

Ancient Philosophers of Nature

When modern people think about "science" they think of mathematical formulas, physical laws, chemical reactions, and biological categories. This is because, as a result of hundreds of years of investigation and inquiry, much of the natural world has been analyzed, measured, and defined.



The world of the ancients was very different. They were able to observe the natural world, but the laws and mathematical principles that guided it were unknown and unnamed. They could make conjectures about how things might be, but had no way of proving the existence of patterns or laws, accurately measuring complex quantities like temperature or pressure. They were able to identify some elements by observation but were ignorant of the underlying organization of matter. Even with such hindrances however, the ancient "philosophers" identified many true things about the natural world and summarized the scientific knowledge of the day in books that were used as reliable references for nearly a millennium.

The information on this page is meant to give an idea of the state of scientific knowledge at the beginning of the Christian era, and to give insight into the thoughts of the earliest "Philosophers of Nature."

Terms and Meaning

The following terms are familiar to modern students, but they had different meanings in ancient times. To understand the how the ancient philosophers viewed science it is necessary to understand the terms they used to describe the natural world.

- **Philosophy** — The word philosophy comes from the Greek word "philosophia" meaning "Love (philo) of Knowledge (sophia)". Most of the great thinkers of the ancient world were called "Philosophers" because they sought understanding and wisdom. (On a related note: '*Santa Sophia*', the great Church in Constantinople means '*Holy Wisdom*'.)
- **Natural Philosophy** — From ancient times until the early 19th century, the term "Natural Philosophy" was used to describe the field of study we now know as science. For example, the famous book in which Newton presented his three Universal laws of Motion, was entitled, *Mathematical Principles of Natural Philosophy*, and all the scientific scholars of the ancient world referred to themselves as philosophers.
- **Science** (traditional) — The ancient meaning of the word "science" corresponded to what we call "knowledge", especially knowledge organized into a specific field of learning. Botany, for example could be defined as the "science of plants"; Geology, "science of the earth"; and Theology, "science of God" (or "Queen of the Sciences").

- **Scientific** (modern) — The modern meaning of the term scientific conjures up the idea of orderly, predictable, systematic, and mathematical. The Ancients had no such understanding of the word and considered any subject involving knowledge acquired by study (law, medicine, language), a 'science'.
- **Astronomy, Astrology** — In modern times, 'Astronomy' refers to the scholarly study of celestial bodies, while 'Astrology' refers to the reading of the stars as a superstitious means of predicting earthly events. The distinction did not emerge until the Middle Ages. In ancient usage, the study of the heavenly bodies involved both 'scientific' predictions regarding seasons, weather, and calendar events and also mystical fortune-telling. The Catholic Church distinguished between legitimate and occult intentions and considered 'Astronomy' an important science and 'Astrology' a form of sacrilege.
- **Alchemy** — The practice of Alchemy, common throughout the ancient world, can be considered a pre-cursor to early chemical experimentation, but it was also associated with sorcery or charlatanism. Alchemists usually attempted to produce a desirable substance, such as elixir of immortality, a cure for disease, or a method for creating precious metals, but they had little success. Two legendary substances associated with alchemy were the **Philosopher's Stone**, used to turn base metals into gold, and **Panacea** medicine that would cure all disease. The Church condemned fraud, but considered alchemy a legitimate pursuit. Many early scientists, such as Roger Bacon, and Albert the Great, were alchemists.
- **Matter and Form** (ancient) — Matter and Form, as defined by Aristotle, was a philosophical means of describing the difference between the physical material that made up an object, and the use or purpose of the object or being. For example, the wood making up a chair is the "matter", but manner in which it is constructed with legs and a seat is its "form".
- **Physics** (ancient) — Although in modern times, 'Physics' refers to the science of matter and energy, in ancient usage the term referred to nature in general. Aristotle's *Physics* was his work describing activities of the natural world. The term 'Metaphysics' were those essays he wrote on matters 'higher' than the physical world, or 'beyond' nature.
- **Soul** (ancient) — Aristotle's most famous work on biology, or the science of living things was entitled 'On the Soul'. This shows that the pagan idea of a soul was not the immortal spiritual essence that Christians think of, but rather, the animating spirit, or 'vital principle' of life. To Aristotle, the soul was a 'life force', and the relationship of an animal's soul to its body, was similar to the relationship of an object's form' to its 'matter.'

