Winter Astrophotography

'Tis the season to brave the elements and capture some stunning images.

Winter can be the perfect season for budding astrophotographers. The easily recognizable constellation of Orion, along with Sirius, the brightest star in the night sky, are great targets for even the most modest camera gear. The season's bright stars add sparkle to nocturnal landscapes, while snow-capped mountains or frozen lakes offer enchanting foreground vistas. And if you're looking to try your hand at deep-sky photography, then M42, the Orion Nebula, is an ideal starting point.

The season's shorter days also mean longer nights and additional hours to capture images. Even if you can't stay up late, you can get some shots in thanks to the early sunsets and brief evening twilight. In fact, the nights are so long that they offer three seasons worth of objects. The early evening provides a review of the previous season, while the pre-dawn hours presents a showcase of what's ahead.

Of course, it's not all good news. Colder temperatures can be uncomfortable and pose some unique challenges when it comes to your camera gear.

Don't Dew It

Taking your camera outside on a cold winter night won't cause any problems . . . initially. However, as your gear cools to below the dew point, water vapor in the air will start to condense on the front element of your lens. Initially, the effects are quite subtle, showing up as a halo, or "blooming" around bright stars. Over time, as the condensation

WINTER WIDE-ANGLE The readily recognized constellation of Orion, along with Sirius, the brightest star in the night sky, feature prominently in this wide-angle photograph that includes the faint, hazy band of the winter Milky Way. The slightly blue color-balance used in this photo helps convey the feeling of a cold winter night.

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gets thicker, dim stars will disappear and the overall image will become hazy, as though clouds were passing overhead. And it can get worse. If it's cold enough, you could end up with a layer of frost on your optics similar to what you would find on a car windshield.

To fix this, don't wipe (or scrape!) your lens. Instead, you have to *gradually* bring the temperature of your equipment back above the dew point. But don't make the common mistake of simply taking everything indoors — this only makes matters worse. The warm, moist air inside will instantly condense on all the cold surfaces of your camera and lens. A better approach is to seal your camera in a plastic bag while it's still outside. This way when you bring it indoors, the moisture condenses on the plastic bag instead of your gear. Once everything has warmed up a bit you can remove your camera from the bag and let it dry out completely.

As with many things, an ounce of prevention is worth a pound of cure. Using a lens hood lessens the rate at which your lens radiates away heat, which will in turn slow the process of dew formation. These accessories are critical on humid evenings. If your lens didn't come with one, you can purchase an aftermarket version or even make one yourself out of waterproof material.

Unfortunately, lens hoods don't completely prevent dewing — usually they just buy you a bit more time. To keep your lens from fogging up it needs to maintain a temperature slightly higher than the dew point. The simplest way to do this is to attach one of those little chemical hand-warmer packets to the underside of your lens with an elastic band. A better (though more costly) solution is an electrically powered dew heater. Some run off 12-volt DC power, while others use a USB connection. Typical devices consist of two parts: a controller plus one or more heating bands that strap (usually with Velcro) around the lens.

Keeping Chill

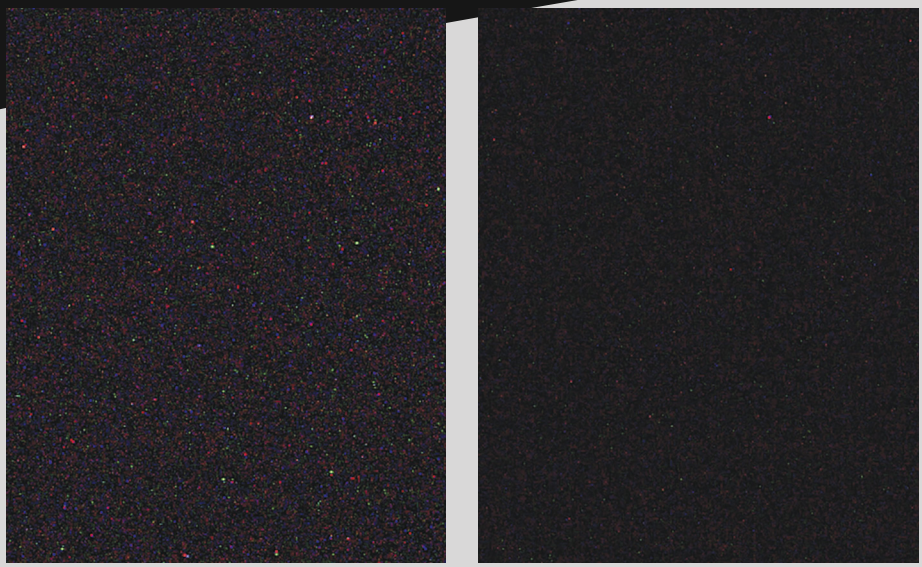
Cold weather can also affect the focus of your lens. As the temperature drops, the metal and plastic components in the lens barrel will contract slightly, throwing stars out of focus. My advice is to check your photos regularly during a winter imaging session. Just be careful not to breathe on your camera or lens when tweaking focus — the warm moist air you exhale will instantly condense on the glass.

