Text and photography by TONY PUERZER

CHOOSING A LENS FOR ASTROPHOTOGRAPHY

Is it possible to find camera optics that combine speed and quality with low cost?

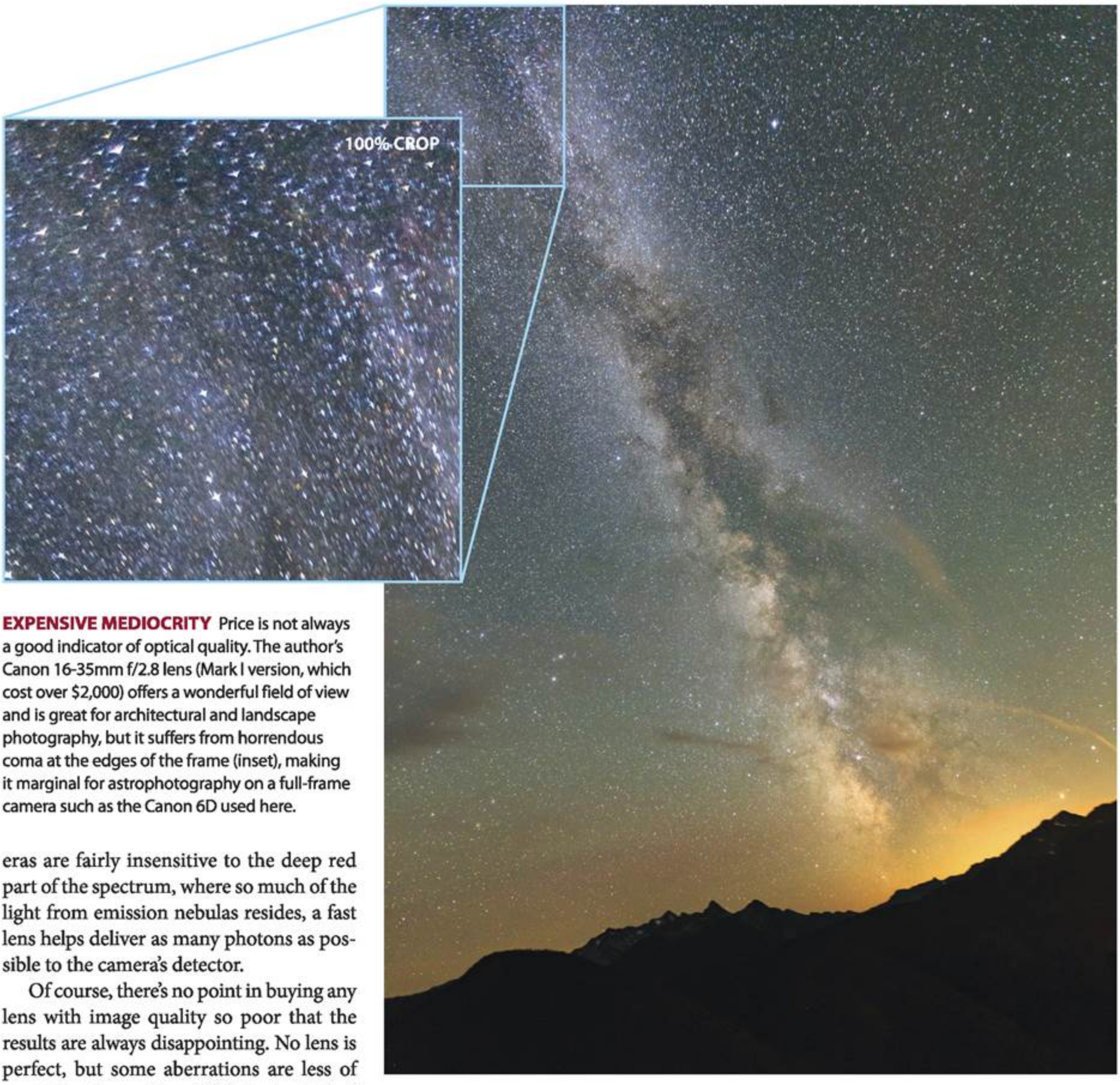
WIDER THAN WIDE A fish-eye lens affords the widest possible view of the night sky, capturing the dramatic sweep of the Milky Way. The Canon 15mm fish-eye used for this photo offers a 180-degree diagonal field of view when mounted on a full-frame camera, such as the Canon 6D. The camera was set to ISO 3200 with the lens wide open at f/2.8. An iOptron SkyTracker mount was used to prevent the stars from trailing during the 2-minute exposure.

SPEED, QUALITY, PRICE: Pick two. You've probably heard some version of the above phrase if you've ever hired a contractor or had a mechanic work on your car. Basically, it's a variation of the familiar adage "you can't have it all." And yet when it comes to selecting lenses for astrophotography, you really can have it all—but only if you choose carefully.

BALANCING FACTORS

In astrophotography, optical speed is the single most important factor. A "fast" lens is one with a low f-stop number, which is simply the ratio between its focal length and aperture. For example, a 28mm lens with an aperture of 10mm would be an f/2.8 optic. Your digital camera probably came with an inexpensive "kit" zoom lens with an f-ratio that varies from f/3.5 to f/5.6. That's fine for general use, but if you're looking to up your astrophoto game, you'll need to consider a lens with an opening of f/2.8 or larger.

