Lost in the Glare

Some interesting objects await imagers who can tear their cameras away from the showpieces of the night skies.

▲ **STEALING THE SPOTLIGHT** Many fine deep-sky objects reside in the shadow of more glorious targets. Take NGC 2023 above — this complex mixture of reflection and emission nebula resides about 5 arcminutes from B33, the famous Horsehead Nebula, which draws more attention. The close-up image reveals a complex interplay of dust and emission nebulosity that makes this and other similar targets worthy subjects for astrophotographers to pursue. North is to the left in these images. Unless otherwise noted, all images are courtesy of the author.

NGC 2023: S. MAZLIN / M. HANSON / W. KELLER / R. PARKER / T. TSE / P. PROULX (SSRO)

Years ago, when comedian Rodney Dangerfield said, "I don't get no respect," he might as well have been empathizing with the subjects of this article. I'm talking about deep-sky objects (DSOs) that are often ignored or underappreciated by most astrophotographers. While trophy objects such as M31, the Andromeda Galaxy, or M42, the Orion Nebula, are great, it's time to give some less-imaged (or less-noticed) astronomical gems a moment to bask in the spotlight in their own right.

Not all of these overlooked targets are faint. Even bright DSOs can fail to get the respect they deserve when they lie in the shadow of something "bigger and better." On the other hand, sometimes they occupy a region of sky that amateurs ignore due to a perceived lack of interesting deep-sky objects; these are lost in the dark, rather than the glare.

Targets Near Bright Stars

DSOs that are tucked up against a bright star can literally get lost in the star's glare. In this situation, clean optics and a dry, transparent sky are extra important, since any dirt or moisture amplifies light scatter around bright stars, overwhelming the view of anything nearby.

Lying adjacent to the bright, 2nd-magnitude star Gamma Cassiopeiae (γ Cas) are two attractive nebulae, **IC 59** and **IC 63**. Both contain a mix of red emission and blue reflection components. But don't let the brightness of γ Cas scare you away. The right hardware, such as an anti-blooming camera, a hydrogen-alpha filter (instead of or in addition to RGB filters), combined with careful processing, allows these pretty nebulae to be revealed basking in the rays of γ Cas.

Another interesting target also lies beside a bright naked-eye star. The dwarf spheroidal galaxy **Leo I** hides within the glare of 1st-magnitude Regulus. Even though the galaxy has a respectable integrated brightness of magnitude 11.2, it's low surface brightness renders it nearly invisible next to Regulus, which is more than 5,000 times brighter. Leo I displays little detail, but it's an accomplishment just to be able to record it. As a galaxy, it emits light at all visible wavelengths, so narrowband filters won't help to record it. However, careful processing of a combination of short and long exposures will reveal this subtle galaxy while still controlling light scatter around Regulus.

