What's up in Astronomy by Eric Erickson

Offered Title: The Day Our Universe Changed

It didn't happen that fast. The universe had been just fine for 1400 years, since Ptolemy published his grand design. So, why should anyone believe a guy from Poland who claims it's wrong? If it ain't broke, don't fix it eh?

An Earth centered universe had been the accepted model from before Old Testament times. Everything seemed to work up there, so astronomers were not exactly excited about the proposed change. This proposal was huge! Moving the Sun to the center and placing Earth in orbit with the other planets was nothing short of heresy. Saying this proposal met with resistance is a gross understatement.

Nicolas Copernicus turned the astronomy world upside down by switching the Earth and Sun positions. What prompted him to make this controversial change? The Equant. Ptolemy invented the equant, a secondary point around which the planets revolved (epicycles) that produced a constant speed, perfect circle, and explained retrograde motion. This was the Greek ideal for planetary orbits. Copernicus thought the equant an artificial concept.

Interesting, Ptolemy invented the equant to solve planetary orbit geometry because he believed Earth was the center of our universe. He did this while his observations were telling him…maybe the Sun is at center? Another great mind invented an artificial construct to make our universe fit his beliefs. Albert Einstein invented the cosmological constant to fit his belief in a static universe, while his equations described an expanding universe.

Copernicus worked out the geometry of planetary orbits, noting that the Sun better fit the center. With his *Heliocentric* model of the universe the planets moved at a constant speed and in circular orbits. While he considered Ptolemy's equants artificial, Copernicus ended up relying on a few planetary epicycles to explain retrograde. Copernicus waited decades, not publishing, yet his heliocentric model became well known, and controversial. Astronomers asked, if Earth now orbits the Sun why do we not see parallax with the stars?

Copernicus finally published his *De revolutionibus orbium coelestium* (On the Revolutions of the Heavenly Spheres) in 1543. His good friend and collaborator Georg Joachim Rheticus encouraged Copernicus to finish it and helped with publication. Copernicus originally wanted its title to be *De revolutionibus* (On the Revolutions) but the publisher added *orbium coelestium* (heavenly spheres) to make it more palatable. Even the books preface was changed, written by Lutheran clergyman Andreas Osiander, to spin it as a mathematical exercise, avoiding potential religious conflicts.

By the time his book was published Copernicus was dying and didn't have the strength to challenge his publisher. An original manuscript survives in the Jagiellonian Library in Krakow, with Copernicus's original title and preface.

Today we know planetary orbits are elliptical, change speed, planetary orbital speed differentials cause retrograde, and we can measure tiny stellar parallax. Technology.

Next week, Kepler fixes it.

What's in The Sky

August 24; pre-dawn; southeast: A Crescent Moon is close to Aldebaran in Taurus