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# SKY & TELESCOPE

THE ESSENTIAL GUIDE TO ASTRONOMY

AUGUST 2022


# DISCOVERING
## Saturn's Ring Spokes

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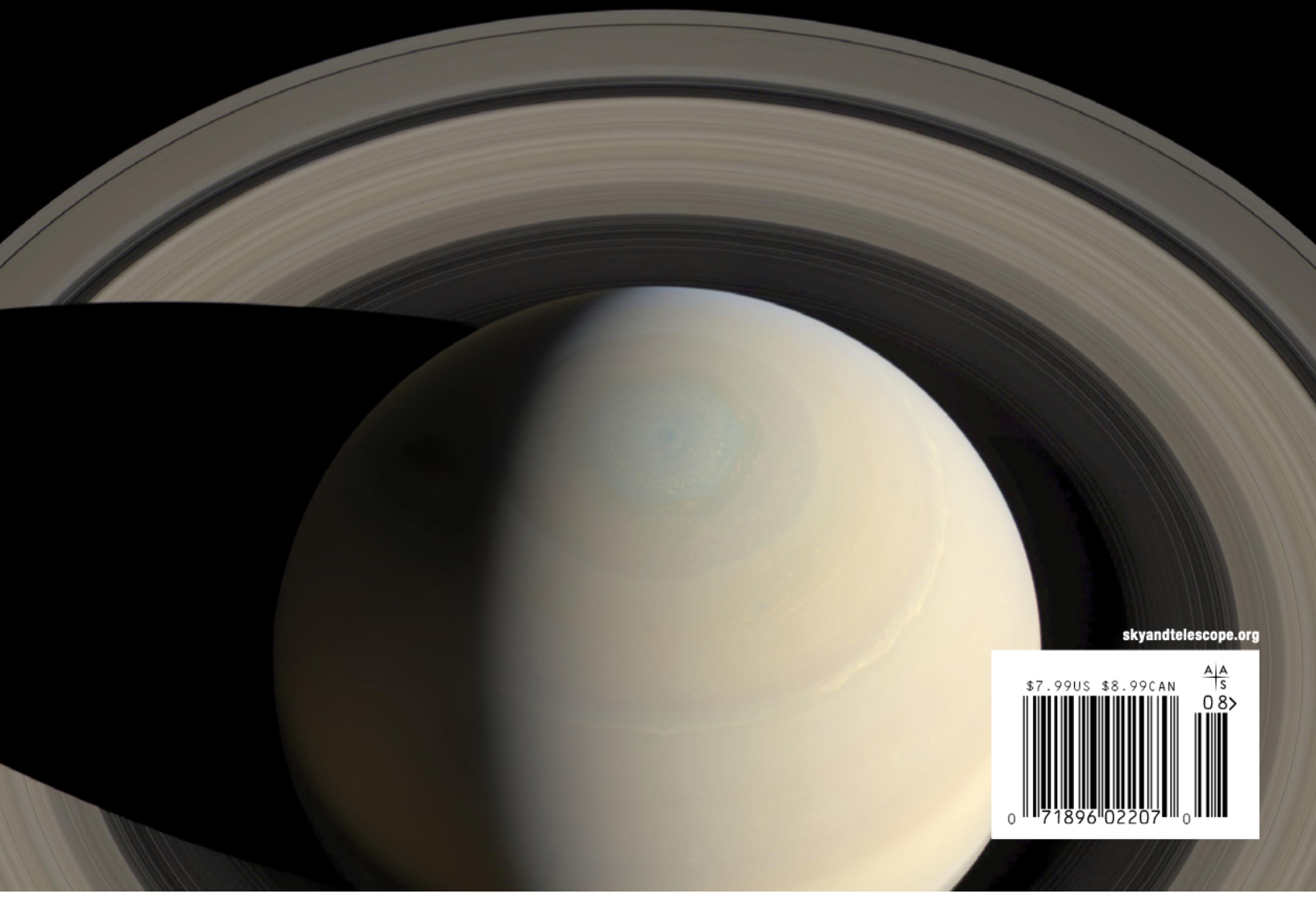

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Vultur
Cerberus
et
Rarus
Hercules
Vulpecula
Sagitta
TAURUS
PONIATOVII
OPHIUCHUS
AQUILA
ANTINOUS
Aequator
SCUTUM
SOBIESII
Sagittarius
Scutum
Tropicus
Ecliptica


# A Visit to Taurus Poniatovii

The constellation may be no longer, but that shouldn't stop you from exploring its many lovely sights.

