Beyond Your Camera's Kit Lens

Go wide or go deep — the sky's the limit when it comes to choosing a second lens.

Most interchangeable-lens cameras come with an inexpensive "kit lens" that works well for everyday photography. In our June 2021 issue, I showed how you can use basic equipment to create some compelling night-sky images. However, as your experience grows you may begin to feel limited by having just the one lens. But with so many options available, how do you choose the best second lens? The answer largely depends on what kinds of photographs you want to make.

Speed Limits

If you're shooting with a camera on a stationary tripod, then a fast, ultra-wide model is a great choice. A "fast" lens (one with a low f-stop number, such as f/1.8) delivers more light to your camera's sensor, which is critical for keeping exposure times to a minimum. The lower magnification of a short-focal-length lens allows you to maximize the exposure time before the stars start to

▶ National Parks and designated dark-sky locations are prime candidates for observing and photographing the Milky Way. The dark skies and high altitude of Bryce Canyon National Park in Utah were the perfect setting for this photo of the Milky Way setting behind a bristlecone pine. A Canon EOS 6D camera was set to ISO 6400 for this 30-second exposure with a Canon EF 15mm f/2.8 fisheye lens at f/2.8.

trail due to Earth's rotation. You'll also find that the wide field of view increases your compositional options, allowing you to capture more of the night sky (especially the Milky Way) while including an interesting foreground that adds visual appeal to your photos.

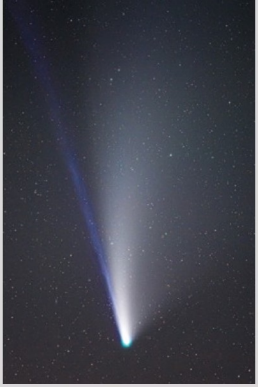
If you have access to a motorized equatorial telescope mount, or to one of the many battery-powered sky-trackers, then you have more options. By counteracting Earth's rotation, these mounts allow for longer exposures and the use of greater focal lengths that provide extra detail, all without trailed stars. You can also get away with slower apertures (f/4, for example) while retaining pinpoint star images despite the additional exposure time required.

Either way, you can choose a basic lens since features such as auto focus and image stabilization aren't needed for astrophotography. Quality zoom lenses are versatile but rather expensive compared to fixed-focal-length prime lenses. These so-called *prime lenses* (ones with a single focal length) are likely to be less expensive and readily available on the used market.

A Question of Focus

When checking out a lens in person, pay particular attention to the quality of its manual focus adjustment. That's because the auto-focus systems on most cameras struggle in dim light, and you'll need to use manual focus and "live view" (if your camera has that feature) to achieve sharp stars. This is one of those situations in which you get what you pay for — it's simply easier to focus a high-quality lens than a low-end, budget option. Precise focusing is another reason why a fast lens is desirable. Beyond allowing for shorter exposures, it provides a much brighter live-view image.

Price is also often an indicator of optical quality. When comparing two similar spec'd lenses, the more expensive model is likely to perform better "wide open", that is, at its maximum (lowest f-number) setting. Such a lens will render pinpoint-star images across the entire frame. It's no use buying a fast lens if you have to stop it down to a small aperture to produce acceptable image sharpness. Each increase in f-stop cuts the amount of light reaching your camera's sensor in half — which is why, ideally, you'll want to shoot with your lens wide open.



◀ A Canon 300-mm, f/4 telephoto lens provided the perfect framing for capturing the beautiful Comet NEOWISE (C/2020 F3) as it appeared in the evening sky in July, 2020. This 30-second exposure was recorded with a Canon EOS RP full-frame mirrorless camera set to ISO 3200. An iOptron iEQ30 Pro motorized equatorial mount carried the camera to prevent trailed stars.

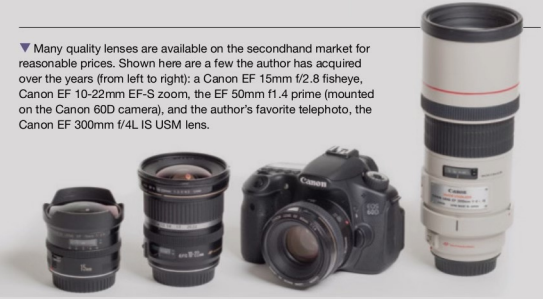
Of course, no lens is perfect, but some aberrations are more troublesome than others. Image-editing software, such as *Adobe Lightroom* or *Photoshop*, can compensate for faults such as vignetting, geometric distortion, and even mild chromatic aberration. As long as a lens doesn't exhibit severe *coma* (in which stars are stretched out into comet-like streaks in the corners of the image) or *field curvature* (which prevents the entire image from coming to focus at once), it'll perform quite well.

