Aristole And Meteorology Essay, Research Paper

Thesis: How accurate or inaccurate were Aristotle?s writings on meteorology?

Introduction: Aristotle wrote about many subjects that can be grouped into five general divisions: logic, physical works, psychological works, natural history works, and philosophical works. One of the little known physical works concerned meteorology. Aristotle?s views on meteorology are fascinating, but many of the views were not accurate. This paper compares only a few of his views to actual meteorological facts.

I. Biography

A. Birth and growth

B. Influence on writings

II. Basis of Aristotle?s meteorology

A. Elements and theory

B. Science and facts

III. Water vapor and precipitation

A. Aristotle?s view

B. Science and fact

IV. Winds

A. Aristotle?s view

B. Science and fact

Conclusion: Aristotle explained the various meteorological phenomenon in simplistic terms. The explanations match his theory of how matter and shape were interrelated. Aristotle?s ideas on water vapor and precipitation were somewhat accurate, considering that there were no tools to measure the atmosphere in his time. His views on wind, however, were not accurate at all. He wrote extensively on winds, but never fully comprehended how wind occurred.

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Aristotle on Meteorology

Aristotle was born in 384 BC, at Stagirus, a Greek colony on the Aegean Sea near Macedonia. In 367 BC, Aristotle entered the Academy at Athens and studied under Plato, attending his lectures for a period of twenty years. In the later years of his association with Plato and the Academy, he began to lecture on his own account, especially on the subject of rhetoric. When Plato died in 347, Aristotle and another of Plato?s students, Xenocrates, left Athens for Assus, and set up an academy (Encyclopedia 2).

In 342, Aristotle returned to Macedonia and became the tutor to a very young Alexander the Great. He did this for the next five to seven years. Both Philip and Alexander appear to have paid Aristotle high honor. There are stories that indicate the Macedonian court supplied Aristotle with funds for teaching, and with slaves to collect specimens for his studies in natural science (Encyclopedia 4).

Aristotle returned to Athens when Alexander the Great began his conquests. He found the Platonic school flourishing under Xenocrates, and Platonism the dominant philosophy of Athens (Encyclopedia 5). Aristotle thus set up his own school at a place called the Lyceum. When teaching at the Lyceum, Aristotle had a habit of walking about as he discoursed. It was because of this that his followers became known in later years as the peripatetics, meaning, “to walk about? (Shakian 126). For the next thirteen years, he devoted his energies to his teaching and composing his philosophical treatises. His institution integrated extensive equipment, including maps and the largest library collection in Europe. He is said to have given two kinds of lectures: the more detailed discussions in the morning for an inner circle of advanced students, and the popular discourses in the evening for the general body of lovers of knowledge.

At the sudden death of Alexander in 323 BC, the pro-Macedonian government in Athens was overthrown, and a general reaction occurred against anything Macedonian. A charge of impiety was trumped up against Aristotle. To escape prosecution he fled to Chalcis in Euboea so that (Aristotle says) “The Athenians might not have another opportunity of sinning against philosophy as they had already done in the person of Socrates? (Encyclopedia 5). In the first year of his residence at Chalcis he complained of a stomach illness and died in 322 BC (Encyclopedia 7).

One of Aristotle?s writings is about meteorology. His theories are based on his belief that all objects in the world are composed of form and matter and the world is arranged according to the relative standing each object occupies in the universe (Shakian 127). This basis led to his theory that any motion was from the center or to the center (Encyclopedia 28). Aristotle saw the universe as a scale lying between the two extremes: form without matter on one end, and matter without form on the other end. Additionally, he believed all matter is made of four bodies: fire, air, water, and earth (Encyclopedia 29). With this information as a basis, it is no wonder that any remaining theories would probably be incorrect.