When I first learned the summer constellations as a young stargazer in the mid-1970s, a striking little group of stars caught my eye, and it has enthralled me ever since. Located southeast of Hercules and just north of the celestial equator, this collection looked to me like a small horned beast — a little celestial bull perhaps — charging eastward toward the dust lanes and clouds of the Milky Way. Was it a bright star cluster or a small constellation, I wondered? My *Norton's Star Atlas* (16th edition) showed these stars as a small, unnamed outcropping of Ophiuchus. So did my copy of H. A. Rey's *Find the Constellations*, which depicted them as the eastern shoulder and arm of Ophiuchus entangled with the Serpent's Tail, Serpens Cauda. Not much to see here, it seemed.

I eventually learned that these stars were indeed once a distinct — and now defunct — constellation called Taurus Poniatovii, or Poniatowski's Bull. In 1777, Marcin Poczobutt, director of the royal observatory at Vilna (today's Vilnius, in Lithuania), named it after Stanisław August Poniatowski, King of Poland and Grand Duke of Lithuania from 1764 to 1795. Poczobutt cataloged 16 stars, and Jean Fortin included them in 1778 in his *Atlas céleste de Flamstéed* as *Taureau Royal de Poniatowski*. Johann Elert Bode added many fainter stars to the asterism in his 1801 atlas *Uranographia*. As one of the few constellations named for 18th-century political figures — and a patently awkward little construct — it fell into disuse by the late 19th century. The name remains, though, to describe what currently is an asterism entirely within Ophiuchus.

But it's nevertheless a pretty little group, one I return to every summer. The fourth-magnitude stars 67, 68, and 70 Ophiuchi form the V-shaped head of the bull, while 5th-magnitude 66 Ophiuchi and the variable 73 Ophiuchi serve as the tips of a pair of little horns. The two stars at the hind end of the little bull are 3rd- and 4th-magnitude Beta (β) Ophiuchi (or Cebalrai) and Gamma (γ) Ophiuchi, respec-

◀ **REGAL CELESTIAL BULL** Named in honor of the reigning monarch of Poland and Lithuania in the second half of the 18th century, Taurus Poniatovii was a constellation in its own right for more than a century. The German astronomer Johann Bode was among several celestial cartographers to include the constellation in their atlases.

JOHANN ELERT BODE / PUBLIC DOMAIN

tively. The entire asterism spans 7°. In binoculars, the field is flecked with fainter 9th- and 10th-magnitude stars, especially around the head, which dips into the edge of the Milky Way (see, e.g., *S&T:* Aug. 2013, p. 45). Taurus Poniatovii also makes for a good base of operations to check in on nearly every category of deep-sky sight in this small patch of sky.

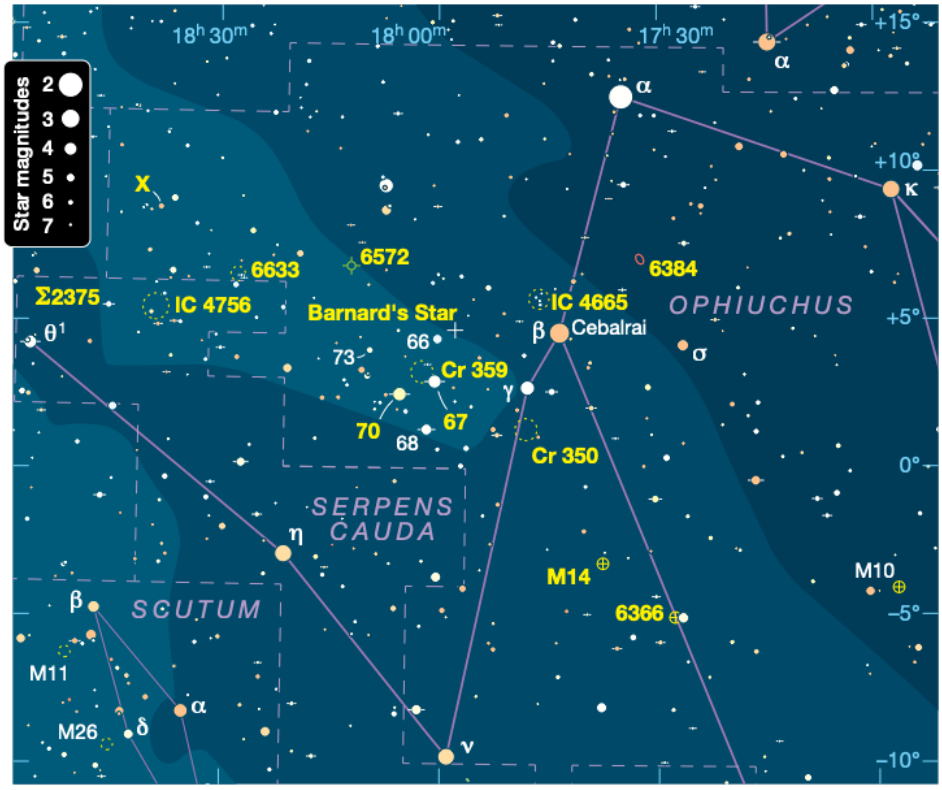
## Young Star Clusters with a Common Origin

