# Lecture 2. Pre-Modern Science

***The comprehension of knowledge in the early states of Egypt, Mesopotamia, China, India. — The Science in Antiquity. The development of theoretical type of knowledge. The rise of the first scientific and philosophical schools (Pythagoreans, Plato’s Academy, Aristotle’s Lyceum, the Hellenistic sects). — The Medieval scientia as a sprcific form of knowledge. Alchemy and scholastics: the Hermeticism and authoritative knowledge as the germinal forms of the experimental studies of nature VS the ecclesiastical dogmatism.***

I. When answering the question of the appearance of science that it has always existed (from the period of the early states), we have to mean:

1. What form was it represented there in?
2. What new did the Ancient Greek scientists and scholars bring into the studies of the world?

It has been adopted to speak about the science in the early states of Ancient China, Mesopotamia, Egypt in terms of ***pre-scientific forms*** of knowledge (or ***the archaic way of thinking***). By the latter we mean that it was Antiquity when the very theoretical statements in science appeared, primarily after the works of Thales and Pythagoras.

We have got used to think that the civilizations of the East had their own and very complicated (though lacking the demonstration) sets of knowledge, such as: numeral system, calendars, nature observation and the sets of astronomic, geographic, medical, technical knowledge). The statements that appeared in the frameworks of pre-scientific knowledge passed either among the learned, or narrow family circles (e.g., the priests in Egypt, the Chaldeans in Babylonia, etc.). They did not transfer freely, and the audience was drastically restricted. *This form of scientific knowledge existed and was used primarily in practice.*

The Greeks borrowed from Egypt and Babylonia a lot, however, they rendered it in a completely different way. Mainly, the Greeks established the theoretical form of knowledge (Gr. θεωρία — theoria — ‘contemplation’), or “the spiritual contemplation of the abstract stuff”.

For a Greek, there were various kinds of what we could call “knowledge” nowadays:

* Gnosis (γνώσις) — the knowledge as a whole system with a complete set of positions (not only belonging to a human being);
* Episteme (ἐπιστήμη) — the study of something, or learning of something: we could probably call it science in terms of the set of positions and rules in this precise field;
* Phronesis (φρόνησις) — the knowledge of the proper and not proper, to put it, a form of practical wisdom (savvy, or common sense)
* Mathema (μάθημα) — the knowledge of something that could be taught, for instance, how to count; the knowledge about something.

At the same time knowledge could be more or less perfect. Thus, according to Aristotle, the practical knowledge (as well as the practical way of life) is less perfect than the theoretical/contemplative for of knowledge (as the contemplative way of life, correspondingly). One should consider Aristotle’s division of the world into sublunary (or the world that moves — the ***physical*** one), and superlunary (or the essential and static world — the ***metaphysical*** one).

According to the tradition, there were ***exoteric*** (for the profanes, or the unlearned) and ***esoteric*** (for the initiated, or the learned) ***education*** in the schools in Antiquity.

The schools in the history of the Greek thought are the following:

* Pre-Socratic (VII—V BC): the Ionians and Eleatics (see Lecture 1); the Pythagoreans; the Sophists;
* Classical period (IV BC) — Plato’s Academy and Aristotle’s Lyceum;
* Hellenistic philosophy (IV BC — II AD): the cynics, sceptics (or Pyrrhonism), stoics and epicureans;
* Late Antiquity (II AD to the close of the Academy in 529 AD by Justinian) — Neoplatonism.

II. When in 313 AD Constantine the Great, Roman Emperor, adopted the Edict of Milan, Christianity gradually became the official religion of the Roman Empire. The influence of the spiritual power over the secular increased considerably. From the fall of Rome in 467 AD and to the rise of Constantinople in VIII—IX AD, Christian church became of the civilizational pillars of former Roman world (also called P*ax Romanum*), up to the Great Schism in 1054. ***NB! The Dogma of Filioque!***

The basis of the Medieval science is Holy Scripture (Bible, especially New Testament). God is Logos (“In the beginning was the Word, and the Word was with God, and the Word was God”, John 1:1). One may reach the Truth via Revelation, not experiment.

**The characteristics of the Medieval science:**

The main task that the theologians and philosophers in Middle Aged were dealing with was the interpretation of Holy Scripture; the latter they defined as having a common border between the Divine revelation and human understanding. The main comprehensive method was hermeneutics, or the art of interpretation of holy texts. Hence, we meet interest to the problem of understanding, the relation of sense and the Word, as well as the sign and the meaning. This problem is closely connected with the ***problem of universals*** (i.e. general concepts).

1. From their pagan predecessors, Medieval thinkers inherited the ideas of Neoplatonism, Aristotle’s logic and physical doctrine. The Medieval thinker’s thought, however, is not independent — it always considers the ***authority*** (e.g., ps.-Dionysius Areopagite).
2. God had created two Books, which are opened to a human via the revelation only: the one of Nature, and the Bible. The human cannot intervene into them and learn them by his own means. Hence, we face with the prohibition of the experimental knowledge, studies of nature, any doubts in the statements of Catholic church (e.g., autopsy, chemical or physical experiments, the critique of the official dogmas, etc.).
3. A human being is an imperfect creature of the perfect Creator. The man undergoes the Original Sin (the fall and exile from Paradise). Therefore, the earthly world is just an imperfect reflection of the perfect City of God (in terms of St. Augustine). The man has free will, but no one can avoid the Providence.

At the same time in Middle Ages there started appearing the first **universities** in Europe:

* 1088 — in Bologna (which is the oldest);
* c. 1096 — in Oxford;
* mid. XII AD — in Paris;
* 1209 — in Cambridge;
* 1222 — in Padua;
* 1343 —in Pisa, etc.

Traditionally, education at a university was divided into two levels: the preliminary course, or **trivium** (Arts: Grammar, Dialectics/Logic, Rhetoric), and the higher course, or **quadrivium** (Sciences: Arithmetic, Geometry, Astronomy, Music). Together these two levels were called the Liberal Arts (in contrast to Law, Medicine or Theology). For history of philosophy the main result of the establishment of university schools became the appearance of **scholasticism**. The germinal alchemic experiments took place, and the early hermetic societies appear (both tendencies were strictly prosecuted by the Church). The word ‘**hermeticism’** comes from the name of Hermes Trismegistus, the legendary magus and wizard of ancient times.

***Key words***: archaic way of thinking, pre-science, theoretical knowledge, practical knowledge, physics, logic, metaphysics, the universals, authority, trivium, quadrivium, scholasticism, Hermeticism, alchemy.

***Key figures***: Pythagoras, Plato, Aristotle, Zeno of Citium, Epictetus, Epicurus, Plotinus, Constantine he Great, Hermes Trismegistus, St. Augustine, Peter Abelard, Thomas Aquinas, Martianus Capella, Roger Bacon.