



The Missing Link?: The Maragha Observatory

By Eman M. Elshaikh

For centuries, thinkers like Ptolemy, Copernicus, and Galileo debated what the Universe looked like. Many scholars initially believed that the Earth was the center of the Universe. But over time, scholars moved toward the idea that the Sun was the center of the Universe. How exactly did they get there?

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Planetary revolutions



Many ancient astronomers believed that the Sun, stars, and planets revolved, or traveled around, Earth. Astronomers study the planets, stars, and space. One of these ancient astronomers was Ptolemy (100–170 CE). He and others believed that the Earth was at the center of the Universe. This belief persisted among scholars for hundreds of years.

By the sixteenth century, however, astronomers like Copernicus (1473–1543 CE) and Galileo (1564–1642 CE) started challenging Ptolemy’s model. A model is a tool that represents, or simulates, something that can or could happen in reality. Copernicus and Galileo created a *heliocentric* model where the Sun was at the center of the Universe. This new model shocked people. The Catholic Church even jailed Galileo for his ideas.

Like all scholars, Copernicus and Galileo came up with their theories using ideas from those who came before them. Copernicus was born nearly 1,400 years after Ptolemy, and we don’t hear much about the people who came between. But for centuries, scholars had been slowly chipping away at the Earth-at-the-center model.

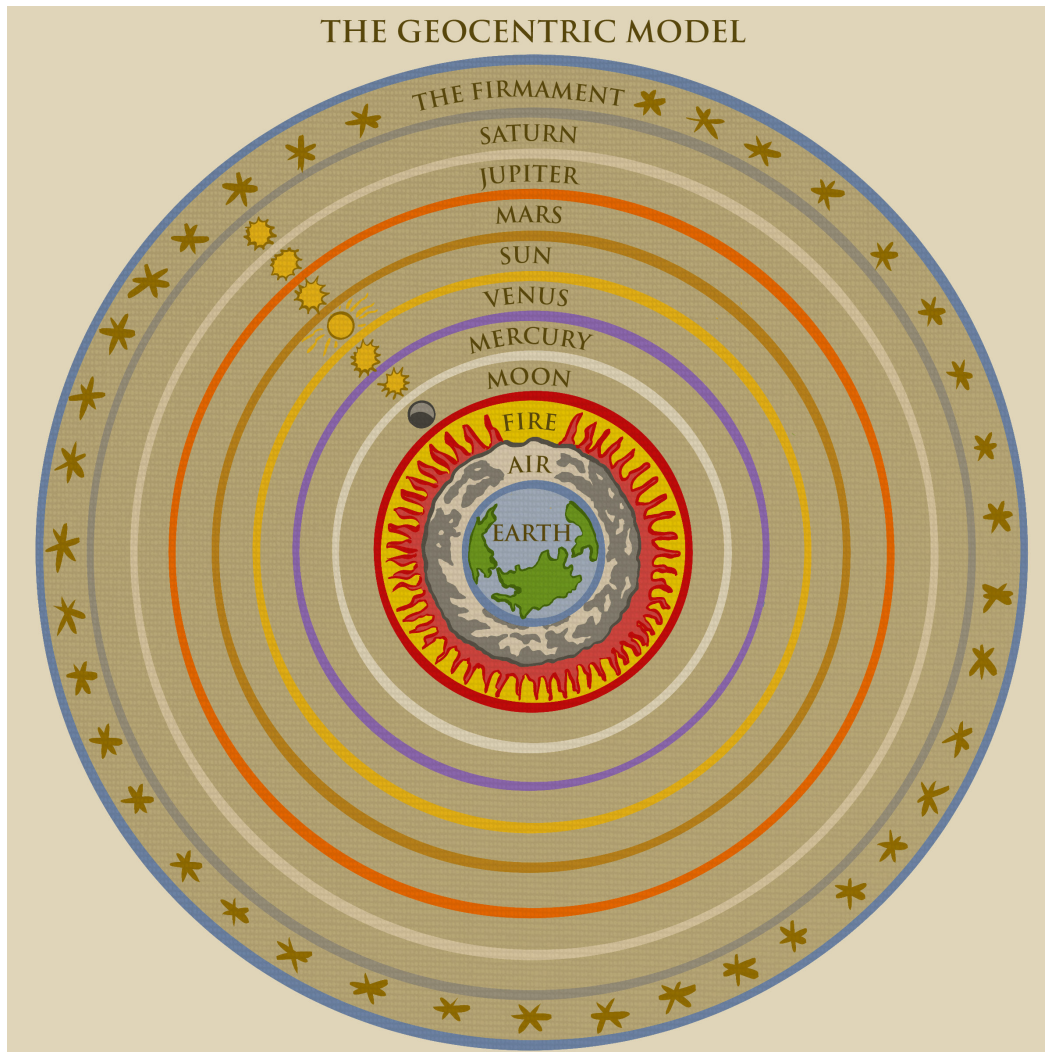
The Arab astronomer Ibn al-Haytham (965–1040 CE) questioned Ptolemy’s model. He claimed that Ptolemy’s idea about how different planets fit together didn’t work. An even earlier Arab astronomer, al-Battani (858–929 CE), calculated the movement of the Sun and the planets. Copernicus cited his observations. The work of scholars like Ibn al-Haytham and al-Battani helped later scholars construct their theories.

