One Good Target

With Some Other Sights Worth Seeing
While You're in the Neighborhood

January
The Ice Giants: Uranus and Neptune

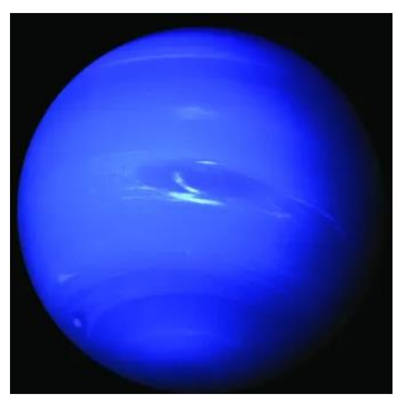
Hovering near the limits of naked-eye visibility and moving through the sky far more slowly than the more Sunward planets, Uranus went largely unnoticed by the ancients (although Hipparchus included it as a star in his 128 BCE catalog). Over time, the idea that the solar system is home to only six planets became so firmly entrenched that Uranus was noticed, but misinterpreted as a star, dozens of times by accomplished observers during the century before it was finally identified as a planet – John Flamsteed, for example, cataloged it as 34 Tauri. William Herschel finally identified the pale green wanderer as a planet in 1781, although he initially assumed that he had found only a new comet: the possibility that there might be as yet undiscovered planets was not part of his, or his contemporaries', understanding of the world.

Neptune was not only unknown to the ancients, it was literally unknowable, since the naked eye cannot detect its presence without optical help. After the invention of the telescope, Neptune followed the same path as Uranus, seen and misidentified long before it was recognized as a planet – and by no less a figure than Galileo: on December 28, 1612, he charted several stars he observed near Jupiter, including one that occupied the spot Neptune was later calculated to have occupied at that time. A month later, he charted the same field and noticed that the object he labeled "star b" had changed its position. Galileo thus saw and charted Neptune, and even specifically noted its movement, yet failed to draw the conclusion that he had stumbled upon a previously-unknown planet.

Uranus (left)
imaged by Voyager 2
1986

Neptune (right)
imaged by Voyager 2
1989

Credit: NASA



Neptune was finally identified as a planet after astronomers noted discrepancies between the calculated and observed positions of Uranus during the 1820s and 1830s. Some astronomers considered the possibility that those discrepancies could have resulted from the gravitational effects of a more distant but undiscovered planet. John Couch Adams at Cambridge and Urbain LeVerrier in Paris independently calculated the likely mass, orbit, and position of the assumed stealth planet, and on September 23, 1846, J. G. Galle and H. L. d'Arrest at the Berlin Observatory identified Neptune less than a degree from the spot predicted by the French calculations. It was confirmed as a planet when its position changed the following night.

Uranus and Neptune share several observational characteristics. For one thing, they both display a distinctive color – blue for Neptune, a bit greenish for Uranus – due to the prevalence of methane clouds in the cold upper reaches of their atmospheres. Their clouds cover relatively small rock-and-ice cores amounting to 10-15 Earth masses, containing highly-compressed forms of water, methane, ammonia, and other ices (hence their classification as "ice giants"). Apart from their color, they are both essentially featureless to visual observation in amateur instruments. Even during Voyager 2's flyby in 1986, Uranus showed no detail at visual wavelengths, while Neptune revealed a pair of dark spots when the same spacecraft passed it in 1989. The larger one – dubbed *the Great Dark Spot* – was comparable in size to Jupiter's Great Red Spot when Voyager saw it, although later Hubble images suggest that like the Great Red Spot, Neptune's spot has downsized considerably since then, and may no longer exist. Also invisible to amateur scopes are both planets' ring systems: both Neptune and Uranus have them, but they're both far smaller and more sparsely populated than the rings of Saturn.

These planets also share relatively long orbital periods – 84 years for Uranus and 165 years for Neptune – so they appear to move across our sky at a nearly imperceptible rate. Over the course of a year, Uranus travels only 4.3° in our sky, and Neptune only 2.2°. Each of them can remain in the same constellation for years at a time.

Uranus has another interesting characteristic, which is unique among the Sun's planets: while the other planets spin like tops as they traverse their orbits, Uranus rolls like a wheel along its orbital path. Why? At some point in its formation or infancy, Uranus appears to have been struck by a huge impactor, with sufficient force to literally knock it off its rotational feet and tip its axis a little more than 90° in relation to its orbital plane. As a result, while the moons of other planets seem to move left and right as we view them from Earth, the moons of Uranus appear to move quite differently: in a circle when the planet's poles are pointing towards us, up and down when we're looking at its equator, and on an elliptical path when between those extremes.

So what will you see if you observe these planets in binoculars? For Uranus, you will probably be able to see the planet's blue-green color, but it will be starlike – you won't be able to discern its disk, which ranges from only 3 to 4 arcseconds in width. Neptune's disk, only around 2 arcseconds across, is also undetectable in binoculars. Binoculars also won't bring enough reflected Neptunian light to your eyes to activate their color-sensing cones, so it will be both starlike and colorless, identifiable only by its position in relation to other targets in the field, or by its slow movement against the background stars.

If you view Uranus through a telescope, you'll see the same blue-green tint. Its disk will be apparent in 3"+ scopes at medium power (try 100x). If you have an 8" or larger scope, try for a couple of its moons. The brightest are Titania at mag 13.7 and Oberon at 13.9. They both remain within 12 Uranian diameters of the planet. The *Sky & Telescope* website features a Uranian moon locator that will show the locations of several Uranian moons for any date and time you select. https://skyandtelescope.org/wp-content/plugins/observing-tools/uranus_moons/uranian.html Some observers with larger scopes report indistinct dark belts crossing the planet's face in moments of excellent seeing. For Neptune, you'll need a 4"+ scope to see its blue color, and a 6"+ scope at high power (at least 150x) to detect its disk. The only Neptunian moon accessible to amateur telescopes is Triton, mag 13.5, which is never more than 17 arcseconds from the disk. You'll need at least an 8" scope to spot it, but *Sky & Telescope* will help you find it. https://skyandtelescope.org/wp-content/plugins/observing-tools/neptune_moons/neptune.html Good luck, and happy observing!

Rick Gering / January 2026