

Visible towards the southern horizon from winter through spring in the northern hemisphere, Orion is one of the most easily recognizable and beloved constellations.

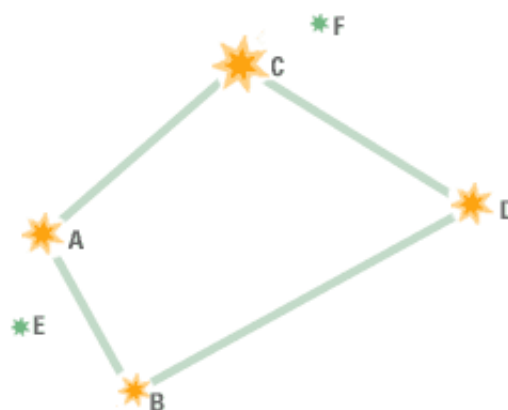
By far, the most popular celestial gem in the constellation of Orion is **M42, The Great Orion Nebula**. Although it is 1500 light-years away, M42 is a great target to view in small telescopes. This is due not only to its brightness, but also to its wonderful cloud structure, which in telescopes takes on a clearly three-dimensional shape.

Observers new and old come back to M42 time and time again because of the wealth of detail visible: pinpoint stars hang among uncanny, ghostly tendrils of glowing hydrogen that stream across space for trillions of miles.

Astronomers call M42 a stellar nursery; when you look at this giant gas cloud you are seeing what our own solar system might have looked like billions of years ago. The nebula's reddish coloration (visible only in photographs) betrays the ionized hydrogen that predominates the composition of the cloud, but carbon monoxide and other complex molecules have also been detected. When viewed through a large telescope, the cloud takes on a wonderful greenish hue.

The energy that keeps the nebula glowing so bright comes from the very hot, young stars in the brightest part of the cloud. Known as the **Trapezium**, this formation of four stars (from west to east: A, B, C, and D) is visible in most backyard telescopes.

A fun challenge for



NGC 2022 is a bright planetary nebula: a dying sun peeling off its outer shell. Because planetary nebulae are best viewed at high magnification, you should start out low (40x) to find the object, and then try 100x and 200x. The name "planetary" is misleading, as these objects are not planets at all but stars at the end of their life cycle. However, they do look something like cloudy planets, and this fact confused earlier observers whose incorrect naming convention has stayed with us to this day.

NGC 2174 is a bright but diffuse emission nebula, a cloud of hydrogen gas very close to a young hot star (or multiple stars). In such clouds, energy from the stars heats up the hydrogen to 10,000°K until it glows with the distinctive red color one can see in long-exposure photographs.

Betelgeuse is the only red star in Orion. Not only does this make it easy to identify, it also tells us we are looking at a giant star. Betelgeuse (pronounced beetle juice by most astronomers) derives its name from an Arabic phrase meaning "the armpit of the central one." The star marks the eastern shoulder of mighty Orion, the Hunter. Another name for Betelgeuse is Alpha Orionis, indicating it is the brightest star in the winter constellation of Orion. However, Rigel (Beta Orionis) is actually brighter. The misclassification happened because Betelgeuse is a variable star (a star that changes brightness over time) and it might have been brighter than Rigel when Johannes Bayer originally categorized it. Betelgeuse is an M1 red supergiant, 650 times the diameter and about 15 times the mass of the Sun. If Betelgeuse were to replace the Sun, planets out to the orbit of Mars would be engulfed! Betelgeuse is an ancient star approaching the end of its life cycle. Because of its mass it might fuse elements all the way to iron and blow up as a supernova that would be as bright as the crescent Moon, as seen from Earth. A dense neutron star would be left behind. The other alternative is that it might evolve into a rare neon-oxygen dwarf. Betelgeuse was the first star

amateur astronomers is to "bag" the two 11th magnitude **E and F stars**, shown here in green. Their proximity to far brighter stars makes them difficult to separate on nights of so-so seeing. On great nights, discerning the E and F stars is a good test of your telescope's optics.

More Targets

The **Horsehead Nebula** was made famous from its beautiful photographs – it really does resemble what its name implies! The Horsehead can be found just below Alnitak (the leftmost/easternmost star in Orion's belt). The Horsehead is an extremely difficult target for medium aperture telescopes, and requires steady and dark skies to be seen even in a larger telescope.

A far easier nebular target in the same area can be found above Alnitak: Located above Orion's belt, **M78** belongs to the same large cloud of gas and dust as the main Orion nebula (M42). It has 2 companion nebulae (NGC 2067 & 2071). All 3 are reflection nebulae, and M78 is in fact the brightest reflection nebula. It is visible in binoculars but best seen through a telescope.

to have its surface directly imaged, a feat accomplished in 1996 with the Hubble Space Telescope.

On the western heel of Orion, the Hunter, rests brilliant **Rigel**. In classical mythology, Rigel marks the spot where Scorpio, the Scorpion stung Orion after a brief and fierce battle. Its Arabic name means the Foot. Rigel is a multiple star system. The brighter component, Rigel A, is a blue super giant that shines a remarkable 40,000 times stronger than the Sun! Although 775 light-years distant, its light shines bright in our evening skies, at magnitude 0.12. Telescope observers should be able to resolve Rigel's companion, a fairly bright 7th magnitude star. A heavy star of 17 solar masses, Rigel is likely to go out with a bang some day, or it might become a rare oxygen-neon white dwarf.

Don't forget to compare the colors of Betelgeuse and Rigel!