Prime Time

For wide-field, fixed-tripod shots, there are a number of high-quality options available from a variety of different companies. Of course, every camera manufacturer makes (and promotes) its own line of lenses, but these often come at a premium price. If you own a full-frame camera, a budget-friendly option is the Rokinon/Samyang 14mm F2.8 ED AS IF UMC lens, which is available for a variety of common lens mounts. If price is less of an issue, it's hard to beat the excellent Sigma 14mm f/1.8 DG HSM Art lens. For APS-C crop-sensor cameras, check out the Rokinon/Samyang 10mm F2.8 ED AS NCS CS prime lens, as well as the Tokina atx-i 11-20mm f/2.8 CF zoom.

Although fish-eye lenses are somewhat specialized, don't rule them out if capturing super-wide vistas is your main imaging goal. One of my favorites is a discontinued Canon 15-mm model that I picked up used for a good price. Admittedly, it suffers from pretty severe coma, but that's a defect I'm willing to live with given its unique field of view and fast (f/2.8) aperture. For crop-sensor cameras, an 8-mm fisheye lens

▼ Many quality lenses are available on the secondhand market for reasonable prices. Shown here are a few the author has acquired over the years (from left to right): a Canon EF 15mm f/2.8 fisheye, Canon EF 10-22mm EF-S zoom, the EF 50mm f1.4 prime (mounted on the Canon 60D camera), and the author's favorite telephoto, the Canon EF 300mm f/4L IS USM lens.



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▲ Despite being quite bright, the northern lights can change rapidly, which means you need very short exposures to record the sight without blurring. The combination of a 15-mm fisheye lens mounted on a full-frame Canon 6D camera was just wide enough to capture this sky-filling auroral display in Iceland. The fast f/2.8 lens aperture, plus a setting of ISO 1600, allowed for a 5-second exposure that effectively froze the action.

would provide similar results.

For those with tracking mounts, there's an almost unlimited number of choices available. This is why it's important to prioritize your astrophotography goals before reaching for your credit card. When it comes to versatility and ease-of-use, I like short- to medium-telephoto lenses (in the 80- to 100-mm range). With these, you can photograph large, individual deep-sky objects, while still enjoying relatively relaxed tracking requirements. Prime lenses in this category are used extensively by portrait photographers, and the same features they value — wide lens openings and tack-sharp results — also make them ideal for astrophotography.

As a Canon camera user, two of my favorites are the Canon EF 85mm f/1.8 USM Lens and the Canon EF 100mm f/2.8 Macro USM Lens. (Yes, a macro lens that's also great for astrophotography — go figure!) Importantly, both these lenses are available on the used market at substantial savings.

While prime lenses typically offer the best performance for your imaging dollar, there are notable exceptions. Many manufacturers offer high-quality zoom lenses in the 70-200 mm range. For example, the Tamron SP 70-200mm f/2.8 Di VC USD G2 Lens is a very desirable option for astrophotography. While these zooms certainly aren't cheap, you can save some money by shopping for older, non-stabilized models such as the Canon EF 70-200mm f/2.8L USM lens. In fact, the slower, f/4 version of that particular model is one of my all-time favorites due to its quality optics, useful zoom range, and light weight. Since this lens is well within the capacity of portable tracking mounts, it's a versatile option for an imaging rig to take along on your next vacation.

▲ If your telescope has a motorized equatorial mount, chances are you can replace the scope tube with your camera fitted with a short dovetail bar. This photo shows a Canon 60D DSLR camera and Canon EF 10-22mm EF-S zoom lens riding on an iOptron iEq30 Pro mount.

Going Long

If photographing individual deep-sky targets is your aspiration, consider prime lenses in the 135- to 300-mm range. Such optics reveal significant detail in many deep-sky objects without needing heavy-duty mounts, though they do require more precise tracking due to their higher magnifications. Check out the Rokinon 135mm f/2.0 ED UMC lens if you are looking for a fast, budget-friendly model in this category. On the used market, the Canon EF 200mm f/2.8L II USM lens can be an excellent value.

At the top end of the telephoto range you can save a significant amount of money by relaxing the fast f/stop requirement — but only if you're confident your mount can track accurately. There are a number of good options in the f/4 to f/5.6 range available from a wide variety of manufacturers. My go-to lens in this category is the (now discontinued) Canon EF 300mm f/4L IS USM lens.

Beyond these focal lengths, you're probably better off attaching your camera to a small refractor telescope, which typically costs less than the equivalent telephoto options. Just be aware that every increase in focal length requires a larger, heavier, and more accurate mount. If you value simplicity and stress-free imaging, stick with a shorter-focal-length optic.

Each category of lens offers a unique set of capabilities and limitations. So, when it's time to go beyond your camera's kit lens, the biggest decision isn't which lens to buy, it's what kind of astrophotography you want to try next.

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