A golden age during a dark age

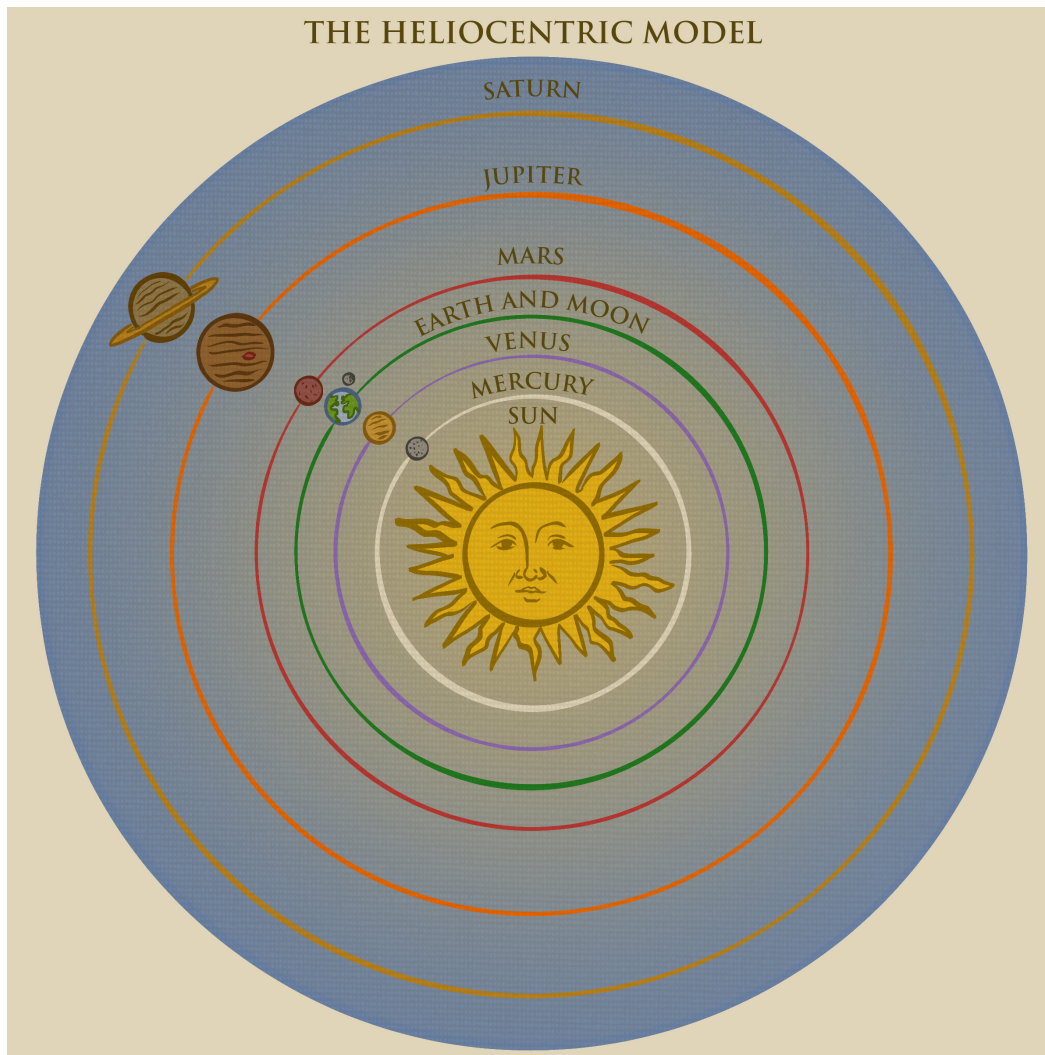
Ibn al-Haytham and al-Battani were part of a tradition of astronomy in the Islamic world. Their work launched the Islamic Golden Age. This was a period of scientific and cultural achievement. They built on the knowledge of prior Greek, Indian, Chinese, Babylonian, Persian, and Arab thinkers.