My youthful and untutored suspicion that the stars listed above form a cluster was only slightly off. There *is* an open star cluster here but, except for 67 Ophiuchi, the naked-eye stars of Taurus Poniatovii are not part of it. Cataloged as **Collinder 359** (and Melotte 186), the cluster appears as a loose and unconcentrated collection of stars spanning about 4° around the head of the little bull. It's ideal for binocular observing, and my 12×36 image-stabilized binoculars reveal perhaps two dozen mostly blue-white stars, though it's hard to tell at a glance which are true cluster members. A study published in 2006 using data from the 3.6-meter Canada-France-Hawaii Telescope (CFHT) identifies some 500 cluster members with the relatively young ages of 40 to 80 million years, assuming an average distance of about 1,470 light-years. The research suggests that these stars did form together, but it's unclear whether they remain gravitationally bound or if they have since dispersed into a loosely associated moving group, like the Big Dipper.

The blue supergiant **67 Ophiuchi**, the anchor of Collinder 359, is a fine double star that easily splits — even in a pair of binoculars — into two blue-white components of magnitudes 4.0 and 8.1, separated by a wide 55″. A second line-of-sight component of magnitude 13.7 lies 6.6″ from the bright primary and presents a challenge for observers with 12-inch telescopes.

The CFHT study of Collinder 359 also suggests that the cluster may have a common origin with the adjacent and more concentrated open cluster **IC 4665**. Located 1.3° northeast of Cebalrai and about 4.5° from the center of Collinder 359, this dazzling collection of stars ranks as one of the best in the northern sky for binoculars or wide-field telescopes. It shines at magnitude 4.7, but with a diameter of 70′ its low surface brightness renders it barely visible without optics even under a dark sky. In my 12×36s I see perhaps a dozen stars, while my 100-mm binocular telescope at 23× shows a stunning vista of 50 to 60 uniformly blue-white stars arrayed in intertwined arcs. Given the cluster's relative youth, few of its stars have evolved into red giants. If your scope's field is inverted, look carefully at the inner stars of IC 4665 — after a time, you may see they form the word "HI" like a friendly cosmic greeting.

Make a quick stop about 1.5° south of Gamma Ophiuchi to peek at **Collinder 350**, which lies at a distance of 1,200 light-years. While nowhere near as rich as IC 4665, this ancient open cluster (pegged at 590 million years) appears sparse but appealing at 23× in my 100-mm binoscope. I see about 30 stars of magnitudes 9 to 11 spread over 40′ splayed out from the middle of the cluster in four spidery arms.




▲ **THE LITTLE CELESTIAL BULL** Explore deep-sky targets that today are in Ophiuchus and Serpens Cauda but that once were in Taurus Poniatovii.

## A Pair of Speedy Nearby Stars

Now let's head to **70 Ophiuchi**, one of the three bright stars in the face of the little bull. At a distance of 16.6 light-years, 70 Ophiuchi ranks as one of the closest stars to Earth visible to the naked eye. It's also a beautiful double star with a yellow-orange primary of magnitude 4.2 and a red-orange secondary of magnitude 6.2. The star splits easily in an 80-mm telescope at about 80×.