The lower the f-stop number, the shorter the exposure you'll need to record dim objects. Keeping exposure times short is essential if you want to use a fixed tripod and avoid star trails. But such a lens has important benefits even when your camera is mounted on a tracking platform or an equatorial mount. Generally, the longer the exposure, the more likely you're going to get pictures that show errors from imprecise polar alignment or slop in the mount's gears and motors. And since digital cam-



EXPENSIVE MEDIOCRITY Price is not always a good indicator of optical quality. The author's Canon 16-35mm f/2.8 lens (Mark I version, which cost over $2,000) offers a wonderful field of view and is great for architectural and landscape photography, but it suffers from horrendous coma at the edges of the frame (inset), making it marginal for astrophotography on a full-frame camera such as the Canon 6D used here.

eras are fairly insensitive to the deep red part of the spectrum, where so much of the light from emission nebulas resides, a fast lens helps deliver as many photons as possible to the camera's detector.

Of course, there's no point in buying any lens with image quality so poor that the results are always disappointing. No lens is perfect, but some aberrations are less of a problem than others. With just a click of the mouse, image-editing software, such as Adobe Lightroom or Photoshop, can correct for vignetting, barrel and pincushion distortion and even mild chromatic aberration. As long as a lens doesn't exhibit severe coma (where stars are stretched into comet-like streaks at the edges of the frame) or field curvature (which prevents the entire image from coming to focus at once), it'll perform reasonably well for shooting the night sky. If your lens does show these kinds of aberrations, try stopping it down from wide open. You'll get improved star images but at the expense of longer exposures.

Unfortunately, good, fast lenses aren't cheap. To avoid breaking the bank, you'll need to choose the features that matter most for astrophotography. Auto-focus, image stabilization and auto-aperture are all great for daytime photography, but you'll end up turning them off when photographing the stars. You can save money by choosing a lens without these features. In addition, significant cost savings can be had by avoiding zoom lenses in favour of "prime" lenses that have a single fixed focal length. Fast zooms are among the priciest lenses on the market! If you're willing to keep things basic, you'll discover there's a wide selection of excellent models at a reasonable cost.

FOCAL-LENGTH CHOICES

The ideal focal length for astrophotography depends entirely on what you want to image. A constellation portrait requires a much different setup than a close-up of a globular cluster. But if you're purchasing your first astrophotography lens, I recommend choosing an ultrawide unit.

With lenses in the 8-to-16mm range, you can capture big swaths of the night sky, such as the majestic arch of the Milky Way, while still including some of the foreground landscape for added visual interest. These focal lengths also allow you to make long exposures without a tracking mount before

FAMILY PORTRAIT A couple of the author's favourite lenses for wide-field astrophotography are shown here: the Canon 15mm f/2.8 fish-eye, at left, and the 10-22mm wide-angle zoom, centre. Another favourite is the 50mm f/1.4 mounted on his astro-modified Canon EOS 60D camera, right.

star trailing becomes apparent. Brands such as Samyang and Rokinon offer a number of relatively inexpensive ultrawide prime lenses that fit a variety of popular cameras.

Although fish-eye lenses are highly specialized, don't rule them out. One of my favourites is a discontinued Canon 15mm model that I picked up used for a good price. Admittedly, it suffers from some pretty severe coma at the edges of the field, but that's a defect I'm willing to live with to achieve an all-encompassing perspective.

If your budget permits additional purchases, I'd opt for a wide-angle lens in the 16-to-28mm range. These slightly longer focal lengths still allow you to include some of the horizon as well as large areas of the night sky—especially when shooting in "portrait" orientation. Note, however, that while these focal lengths can yield untrailed stars when used on a fixed tripod, longer exposures will require a tracking platform or an equatorial mount.

Keep in mind that if your camera has an APS-C-sized sensor, you'll need to do a little math to find lenses that match the ones I recommend. Simply divide the focal length you want by the crop factor of your camera. The 1.6× crop factor of the sensor in my Canon 60D, for example, means that a 10mm lens will cover the same field of view that a 16mm model provides on my full-frame Canon 6D. For cropped Nikon DSLRs, the conversion factor is 1.5×.

Obviously, longer-focal-length lenses are extremely useful for imaging specific deep-sky objects, but the options described here are the best place to begin. I'll tackle the subject of normal and telephoto lenses in an upcoming column. In the meantime, get shooting with a wide-angle lens. If you have the itch to experiment, try the lens that came with your camera as well. When it comes to speed, quality and price, a so-called kit lens may not be particularly fast or an optical champ, but a lens you already have costs *nothing*—and one out of three ain't bad! ✦

Tony Puerzer is a full-time professional photographer and part-time amateur astronomer living in Nanaimo, British Columbia.

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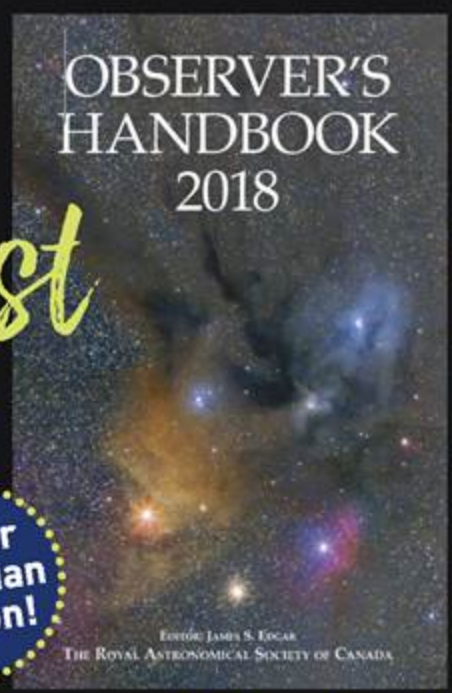

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