

Dispelling myths and highlighting history of the heliocentric model

The truth about a problem, and in particular about a scientific one, generally has many sides and is difficult to reach. So it is with the history of the Copernican model of the solar system and how it was finally adopted. Although the textbook version is inexact in some details and certainly not complete, the same could be said about several statements Mano Singham makes in his article discussing those myths (PHYSICS TODAY, December 2007, page 48).

Discussing various opinions on the Copernican doctrine, the author claims that "in 1615 Cardinal Robert Bellarmine, a prominent persecutor of Galileo, said that 'the Earth is very far from heaven and sits motionless at the center of the world.'"

Actually, Cardinal Bellarmine, a supporter of the church's official doctrine that the Sun traveled around the motionless Earth, was not a persecutor of Galileo. Before Galileo's visit to Rome in 1615, Bellarmine had known him for almost 15 years, had viewed Jupiter's moon through Galileo's telescope in 1611, and highly respected his achievements, which the cardinal could appreciate more than most, since he had studied astronomy in Florence.

It is true that in 1616 Cardinal Bellarmine, speaking as the pope's representative, admonished Galileo to abandon the opinion that the Sun is the center of the universe and instead hold it as a hypothesis without proof and contrary to the scripture. However, since whispers of heresy and blasphemy continued to smear Galileo's

name, he appealed to the cardinal for redress and received a vindicating letter of endorsement.¹

Singham also does not mention that several of Galileo's discoveries supported the heliocentric model. Galileo saw that Venus has phases similar to those of the Moon, and his discovery of spots on the Sun spoiled the idea of the perfect heavenly sphere. In addition, the moons of Jupiter provided a proof that Earth is not unique in having a satellite.

As for Tycho Brahe, his "aid" to the success of the Copernican model was actually a geocentric model in which the other planets did circle around the Sun, but together they all moved around the immobile Earth in the center of the universe.

The PHYSICS TODAY article discusses in detail the contributions of Johannes Kepler to the "great debate" but not those of Galileo. Nowhere does Singham mention Galileo's monumental work *Dialogue Concerning the Two Chief World Systems, Ptolemaic and Copernican*. That now famous work presents solutions to several apparent problems with heliocentricity. But the Catholic Church did its best to prevent that knowledge from being spread and eventually accepted.

The culmination was Galileo's trial. The tragic outcome is well known: Galileo was forced to sign his abjuration and condemned to house arrest for the rest of his life. As the author rightly points out, the edict against Galileo was not lifted until 1992.

Coming back to the "myth" that the church held back scientific progress for a millennium, we must remember that this behavior began long before Copernicus and his successors. History records much of the retrograde attitude of the church toward scientific progress. In the 16th century, all books in the Catholic countries of Europe had to pass censorship, according to the papal bull issued in 1515. The Roman Inquisition, reorganized in 1542, supervised all printing in Italy and in 1559 promulgated its first index of prohibited books. In 1564, after the Council of Trent, the restrictions became even more severe.

There is another "myth" presumably found in the popular version of the story about the geocentric and heliocentric models. According to Singham, ancient Greeks, being more philosophers than experimentalists, supported the idea of Earth being stationary, with planets and stars rotating around it. But that statement is not entirely true. Actually, those ideas, from Eudoxus, Aristotle, and later Ptolemy, were willingly accepted by the Christian church later. But one must not forget Archimedes, in whose book *Arenarius* one finds the concept of the heliocentric cosmos, proposed by Aristarchus of Samos in the third century BC and by others before him.² Aristarchus's model was well known in Europe at the beginning of the High Middle Ages but was not seriously entertained until Copernicus.

References

1. D. Sobel, *Galileo's Daughter: A Historical Memoir of Science, Faith, and Love*, Penguin Books, New York (2000), p. 81.
2. L. Russo, *The Forgotten Revolution: How Science Was Born in 300 BC and Why It Had to Be Reborn*, S. Levy, trans., Springer, New York (2004).

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Is it Mano Singham debunking the Copernican myths, or are those post-1650 "writers making this revisionist claim"?

Following an earlier reconstruction by Dennis Danielson, Singham bases his objection to the popular mythology on his claim that the Catholic Church did not object initially to the Copernican heliocentric model and that the initial resistance came instead from the physics and astronomy communities. His largely irrelevant (to his main thesis) recounting of some historical events preceding and following Copernicus's death in 1543 makes for interesting reading but omits certain facts that support the popular historical account that most of us learned.

Although the works of Tycho Brahe and Johannes Kepler did provide much of the factual basis for heliocentricity,

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