The components of 70 Ophiuchi revolve around their common center of mass in a highly elliptical orbit every 88 years. On astronomical scales, this is speedy, which adds to the appeal of this little system. In 1984, when they were most recently closest, 2.3″ separated the stars; by 2028, that distance will increase to 6.7″. You could take advantage of 70 Ophiuchi's orbital motion to carefully record the changing position and separation of these stars over several years. The components make a full revolution over the

▲ **COSMIC GREETING** If southwest is up in your scope, you might see the sight of the stars of IC 4665 arrayed in a friendly celestial "HI." Don't give up if you don't see it at first — it's well worth the wait once you finally discern the pattern. Turn the page upside down to see it better in the image.

STEFAN BINNEWIES / JOSEF PÖPSEL

course of an average human lifetime and half a turn over the career of a dedicated stargazer. Astronomers established the masses of the primary and secondary as 0.9 and 0.7 solar masses, respectively. Since 1939, 70 Ophiuchi has served as a template to determine the masses of other, more distant stars based on their spectral types.

Taurus Poniatovii offers another target for a long-term observing project: **Barnard's Star**. This red dwarf features the largest proper motion of any star, about 10.4″ per year almost due north (see *S&T:* June 2022, p. 34). With an age perhaps twice that of our solar system, Barnard's Star lies just 6 light-years away (5.96 light-years, in fact) making it the closest star to Earth north of the celestial equator. Since E. E. Barnard first measured its proper motion in 1916, the star has traversed more than half a Moon diameter across the sky. You can easily record the star's motion against the background stars from year to year with carefully rendered sketches or with a sequence of images.

While intriguing, Barnard's Star gets no points for beauty. It's a dim-bulb red dwarf of magnitude 9.5 with an intrinsic brightness about 1/2500 that of our Sun and a mass just 16% as large. But as a near neighbor, this swift little star remains worthy of frequent observation. More aperture shows more color, but I can barely detect its red-orange hue with my binoscope in suburban skies.

## A Summer "Double Cluster"

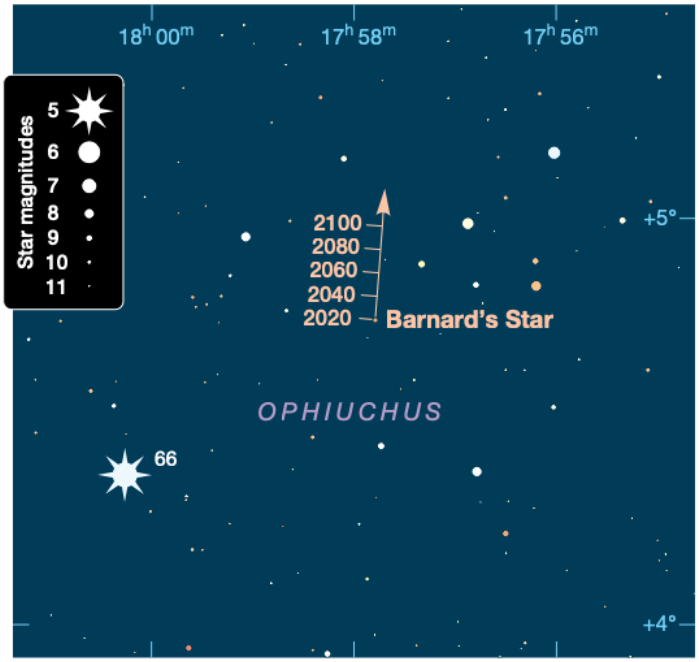
Wandering about 8° east-northeast of the approximate center of Taurus Poniatovii brings you to the superb open star clusters **IC 4756** and **NGC 6633**. Former *Sky & Telescope* editor Stephen James O'Meara dubbed them the Tweedledee and Tweedledum clusters, respectively. Others call the pair the

Ophiuchus Double Cluster, even if IC 4756 lies just over the boundary in Serpens Cauda.

