The evolution of mathematics of celestial motion assignment

Aristotle theorized that the world was imposed of only four basic building blocks; Air, Fire, Water, and Rock. Grouped into pairs, Air and Fire moved linearly upward while Water and Rock moved linearly downward. Though elegant in their simplicity, these rules of linear motion were confined between the Earth and the Moon, to what Aristotle called the " sublunary realm. " Anything beyond this was referred to as the " tarantulas realm" which consisted of any celestial body; the Moon, Sun, planets, and all of the Stars.

Instead of the obeying the laws of linear motion, this realm operated on the bases of uniform circular motion. Each celestial body was set wealth its own " crystalline sphere" which was unmoved and never changing; the size of these spheres was directly proportional to the body's rotational period. This sudden change in physics was attributed to a fifth element known as tether which spanned the entirety of the tarantulas realm. Because of Aristotle relatively simple view of the universe's problems were bound to be found.

One such problem was the unexplainable retrograde motion of Mars, which seemingly backtracked its way across the sky. Regarding this retrograde motion, a mathematical solution to the " Mars Problem" was covered In DADA by adding a complex system of smaller spheres rotating on an epicycle found on the present crystalline spheres. Known as the Ptolemaic system, this new uniform circular motion was composed of between thirty and forty total circles. Although more geometrically complex, this arrangement did account for these irregularities.

Regardless of this systems accuracy, an astronomical revolution was about to take hold. Lead by Nicolas Copernicus, this revolution was centered on a heliocentric model of the universe in order to decrease the geological complexity that came from the Ptolemaic system. In his book De Revolutionists Erbium Copernicus argued that Ptolemy had violated the concept of circular motion by creating too complex of a system by overlapping spheres to account for observational Inaccuracies.

By focusing on uniform circular motion with the sun at the center of the universe, Copernicus attempted to create a simpler model of the universe by proposing that the Earth, not only revolved around the Sun but, rotated on an axis. In addition, Copernicus also increased the size of the universe so that the stars, on the outermost edges of the universe, would look as If they were stationary. Regardless of the improvements made to the design, Copernicus, realizing that his system had 1 OFF more accurate and to account for the universes ever increasing complexity.

Contrasting the two models let it be known that both are accurate and are geometrically correct. Copernicus system was, however, only slightly easier to use. Because of this and being the first serious introduction of a mathematically sound heliocentric model of the universe, Copernicus contributions to the world of astronomy give it the rare title of being a revolution. Although he is not considered revolutionary, Johannes Keeper was definitely a visionary in the world of mathematics.

With his gift for geometry Keeper helped add more concrete evidence to the Heliocentric model of the universe and establish regularity to the known universe. Through his work with the famous Itchy Brake, Keeper discovered his three laws of planetary motion. These laws by themselves finally address, not only the mystery of retrograde motion but also, the mathematics behind the motion of any celestial body. By abandoning the idea of circular motion, his first law states that the orbits of the planets are not circular but are instead ellipses.

The planet described would always be in relation with the Sun at one of the foci. By analyzing even more of Tetchy extensive astronomical data Keeper was able to discover his second law of motion. His second law addresses the change in velocity as a planet orbits the sun; a line Joining a planet and the Sun sweeps out equal areas during equal intervals of time. In 1609 he published these laws in Astronomic Nova as two laws which focus on a single planet's motional characteristics. However over the next fifteen years

Keeper began to search for a third law which would focus on the relationship between different planets. This final law would, after centuries, bring regularity to the universe. Keeper's third and final law was discovered in 1619 and is best described as the ratio of the squares of the periods of any two planets being equal to the ratio of the cubes of their average distances from the Sun. Although Keeper was a visionary, and arguably the true astronomical revolutionary, another great mind must be mentioned when talking about laws of motion.

Sir Isaac Newton was the first to dress and theorize the force attracting the planets and the Sun. Adding to the work of Keeper, in his Philosophize Naturalist Principia Mathematics Newton establishes the theory of gravitation. With this he explains that any two bodies in the universe attract each other with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between them. This underlying force to Keeper’s laws, in addition to Keeper’s laws themselves, give us still today a clear understanding of the mechanics behind how our solar system works.