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## **RANDOM AND ARBITRARY CONTINGENCIES IN HISTORY OF SCIENCE AND TECHNOLOGY [6] – THE RANDOM CULTURAL BACKGROUNDS FOR THE SUN-CENTERED UNIVERSE**

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### **ABSTRACT**

The Copernican revolution was made possible not by some causal, rational or mathematical basis or standard. Rather, it was triggered by some random and arbitrary cultural background such as Heliocentrism during the renaissance. Heliocentrism itself was culturally motivated by some other contingent cultural factors such as perspective in painting and Neoplatonism in philosophy.

**KEYWORDS:** Renaissance, perspective, Heliocentrism, Almagest, Copernicus, Ptolemy, Neoplatonism, contingent cultural factors

### **INTRODUCTION**

Ptolemy's Earth-centered universe around the second century AD is based on Aristotle's arrangement of four elements. Thus, starting with the Earth at the center of the universe, water, air, and fire are arranged in an ascending order. Then, the fifth element of ether is filling the entire universe. In this realm of ether, the first celestial object, the moon, is circling eastward around the Earth, the center of the universe. After the moon, the first planet, Mercury, and the second one, Venus, are circling around the Earth on each small circle called the epicycle while the centers of their epicycles are then moving around the Earth on each big circle called the deferent. At the same time, the center of Mercury's epicycle is directly connected to that of Venus' which is then in turn connected to the Sun. So, Mercury, Venus and the Sun are all more or less moving together around the center of universe. This could explain why Mercury and Venus are always located near to the Sun, only visible during early morning and evening. After the Sun, another planet, Mars is located with its epicycle and deferent, but it is no longer connected to the Sun or any other celestial bodies. Later, in the middle east during the medieval time, the number of Mars' epicycles will be increased as many as ten or more. These Martian epicycles on top of each other will increase the accuracy

on the location of Mars, but at the same time, Mars' motion gets more and more complicated in Ptolemy's universe.

### **Copernicus Revolution**

However, during the Medieval time, Ptolemy's Earth centered universe did not survive in Europe after the demise of Alexandria and Rome in the 5th century, since early christianity did not embrace ancient Greek natural philosophy. In this negative environment, ancient Greek philosophy such as that of Aristotle was considered the so-called pagan philosophy. It was only after the 13th century that Aristotle's philosophy was re-recognized when much work of Aristotle was re-introduced back to Europe through the works of Islam. This period of European translation on Aristotle's works from Arabic to Latin language is now called the 13th century small Renaissance, which triggered the Roman Catholic church to accept Aristotle's philosophy in the name of Scholasticism, the main philosophy of the Medieval Catholic Church.

The revival of Aristotle in the 13th century Europe brought back Ptolemy's universe through the book, *Almagest*, in which Ptolemy's accuracy had been reinforced in Islam by introducing more and more number of epicycles on the planet motions, adding more and more complexity on the model. But, It took several more centuries for European astronomers to fully understand the meanings of the book, *Almagest*. It was in fact only in 1543 that the first European astronomer Copernicus finally understood the full content of *Almagest* (Wallis, 1939)

In the meantime, starting in the 15th century of Italy, a new technic of incorporating three-dimensional features on a two-dimensional plane appears in painting for the first time in European history, which is nowadays called "perspective", showing light and shadow effect with various colors involved. Especially, the ultimate source of light in painting appears to be the Sun, thereby the sun itself becoming one of the main cultural themes with a special interest among people during the 15th and 16th century Europe. This is the 15th and 16th century Renaissance which causes another special interest in the ancient philosopher Plato, thus becoming the so-called Neo-Platonism. This Neo-Platonism puts an additional metaphysical emphasis on the Sun, which in turn, together with the special interest in the Sun, triggers Heliocentrism in astronomy during the Renaissance.

It appears that Copernicus himself is strongly influenced by the general cultural environment of Renaissance. Thus, during Renaissance, Neo-Platonism with a special metaphysical emphasis on the Sun is the backbone of Copernicus' Sun centered universe. Finally understanding the full meaning of *Almagest*, Copernicus possessing a metaphysical importance toward the Sun had less difficulty on putting the Sun at the center of the universe. Because of this preference on the Sun itself, Heliocentrism was never

questioned in his mind and he could go directly to the main issues of technical problems of Ptolemy's model, criticizing the earth centered universe once he grasped the full meaning of it.

Nonetheless, it has to be emphasized that the motivation behind the Copernican revolution has nothing to do with rationality, objectivity, or observational evidence etc. Rather, it has something to do with Renaissance culture of Heliocentrism. This cultural background is random and arbitrary contingent for the Copernicus revolution, meaning it has no causal relation to the Copernican revolution. In other words, Heliocentrism made the Copernican revolution possible as a random and arbitrary cultural factor.

### **CONCLUSION**

One of the historical contingencies during the Renaissance, Heliocentrism, had a triggering effect as a random cultural background on the Copernicus revolution. Heliocentrism itself originated from a special painting technic called perspective together with Neoplatonism of Renaissance culture. However, scientists nowadays tend to disregard this kind of a random cultural background for causing any major scientific development such as the Copernican revolution. To them, causal science and random culture are totally different two things. However, some random and arbitrary cultural background can have a decisive role on one of the greatest scientific achievements in science such as the Copernican revolution.

### **REFERENCES**

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