Scientific fact cannot disprove that all objects are of form and matter. Any one can agree or disagree with that philosophy. However, scientific fact does show that movement can occur in directions away from the center or toward the center. For example, solar radiation from the sun does not travel in direct lines to or from a center. Some of the radiation scatters into space. Some is reflects from the earth?s surface and is lost into space (Lutgens 37-43). Air molecules do not move toward or away from a center. Air particles move in an infinite number of directions due to molecule size, shape, weight and composition. Finally, Aristotle?s theory that matter is made of four bodies is dramatically short sighted. Air is a mixture of at least nine different components and is constantly changing in composition. Nitrogen and oxygen make up nearly 99% of the volume of dry air. Of all the components of air, carbon dioxide is the most interest to meteorologists (Lutgens 5). In all fairness, Aristotle had no way to measure or determine the exact components of the atmosphere.

In book 1, part 3 of Aristotle?s meteorology, Aristotle describes his explanation of water vapor. His explanation describes the area between the surface of the earth and the visible portion of the Milky Way. It is important to note that he views the Milky Way as a plane or upper level surface (Aristotle, ?Meteorology? 253). Aristotle is very close to a scientific answer when he deduced ?that what immediately surrounds the earth is not mere air, but a sort of vapour, and that its vaporous nature is the reason why it condenses back to water again? (Aristotle, ?Meteorology? 253). His logic is interesting when he indicates that this expanse of a body cannot be fire ?for then all the rest would have dried up? (Aristotle ?Meteorology? 254). In part 9, Aristotle addressed the issue of precipitation. He explained that air condensing into water becomes a cloud. Mist is what remains when a cloud condenses into water. He further explained that when water falls in small drops, it is drizzle, and when the drops are larger, it is called rain (Aristotle ?Meteorology? 267).

This is one area where Aristotle was close to accurate. One flaw is his view of the Milky Way as a flat plane. Science has shown that the Milky Way is just one of an infinite number of star galaxies. Aristotle realized water vapor existed. He also realized that the area between the earth and the heavens was not fire. What Aristotle deduced as water vapor is scientifically referred to as a parcel of air. As the air parcel rises, it cools and may condense to form a cloud (Lutgens 81). Aristotle believed the remains of water vapor that did not form a cloud was mist. Actually, what remains is just other air parcels. The energy used to condense the air molecule is released as latent heat creating a cycle of rising and sinking air molecules (Lutgens 82-83). Aristotle provided names for the size of water droplets. It is possible that Aristotle coined the names drizzle and rain. Scientifically, drizzle is defined as small droplets of less than .5 mm. Rain is defined as droplets of .5 mm to 5 mm (Lutgens 131).

Aristotle dedicated several chapters to the theory of winds. Without scientific measurements, the cause or theory of wind was difficult to determine or explain. Aristotle compared wind to a flowing river in book 1 (Aristotle ?Meteorology? 348). Unfortunately, Aristotle could not discern why the river of wind never dried up. Therefore, he abandoned that theory and analogy of wind and simply tried to explain rivers instead. In book two, he dedicated three more chapters to wind. Aristotle used his theory of water vapor and direct observation of something he called smoke to describe the occurrence of wind. He related the rising water vapor and the heat of the sun. This combination created wind. Rain contributed to wind development by causing calm winds after a rain (Encyclopedia 191).

Wind must have been a difficult subject for Aristotle to explain, considering how much was written about the subject. The facts indicate he was close to an answer but never fully understood the concept of wind. The definition of wind is the result of horizontal differences in air pressure. Air flows from areas of high pressure to areas of lower pressure. It is nature?s method to balance inequalities of pressure. Unequal heating of the earth?s surface generates the pressure differences. Therefore, solar radiation is the ultimate driving force of wind (Lutgens 149). The effects Aristotle explained were often the results of the pressure changes. He realized the sun had some influence. The clam wind after a rain is an occurrence with strong thunderstorms that leave a micro scale high-pressure dome in their wake (Lutgens 153).

Aristotle explained the various meteorological phenomenon in simplistic terms. The explanations match his theory of how matter and shape were interrelated. Aristotle?s ideas on water vapor and precipitation were somewhat accurate, considering there were no tools to measure the atmosphere in his time. His views on wind, however, were not accurate at all. He wrote extensively on winds but never fully comprehended how wind occurred.

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