

# Become Starry-Eyed



Introduction to  
**Astro-landscape Photography**

By Jürgen M Lobert

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Astro-Landscape photography has become one of the most popular types of photography over the past 20 years.

In contrast to *astro* photography, the deep-space imaging of distant planets, galaxies, gas clouds and nebulae, as done so very well by the Hubble Space Telescope, *astro-landscape* photography is very much Earth-bound and, as the name suggests, always includes a landscape portion and a sky portion. When hearing the term, most people think “Milky Way”, but astro-landscapes include a variety of different things we can capture at night.

The reason for its recent popularity is that digital cameras are much more sensitive and have higher resolution than film ever did, and it is that sensitivity that allows us to easily see and capture the Milky Way, stars, aurora, and more rare effects like airglow and the Zodiacal light. And, of course, features like LiveView and instant replay help, both in focusing, composition and making this easier than with film.

Astro-landscape photography is, however, still an advanced topic and technique, which pushes the

capabilities of equipment and the photographer alike. To do this well, it takes more than the right equipment, but also a few technical approaches to avoid pitfalls that will degrade the outcome. As with all variations of night photography, this is a slow and very methodical type of imaging.

### Equipment

Astro-landscapes are created at night. The lack of light requires a tripod to be used. Exposure times are typically in the 10-30 second range for Milky way and Aurora, and up to an hour for star trails. This also requires a programmable intervalometer or

*Fantasia*, a composite of two images. Aurora: 14mm, 6s, f/4.0 and ISO 800 during nautical twilight.



remote control and manual timing. And most of this being done outdoors and in remote, very dark places, adequate peripheral equipment, clothing and shoe wear are advised.

For lenses, capturing wide views calls for super-wide to wide angles, but medium focal lengths can be used when imaging panoramas, an advanced technique.

For this type of photography, which pushes the limits of the camera, fast lenses, i.e. those with wide apertures of  $f/2.8$  or lower, are required to get the best quality photos. Quality of lens, advanced coatings and especially a lack of coma, an optical aberration, are important and not all expensive lenses perform as well as some more affordable solutions.

This type of photography also uses all manual approaches, hence, auto-focus is not needed and some inexpensive, manual lenses can be found that perform well optically.

### Exposure Settings - Star Trails

There are two general approaches, one for high sensitivity Milky Way, Aurora, meteor and Zodiacal light imaging, and one for star trails.

The technique for **star trail exposures** follows the normal night photo

paradigms, where it is advised to shoot at a low ISO sensitivity of 100-400 to maximize dynamic range, minimize noise and also force longer exposures for longer trails. *Listening to the Stars* below was created from four images at 8 min,  $f/5.6$  ISO 100.



This author strongly cautions against advice given by too many other instructors to simply set the ISO to 6400 and shoot 30 second images. Not only does this make for a very large number of photos to be handled and stacked in post processing, but it also vastly reduces dynamic range and increases noise. Low ISO, longer exposures can produce stunningly smooth photos that can be printed large for gallery exhibition.

The above technique to shoot individual images at around ISO 400,  $f/5.6$  and 4 minutes (the author's favorite sweet spot) has a number of advantages. The most important one is that each image is optimized for exposure and one can

extend or shorten the star trail to individual liking.

The other approach is to take single exposures. One can easily take a single frame at low ISO (50-100) and an aperture of  $f/6.3-7.1$  that extends for up to an hour in dark locations, or 15 minutes in moonlit settings, as in *Fall at Alabama Hills* below.



### Exposure Settings - Star Points

The second approach for astro-landscape exposure settings is used for the **higher sensitivity photos** to shoot the Milky Way, aurora, star points, meteors, zodiacal light and others.

For this kind of photos, we want to specifically avoid trails from forming and rather capture star points. This means short exposures; with the lack of light and our aperture already wide open, that means increasing the ISO to 1600 or higher.

To determine what exposure times we can use to avoid star trails, the community has created a number of rules of thumb, you will find the rules of 600, 500, 400 and others on the web.

The Rule of 400 suggests that the maximum exposure time to prevent perceptible star trails is calculated by dividing the number 400 by the focal length of the lens:

$$400 / \text{focal length} = \text{exposure time}$$

For a 20 mm lens, for example, this yields  $400/20 \text{ mm} = 20$  seconds exposure time. A super wide lens of 14 mm would yield 28, or a rounded 30 seconds and so forth.

The author has created an [in-depth article](#) to explain the choices and in the end, it comes down to what the photographer wants to do with the image. Posting on social media requires less resolution and a less stringent method for exposure time, but for the more discerning applications such as gallery prints, the [rule of 400](#) is a good approach and can be fine-tuned by using more advanced editing techniques.

For both approaches - star trails or star points - it is advised to shoot [at the lowest possible ISO sensitivity](#) for any given context. That doesn't mean to shoot at ISO 100, but rather that, if

there is a choice between ISO 1600 and 3200, to choose the 1600 setting. Even with the latest camera models, settings higher than ISO 800 will very noticeably degrade images through noise and diminished dynamic range, the latter producing blotchy shadows and unattractive foregrounds.



