## Lecture 5. Experiment and Classical Science of Modern Age

***Descartes and Francis Bacon. — The mathematical approach to natural science: Galileo and Newton; the investigations of Boyle, Hooke, Leeuwenhoek, Lavoisier. — Bacon’s system of human knowledge, Leibnitz’s Mathesis Universalis project and the appearance of great classifications: Linnaeus, Hegel, Mendeleev. — The Encyclopedia phenomenon. — Immanuel Kant’s philosophy of freedom.***

1. *We have already mentioned that in XV—XVI centuries the Age of Discoveries stroke the scholastic doctrines about world and the arrangement of the Universe drastically. Besides the geographical discoveries the great discoveries made at the break of the Modern age were playing the leading part.*

The increase of the fact about the outer world as well as the development and perfection of the scientific world-view at the age of Modernity raise the challenge of correct and exact investigation and description of the reality around us. Hence two most influential epistemological paradigms were elaborated by sir Fr. Bacon (1561—1626) and R. Descartes (1596—1650).

 “Those who have taken upon them to lay down the law of nature as a thing already searched out and understood, whether they have spoken in simple assurance or professional affectation, have therein done philosophy and the sciences great injury. For as they have been successful in inducing belief, so they have been effective in quenching and stopping inquiry; and have done more harm by spoiling and putting an end to other men's efforts than good by their own. Those on the other hand who have taken a contrary course, and asserted that absolutely nothing can be known — whether it were from hatred of the ancient sophists, or from uncertainty and fluctuation of mind, or even from a kind of fullness of learning, that they fell upon this opinion — have certainly advanced reasons for it that are not to be despised <…> Now my method, though hard to practice, is easy to explain; and it is this. I propose to establish progressive stages of certainty. The evidence of the sense, helped and guarded by a certain process of correction, I retain. But the mental operation which follows the act of sense I for the most part reject; and instead of it I open and lay out a new and certain path for the mind to proceed in, starting directly from the simple sensuous perception”.

Sir Francis Bacon (from *The New Organon, Author’s Preface*)

**Francis Bacon** was an English lawyer, statesman and philosopher, traditionally regarded as the first important figure in the history of British empiricism and the development of the modern scientific world-view. He thought that science should aim at collecting empirical data and use them for inductive generalizations, instead of seeking explanations in terms of final causes (i.e. purposes).

**Rene Descartes** is universally acknowledged as one of the chief architects of the Modern age, and bequeathed two principle doctrines to the philosophical world. The first was a comprehensive physic-mathematical reductionism: all observed phenomena were ultimately to be explained by reference to the interactions of particles describable solely in terms of size, shape and motion. The second was a conception of the mind as lying outside the purview of physics — a phenomenon sui generis whose nature could be grasped only from within, via introspective reflection. He is also famous for introducing the phrase “cogito ergo sum”. (both articles ­— from Thomas Mautner’s *Dictionary of Philosophy*)

1. *The Modern principles of knowledge and the achievements of the* ***experimental******science*** *formed a specific type of* ***rationality*** *which is widely* ***called classical****.*

 “I prefer to find a truth albeit in small things rather than argue about the greatest without reaching any truth” (Galileo Galilei).

1543 — Copernicus published his book *On the Revolutions of the Celestial Spheres* in which he stated expounded the heliocentric system of the world.

1610 — Galileo published his book *The Starry Messenger* where he described his discoveries made with the telescope.

1616 — William Harvey delivered his lectures on cardiovascular system.

1618 — Johannes Kepler formulated the laws describing the elliptic orbits of the planets that go round the Sun.

1642 — Galileo died and sir Isaak Newton was born.

1661 — Robert Boyle in his book *The Sceptical Chymist* suggested that all matter is been created from the corpuscles.

1665 — Robert Hooke published the sketches of various thing seen through the microscope in his book *Micrographia.*

1687 — *Philosophiæ Naturalis Principia Mathematica*by sir Isaak Newton was published where he formulated the law of universal gravitation and the Newton’s laws of motion.

1704 — Newton published his *Opticks* in which he described his experiments with light systematized miscellaneous yet not arranged data in this field.

1753 — C. Linnaeus published his binary (i.e. of genus and species) botanic taxonomy.

1774 — Joseph Priestley discovered oxygen and called him "dephlogisticated air".

1779 — Antoine Lavoisier approved Priestley’s experiments and gave the oxygen its name.

1789 — Lavoisier published his book *Method of Chemical Nomenclature* where he described thirty-three elements and elaborated the scientific nomenclature.

***Ключевые фигуры***: F. Bacon, R. Descartes, A. Lavoisier, A.Leeuwenhoek, R. Hooke, R. Boyle, I. Newton, Galileo Galilei, C. Linnaeus, G. W. F. Hegel, I. Kant, G. W. Leibnitz.

***Ключевые понятия***: the great instauration of sciences, organon, classification, mathesis universalis, radical doubt, phlogiston theory, experiment, encyclopedia, classical rationality, transcendental, a priori, a posteriori.