IC 4756 spans 40′ and makes an excellent cluster for wide-field instruments and binoculars. You can easily see a lovely patch of some 80 to 90 stars set in a rich background. Although it's a bright magnitude 4.6, early telescopic stargazers such as Charles Messier, Jean-Philippe Loys de Cheseaux, and William Herschel missed it, likely because their narrow-field telescopes failed to discern the cluster's appearance. Even my old *Norton's Star Atlas* omits this sprawling star cluster, though it does show NGC 6633. Although IC 4756 is nearly lost in a rich portion of the Milky Way, it's a sparkling, ancient cluster, more than 600 million years old, with many aged, red-orange stars. In my binoscope at 42× with a 1.5° field of view, I see a loose collection of colorful stars slightly stretched in the east-to-west direction, arrayed in all types of shapes and patterns.

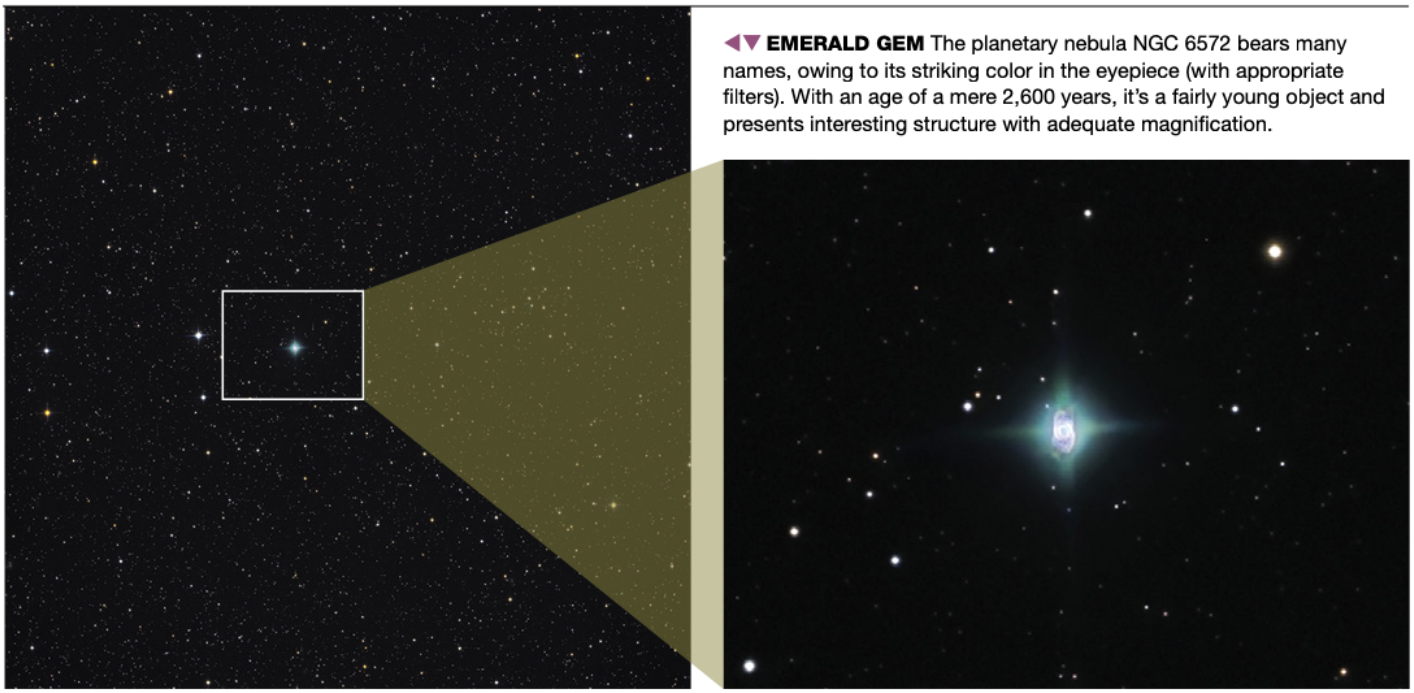
Scan about 1.7° east of IC 4756 to look for the fairly tight double star **Struve 2375**. Both components are whitish, one of magnitude 6.3 and the other of 6.7, with a separation of 2.6″. With my 10-inch Dobsonian I can just split them at 133× on a night of steady seeing. Each component is itself a very closely spaced pair, too close to be resolved directly in a backyard telescope.