Overlooked Galaxies

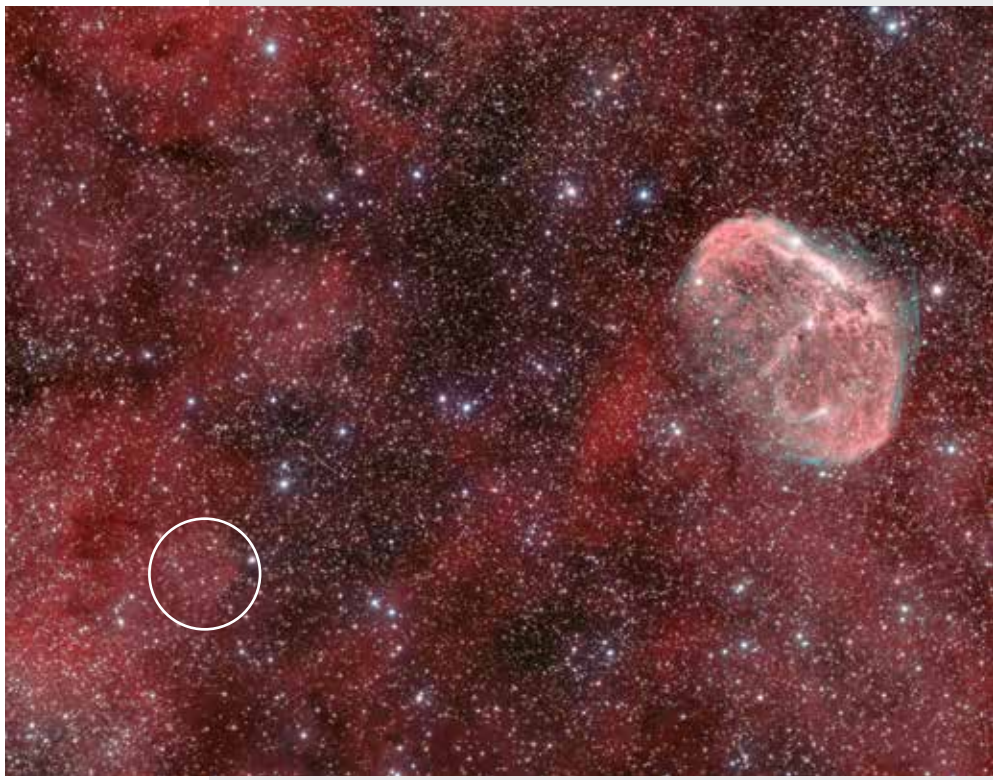
Speaking of galaxies, the best places to hunt them down is usually far from the dense star fields of the Milky Way. This is because the myriad stars and vast clouds of galactic dust seen within the plane of our home galaxy block distant galaxies, making them much harder to detect. But galaxies actually appear all over the sky — you simply need to know where to look for them. In fact, you might have already imaged a few unknowingly.

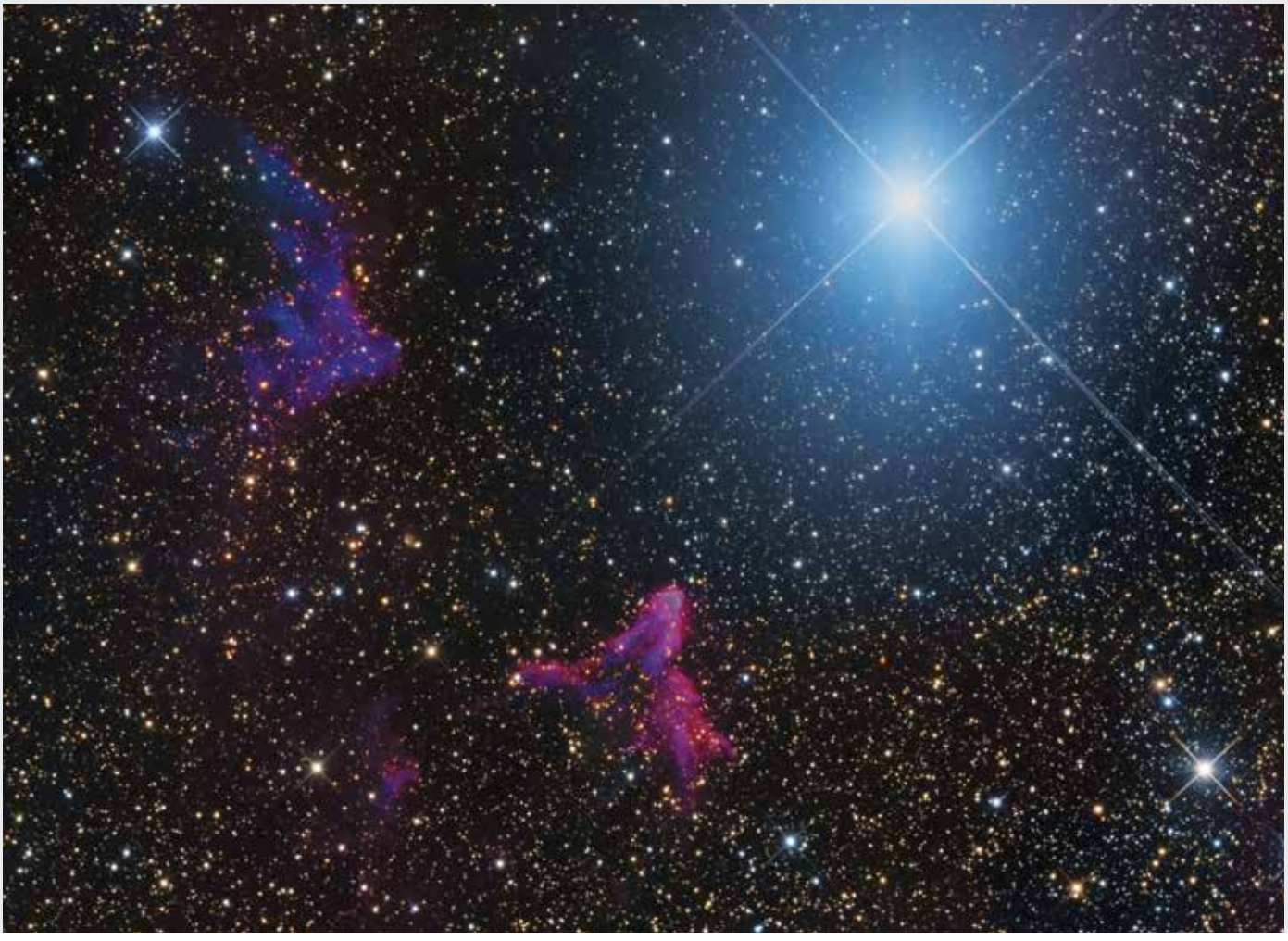
For example, M13, the Hercules Cluster, is arguably the finest globular cluster visible from mid-northern latitudes. Because of its brilliance, it's easy to give short shrift to the many galaxies in or just outside its halo, including **NGC 6207**. If you're processing your image to highlight the contrast between bold M13 and a dark background, the galaxy might be rendered too dark to see its structure. This approach would also render another galaxy invisible, namely **IC 4617**, which lies just off the line connecting M13 and NGC 6207. Brightening up the background or inverting the image (black stars on white) can make these tiny galaxies stand out better from the background.

