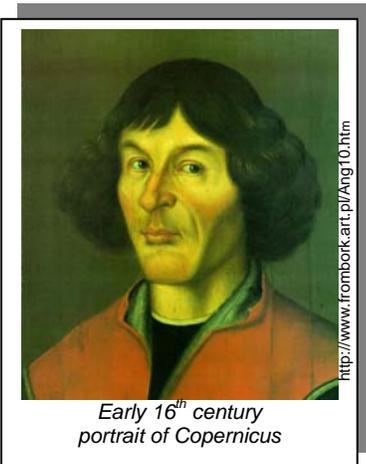




## Thinking Outside the Box!

When something is referred to as a “classic,” what does that mean to you? For example a “classic” car reflects a style and design that has become associated with a historical era. Mercury, Venus, Mars, Jupiter and Saturn are known as “the classical planets” because mathematicians were predicting the cyclic changes in their positions nearly two thousand years ago. How could the study of these five planets extend so far back in history? Astronomers could see the “classical planets” with a very common instrument – the human eye. Fueled by curiosity, such observations powered the progress made in the early eras of astronomy.



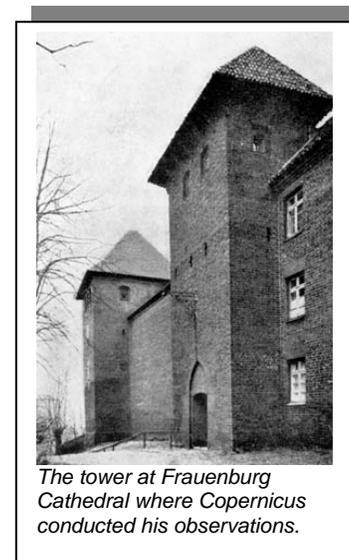
### Challenging a Classic Theory

In 1530, **Nicolas Copernicus** proposed a fantastic concept based on years of observations! In his great work, *De Revolutionibus*, he theorized that the Earth rotated on its axis once daily and traveled *around the sun* once a year and that all the known planets orbited *around the sun*, rather than around the Earth. His conclusions challenged **Ptolemy’s geocentric** theory that the Earth, located at the center of the universe, remained motionless while all celestial bodies, including the sun and the fixed stars, revolved around it. Ptolemy’s idea had been accepted for more than a thousand years by all educated people, including the politically powerful churchmen of the time.

### Copernicus’ Contributions to Science

Copernicus was born Mikolaj Kopernik in Torun, Poland. He studied canon law (laws of the church) and medicine in Italy. While he was a clergyman at Frauenburg cathedral, he painted and translated Greek poetry into Latin for relaxation, until astronomy became his primary interest. He observed the skies with his unaided eyes from a tower built into the protective wall around the cathedral and carried on his investigations quietly by himself.

Copernicus was in no hurry to publish his theory, not because he was concerned with what the church and other intellectuals might say about it, but rather because he was a perfectionist. Even after working on it for 30 years, he thought that there were still observations to be checked and rechecked. Copernicus’ work might not have ever reached the printing press, if not for the encouragement of **George Rheticus**, a young German mathematics professor who spent two years working with the master astronomer.

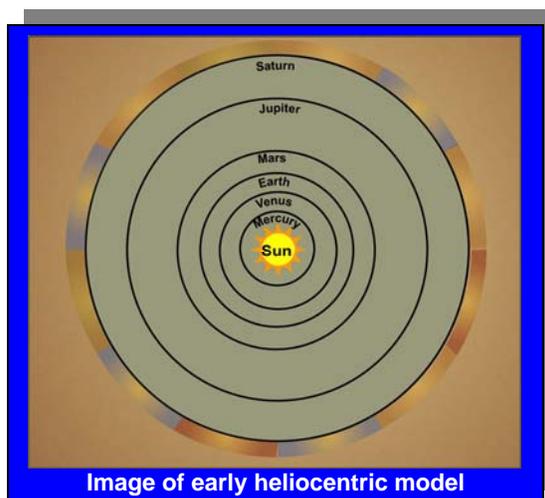
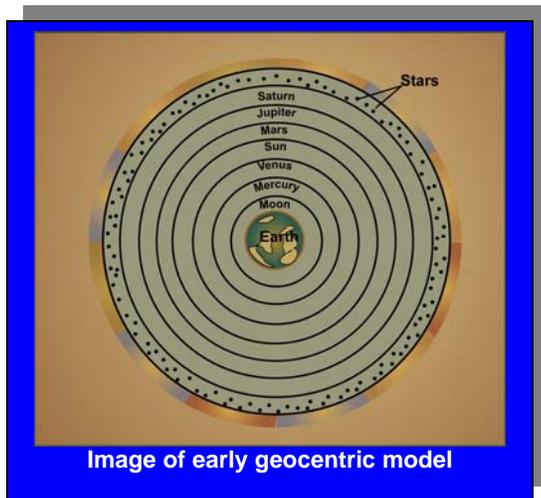


### Copernicus Sparks Controversy

Copernicus died in 1543 and never knew what a stir his work had caused. As the German philosopher Johann Goethe wrote, “The world had scarcely become known as round and complete in itself when it was asked to waive the tremendous privilege of being the center of the universe.” What Goethe meant

is that only fifty years after Christopher Columbus sailed to New World and cast doubt on the “flat earth” concept, Copernicus proposed that the Earth was not the center of the Solar System.

As with many newly proposed scientific concepts, the Copernican **heliocentric** (or sun-centered) planetary system was not immediately accepted by the scientific community. In fact, it was rejected outright by many of his 16<sup>th</sup> century colleagues. However, Copernicus’ discovery was a crucial link in our understanding of the early stages of planet formation, which is the primary reason for the Dawn mission.



### Additional Resources

#### Web Sites

Explore the Solar System with this interactive Web site:

<http://liftoff.msfc.nasa.gov/academy/space/solarsystem/solarsystemjava.html>

For more about Ptolemy, a Greek astronomer, go to:

<http://nineplanets.org/psc/theman.html>

<http://www-gap.dcs.st-and.ac.uk/~history/Mathematicians/Ptolemy.html>

[http://www.windows.ucar.edu/tour/link=/people/ancient\\_epoch/ptolemy.html&edu=mid](http://www.windows.ucar.edu/tour/link=/people/ancient_epoch/ptolemy.html&edu=mid)

To learn more about Copernicus’ life and work, visit the following Web sites:

<http://www.blupete.com/Literature/Biographies/Science/Copernicus.htm>

<http://www-gap.dcs.st-and.ac.uk/~history/Mathematicians/Copernicus.html>

[http://es.rice.edu/ES/humsoc/Galileo/Things/copernican\\_system.html](http://es.rice.edu/ES/humsoc/Galileo/Things/copernican_system.html)

#### Print Resources

Cousins, F.W. (1972). *The solar system*. New York, NY: Pica Press.

Grunn, B. (1991). *The timetable of history – A horizontal linkage of people and events*. Simon & Schuster, Inc.

McSween, H.Y. (1999). *Meteorites and their parent planets*. Cambridge; NY: Cambridge University Press.

Peebles, C. (2000). *Asteroids: A history*. Washington, DC: Smithsonian Institution Press.

Roth, G.D. (1962). *The system of minor planet*. Princeton, NJ: Company Inc.

Schorn, R.A. (1988). *Planetary astronomy*. College Station, TX: Texas A&M University Press.