Just 3° northwest of IC 4756, NGC 6633 appears about half as large, making it easier to discern from the rich background. In my binoscope at 23×, I see about 30 stars arranged in a thick bar extending northeast to southwest with a dozen more stars sprinkled outside this structure. The two clusters are about the same age and at comparable distances from us, so NGC 6633 is truly smaller in size. It spans about 7 light-years compared with IC 4756's 18 light-years. What NGC 6633 lacks in size it makes up for in sheer beauty. I see many patterns among these stars, including an obvious hook shape arcing eastward from the center of the cluster and ending at a bright 6th-magnitude star to the south.




▲ **STAR ON THE RUN** Barnard's Star will cover a distance of around 17′ in the next 100 years or so. Check in on it from time to time and you might start noticing differences in its position.

Variable-star enthusiasts can look about 3.5° north of IC 4756 to see **X Ophiuchi** at the vertex of an equilateral triangle formed with this cluster and NGC 6633. This star is a reddish Mira-type variable, one of the few such variables in a binary system. Its components are too close to split in amateur telescopes, but the non-variable companion serves to prop up the system's overall brightness when the



◀▼ **EMERALD GEM** The planetary nebula NGC 6572 bears many names, owing to its striking color in the eyepiece (with appropriate filters). With an age of a mere 2,600 years, it's a fairly young object and presents interesting structure with adequate magnification.

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▲ **TWEEDLEDEE AND TWEEDLEDUM** IC 4756 (top) and NGC 6633 make for a pretty pair of open clusters. The field of view for IC 4756 is 100′ while for NGC 6633 it's 60′. Foreground stars pepper both images, making it somewhat tough to identify cluster members.

JIM THOMMES (2)

primary fades to minimum every 338 days. Mira variables can brighten (or dim) by eight or nine magnitudes over their cycle, but X Ophiuchi only fades from magnitude 5.9 to 8.6. Also, Mira variables tend to get redder as they reach minimum brightness, but X Ophiuchi takes on the orange color of its fainter companion star as the primary fades.

## Power Up and Go Deep

Let's increase the magnification and examine a few smaller deep-sky sights around Taurus Poniatovii, beginning with the planetary nebula **NGC 6572**. Sometimes called the Blue Racquetball or Emerald Nebula, this gemlike planetary exhibits intense blue-green color from doubly ionized oxygen atoms excited by the nebula's hot central star. The nebula lies twice as distant as the more famous Ring Nebula (M57) but shines almost twice as bright and covers 25 times less area. Because its brightness is squeezed into a 15″ disk, it's easy to spot. Resolving that tiny disk is another matter: The planetary appears starlike at low magnification but acquires some size above 70×. At 92× in my 10-inch Dob, I see a tiny but elongated glow. A wee hint of structure emerges at 184×. Like many small planetaries, NGC 6572 takes as much magnification as sky conditions allow. But unlike other planetaries, NGC 6572 has no outer halo and remains optically dense due to its relative youth. Most planetary nebulae last a few tens of thousands of years, but the Emerald Nebula formed from the last gasps of a dying star maybe around 2,600 years ago, making it just slightly younger than the city of Rome.

And what's this — a galaxy in Ophiuchus? Sure enough, just 3.7° northwest of Cebalrai lies the lovely barred spiral

▲ **BARRED BEAUTY** NGC 6384 poses elegantly at a distance of some 90 million light-years in Ophiuchus. Research suggests that the bar channels gas from the outer edges of the galaxy into the center, where it forms new stars. This image was obtained with a 24-inch telescope.

**NGC 6384**. Or at least it's lovely in Hubble Space Telescope images, where it displays stately spiral arms and intricate dusty tendrils and clots of new blue-white stars. To backyard telescopic observers, this 10th-magnitude galaxy presents a more modest sight. It spans about 6′ × 4′, and in my 10-inch Dob at 133× and 184× it appears as a featureless oval that's obviously brighter — though not stellar — towards the core.