Even relatively bright galaxies can sometimes get passed over, particularly when they are members of a crowded galaxy cluster. Markarian's Chain in the Virgo Cluster is one of the most popular fields for galaxy hunters. But next time you're thinking of exploring Virgo, why not go after **NGC 4216** a bit to the chain's west? It makes a

▲ **NEIGHBORS** Another target that gets little attention due to its proximity to a showpiece object, dwarf elliptical galaxy Messier 110 orbits M31 and displays tantalizing dark dust near its core when imaged with larger apertures.

▼ **IN PLAIN SIGHT** NGC 6888, the Crescent Nebula, is immersed in a dense nebulous field. The recently discovered Soap Bubble planetary nebula (PN G75.5+1.7) is the thin sphere just visible on the bottom left side.





photogenic trio with fainter **NGC 4222** and **NGC 4206** and is bright enough (10th magnitude) to record with relatively short exposure times.

Another example of a galaxy gem hiding in plain sight is **M110**, one of the Andromeda Galaxy's large satellite galaxies. It looks like a spider's nest — or perhaps a tightly wrapped meal in a spider's web. Although M110 appears relatively large and bright, it is completely overshadowed by its proximity to spectacular M31 and is rarely the main focus of imagers. But high-resolution images of M110 show mottling and a distinct dark feature, while long integration times reveal a faint bridge of stars that appears to tether the satellite galaxy to M31.

Buried Treasure

In contrast to galaxies, the rich star clouds of the Milky Way are a great place to find attractive open clusters. Yet they seem to be less popular with astrophotographers than other classes of DSOs, such as galaxies and nebulae. I've heard many people say that open clusters look better through the eyepiece than through a camera. However, some gorgeous examples are worth exploring with your camera, even though they're not easily accessible to most visual observers.

One of my favorites in this category is **Trumpler 5** (Tr 5), which lies not far from the more famous Christmas Tree Cluster and Cone Nebula, together designated NGC 2264. In contrast to most open clusters, which tend to have white or bluish colors, Tr 5 is composed primarily of red, yellow, and orange stars. The cluster is much older than most, so its hotter, more massive blue and white stars have long since faded, imparting a golden hue to Tr 5.