◀ **FUZZY M42** Moist winter air and cold optics don't get along. Moisture condenses on any surface (including your lens) when temperatures fall below the dew point. The first signs can be quite subtle, with faint halos appearing around bright stars. As dew continues to form, dim stars won't be recorded, and the overall image becomes fuzzy and low-contrast. The effects of dewing are present in this two-minute exposure of the Orion Nebula, M42.

Camera batteries are impacted by cold conditions as well. It's worth keeping a spare one (or two) warm in your pocket or indoors while your camera is clicking away. Better yet, you can get a "dummy battery" adapter that allows you to power your camera directly from either an AC outlet or a portable power bank. These are essential accessories if you're planning to shoot a long, time-lapse sequence, a star-trail photo, or meteors. The adapters sold by camera manufacturers can be quite expensive, but you can usually find a low-cost alternative from a third-party source. Some of the newest mirrorless cameras even allow you to power them via a USB-C cable. Check your manual to see if this option is supported on your particular model.

Cold weather isn't all bad, however — digital cameras actually produce better images at lower temperatures. As imaging sensors heat up, thermal noise increases, creating a colorful, confetti-like pattern of speckles in long-exposure images. High-end, dedicated astro cameras have electronic coolers built in to minimize this effect, but you can

▲ **WIRELESS WONDER** The screen of an iPad dwarfs the rear display of this Canon 80D camera. Using Live View on a larger display makes obtaining perfect focus far easier, and because the connection is wireless, the iPad can be placed inside a warm car or house.



◀ **HOT MESS** Digital-camera sensors work better in cool conditions, as illustrated by this pair of 60-second exposures taken with a Canon 60D DSLR camera working at ISO 3200. The cropped-in images show the difference in thermal noise when the sensor is running at 28°C (left) vs –5°C (right).

get similar benefits by shooting on cold winter evenings. A drop in temperature of as little as 6° to 8°C (10° to 15°F) cuts thermal noise in half, yielding cleaner-looking images that will withstand a lot of post-processing.

Cold Comfort

Taking photos on cold winter nights not only affects the equipment, but also the photographer. You'll need to dress more warmly than you would for normal daytime activities since you'll be standing still for long stretches. Extra layers of clothing are key to keeping you warm and comfortable. A Thermos of coffee or hot chocolate can also provide a welcome boost as you work with your camera to capture that perfect shot. Tuck a couple of hand warmers in your gloves to keep your fingertips from becoming numb. Most of all, remember it's important to stay warm since once you're cold, it's nearly impossible to shake off the chill without retreating indoors — something you'll be reluctant to do when you finally get one of those rare, crystal-clear, moonless winter nights.

Of course, you don't have to stand next to your camera at all. Several options allow you to stay inside while your camera clicks away out in the cold. Many models have a built-in intervalometer that you can program to take a sequence of exposures over a given time period. If yours doesn't have this feature, you can purchase an inexpensive external intervalometer. Some manufacturers even offer software that allows you to control your camera remotely, either via Wi-Fi or a USB cable. For example, Canon supplies a free computer program called *EOS Utility*, plus a mobile application called *Canon Camera Connect*, which runs wirelessly on iOS and Android devices.

A Wi-Fi connection allows you to control your camera from up to 10 meters (33 feet) away. This lets you sit inside in total comfort while your camera works away outside. And because the connection is wireless, there's no risk of shaking your camera while changing settings or firing the shutter.

Another advantage to connecting wirelessly is you can use the much larger screen of your computer or tablet to check for focus drift. Even better, if you have an auto-focus lens, many applications permit you to tweak the focus directly via your connected device. Having the ability to view a magnified image and make small adjustments remotely is a game-changer. Plus, being able to instantly review the images on your device's big screen allows you to confirm that you captured the keeper you were hoping for.

If this discussion has left you feeling a bit cool about winter imaging, there's one more option available. You can always take a vacation to some deserted tropical island and pack your astrophotography gear along with your suntan lotion and swimming trunks!

▲ **WINTER MOON** On winter nights the full Moon follows a path similar to the Sun's on summer days. Rising well north of east, the Moon was perfectly placed over distant snow-capped mountains on a cold, clear evening when this shot was captured.

■ **TONY PUERZER** is a retired professional photographer and an avid amateur astrophotographer. He enjoys imaging on cold winter nights because there are no mosquitos to contend with.