

Through Aristotelian Spectacles

Modern scientists often look with contempt upon the way the ancients described the working of the natural world, especially the laws describing motion of Earth-bound bodies and musings on the heavenly realms. Ideas such as the Earth being immobile at the center of the universe, surrounded by nested crystalline spheres seem almost incomprehensible from the vantage of the 21st century. However, if we look at creation filtered through spectacles of an Aristotelian world view, many of the tenants of medieval science (or Natural Philosophy, as it would have been referred to at the time) fit quite rationally into that framework.

The Philosopher

Aristotle was born into an aristocratic Greek household in Stagieria, Chalcidice, in 384 BC. He is one of the best known and most prolific philosophers of the classical era. A student of Plato, he developed extensive treatises on such diverse topics as physics, metaphysics, poetry, theater, music, logic, rhetoric, politics, government, ethics, theology, biology, and medicine. After the death of Plato in 347 BC, Aristotle spent the next four years traveling and studying abroad. In 343 BC, he was called by Philip, King of Macedon to join the court in the capital city of Pella to be tutor to his son Alexander (who went on to be known in later years as Alexander the Great). By 335 BC, Aristotle had returned to Athens and established a school of his own which became known as the Lyceum. After the death of Alexander, he fled the rising anti-Macedonian sentiment in Athens to his country estate at Chalcis, in Euboea, where he died in 322 BC. His school continued until Roman Emperor Justinian closed it in 529 AD. At that time many followers of Aristotle fled to Persia where his teachings were kept alive, but temporarily lost to the western world.

Rediscovery

Aristotle's works were rediscovered by the Christian west when Arabic works started flowing from Moorish Spain and became available in Latin translation around the twelfth century. The writings were rapidly incorporated into the curriculum of the universities at Paris and Oxford. Robert Grosseteste (1175 – 1253 AD) of Oxford was instrumental in embedding Aristotelian teachings in the European university system. Perhaps the greatest advocate of Aristotle was the Italian Dominican philosopher and theologian Thomas Aquinas (1225 – 1274 AD). His works brought together Aristotle's teachings about the cosmos with the traditional Christian teachings based on interpretation of the bible.

The Philosophy

The cosmos was envisioned by Aristotle as a series of concentric spheres with the Earth at the center. This realm was divided into the imperfect, corruptible region extending from the center of the Earth up to the sphere of the Moon. Within this area were the domains of the four elements earth, air, fire, and water, each with its own natural resting place. Earth, being heavy would by its

employed and were very successful in mathematically modeling planetary motions. This complex system of circles upon circles maintained Aristotle's mandate of perfect circular motion. The mathematical results matched observations and allowed prediction of future events. Even when Copernicus developed his theory of a Sun-centered universe, he maintained Aristotle's circular movement and the epicycles and deferents that went along with it. It took Newton's theory of gravity and Kepler's insight to finally dispel the perfect circle from the heavens.

Logical Conclusions

Given this background of natural motions of objects based on their elemental compositions, the medieval ideas of the structure of the universe start to seem much more rational. The Earth itself, being made largely of the element earth must by necessity reside at the center of the universe as the element earth strives to achieve its natural position at the lowest point of the cosmos. Upon it would be layers of water as oceans and lakes, then the air, and finally fire. The Earth would be spherical in shape as objects made of earth would approach the center from all directions.

It is often stated that when the Copernican system was proposed the Church was outraged because the Earth no longer held a privileged position at the center of the universe. The opposite is actually true. The center of the universe was the lowest and most corrupt location and the Church opposed lifting the Earth out of the most vile and base realm. This can be seen in the structure of the Earth in Dante Alighieri's *Divine Comedy* where Hades is placed within the bowels of the Earth with its deepest pit containing Satan at the very center. This, combined with biblical readings such as Psalm CIV, verse 5: "who laid the foundations of the earth, that it should not be removed for ever?", and the lack of 'common sense' cues such as no sensation of movement or visible parallax of the stars lead the ancients to the only reasonable conclusion: the Earth stands still.

Though medieval natural philosophers are often portrayed as backward and ignorant, they based their theories on well thought out principles and logical arguments using the tools and principles available to them. It took refinements in measurement instruments and breakthroughs in mathematics and physics before sufficient proof was developed to break out of the two millennia hold that Aristotle had on natural philosophy. While these concepts are foreign to our modern sensibilities, it is necessary to use Aristotelian spectacles to truly understand the medieval view of the world.

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The figure “*The Medieval Cosmos*” is a public domain image obtained from the Wikimedia Commons on 14 May 2008. The original is from *Cosmographia* by Peter Apian, 1539. <http://en.wikipedia.org/wiki/Image:Ptolemaicsystem-small.png>

Author’s note: The astute reader will note that my references contain a number of works of John D. North. Professor North’s areas of research overlap greatly with my areas of interest: the history of astronomy, time, and medieval English universities. It was with great sadness that I received the news of Prof. North’s death during the writing of this treatise. Even though I never met or directly corresponded with him, his works have been a source of historical enlightenment for me. I therefore dedicate this article to his memory.

About the Author

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