Chippewa Valley Astronomy Update *Friday Oct 14, 2022 Eau Claire Leader Telegram*

Figure caption: Jupiter and two of its moons are seen in this image from last month. Jupiter has four moons that are so big that Galileo was able to see them through his rudimentary telescope. The four moons form an almost straight line that lines up with the bands on the surface of Jupiter.
Image credit: Ed Henry, member of the Chippewa Valley Astronomical Society

How Galileo discovered Jupiter's four large moons

By Lauren Likkel

After Galileo heard about the invention of a "spyglass", he learned how to grind lenses to make a telescope. By 1609 he had crafted high enough quality lenses to make a good telescope, and he began to study the heavens. He was stunned to discover four moons orbiting Jupiter. They are now called the "Galilean moons" and these four largest moons of Jupiter are visible through a telescope this month. They usually look like four stars in a row near the planet.

When Galileo first looked at Jupiter and saw little stars near it, there was no one to say "Hey, can you see Jupiter's moons?", as you might hear if you visit the Beaver Creek Reserve observatory on a Saturday night this October. Before Galileo, no one knew that other planets could have moons, and the word "moon" only meant Earth's Moon. Indeed, Galileo assumed the stars next to Jupiter were uncharted "fixed stars", like the many stars he discovered that were too dim to see without a telescope. The second night he observed that Jupiter had moved compared to the "stars". It took a couple more nights of observations before he realized that the "stars" were actually moving.

If you look at Jupiter through a telescope and don't see all four "Galilean moons", consider this. It took over a week before Galileo saw all four moons at the same time. Besides the cloudy nights, sometimes one or two moons were behind Jupiter, or were too close to the bright planet to be seen, and sometimes two moons were so close together that they looked like one.

Galileo published his observations in 1610 in the book "Sidereus Nuncius". I recommend the translation from Latin to English by Albert Van Helden (2016, 2nd edition). In his preface to "Sidereus

Nuncius, or The Sidereal Messenger", Van Helden comments that "Heavenly phenomena hidden since the beginning of time were suddenly revealed by the telescope".

After many nights of recording the changing orientation of the "stars" that aways were near Jupiter, Galileo concluded in Sidereus Nuncius that they were orbiting Jupiter "like Venus and Mercury orbit the sun". The discovery of objects orbiting Jupiter conflicted with the view that everything revolves around Earth, but it supported the sun-centered view.

When Galileo first observed Jupiter, it was high in the evening sky. In his translation of Galileo's book, Van Helden notes that Jupiter "had just passed opposition (when it is in a straight line with the Earth and the Sun and at its closest approach to the Earth) and was the brightest object in the evening sky". By the way, that is exactly the case this month (October 2022) too. Currently Jupiter is even closer to Earth than it usually is at opposition, so it is looking bigger and brighter than it has in 60 years. That is an advantage that Galileo didn't have.

-- Lauren Likkel is a member of the Chippewa Valley Astronomical Society