There are a few more "surprise" clusters that I now look for through the eyepiece, having first seen them as bonus objects in my photos. Two favorites are **NGC 436**, which lies beneath the "feet" of the famous E.T. Cluster (NGC 457) in Cassiopeia, and **NGC 6802**, next to Brocchi's Cluster (the Coathanger) in Vulpecula.

Lonely Outposts

I have friends who think that if you've seen one globular cluster you've seen them all. I disagree. I think each has its own character, and I've shot many of them over the years. One of my favorites is **NGC 2419**. It tends to be ignored because there are so many bigger, brighter globular clusters available. I think the location of NGC 2419, in the relatively

◀ **WASHING AWAY** The comet-like shapes of nebulae IC 59 (left) and IC 63 (bottom) are due to the ionizing radiation from the luminous star Gamma Cassiopeiae at upper right, which is slowly dissipating the two objects. North is to the left.

▲ **FAINT TREASURE** While the large, faint emission nebula Sharpless 2-129 has been known for more than a half century, the teal-colored object within called Ou 4 was only discovered in 2011.

▶ **GALACTIC CASCADE** When imaging the Virgo Cluster of galaxies, most imagers focus on Markarian's chain. But only about 2° west is a wonderful cascade of three moderately large spiral galaxies, including NGC 4222 (lower left), NGC 4216 (center), and NGC 4206 (upper right), collectively spanning about ½°. North is at left.

sparse constellation Lynx, also contributes to its obscurity. Its nickname, the "Intergalactic Wanderer," just feels right. About 300,000 light-years away, it's farther than galaxies like the Large and Small Magellanic Clouds and the Sagittarius Dwarf. There's not much in the field around it, except for two bright field stars that enhance the perception that NGC 2419 is tiny, dim, and distant. In reality, it's one of the Milky Way's most massive star clusters.

The dwarf spiral galaxy **NGC 6503** in Draco gives me the same feeling of isolation. Every star in the field surrounding it lies in the Milky Way, so there's mostly empty space between us and it. The galaxy actually does lie at the edge of a vast, nearly empty region of space called the Local Void (see page 12). Only about 30,000 light-years across, the galaxy is puny compared to the Local Void, which might be as big as 250 million light-years across!

Obscure Nebulae

Like star clusters, nebulae abound in the Milky Way. This catchall term includes pinkish emission nebulae, blue (and sometimes yellow) reflection nebulae, and planetary nebulae with a colorful mix of emission nebulosity. The Bubble Nebula (NGC 7635), Pleiades (M45), and Dumbbell Nebula (M27) are examples. But many other, less familiar examples are worthy of your camera's gaze. The Sharpless catalog is full of dim emission nebulae (and some of other types). One of the most interesting yet least appreciated is **Sh2-290** in Cancer. It's a classic planetary nebula, showing distinct red- and teal-colored regions corresponding to hydrogen-alpha and oxygen-III emissions, respectively.

Planetary nebula **Abell 39** in Hercules has to compete for attention with bright globular clusters M13 and M92. This ghostly green object is a near-perfect sphere about 2½ light-years in diameter, making it the largest such sphere currently known. Several background galaxies are seen through the nebula that are thousands of times more distant.

Another faint spherical structure, **PN G75.5+1.7** known as the Soap Bubble Nebula, is hidden in plain sight in Cygnus just ½° southeast of NGC 6888, the Crescent Nebula. In fact,

(continued on page 64)

▶ **LOOK TO THE RIGHT** Just 1° west of NGC 2264 is the beautiful old open cluster Trumpler 5, which is populated by old reddish stars and is a treat for observers and imagers alike.

▲ **LONELY GLOBULAR** Relatively dim, NGC 2419 is the most distant globular cluster associated with the Milky Way.

▶ **CLUSTER COMPANIONS** M13 is perhaps the showpiece globular cluster for northern observers and imagers. Long exposures of this target with 6-inch or larger instruments will reveal a wealth of detail in the bonus spiral galaxy NGC 6207 (top left) just ½° to its northeast. Between it and M13 lies an even more distant galaxy, IC 4617 (arrowed).

▶▶ **BANDED NEBULA** About 1½° south of IC 5070, the Pelican Nebula in Cygnus, resides another large-but-faint nebula, IC 5068, which rewards imagers shooting through narrowband filters with complex, overlapping bands of nebulosity in a roughly rectangular shape.

