



THE GLORIOUS CONSTELLATIONS
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Orion the Hunter

Famous for bold stars and strong, linear features, the Hunter trims his warrior attire with some of the most gorgeous nebulae in the sky. /// BY TOM POLAKIS

No constellation dominates the winter sky like Orion the Hunter. Its brightest stars form one of the best known celestial shapes, which is visible even from cities. The plane of the Milky Way clips the northeast corner of the constellation and manifests itself as a featureless, hazy band through the neighboring constellations of Gemini and Monoceros. ☾ Orion's seven brightest stars are all 2nd magnitude or better. Most spectacular is Rigel, which shines at nearly magnitude 0 despite its great distance, just

shy of 1,000 light-years. A 7th-magnitude companion to Rigel lies just 9" to the south. Betelgeuse is a red giant half as far away as Rigel. With an angular size of over 0.1", Betelgeuse's diameter would encompass the orbit of Jupiter. All three of Orion's "belt stars" are blue-white suns of very similar spectral types. On transparent nights, look for the large number of 6th- and 7th-magnitude stars clustered around the belt.

We begin observing in Orion with an unlikely target. The tiny planetary nebula **J320** was discovered by French observer Robert Jonckheere in 1916. It is bright enough to be visible through a 6-inch telescope, but picking it out from the star field can be a challenge. "Blinking" the field with a nebula filter will cause the almost star-like disk of J320 to pop into view. In my 10-inch scope at 250x, the circular disk appears 5" across with a bright center.

A pan of nearly 10° due south brings a bright carbon star into the field. At its brightest, **W Orionis** is easily found with a finder scope, but it fades as faint as 12th magnitude over a period of 214 days.

Tom Polakis lives in Arizona, where he is an aerospace engineer by day and a deep-sky observer and astrophotographer by night.



ORION is easily recognized thanks to its bright stars, especially the three in a row that serve as the Hunter's belt. ALAN DYER

Large-aperture telescopes reveal its ruddy hue, which is best detected using direct vision. The color of this cool star comes from its sooty outer layer.

Two degrees north of the 3rd-magnitude star Beta (β) Eridani lies the reflection nebula **NGC 1788**. In a 10-inch scope,

it looks bright and measures 3' by 2'. The nebula has two lobes; the western lobe surrounds a 10th-magnitude star while the eastern lobe has a small, bright concentration of light at its center. The edge of the nebulosity is diffuse, and the south end meets dark nebula LDN 1616, which is apparent from the lack of background stars over a 5-arcminute-wide region. NGC 1788 hosts ongoing star formation and is illuminated by a small cluster of stars hidden from view.

Although Orion holds plenty of alluring targets, telescopes seem to be magnetically attracted to **M42 (NGC 1976)**, the Orion Nebula. Let's begin by investigating the scene with a small, rich-field scope. Between two pairs of bright stars sits a cloud that appears to have two curved wings and a very bright clump of stars near its center. Increasing the aperture and magnification shows this stellar group to be the Trapezium, which includes four bright, young stars born from the nebula. Just to the east of the Trapezium, a bright, scalloped bar embeds itself in the haze. When viewed through a larger scope, the curved wings can be traced around to meet each other, forming a full circle.

Large telescopes reveal two more stars in the Trapezium and show a field filled

with mottled detail. The eastern wing has a ruddy appearance — one of the few deep-sky objects bright enough to show its red color to visual observers. The Orion Nebula is brightest around the Trapezium, where it shines with a lime-green tint. Protruding into the glowing region is the dark “fish mouth” of obscuring material that borders the nebulosity.

As with most of the nebulae in the vicinity of Orion’s belt, M42 is 1,500 light-years away and just a small enhancement in a giant molecular cloud. Embedded in the nebulosity is the Orion Nebula Cluster, a gathering of more than 4,000 stars with an average age of only one million years.