## Deep-sky Sights of Taurus Poniatovii

| Object | Type | Mag(v) | Size/Sep | RA | Dec. |
|---|---|---|---|---|---|
| Collinder 359 | Open cluster | 3.0 | 4° | $18^h\ 01.1^m$ | +02° 54′ |
| 67 Ophiuchi | Double star | 4.0, 8.1 | 55″ | $18^h\ 00.6^m$ | +02° 56′ |
| IC 4665 | Open cluster | 4.2 | 70′ | $17^h\ 46.2^m$ | +05° 43′ |
| Collinder 350 | Open cluster | 6.1 | 40′ | $17^h\ 48.2^m$ | +01° 18′ |
| 70 Ophiuchi | Double star | 4.2, 6.2 | 2.3″ – 6.7″ | $18^h\ 05.5^m$ | +02° 30′ |
| Barnard's Star | Red dwarf | 9.5 | — | $17^h\ 57.8^m$ | +04° 42′ |
| IC 4756 | Open cluster | 4.6 | 40′ | $18^h\ 38.9^m$ | +05° 26′ |
| NGC 6633 | Open cluster | 4.6 | 20′ | $18^h\ 27.3^m$ | +06° 30′ |
| Struve 2375 | Double star | 6.3, 6.7 | 2.6″ | $18^h\ 45.5^m$ | +05° 30′ |
| X Ophiuchi | Variable star | 5.9–8.6 | — | $18^h\ 38.4^m$ | +08° 50′ |
| NGC 6572 | Planetary nebula | 8.1 | 15″ | $18^h\ 12.1^m$ | +06° 51′ |
| NGC 6384 | Barred spiral | 10.4 | 6.2′ × 4.1′ | $17^h\ 32.4^m$ | +07° 04′ |
| M14 | Globular cluster | 7.6 | 11′ | $17^h\ 37.6^m$ | –03° 15′ |
| NGC 6366 | Globular cluster | 9.5 | 13′ | $17^h\ 27.7^m$ | –05° 05′ |

Angular sizes and separations are from recent catalogs. Visually, an object's size is often smaller than the cataloged value and varies according to the aperture and magnification of the viewing instrument. Right ascension and declination are for equinox 2000.0.

VOLKER WENDEL / STEFAN BINNEWIES / JOSEF PÖPSEL

▲ **SPARSE CLUSTER** Metal-rich NGC 6366 is classified as a globular, but it's of very weak central concentration, giving it its raggedy appearance. But don't overlook it — you'll find it about ¼° east of 4.5-magnitude 47 Ophiuchi, the bright star in the image above.

You might be tempted to pass this one over. But it's unusual to see even a modest galaxy so near the Milky Way. That position means the field is attractively peppered with foreground stars — something that's definitely worth a look.

Ophiuchus is best known to deep-sky observers for its harvest of globular clusters. Most notable are M10 and M12, which lie about 18° southwest of Taurus Poniatovii. But closer to the asterism are two globulars of note. **M14** sits about 6.5° southwest of Gamma Ophiuchi, in a sparse field that's striking for the absence of stars brighter than 10th magnitude thanks to dust clouds that obscure the background stars and the cluster itself. M14 is about 30,000 light-years away, making it twice as distant as M10 and M12. At magnitude 7.6, it's also fainter. But M14 is *intrinsically* brighter than both, and it even outshines M13 in Hercules. Through the telescope, though, M14 isn't quite as spectacular. In my 10-inch Dob at 133× I see a granular halo about 6′ across and a round, uniform core about half as wide. The entire cluster spans around 11′ in total.

Slew roughly 3° southwest of M14 to find the more challenging globular **NGC 6366**, some 15′ east of the yellow-white, 4.5-magnitude star 47 Ophiuchi. This little cluster measures about 13′ across, making it bigger than M14, but it's nearly two magnitudes fainter despite a distance of just 11,000 light-years. The globular features a low surface brightness and weak central concentration. In the 10-inch at 184× I see only a uniform glow with hints of granularity.

And with that, our tour of Taurus Poniatovii ends. We've seen a pleasing selection of deep-sky objects — a good haul for a patch of sky not much wider than your hand held at arm's length. This little celestial bull serves one more purpose, at least for me. Just as the Pleiades and Hyades hint at a coming winter when they rise in the east on summer mornings, a first glimpse of Taurus Poniatovii ascending hind-end first, swollen by perspective over the horizon in the predawn sky during the frigid weeks in January, gives hope for a summer yet to come. And as the summer nights arrive at last, I never miss a chance to revisit the deep-sky sights in this part of the sky.

■ **BRIAN VENTRUDO** is a Calgary-based writer, scientist, and longtime amateur astronomer. Ventrudo writes about astronomy and stargazing at his website **CosmicPursuits.com**.

RON BRECHER