(continued from page 61)
due to its subtle, thin shape and the nebulous field it sits in, the Soap Bubble was only discovered about a decade ago by amateur astronomer Dave Jurasevich using a 160-mm refractor and CCD camera with narrowband filters. The object was independently noted and reported to the International Astronomical Union by amateurs Keith B. Quattrocchi and Mel Helm who imaged PN G75.5+1.7 in 2008.

▲ **NEARBY PLANETARY** The large nebula Sh2-290 in Cancer, also known as Abell 31, is among the closest and largest planetary nebulae in the sky, but it is exceedingly faint and requires long exposures to reveal all its colorful glory.

Surrounded by Bling

Speaking of busy nebulous fields, one of my favorites is the region around the Bubble Nebula (NGC 7635), which is full of splashy star clusters like M52 and other emission nebulae. Amid all these sparkling jewels, it's easy to overlook little **HH 170**. This hourglass-shaped Herbig-Haro object signals the recent birth of a new star at its center.

One of the most photographed DSOs is the Horsehead Nebula (B33) in Orion, often sharing the field with the spectacular Flame Nebula (NGC 2024). **NGC 2023** usually appears in these portraits too, since it lies more or less between the Horsehead and the Flame. But due to its location, NGC 2023 is rarely imaged at high resolution, when it can reveal tremendous color and detail.

Similarly, try photographing the regions in Cygnus around the North America Nebula (NGC 7000), particularly beneath the "Gulf of Mexico" and the neighboring Pelican Nebula (IC 5070). **IC 5068** is a boldly textured, rhombus-shaped patch of emission nebula full of colorful stars. Not far to its west is the blue reflection nebula **NGC 6914**, within a few degrees of **Simeis 57**, the Propeller Nebula, another underappreciated nebula often misidentified as DWB 111.

Lost in the Glare Targets

Object	Type	Size	RA	Dec.
IC 59	Emission nebula	10′ × 5′	0^h 56.7^m	+61° 04′
IC 63	Emission nebula	10′ × 3′	0^h 59.5^m	+60° 49′
Leo I	Dwarf spheroidal galaxy	10′ × 7′	10^h 08.5^m	+12° 18′
NGC 6207	Spiral galaxy	3.0′ × 1.3′	16^h 43.1^m	+36° 50′
IC 4617	Spiral galaxy	1.2′ × 0.4′	16^h 42.1^m	+36° 41′
NGC 4216	Spiral galaxy	8.3′ × 2.2′	12^h 15.9^m	+13° 09′
NGC 4222	Spiral galaxy	3.1′ × 0.5′	12^h 16.4^m	+13° 18′
NGC 4206	Spiral galaxy	6.2′ × 1.0′	12^h 15.3^m	+13° 01′
M110	Dwarf elliptical galaxy	17′ × 10′	0^h 40.4^m	+41° 41′
Tr 5	Open cluster	20′	6^h 36.5^m	+9° 29′
NGC 436	Open cluster	5′	1^h 16^m	+58° 49′
NGC 6802	Open cluster	5′	19^h 30.5^m	+20° 16′
NGC 2419	Globular cluster	4.7′	7^h 38.1^m	+38° 53′
NGC 6503	Dwarf spiral galaxy	7.1′ × 2.4′	17^h 49.5^m	+70° 09′
Sh2-290	Planetary nebula	17′	8^h 54.2^m	+8° 54′
Abell 39	Planetary nebula	3′	16^h 27.5^m	+27° 55′
PN G75.5+1.7	Planetary nebula	4.3′	20^h 15.5^m	+38° 03′
HH 170	Herbig-Haro object	1′	23^h 17.5^m	+60° 51′
NGC 2023	Reflection nebula	10′	5^h 41.6^m	-2° 16′
IC 5068	Emission nebula	40′ × 29′	20^h 50.8^m	+42° 31′
NGC 6914	Reflection nebula	12′ × 12′	20^h 24.7^m	+42° 29′
Simeis 57	Emission nebula	30′ × 20′	20^h 16.1^m	+43° 41′
Sh2-129	Emission nebula	175′ × 113′	21^h 11.7^m	+59° 58′
Ou 4	Emission nebula	68′ × 23′	21^h 11.8^m	+59° 59′

Angular sizes are from recent catalogs. Right ascension and declination are for equinox 2000.0.