*Franconia Notch*, a composite of foreground and sky images. Light painting is used for the foreground, the sky shows the north end of the Milky Way, the Andromeda galaxy, Capella, a

meteor and Cassiopeia, the W in the sky. A nice astronomy showcase. Nikon D850, 14 mm, ISO 3200, f/2.8.

One advanced technique to combat foreground noise is to take two images, one at lower ISO, longer time, for the foreground, and a shorter, higher ISO photo for the sky, then combine the two in post processing.

All techniques can use the [High ISO Preview](#), which lets you figure out the correct exposure time for star trail images, or confirm the right choice of exposure time based on the Rule of 400, and also help in fine-tuning the composition.

In contrast to daytime or regular night photography, astro-landscapes do not call for “exposing to the right (ETTR)”, as the outcome would look more like an underexposed daytime image than a night time image, and would force star trails when we want to shoot star points. The paradigm rather changes to an “expose off of the left (EOTL?)” approach, which prevents too much black clipping by pushing the exposure as much as we can, within the limits for exposure time and ISO noise.

## Tips & Tricks

**Camera settings:** the advise is to turn off anything with prefix “auto”, because auto-exposure (program

automatic), auto-focus and auto white balance will not work in the very dark spaces that we need for astro-landscapes. This type of photography needs a completely manual approach.

Also consider turning off the Long Exposure Noise Reduction (LENR), which kicks in on most cameras after a few seconds of exposure time. You can use this for short, high ISO exposures, but for star trails, it would cause gaps in the trail.

**Composition** is as important as it is for any other type of photography. In particular, astro-landscapes have a landscape and a sky portion and it is strongly advised not to let the horizon split the image down the center. The rule of thirds works well here, and consider leading lines, Fibonacci rules and other guidelines.

One other advice is to not let the appearance of the Milky Way - which may overpower you the first times you see and photograph it - also overpower the composition. Vertical images with 80% Milky Way are not very intriguing. Find a good balance between foreground (landscape), middle ground and background (the sky).

Finally, for star trails, this author thinks that they should in most cases be the icing on top, rather than the main

visual feature. In some cases that works, as in the *Full Circle at Ft Jefferson* image below, but in most cases, they add more interest to an image if they are the top third, and with less star trails than your camera can capture at ISO 6400.



Composing an astro-landscape is best done through the view finder, it usually shows more than the LCD screen. [On some cameras, the video LiveView allows you to see a lot](#) when maximizing ISO, exposure time and aperture, but if that doesn't work, the view finder or short images at extreme

ISO can be used to optimize composition.

**Focusing** at night is difficult, because auto-focus doesn't work. You will need to focus by using your LiveView and, for the best results, you absolutely have to focus on the stars. The Milky Way will look unattractive if not made up of very sharp stars.

That also means that the depth of focus at wide open apertures will not allow the close foreground objects to be reasonably sharp. If any close object is included, a focus stack is advised, where a separately focused foreground image is layered with the sky image (as shown on the previous page).

**White balance** is very important here, because the stars actually have beautiful colors, as seen on left, but they only come out if the correct white balance is used. The sky between the stars is what our eyes perceive to be black. Digital cameras see more than we do and space is never black, but should be as close to a neutral grey, the lighter version of black, as possible. Auto- or daytime white balance will render astro landscapes either in yellow/brown or blue, both of which looks very unappealing.

Many people follow the [misleading advise that white balance doesn't](#)

matter if you shoot RAW file format, or that it is purely personal taste what white balance you used.

Both notions are incorrect as explained in the above links. Whatever you do, set your white balance manually so that the image on your LCD looks like what you see in person.

### Urban Star Trails

Natural landscape star trails can have a lot interest and, if done in a single exposure, do actually qualify for the PSA nature category. One of the more unique approaches to star trails is to take them in or over a city. Most people don't bother to look up when roaming around the city, or think that you might actually see stars in a bright city, but it can be done.



ISO is usually low to accommodate the bright lights (also through the maximized dynamic range), an aperture of 5.6 still works well, but exposure times

may become very short, sometimes only 10 seconds long, because of the brighter setting.

The results are very satisfying, though, and guarantee many “how did you do that?” comments on social media. If you can do this over New York City, you can do it anywhere!

### Star Points

Shooting star point photos closely follows the approach of imaging the Milky Way, settings are the same, especially the short exposure times. The only difference being that we shoot away from the Milky Way, which opens up another half of the sky for interesting compositions, often with strong foreground objects that are the focal point, rather than the night sky.



### Light Painting

Light painting can be added to astro-landscapes, but one has to be careful

not to overwhelm the viewer by adding too many points of interest into the same composition. Moderation works well here, unless the photographer purposely wants to push limits. *Red Brick Road to the Milky Way* below adds subtle light to emphasize the path.



### Moonscapes

The moon has special meaning to us and can be captured in a number of ways. Astro-landscapes with the moon not clipping in the highlights need to be done when the moon just comes over the horizon, when the sun has just set. The contrast between sky and moon is low at that point, allowing to capture enough light for the landscape, without the moon being too bright.