Because it’s the closest region of active star formation, M42 has been well studied. Astronomers have found more than a hundred protoplanets (accretion disks surrounding young stars) in the Orion Nebula. Some of these stars discharge high-velocity jets of gas, creating shock waves in the surrounding medium.

Although **M43 (NGC 1982)** has its own designation, it’s difficult to consider it a distinct object from the Orion Nebula. A circular halo about 4' in diameter, M43 appears just north of the “fish mouth” feature of M42. Look for a sharp truncation, caused by a dark nebula, along the eastern edge of the round haze. Telescopes show the bright variable star **NU Orionis** at the center of M43. Shining at a relatively constant 7th magnitude, this star varies by only 0.1 magnitude.



THE ORION NEBULA glows brilliantly as the middle “star” in Orion’s sword. Also known as M42, the famous nebula seems to be connected to the smaller M43 to the north. FABIO FALCHI

/// THE HUNTER



*The moon is bright, and the winds are laid,
and the river is roaring by;
Orion swings, with his belted lights
low down in the western sky.
In the Moonlight, David McKee Wright (1869–1928)*

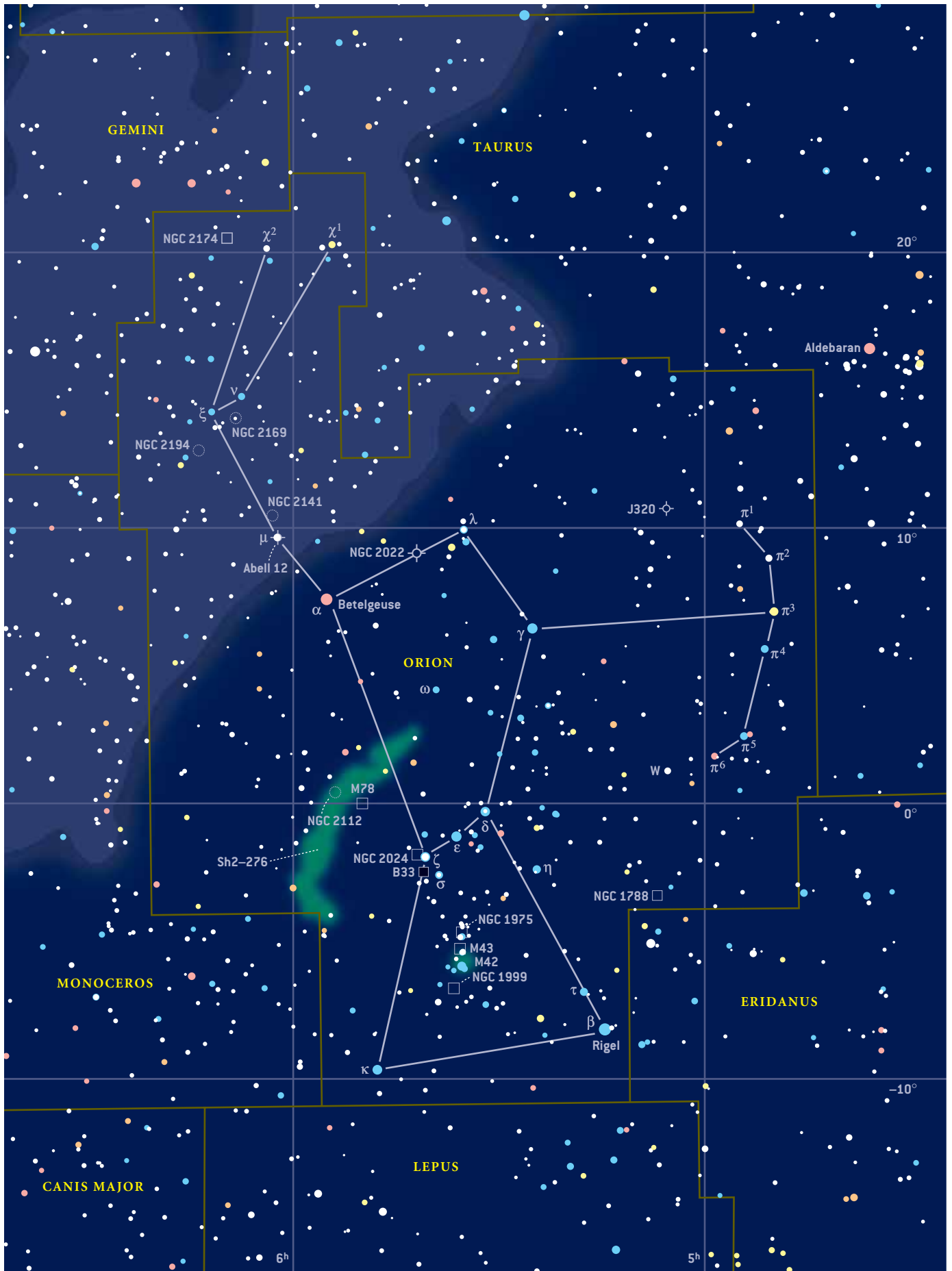
Perhaps the most recognizable constellation, Orion is familiar even to the most casual astronomers. The appearance of a hunter is unmistakable: a group of stars forming a head, four bright quadrilateral stars marking shoulders and knees, three aligned stars constructing his belt, a fainter line of stars (and a bright nebula) outlining a sword, an extended collection of fainter stars imitating a raised club, and a bowed string of stars modeling as a shield.

