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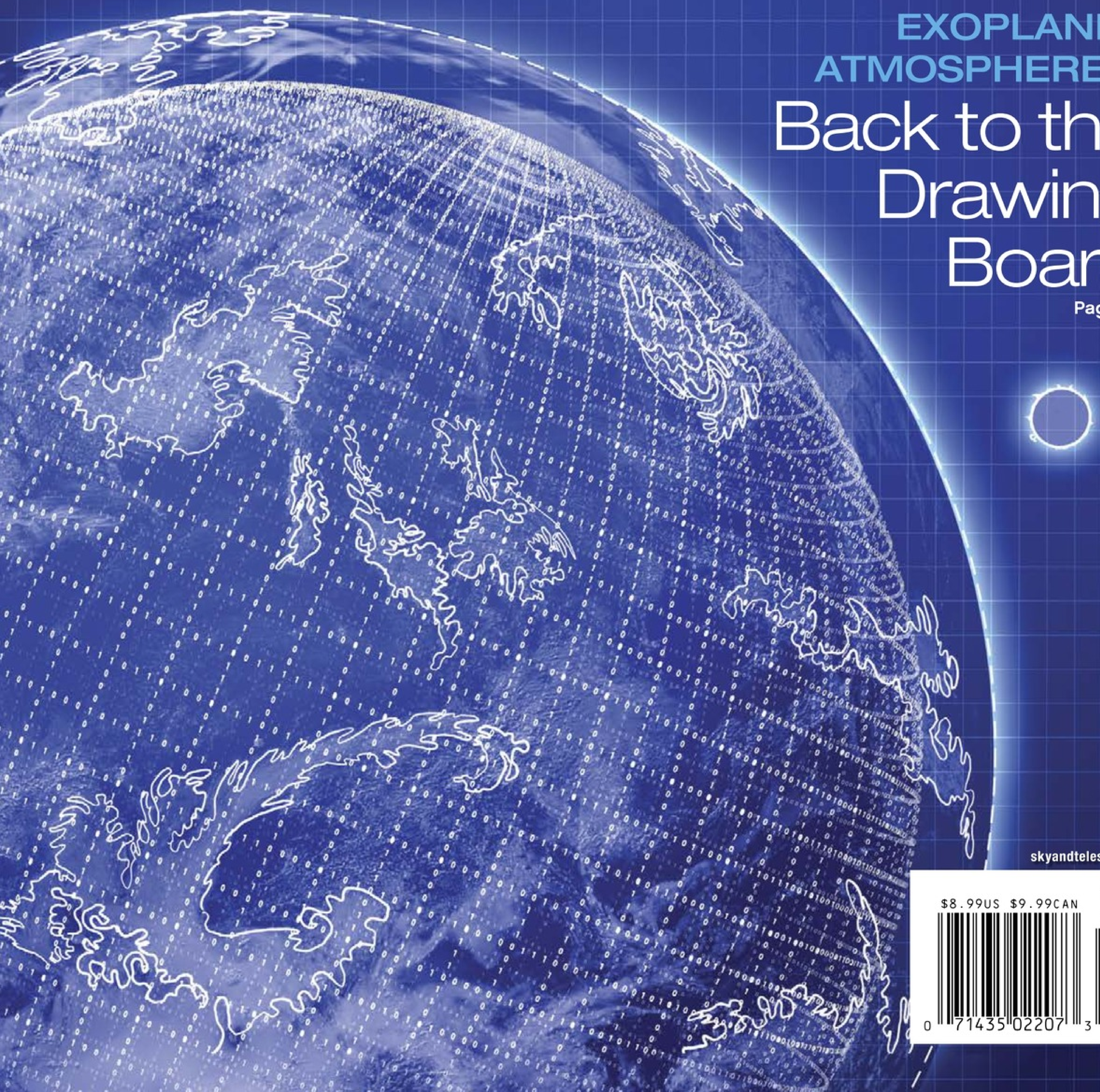
SKY & TELESCOPE

THE ESSENTIAL GUIDE TO ASTRONOMY

DECEMBER 2024



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What Are the Galilean Moons?

▲ **GALILEO'S MOONS** From left to right, they are Io, Europa, Ganymede, and Callisto. They appear here scaled to the moons' relative sizes and placed in order of distance from Jupiter.

THE GALILEAN MOONS are the four largest moons of the planet Jupiter.

History. The name honors Galileo Galilei, who discovered them in 1610 using the newly invented telescope. The find was one of the most earthshaking in the history of science. The four moons were the first new solar system worlds identified since antiquity, and their unveiling revolutionized observational astronomy by demonstrating that optics could reveal far more in the heavens than the naked eye could.

Most significantly, Galileo's revelation provided unequivocal evidence that worlds circled other bodies besides Earth. That realization helped upend the long-accepted geocentric system of Claudius Ptolemy, which held that our planet was the center of the universe and all bodies revolved around it.

Galileo labeled the four moons I, II, III, and IV, in order of their increasing distance from Jupiter. But in time they gained names drawn from classical mythology: Io, Europa, Ganymede, and Callisto. All were lovers of Zeus in the Greek mythos. (Zeus's equivalent in the Roman world was Jupiter.)

Science. The Galilean moons look tiny beside Jupiter, but they are major solar system bodies. Io, Ganymede, and Callisto are all larger than our Moon, and Europa is only slightly smaller. All other Jovian moons — the current count is close to 100 — are orders of magnitude smaller than the Galilean moons.

Each of the four big satellites boasts its own superlative. Io is the most volcanically active body in the solar system, with more than 400 active volcanoes. Europa is the smoothest, and Callisto is the most heavily cratered. Ganymede, for its part, is the largest moon in the entire solar system — appropriate, given that Jupiter is the largest planet. Notably, the outer three Galilean moons stand out from Io in likely having oceans of liquid water beneath their icy crusts (*S&T:* Apr. 2022, p. 14).

Observing. For a novice observer of the night sky, one of the most memorable moments is their first sight of Jupiter through a telescope. Suddenly, where the unaided eye saw just the planet, up to four tiny dots appear arrayed around it. It's like a mini solar system, with those four worlds orbiting the king of planets. If it weren't for Jupiter's brightness overwhelming theirs, they'd actually be visible to the naked eye. But through even a small telescope, the Galilean moons are not only easily visible but resolve into disks that are clearly not stars but worlds of their own.

Observers see the moons strung in a rough line on one or both sides of the planet, like beads on a necklace. That's because the moons circle Jupiter in the plane of its equator, and the Jovian axis is tipped only about 3° from its orbit, so we view that miniature "solar system" almost edge-on.

Of course, the number of moons you can see at any time changes constantly as they revolve around Jupiter. All four may appear on one side of the planet, for instance, or two on each side. Or you may see fewer than four, because one or more of the moons may then be behind or in front of Jupiter.

To find out where the moons are on any given night this month, turn to page 51 to see our "Jupiter's Moons" graphic and "Phenomena of Jupiter's Moons." This table lists key events occurring between the moons and the planet, including when a moon disappears behind Jupiter or within its shadow as well as when a moon or its shadow passes over the planet's face.

For other nights beyond this month, consult our interactive tool (**https://is.gd/GalileanMoons**). It displays the four satellites' positions for any date and time between January 1900 and December 2100. The tool is customizable, so you can change the view depending on whether your telescope shows the sky north up, south up, or mirror-reversed. Happy observing! ■