Once the moon rises high, the sun is long gone and the contrast becomes too harsh to capture the features in the moon, which is now clipping. Of course, one other technique is to layer a moon image taken with a long lens and very short exposure time into a landscape taken with a wide angle lens.

Composites like that can be very playful and distinctive. And if you wanted to know how long you can expose the moon before it blurs, read [yet another blue entry](#).



An advanced technique is to [capture a continuous moon streak](#) without clipping highlights, an approach that



requires the use of neutral density filters at night, not commonly done, but fun to try.

And, of course, lunar eclipses are a more popular event to photograph, also a technique that is primarily enabled by digital cameras.

### Meteors

Meteors, small pieces of intergalactic debris, create bright streaks when entering our atmosphere. Whereas these can be seen at any time of year, there are events called meteor showers, which have specific dates.



Capturing meteors in a photo requires dark skies, as the moon will wash out all but the very brightest events.

Settings are similar as for Milky Way: high ISO, optimized to prevent star trails in most cases. You simply set up your composition, focus on the stars, then let the camera click away at 30s exposure time all night.

In post processing, find and select the photos that have a meteor in them and you can layer them into one composition to make it look like they all came out of the radiant point, the origin of the debris impact in the sky.

### Zodiacal Light

The Zodiacal Light is sunlight scattered by an intergalactic dust field. Because of the incident angle, this light can only be observed twice a year, in March looking west 1-2 hours after sunset, and in October looking east, 1-2 hours before sunrise.



The ZL is brighter than the Milky Way, and shaped like a triangle (above seen on the left, with Venus rising, MW on

the right). Theoretically, it goes across most of the sky, but to see it that way would require a very dark location without nearby cities.

### Airglow

An effect similar to the aurora, airglow is an interaction with charged particles coming from the sun, with the atmosphere above us. In contrast to the aurora, though, airglow does not have vertical structures and often is only a diffuse, green or red glow that we cannot see well, but cameras pick up very nicely. The other difference to aurora is that airglow can be all around us, not just looking north. It is the very strong green color in the photo below, taken in Grand Teton National Park.



### Aurora

Perhaps the most spectacular natural phenomenon in the night sky is the aurora, called Borealis in the north, Australis in the southern hemisphere. As with airglow, charged particles from the sun interact with the upper layers

of our atmosphere to create very colorful curtains that appear very close, but are 200 miles above.

To best capture this, shoot at ISO 1600-3200, wide open aperture (except if seen during twilight), focus on the stars and experiment with exposure times between 4 and 20 seconds. A rapidly evolving and undulating aurora calls for shorter times, a slow moving aurora, or an averaged motion, is nicely captured with 15-30 seconds.



*Opal Skies*, Iceland. 15 mm, f/2.8, ISO 3200, 8 s. For this shot, I set up a second camera with a 15mm fisheye and let it click away the entire night. The fisheye allowed me to capture as much of the sky as possible, while I roamed around with my first camera to take more deliberately composed images.



An astro-landscape with aurora and a setting 9% moon. 24mm, ISO 4500, f/2.8, 6s.

### Where and when to shoot?

For star trails: anytime, anywhere. For Milky Way, Zodiacal light and a lot of other faint events, you will need to search for dark locations. Urban areas allow you to capture stars, but you won't see much of the Milky Way.

The best way to find dark spaces is to use apps or websites dedicated to that purpose, see resources below for some links.

To predict when the Milky Way is where in the sky, an app names Stellarium is highly recommended, it runs on all platforms. You can simulate the night sky in any location and any date or time to see how it looks like. In general, in the northern hemisphere, Milky Way season is May through September, when it is most convenient to see. It can be seen at other times, but the core of our galaxy doesn't come over the horizon much in the winter.

To see aurora overhead, you need to be around 55-65° of latitude (north or south), and it needs to be dark, hence, the summer in each hemisphere is not suitable, as it never gets really dark. Best times for the northern hemisphere are September through April, but keep weather in mind, as you will also need clear skies.



## Resources & Links

### Books & eBooks

- Lance Keimig, Night Photography & Light Painting: Finding Your Way in the Dark.
- Royce Bair, Into the Night
- Grant Collier, Collier's Guide to Night Photography.
- David Kingham, Nightscapes

### Websites

- <http://darksitefinder.com>
- <http://ClearDarkSky.com/>
- Jürgen's Patreon.
- Many Facebook and Instagram groups, search for "astrophotography" (which may include deep space), or "astro-landscapes"

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*photography, light painting and astro-landscapes as well as infrared and urban exploration imagery. Jürgen finds profound peace in roaming the nights and capturing the serenity of strange places and the element of time. He is a club officer of the Boston Camera Club and the founder and organizer of the Greater Boston Night Photographers Meetup group. Jürgen teaches workshops and he organizes some 40 photo excursions per year. Jürgen is also a lecturer, instructor and judge for international camera clubs and conferences and he is a Master Member of the New England Camera Club Council (MNEC).*

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