Resources

Planetarium software is helpful for identifying potential subjects in locations that are off the beaten track, or in the background that might be worth our attention. My first clue that there were hundreds of galaxies in the same field as the Pleiades was when I zoomed in on the field in Software Bisque's *TheSkyX* (**bisque.com**). While these galaxies appear small and featureless, just being able to resolve them in the distant background imparts a sense of the vastness of the cosmos that M45 on its own can't deliver. Most camera-control and planetarium software can chart the location of celestial objects. A great freeware option is *Stellarium* (**stellarium.org**), which can display Digitized Sky Survey image overlays that provide a more photo-realistic view.

Get familiar with compilations of nebulae, like the Sharpless (Sh) and van den Bergh (vdB) catalogs, as well as Lynd's Bright Nebulae (LBN) and Lynd's Dark Nebulae (LDN). Many of their members aren't visible through the eyepiece and are only revealed in deep exposures. These catalogs are accessible via the planetarium software mentioned previously, with many

EXPANDING SPHERE Abel 39 in Hercules is a challenging target for imagers with larger scopes. This ancient planetary nebula appears as a nearly perfect teal-colored sphere.

online resources providing photos or descriptions. While I don't try to duplicate the aesthetic, I sometimes refer to others' results — or more specifically, their technical information — to help me decide what scope and camera combination might achieve a desired composition, and to estimate how much exposure time might be needed.

Imaging Strategies

Most of these DSOs are much fainter than their better-known kin or are challenging to see due to their environment, such as the proximity to a bright star. Successfully imaging them requires a total integration time long enough to reveal the dimmest features in the field. In some cases, extremely long total exposure time is required, sometimes along with specialized narrowband filters. For example, for my sky conditions and equipment, **Sh 2-129**, the Flying Bat, is known to be exceedingly faint. I didn't stop data acquisition until I had 104 hours total exposure, including 30 hours through an oxygen III filter, which was needed to reveal the exceedingly faint Squid Nebula, **Ou 4**, discovered in 2011 by French astro-imager Nicolas Outters.

While patience is a virtue when going after low-surface-brightness DSOs, at some point you need to call it a day. Increasing exposure time yields diminishing returns in terms of signal-to-noise ratio (SNR). For example, doubling a 10-hour exposure only nets you about a 40% improvement; doubling the SNR would require a whopping 40 hours! "Going long" requires a shift in mindset: When I first began imaging I went after three or four targets in a night. Now I spend several nights — sometimes months during the short nights of summer — dedicated to a single patch of sky.

Your best results on faint objects will come from capturing them when they are at their highest in your sky, say 2 or 3 hours on either side of the meridian (the imaginary line passing through both celestial poles and the zenith). That way you'll be shooting through less atmosphere and will be able to reveal fainter structures and finer details.

Narrowband filters — particularly hydrogen alpha — can be useful to better record fine structure in emission nebulae, planetary nebulae, and supernova remnants. What's more, test shots can be taken even when there's a bright Moon up (*S&T:* Nov. 2017, p. 68).

Conclusion

We all want to capture showpiece DSOs. Those big, bright, and beautiful objects impress astronomers and non-astronomers alike. While you're imaging their amazing fields, be alert to hidden treasures you might be missing. Eventually, you'll have shot most of the popular Messier and NGC objects accessible from your site. When that day comes, it's time to start looking further afield for new wonders to photograph. Use the examples described above to get started, and then dive into the catalogs and online tools I've mentioned to find even more candidates to explore. And when you're preparing to image your chosen subjects, have a good look around it to see what you might be missing — maybe it's worth a test shot or two or a little adjustment to the framing of your shot.

By the way: Don't be surprised if you can't find much technical information about some of your chosen targets. After all, they just don't get no respect!

■ **RON BRECHER** likes to image lesser-known deep-sky objects from his home observatory in Guelph, Ontario. Visit his website at **astrodoc.ca**.