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1/28/2017

PHIL 401 A

The Two-Sphere System

Humanity has always tried to find its place in the universe. A chief concern for people striving to determine where we fit is the nature of the changing heavens and earth. Ancient peoples endeavored to explain how and why bodies move in the sky, producing varied theories of astronomy and motion. One such attempt will be the focus of this paper – the two-sphere model used in the Aristotelian tradition. My goal is first to offer a brief outline of what the Aristotelian universe looks like. Then, I will set up several observations about the world that ancient people had develop theories around, and detail how those observations were accounted for by Aristotle.

A picture of Aristotle’s universe begins with two concentric spheres – one with a much larger diameter so that one sphere is inside the other (Kuhn 27). The surface of the inner sphere is the surface of the Earth. The sun, moon, stars, and planets appear on the outer sphere (Kuhn 27). Already, the model has some serious explanatory power in regards to the movement of heavenly bodies. The outer sphere rotates around the earth one per day on an axis in line with the North Star (Kuhn 27). With this, one can begin explaining why stars move in sky. They appear to move because the sphere upon which they sit is constantly rotating around the earth.

This explains some other features of stars. A star appears to set when the horizon interrupts the line of sight between the observer and the star. Similarly, a star will rise when the outer sphere rotates to a position where the line of sight is between the observer and the star no longer passes below the horizon line (Kuhn 19). Observers in the northern hemisphere will notice that the rest of the stars appear to move in circles around the North Star over time. This is because the North Star is located at the axis of the spin, so it appears to barely move. Other stars positioned further from the axis of the spin appear to move more quickly, and do so around the axial star – the North Star. (Kuhn 16)

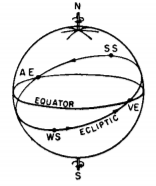
The two-sphere system’s explanation of the movement of the sun requires some additional detail, but can be brought into line with our observations quite smoothly. While the sun clearly doesn’t take the same path as the stars, it is because the sun moves on an additional path. In addition to the rotational path the sun takes while carried by the outer sphere, the sun also moves in a circle around the outer sphere called the *ecliptic* (Kuhn 34). The sun completes one full round of the ecliptic once per year. At each point in the year, the rising and falling of the sun will be slightly different to the observer, as the sun will be on a different position on the ecliptic each time the outer sphere completes a rotation (Kuhn 34).

Figure 1 taken from Thomas Kuhn's "The Copernical Revolution:

The two-sphere system fit into a broader theory of matter and motion laid out by Aristotle. Aristotle gave material explanations for many aspects about celestial bodies. To account for the position of the Earth, Aristotle pointed to what he considered to be the four fundamental elements that make up the world: earth, water, air, and fire (Kuhn 82). These elements are driven toward their natural resting place. Earth is drawn towards the center of the universe with the strongest force, as that is its natural place. Water does the same, but with less force, and so on with air. Flame rises away from the center of the earth instead (Kuhn 82). Because the elements all have their natural resting places in relation to the center of the universe, the Earth must reside at the center of the universe. The sphere containing all the stars, then, must be far removed from the center of the universe, as the earth occupies the center.

The earth appears motionless to us because all of the elements have (to a degree) settled into their place. The sun, stars, and moon are not made of elements, though. According to Aristotle, the heavenly bodies besides the earth are surrounded by and composed by a crystaline substance called aether, which is perfect and immutable (Kuhn 79). Aether’s is not subject to the same laws and forces that affect the elements, and is only moved by the rotation of the outer sphere of stars. The far more settled Earth appears motionless when compared to the perfect heavenly rotation of the outer sphere. The stars appear on the outer sphere, which is why the stars appear to move rather than the Earth. The stars also never appear to change, aside from their position in the sky. Aristotle takes this to be due to their makeup of aether (Kuhn 79). Aether’s perfect, unchanging, and indestructible nature, (along with the fact that their position is tied to the outer sphere so that no movement closer or further away from the earth would be possible), explains why the stars do not change (Kuhn 79). It is because physically they are incapable of changing, and in relation to us, they are always the same distance away, so their relative size does not change.

Many of the features that were the most basic and most pressing questions about the universe can be accounted for by the two-sphere system. This is much of the reason why the two-sphere model persisted for much history. The two-sphere model had explanations for the movements of all the celestial bodies, and was able to do so while still retaining its simple and intuitive nature. Aristotle’s theories of motion utilized the system to create a comprehensive theory of motion and matter, which I have only laid out in part. It is no wonder why the two-sphere model enjoyed such widespread use and success.

Works Cited

Kuhn, Thomas. *The Copernican Revolution*. Harvard University Press, 1957.