Ancient Scientists

The ancient philosophers proposed many and varied theories about how nature was organized. Some of their speculations were wildly off, but others were so accurate and well researched that their works were read by scholars for hundreds of years. The works of Aristotle (Biology, Physics), Galen (Medicine), and Euclid (Geometry), for example, were so highly regarded they were considered authoritative for over a millennium.

GREEK NATURAL PHILOSOPHERS

Pythagoras (570–480 BC) Philosopher and mathematician; invented the Pythagorean Theorem, and established the tradition of study of Natural Philosophy.

Hippocrates (460–377 BC) Father of modern medicine. Set up medical school to train doctors by scientific methods, and attempted surgeries demonstrating a great mastery of medical science. Hippocratic oath taken by doctors is named for him.

Aristotle (384–322 BC) Renowned natural philosopher who cataloged all types of knowledge. His writings on Biology and Physical Science were highly respected and not seriously challenged for over 1000 years.

Euclid (340–300 BC) Most eminent mathematician of his age, wrote Elements of Geometry, used as a mathematical textbook for almost two millennium.

Archimedes (287–212 BC) Considered the greatest scientist, mathematician and inventor of his age. Defined laws of displacement and buoyancy, and made great contributions to geometry. Held off Roman siege of Syracuse with clever defenses.

Eratosthenes (275–192 BC) Greek scientist from Alexandria who accurately calculated the size of the earth by estimating the earth's curvature based on solar observations over hundreds of miles.

GRECO-ROMAN NATURAL PHILOSOPHERS

Pliny the Elder (23–79) Scholar, author of encyclopedias, and naturalist. Wrote Natural Histories. Died while investigating the eruption of Mt. Vesuvius.

Ptolemy (90–168) Greatest astronomer and map-maker of Roman times. Ptolemaic system was so accurate it served as the geocentric model of universe used until age of Copernicus.

Galen (129–199) Renowned physician and philosopher whose voluminous works on the human body were studied until the 17th century.

EARLY CHRISTIAN NATURAL PHILOSOPHERS

Venerable Bede (673-735) Northumbrian scholar from Jarrow Abbey best known for his 'Ecclesiastical History of Britain', but also wrote 'Reckoning of Time', covering 8th century ideas of astronomy.

Isidore of Seville (560-636) Spanish bishop who wrote the first Christian encyclopedia, including excerpts from classic writers and the best scientific knowledge of his age.

Scientific Books of the Ancients

The books listed below were of enormous importance for over a thousand years, and greatly influenced the thinking of the Scientists, philosophers, and scholars from ancient times throughout the Middle Ages.



- **Aristotle's Physics** — This philosophical work was written in order to define the principles and causes of change, movement, and motion, whether animate or inanimate. His purpose is to investigate the causes of movement and change, so his topics entail not only motion of objects, but growth of plants, combustion of matter, and movement of planets.

- **Aristotle's On the Soul** — Aristotle wrote several books on Biology, including several a categorization of animal types and treatises on anatomy, but 'On the Soul' was his most comprehensive philosophical work. The use of the term 'soul' to refer to a life-force, or vital principle. Topics he discusses are the five sense, nutrition and reproduction, the motion of animals, the mind and intellect, and the nature of the 'soul'.

- **Ptolemy's Almagest** — Ptolemy's great work, written in about 150 A.D., synthesized all known astronomical knowledge of the day, and presented both mathematical and conceptual elements of Astronomy. It was based on the best

astrological measurements of the day and correctly identified the order of the planets, and estimated the relative sizes and distances of the sun and moon relative to the earth. It contained a star catalogue, predicted eclipses, and explained the elliptical orbits of planets using "epicycles". It was accurate enough to serve as an authoritative text on Astronomy until the Copernican revolution.

- **Galen's Corpus (collection of works)** — Galen was the greatest Physician-philosopher of the Greco-Roman period, and his extensive writings touch on every medical topic from anatomy, common ailments, symptoms and diagnosis, pharmacology, therapy, and treatment, to diet and hygiene. His works were translated into Arab, but Latin translations were not common until the Middle Ages. Galen's writings described many ailments and temperaments in terms of lack or excess of the "four humors", black bile, yellow bile, phlegm, and blood (Corresponding temperaments: Choleric, Melancholic, Phlegmatic, and Sanguine.)