

Physics 10293 Lab #9:

The Copernican Revolution

Introduction

Today we will explore two articles in Scientific American that cover detailed historical aspects of the Copernican Revolution. The basic story is that, for thousands of years from the first published works on the motions in the heavens, astronomers believed that the Earth was the stationary center of the Universe ("geocentrism"). For a period of about 300 years, starting in the 15th century, astronomers slowly came around to the point of view of "heliocentrism," with the sun at the center of the solar system and the Earth just one of many orbiting planets.

Why did this revolution take so long? Why did so many brilliant people believe a completely wrong model for how the Universe works? Were they just stubborn? Did religious influences prevent the free exchange and growth of ideas? Were there good scientific reasons to stick to the old model, given the available information?

The answers to these questions are closely tied to why we study the history of science: we want to learn what causes scientists to be wrong, what causes scientific revolutions and perhaps put those answers in today's context to see if we are due for another revolution in some field.

"Astronomy in the Age of Columbus"

In order to access this article, you will need to go to the Doc Sharing area for Physics 10293 on the Pearson Learning Studio site at tcuglobal.edu. Find the article at the bottom of the list, below the lab manual files. Read through the article and answer the following questions as you do. The questions are asked in the same order the topics are covered in the article.

Q1. The author asserts that most scientists of Columbus' era (late 15th century) agreed that the Earth is round. Why did many people abandon this belief in the United States after the American Revolution? Explain.

Q2. Columbus himself agreed that the world is round. Explain how he justified his voyage to the king and queen of Spain, to make them believe it was possible.

Q3. Although Columbus wasn't much of an astronomer, he did make use of "Ephemerides," a reference book for timing astronomical phenomena such as lunar phases and eclipses. Explain how.

Q4. Explain why Ptolemy's original geocentric model of the solar system was doubted by scholars of Columbus' era.

Q5. Explain why Copernicus' original heliocentric model of the solar system was no more accurate than Ptolemy's geocentric model.

Q6. Name and explain three different arguments or lines of evidence that helped prompt the revolutionary change in consensus from Ptolemy's geocentric model to a Copernican heliocentric model.

"The Case Against Copernicus"

Now find this article in the same place as the Columbus article, read through it as you answer the following questions, which are again covered in the same order as the article covers the topics.

Q7. Describe the cosmology proposed by Tycho Brahe with the help of a diagram. Explain why it is consistent with Galileo's observations of Venus where the geocentric model isn't.

Q8. Name and explain three arguments or lines of evidence described in the article that astronomers of that time felt contradicted the Copernican heliocentric model.