Text and photography by TONY PUERZER

URBAN ASTROPHOTOGRAPHY TIPS

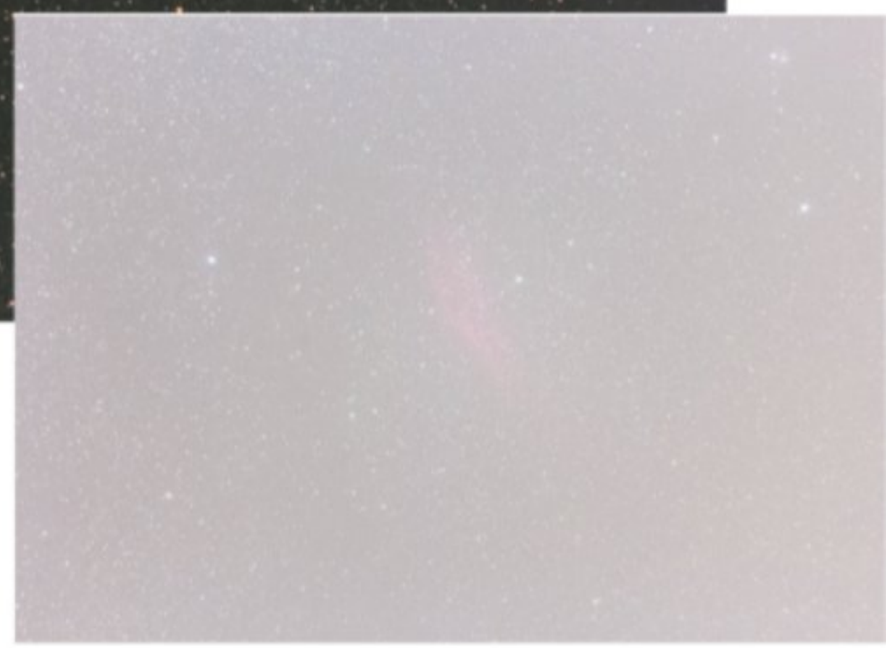
Even if your backyard sky is light-polluted, you can still get great astro-shots

LIGHT DOME This photo of the Milky Way was taken from the outskirts of a medium-sized city. The yellowish glare at bottom issues from city lights, while the dark sky at top is near the much darker opposite horizon. (The "scratch" along the Milky Way is a Perseid meteor.) The author used a Canon EOS 5D Mark II DSLR camera set to ISO 1600 for this 30-second exposure with a Canon EF 15mm f/2.8 fish-eye lens.

IF YOU'RE A CITY DWELLER and an aspiring astrophotographer, you're no doubt aware that light pollution limits your ability to image the night sky. Perhaps you console yourself in the knowledge that the Moon and planets offer a lifetime of picture potential. You might even delight in the compositional opportunities a lighted skyline presents for wide-field shots of lunar and planetary conjunctions.

But if your interest is deep-sky photography, the barriers seem formidable. You might think your only choice is to pack up and head out of town. Obviously, a remote location is best, but what if travel is impractical or inconvenient or impossible?

URBAN ASTROPHOTOGRAPHER City lights present serious challenges for astro-imaging, but there are ways to minimize them. Here, the author's friend Chris Boar is shown setting up a camera and telephoto lens on a tracking mount for a night of urban sky shooting.



CELESTIAL CALIFORNIA The author waited until this large but faint emission nebula in Perseus, above, was positioned high overhead, thus permitting a relatively long exposure of 120 seconds. An astro-modified Canon EOS 60D DSLR camera and a Canon EF 100mm f/2.8 Macro USM lens (wide open) was used for both this photo and the one at right, but only the shot above was taken with an Astronomik CLS filter. Right: Although this 2-minute unfiltered exposure also recorded the California Nebula, city sky glow swamped the image, making effective postprocessing nearly impossible.

CITY STRATEGIES

Fortunately, a range of deep-sky photography can be accomplished from urban environments. I live in a medium-sized city and do a lot of astro-imaging from the front deck of my house. To stack the odds of success in my favour, I target mainly the brightest nebulas, clusters and galaxies. I don't get the results I'd expect from a pristine site, but sitting comfortably indoors on a cold winter's night while my camera clicks away outside is one of life's little pleasures. Plus the hours I'd have spent travelling can be used for actual imaging.

Unlike smoke or clouds, light pollution doesn't block starlight. It's an *additive* source, turning an otherwise black sky into a brownish yellow, greenish grey or greyish white glow that reduces contrast, making it harder to isolate the faint celestial object you're trying to record. Unless you experience an overnight power failure, which comes with its own problems, the unwanted light can't be eliminated. Even so, its impacts can be minimized with careful planning.

