608 for use as a simple telescope, and perfected by Galileo in 1609 for use in astronomy, enabled him to make observations that once again confirmed that the geocentric theory was refutable. Galileo's contribution was also very important in the sciences (kinematics, astronomical observations, etc.).

René Descartes

began his career as a scientist, working in analysis, geometry and optics. On learning of the outcome of Galileo's trial (November 1633), he abandoned plans to publish a treatise on the world and light (1634), and embarked on a philosophical career, seeking to define a method for acquiring a just and exact science.

Blaise Pascal

made discoveries in mathematics (probability) and fluid mechanics (atmospheric experiments).

Leibniz, along with Newton, is considered the inventor of infinitesimal and integral calculus, the foundation of classical mechanics. Along with Irish physicist and chemist Robert Boyle, Francis Bacon is considered the founder of the experimental method.

Robert Boyle

is also considered the founder of the philosophy of nature.

1.1. The first scientific journals

The appearance of the first scientific journals led to better dissemination of knowledge and more constructive criticism between scientists, and above all to the seminal work in botany and zoology by J. Ray and F. Willughby.

John Ray (1627-1705) and **Francis Willughby (1635-1672)** played key roles in both botany and zoology during this period. In botany, Ray published a catalogus plantarum circa Cantabrigiam nascentium (Cambridge, 1660), or Catalogue of plants in the vicinity of Cambridge. The work was highly innovative compared to other British botanical publications. It set new standards that were to be followed by many botanists in Europe. In 1670, Ray published a similar work on British flora in London: Catalogus plantarum Angliae. In 1682, Ray collected various essays on botany in Methodus plantarum nova. From 1686 to 1704, he published a vast work on European flora, in which he described 18,000 species: Historia plantarum.

In zoology, Ray was the first to propose a classification of animals based on anatomical rather than behavioral or environmental criteria. His classification, particularly of birds, was the most advanced until Linné's work.

Willughby's untimely death prevented him from completing several works, which Ray

later expanded and published under Willughby's sole name. These include Ornithologia (London, 1676) and De historia piscium (Oxford, 1686). Ray's most important works include Synopsis animalium quadrupedum et serpentini generis

(London, 1693).

1.2. Advances in biology and the use of the microscope

It should be noted that biology did not become a truly autonomous discipline within natural history until the 19th century, with the development of modern microscopes.

The second half of the 18th century saw the publication of a number of highly innovative works, some of which were made possible by the invention of the microscope. The invention is probably dated 1590 and is sometimes attributed to Zacharias Janssen (1580-1638).

The invention of the microscope at the end of the 16^{th} century, perfected in the 17^{th} century, enabled us to study living beings in much greater depth.

William Harvey (1578-1657)

discovered blood circulation in 1628. Harvey had studied heart movements not only in cold-blooded people, whose hearts beat more slowly.

Francesco Redi and spontaneous generation. (1626- 1697). Since Antiquity, we've seen that certain invertebrates (insects, worms, etc.) and vertebrates (toads, frogs, eels, etc.) arose spontaneously from the environments in which they lived (spontaneous ludge, which was combated by the Italian naturalist Redi. He was also one of the founders of parasitology, with his

work on animal parasites (1684) describing some fifty species of Helminthes, Acarinae and Insects.

Microscopic biologists:

the most famous microscopists of the 17th century were :

Marcello Malpighi (1628-1694)

-The father of microscopic anatomy.

-Whose name is now attached to dozens o f structures in the human body and in insects.

-Publishes botanical works in his book entitled Anatome plantarum on the cellular anatomy of plants and studies plant embryology.

Antoni van Leeuwenhoek (1632-1723)

-Dutch biologist.

-He built hundreds of microscopes, and thanks to them made fundamental biological observations: discovery of Protozoa and bacteria, study in 1677 of spermatozoa,

observation of various microscopic animals (Sponges, Nematodes, etc.....).

-He also described the blood cells of various vertebrates and invertebrates.

-He also studied various animal tissues under the microscope.

- Along with Malpighi, he is considered one of the founders of Histology.

Robert Hooke (1635-1703)

-English microscopist.

-In his Micrographia (1665), he described and illustrated various living objects seen through a microscope. Jan Swammerdam (1637-1680) -2nd Dutch microscopist.

-He was a pioneer of fine anatomical study techniques, in particular the injection of dyes into human or animal organs.

-His dissections of Insects were astonishing for their time, and made him one of the creatures of Invertebrate anatomy.

-He was also a physiologist and embryologist.

2. 18th century

In the 18th century, the life and earth sciences also underwent major development following voyages to Africa and the Pacific:

Georges Louis Leclerc, comte de Buffon (1707-1788), Carl Von Linné (1707-1778), Jean-Baptiste Lamarck (1744-1829).

2.1. Advances in biology

This was the "Age of Enlightenment", when independent-minded philosophers and scientists reacted against the excesses of theology, in an attempt to make rationalism, the marvellous and superstition triumph. As far as we're concerned, it was the period when biology began to become an experimental science, particularly in the second half of the century, which in many ways heralded the discoveries of the 19th century.

At the beginning of the 18th century, Joseph Guichard Duvernay (1648-1730) published several important memoirs for the Académie des Sciences in Paris on the circulatory and respiratory systems of cold-blooded vertebrates such as frogs, snakes and others.

In 1720, Michael Bernhard Valentini (1657-1729) published a study comparing the anatomy of different vertebrates.

In 1734, Jacob Theodor Klein (1685-1759) published Naturalis Dispositio Echinodermatum, a pioneering work on sea urchins.

2.2. Botany

Sébastien Vaillant (1669-1722)

-French botanist.

-Publishes the Botanicon Parisiene (or Alphabetical enumeration of plants growing around Paris), after a long period working on plant reproduction.

-This book is one of the first to describe the flora of the around Paris.

Johann Wolfgang von Goethe (1749-1832)

-Famous German writer and scientist.

-published, in 1790, an essay on plant metamorphoses, Versuch die Metamorphose der Pflanzen zu erklaren.

-He also outlines a theory of evolution in plants and links morphology with phylogeny.

-This makes him one of the first (and perhaps the first) to use the term metamorphosis in botany.

2.3. Buffon

Through his writings (notably his Histoires naturelles), the French naturalist Georges-Louis Leclerc, comte de Buffon (1707-1788) made a major contribution to popularizing natural history among his contemporaries. He was also intendant of the King's Garden between 1739 and 1788.

2.4. Linné

Swedish naturalist Carl Von Linné (1707-1778) played an essential role, notably

with his descriptions of tens of thousands of spaces and the introduction of binominal

nomenclature. His plant classification was based on the work of Rudolf Jakob Camerarius (1665-1721) on plant sexuality.