Ancient stargazers also identified the celestial figure as a man. Egyptians revered the celestial profile as either the god of light, Horus, or his father, Osiris; while the Sumerians and Babylonians linked the stellar body with the king of Uruk, Gilgamesh. In fact, the Sumerian name *Uru-anna* (light of the sky) resembles the constellation’s contemporary name. That culture’s association of Orion with

mighty Gilgamesh also accounts for the Hunter’s eternal struggle with Taurus the Bull: Gilgamesh fought a bull when a scorned admirer ordered the animal to destroy Uruk.

A popular legend retold by many throughout history, the Greek account of Orion’s life and death varies with the storyteller. One popular adaptation involves the huntress Artemis, who fell in love with Orion. Artemis’s brother, Apollo, disapproved of the couple, though. One day, he spotted Orion swimming in the distance and challenged his sister to hit the faraway, floating object with an arrow. Artemis was skilled, and she struck the target on her first attempt. She was devastated when Orion’s body washed ashore and she realized what she had done.

Other accounts blame Orion’s demise on a scorpion. In one version, Orion boasted he could kill any beast on Earth and subsequently was attacked and killed by the scorpion. Another story claims that a scorpion was chasing Orion when he jumped into the water to escape it. It was then that Apollo pointed out the bobbing target to Artemis. In Greece, Orion sets into the western sea when Scorpius the Scorpion rises in the east. — *Vanessa Thomas*





THE FLAME, HORSEHEAD, RUNNING MAN, AND ORION NEBULAE pack an amazing, colorful punch into a relatively small area and repeatedly seduce observers into Orion's sword region. JOHN A. VOLK



BARNARD'S LOOP, or Sh2-276, wraps around the eastern side of Orion's torso. GERALD RHEMANN

A half degree north of the Orion Nebula, **NGC 1975** highlights a complex of reflection nebulae sometimes called the Running Man Nebula. Through a 13-inch scope, NGC 1975 appears as an elongated, bright nebula with a mottled texture. The

5th-magnitude stars 42 and 45 Orionis are embedded in a dark rift that divides two prominent strips of nebulosity.

Slightly more than 1° south-southeast of M42 lies the reflection nebula **NGC 1999**, which would be rather ordinary were it

not for a dark obscuration near its center. This feature initially creates the impression of a ring-shaped planetary nebula, but increased magnification shows the dark nebula's triangular form. Just outside the dark cloud sits V380 Orionis, a variable star that illuminates this reflection nebula.