Light pollution possesses three fundamental characteristics that you can exploit. First, it's not as bad in some directions as it is in others; second, it generally decreases as the night progresses; and third, it emits most strongly at specific, identifiable wavelengths. An awareness of these factors can significantly improve your chances of creating better astrophotos.

Sky glow is rarely uniform in all directions. This is certainly true if you're located in the suburbs. The glare is likely worse toward downtown. The horizon in the opposite direction, though darker, might feature light domes from neighbouring cities. Additional light domes can issue from local sources such as airports, car dealerships, shopping malls, commercial greenhouses, and so on. Avoiding these blooms of light is often difficult.

But here's the thing: The cumulative glare is normally less intense higher up. By imaging deep-sky wonders when they're near their maximum altitude—when they *culminate*—you'll enjoy superior results. A desktop planetarium program will tell you when your favourite objects are at their evening best. M13, the Great Globular Cluster in Hercules, rides high in July; M31, the Andromeda Galaxy, does likewise in November; and M42, the Orion Nebula, culminates in February. Your specific local conditions have a role to play too. If you have more sky glow overhead than toward the east, for example, you may need to catch your quarry before it actually culminates. And if there's a light dome to the south, some objects will always be out of reach from your location.

It's also helpful to be aware that prime time for astrophotography often occurs *after* midnight, not before. Consider shooting your desired target when it culminates "out of season," just before dawn. M42, for example, culminates in late October at around 4 a.m. The wee hours are darkest because many residential (and at least a few commercial) lights have been switched off by then. And the reduced vehicle traffic results in fewer airborne, light-scattering particulates. (Those nasty particulates are affected by seasonal weather variations—for imaging, cold, dry air is preferable to warm, moist air.)

CITY HORSEHEAD Despite bright city lights, the author captured the famously faint Horsehead Nebula in the belt of Orion. He used an astro-modified Canon EOS 60D DSLR camera fitted with an Astronomik CLS filter and a Canon EF 300mm f/4L IS USM telephoto lens to take the ten 120-second frames (shot at ISO 1600) used for the final image. An iOptron iEQ30 Pro equatorial mount tracked the sky during the exposures.

CHOOSE YOUR WEAPONS

On the equipment end, you can battle light pollution by adding nebula filters to your arsenal. Such filters allow emissions from certain nebulas to pass through while blocking much of the light produced by sodium-vapour and mercury-vapour streetlamps. Although many communities are switching to broadband LED bulbs, the older lights are still prevalent, so check out the filters offered by Astronomik, Astro Hutech, Optolong, Tele Vue and others. I rarely remove my Astronomik CLS Clip-Filter from my astro-modified Canon 60D DSLR camera.

Depending on their specific characteristics, nebula filters usually impart a colour cast to images, so it's critical to obtain a proper white balance with your camera. The white balance's automatic setting works well during the day; however, leaving it on "daylight" for a nighttime photo of a light-polluted sky usually results in an unappealing brownish cast. To give the sky a more natural, cool blue colour, try the tungsten setting. And operate in raw (not JPEG) mode, as it will allow you to fine-tune the white balance afterward.

A filter darkens the sky, allowing you to double or triple the exposure time before you reach the sky-fog exposure limit. This means you'll capture significantly more light from the dim object you're shooting, resulting in a higher-contrast image that's much easier to postprocess.

The correct exposure will depend on the ISO setting, the lens's f-ratio and sky conditions. I suggest you take a series of test exposures. When evaluating your tests, don't rely solely on the camera's rear LCD screen. Instead, use the histogram display (the instruction manual explains how to enable this handy feature). In a well-exposed image from a *dark* site, the "hump" in the histogram will be fully separated from the left side of the display without extending much past the centre point of the graph. In town, you'll need to expose so that the hump is a bit farther to the right, without clipping any of the highlights. Doing so will ensure you don't underexpose your celestial treasure, since its contribution to the histogram is likely masked by that from the surrounding sky glow.

If your DSLR is on a fixed tripod, chances are the exposures will be long enough to produce star trails, especially if you're working with anything other than an extreme wide-angle lens. You can eliminate star trails by attaching the camera to a motorized equatorial telescope mount or a portable tracking platform. These devices counteract the Earth's rotation, thus enabling untrailed exposures of several minutes, which, in turn, allows the use of longer lenses and/or lower ISO settings.

Tracked astrophotos make available another powerful weapon called image stacking. This involves capturing multiple shots of the same object, then blending them during postprocessing. Stacking can dramatically reduce visual noise and help your final image withstand the aggressive postprocessing necessary to minimize the effects of sky glow. For information on this technique, consult my "Image-Stacking Basics" article in the July/August 2018 issue, page 33.

Yes, the challenges presented by urban light pollution are significant, but they're not insurmountable. Get cracking and shoot. You might be pleasantly surprised at what you can accomplish. ✦

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