For Muslims of this period, astronomy was a practical science that was important for religious practice. By measuring the movement of the Sun, Moon, and stars, they determined the times for daily prayers, and they also calculated the direction of Mecca, Islam's holiest city. This knowledge was valuable to Muslim leaders.

As a result, many Muslim rulers built observatories, which are places for observing and studying natural objects and events in space and on Earth. Among the most famous and important of these was the Maragha Observatory. There, scholars seriously challenged Ptolemy's Earth-at-the-center system.



The geocentric or Earth-centered model of the Universe, which places the Earth at the center of planetary orbits. Ptolemy was one thinker who proposed this model, which was accepted for centuries after Ptolemy's death. By BHP and Peter Quatch, CC BY-NC 4.0.



The heliocentric or Sun-centered model of the Universe, which places the Sun at the center of planetary orbits. Copernicus was arguably the first scholar to propose this model. By BHP and Peter Quatch, CC BY-NC 4.0.

The Maragha Observatory

In the thirteenth century, the Mongol ruler Hulagu Khan conquered a big part of the Islamic world. Many Mongol rulers supported scholars, especially astronomers. Hulagu Khan worked with the Persian astronomer Nasir al-Din al-Tusi, and they built the Maragha Observatory in Persia. It was the most advanced observatory in the world at the time. It attracted astronomers from across the Islamic world.

Maragha astronomers recorded their astronomical observations and calculations in the observatory library. They came up with new ideas about how the planets moved. One of the most important of these ideas was a mathematical idea called the "Tusi couple," named after Nasir al-Din al-Tusi. It helped astronomers understand how different stars and planets relate to each other in space.

Syrian astronomer Ibn al-Shatir built on this work. Using the Tusi couple, Ibn al-Shatir corrected Ptolemy's calculations of distances between planets. Ibn al-Shatir wanted to create a model using his new observations. His model was much more accurate than Ptolemy's.

The missing link?

The Maragha Observatory scholars did not understand that the Sun was at the center of the solar system. (A solar system is a group of suns, planets, and other objects held together by gravity. Our solar system includes the Sun (a star) and everything bound to it by gravity). However, their work may have provided the foundation for Copernicus's heliocentric model. Not all historians agree on this.

On the one hand, some historians argue that scholars like al-Tusi and Ibn al-Shatir influenced Copernicus's heliocentric system. They use this evidence to support their claims:

1. The work of these scholars had been translated and spread around Eurasia for centuries before Copernicus's time. Copernicus would have very likely come across their work.
2. There are similarities between Copernicus's diagrams and mathematical arguments and those of the Maragha scholars. Some of Copernicus's models used ideas that were nearly identical to the Tusi couple.
3. Without this link, it's more difficult to explain how Copernicus reached his conclusion.

On the other hand, other historians don't think the Maragha Observatory scholars influenced Copernicus's heliocentric system. They use this evidence:

1. While Copernicus cited scholars like al-Battani, he never mentioned al-Tusi or Ibn al-Shatir.
2. These Islamic scholars didn't have a heliocentric model, and their models are pretty different from Copernicus's.
3. There may be similarities in mathematical ideas, but these ideas are used very differently. Even with the similarities, they could be independent discoveries.

Historians are still learning about collective learning. Who learns it? Who collects it? How is knowledge shared, moved, changed, translated, improved, and challenged? No matter how historians answer these questions, it's important to keep revealing the influence of Ibn al-Haytham, al-Battani, al-Tusi, Ibn al-Shatir, and many others. Only then can we start to make connections that allow us to tell our Big History more fully.

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Image credits

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The geocentric or Earth-centered model of the Universe, which places the Earth at the center of planetary orbits. Ptolemy was one thinker who proposed this model, which was accepted for centuries after Ptolemy's death. By BHP and Peter Quatch, <http://peterquach.com>, CC BY-NC 4.0.

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