The bright emission nebula **NGC 2024**, or the Flame Nebula, resides too close for comfort to the glare of Zeta (ζ) Orionis. A magnification of around 100x proves high enough to remove the star from the field but low enough to show the entire nebula. NGC 2024 resembles a U shape with squared edges. A nebula filter shows the edges' complexity, which gives rise to the flame moniker. Like many of our objects, NGC 2024 lies in the Orion Molecular Cloud at a distance of 1,500 light-years. The ionizing source for the emission nebula is visible only at infrared wavelengths.

Panning 30' south of Zeta Orionis brings a popular star-party target into view. Dark nebula **Barnard 33 (Horsehead Nebula)** has twenty-seven times more mass than the Sun and is similar in structure to the "elephant trunks" of the Eagle Nebula. We see the Horsehead only because it is silhouetted against IC 434, a background emission nebula (the brightest part of which measures 15' by 5'). Look first for a dark feature 5' in diameter superimposed on this bright nebula. The horse's shape becomes apparent in apertures of around 10 inches and at magnifications greater than 100x. Use a filter that allows the H-beta emission band to pass through, such as a wide-band nebula filter or a specialized H-beta filter.

/// Deep-sky objects in Orion

OBJECT	R. A.	DEC.	MAG.	SIZE	TYPE	NOTES
W Orionis	5h05.4m	1°11'	6.2	—	Star	Carbon star
J320	5h05.6m	10°42'	12.0	26"	PN	—
NGC 1788	5h06.9m	-3°21'	—	5' by 3'	BN	—
NGC 1975	5h35.4m	-4°41'	—	10' by 5'	BN	—
M42 (NGC 1976)	5h35.4m	-5°27'	—	65' by 60'	BN	Orion Nebula
M43 (NGC 1982)	5h35.6m	-5°16'	—	20' by 15'	BN	—
NGC 1999	5h36.5m	-6°42'	—	2' by 2'	BN	—
B33	5h40.9m	-2°28'	—	6' by 4'	DN	Horsehead Nebula
NGC 2024	5h41.9m	-1°51'	—	30' by 30'	BN	Flame Nebula
NGC 2022	5h42.1m	9°05'	11.9	39"	PN	—
M78 (NGC 2068)	5h46.7m	0°03'	—	8' by 6'	BN	—
Sh2-276	5h48.0m	1°00'	—	600' by 30'	BN	Barnard's Loop
NGC 2112	5h53.9m	0°24'	8.4	11'	OC	—
Abell 12	6h02.3m	9°39'	12.0	37"	PN	—
NGC 2141	6h03.1m	10°26'	9.4	10'	OC	—
NGC 2169	6h08.4m	13°58'	5.9	6'	OC	—
NGC 2174	6h09.7m	20°30'	—	40' by 30'	BN	—
NGC 2194	6h13.8m	12°48'	8.5	8'	OC	—

Object: Designation in Messier, NGC, or other catalog. **R. A. and Dec.:** Right ascension and declination in epoch 2000.0 coordinates. **Mag.:** Visual magnitude. **Size:** Size in arcminutes or arcseconds.



THE TRAPEZIUM REGION at the center of the Orion Nebula (M42) holds a stellar cluster dominated by four bright, young stars born within the nebula. A dark bar (forming the bottom “lip” of the “fish mouth”) protrudes into the bright nebula and points out the Trapezium stars. TONY HALLAS



NGC 1788 is a double-lobed reflection nebula near Orion’s border with Eridanus. A dark nebula lurks to the south. PRESTON SCOTT JUSTIS



NGC 1975 forms an interesting complex of reflection nebulae with NGCs 1973 and 1977. Some call the group the Running Man Nebula. ANDREW PETERS



NGC 1999 may look like a ring nebula at first, but closer inspection will reveal a dark, triangular nebula obscuring its center. DSS/POSS2/UKSTU

To the north and east of Barnard 33, you’ll find **M78 (NGC 2068)**, one of the sky’s brightest reflection nebulae. The two most vivid concentrations in this nebula bracket an 11th-magnitude star. In a 13-inch scope, M78 spans 5', showing an abrupt northwestern edge and an ill-defined southern edge. A dark lane divides M78 from the much fainter mist of NGC 2067 to the northwest. A quarter degree to the

north lies NGC 2071, which adds another reflection nebula to the scene. Backing off to the lowest magnification reveals a gray and mostly starless background, indicative of an associated molecular cloud.

