## CHAPTER 4 GOD'S WORD AND GOD'S WORLD IN CONFLICT?

## THE PHASES OF VENUS

**B** efore the time of Copernicus and Galileo, the accepted model of the solar system was *geocentric*. In this model the Earth was stationary while the planets, the Sun, and the Moon orbited the Earth. This model was developed in great detail by the Greek scientist Ptolemy around A.D. 200 before the telescope was invented.

In the Middle Ages scholars began to notice that the planets were not exactly where the geocentric model predicted they would be. Copernicus (1473-1543) set out to develop a new model for the motion of planets— the *heliocentric* model. In this new system, the Sun is stationary, the Earth and all the other planets orbit the Sun, and the Moon orbits the Earth. This was a revolutionary idea!

Ptolemy's geocentric model and Copernicus' heliocentric model made similar predictions about lots of observations, but they made very different predictions about how Venus would appear from Earth. Like the Moon, Venus is a sphere and it is visible because it reflects light from the Sun. The Moon looks like a disk to us. Venus is farther away than the Moon, so without a telescope Venus looks like a point of light. But through a telescope Venus appears as a disk, just like the Moon. And like the Moon, Venus can have phases, appearing full, new, or crescent, depending on whether the sunlit side of Venus is mostly facing towards or away from Earth. Thus the phases of Venus depend on the relative positions of the Earth, Sun, and Venus, and their relative positions depend on the orbits (see the diagram).

In Ptolemy's geocentric model, Venus orbits the Earth and is forced to stay between the Earth and the Sun at all times. Thus, in the geocentric model, the sunlit side of Venus would always face mostly away from Earth and Venus should always appear as a crescent, never full. In the heliocentric model Venus orbits the Sun, so that it is sometimes between the Earth and the Sun and appears as a crescent. But at other times its orbit will take it to the far side of the Sun, so Venus's sunlit side will be facing the Earth and therefore appear nearly full. So in the heliocentric model (but not in the geocentric model) we would see a nearly full Venus once each orbit.

What Galileo observed was that Venus moved between full and crescent phases in a cycle that matched the prediction of the heliocentric model. His observations clearly contradicted the prediction of the geocentric model. Here was firm scientific evidence that the geocentric model was in serious need of repair or was wrong altogether. Galileo became convinced that the Earth moved around a stationary Sun and that his observations proved it.

© 2011 by Faith Alive Christian Resources, 2850 Kalamazoo Ave. SE, Grand Rapids, MI 49560. This article is part of a collection associated with the book *Origins: Christian Perspectives on Creation, Evolution, and Intelligent Design.* www.faithaliveresources.org/origins This is an example of a scientific revolution, in which a long established model (geocentrism) was overthrown by new observations (the phases of Venus) enabled by new technology (the telescope). The new model of heliocentrism could explain all of the planetary motions of the older model and could also explain the new data on the phases of Venus.