Sh2-276 (Barnard’s Loop) appears best through a rich-field telescope. The nebula’s main strip is some 6° long and tapers at the northwestern end. My 8-inch f/4 at 30x brings out a slight enhancement to the

field’s brightness when a nebula filter is in place. Binoculars may be better than a rich-field instrument because they can take in a good part of the loop. Deep photographs show a true, circumscribed loop covering much of the constellation.

The brightest part of Barnard’s Loop is found around star cluster **NGC 2112**. This cluster contains about twenty-five stars — most of them faint — across an area 8' in



THE FLAME NEBULA (NGC 2024) has branches of nebulosity that lick the sky just as campfire flames reach into a cold night. Zeta Orionis lies beyond the bottom edge of the frame. A. TREMBLY, JR.



THE HORSEHEAD NEBULA, or Barnard 33, is perhaps the most distinctive dark nebula and a favorite of astrophotographers. JACK NEWTON



M78 (upper right) overwhelms the dimmer mist of NGC 2067 while NGC 2071 holds its own a bit farther away (lower left). KIM ZUSSMAN

diameter. The cluster is loose and scattered but has a strong background glow hinting at the presence of dozens of unresolved stars. NGC 2112 lies 2,800 light-years away from us and 600 light-years above the galaxy's plane.

Moving northward, we find a bright target for an 8-inch scope: planetary nebula **NGC 2022**. Using a magnification of 300x, the nebula's 15" disk has a hazy edge.

A larger instrument begins to reveal a dark center, implying a ring structure. The central star is magnitude 14.8 and out of view for most observers.

Pan your scope 3° northeast of Betelgeuse to find Mu (μ) Orionis. With a nebula filter, you should be able to spot the disk of planetary nebula **Abell 12**, which appears to touch the bright star. The filter suppresses the star's glare and



NGC 2174 is a vivid emission nebula near the tip of Orion's club. A 7th-magnitude foreground star lies over its heart. GEORGE GREANEY AND DEAN EASTON

darkens the surrounding sky. Using the highest magnification that the seeing permits, the disk will appear 15" across and reveal hints of annular structure.

Open cluster **NGC 2141** lies less than a degree north of Abell 12. A faint object overall, the cluster becomes well defined through larger scopes, which show dozens of equally bright stars at the limit of detection. When viewed through smaller scopes, these stars manifest themselves as a background haze with a sharp edge 10' in diameter. At 2.5 billion years old, NGC 2141 is an ancient cluster that lies 12,000 light-years away.

Continuing north and west, we come upon **NGC 2194**, a fine open cluster containing several dozen stars. An assortment of stars between magnitudes 10 and 13 are spread over an area 6' across. Look for a concentration of 11th-magnitude stars at the cluster's heart. Approximately 10,000 light-years separate us from NGC 2194.

At a dark site with unaided vision, an observer can spot open cluster **NGC 2169** as a tiny clump just west of Xi (ξ) Orionis. The cluster spans only 5' across, but it contains seven stars brighter than 9th magnitude. It is not spectacular telescopically, but the brightness of its members gives it an easily recognizable form against starry Milky Way fields.

The bright emission nebula **NGC 2174** perches near Orion's border with Gemini. Situated in a rich field, the nebula appears 12' across and perfectly circular. It has a diffuse edge but is otherwise uniform. A 7th-magnitude star appears to shine in the center of the nebula, but it's actually superimposed. The nebulosity is enhanced greatly with a nebula filter. ■