

About Aurora Photography – a short guide

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Introduction

Photographing auroras (northern lights) differs from normal daytime photography in many ways:

- auroras are dim compared with a daylight scene
- auroras can fill most of the sky
- auroras move sometimes very rapidly, and can get blurred with very long exposures
- you have to work in dark
- the temperature can be very low, especially in midwinter

This sets special requirements for both the equipment and technique. In this guide I will give instructions to a newcomer in aurora photography.

Practise!

It is said that when using telescope or photographing in dark, you lose 50 points from your IQ. I do not know of you, but I have so little left after losing those 50 points, that I have to practice well in advance to be ready if I want success when the opportunity comes. I strongly recommend practising to you too. Read this guide with your camera in hand, find and use all the settings you will need and go outside to make exposures of the night sky (probably there will not be auroras, but the procedure is the same as in aurora photography). It is too late to fumble with your camera when the sky is in flames with auroras! Repeat the exercise in several nights and make a note card of the camera settings and other important things to remember and keep it with your camera.

The Equipment

Good news: with modern digital cameras, you can get better aurora photographs than with an old type camera using film. Bad news: a compact digital camera is not good for this type of photography, the most basic “point and shoot” (PS) cameras being useless under the night sky.

The camera must have at least the following features to make aurora photography possible with it:

- manual aperture and exposure settings
- slowest shutter speed 10 s or longer
- manual focusing
- tripod socket

Preferable features:

- maximum lens aperture f:2.8 or better. The smaller the number, the larger the aperture: f:2 is better than f:2.8. A f:3.5 lens will do too, but you need longer exposures or higher ISO.
- the shortest zoom focal length 28 mm or shorter (35 mm equivalent*). You need a wide angle (short focal length) lens for auroras.
- RAW file format. RAW is an unprocessed format containing all the information photons leave on the sensor. It gives the best result, but you have to process it in a suitable program. Many cameras can save the image in RAW and JPG simultaneously.

Most so-called high-end compacts and some common compacts have these features.

* Digital camera sensors vary in size, and thus the focal length of the lens tells nothing of the viewing angle. The 35 mm equivalent focal length is the focal length in a full frame (24x36 mm²) camera that gives the same viewing angle as the actual lens.

The larger the sensor, the better. Larger sensor means larger pixels with larger photon-collecting area per pixel and less noise. For the same reason, less pixels in a sensor of same size, other factors being equal, means less noise. More megapixels do not necessarily make the camera better for aurora photography!

The best camera for aurora photography is a digital single lens reflex (DSLR) or mirrorless system camera, preferably with a full-frame (24x36 mm²) sensor, equipped with a large-aperture wide-angle or even a fish-eye (180°) lens. An APS-C (about 16x23mm²) or micro four-thirds size sensor (13x17 mm²) will do good job too. These cameras have all the features needed for aurora photography, and they are often easier to use in the dark than compact cameras.

Live view (it shows the image on the monitor before the exposure) with enough magnification is great for focusing. Without it, you have to find the right focus by trial and error. Auto focus do not work in dark, and the infinity setting of most lenses is not exact, a property meant to allow the effect of varying temperature on the infinity focus.

If your camera has an integrated flash, set it off. A flash will not illuminate the sky, but often there are very small ice crystals in the air, and they are seen in a flash photograph as white spots in the image. A flash in dark causes temporary blindness and great irritation in your company.

If all this sounds too technical, do some experiments with your camera and photograph the sky with your camera using the largest aperture and exposure times in the range of 5 – 20 s to find the infinity focus and then look at the resulting images on your computer monitor to find the noise and possible focusing errors. You can do the experiments under a moderately light-polluted sky. The scattered city light on the sky is about as bright as auroras. If you can't get a decent photo with your camera, it will not work for auroras.

Besides the camera, you will need a good tripod with ball head; a pan and tilt head is not so swift to use as a ball head. The tripod weight is an issue when traveling, but here the quality is more important than weight because you will use a wide-angle and self-timer. In loose snow, some kind of snowshoes is needed for the tripod, or you have to tramp the snow hard. A cable release is not needed, if your camera can expose up to 20 – 30 s without pressing the shutter release all the time.

Most aurora nights are cold, so you will need warm clothing. Warm boots are important when standing long periods in the snow, as well as warm headgear. Thin gloves completed with mittens are best to keep your hands warm without freezing your fingers when handling the camera. Check that you can push the camera buttons with the gloves on. **A plastic bag for the camera is a necessity. Put your camera in the bag before going inside after a shooting session, so the cold camera will not freeze all over with the moisture in the inside air.** This is important: the condensation and ice can damage your camera, and the camera will be useless anyway until it is dry again. Wait until the camera is warm before taking it out of the plastic bag. If you take the cold camera outside again, take it out of the bag only after leaving the room.

A headlamp frees your hands and is not easily lost in the dark. Preferably, it should have a setting for red light to save your dark adaptation. Looking at the camera monitor will spoil your night vision, so avoid it and if you have to look at the monitor, keep one eye closed to have one adapted eye left.

A modern camera with dead battery is useless. When cooling, a battery loses a lot of capacity, so it is very important to **charge the battery before going under the auroras.** A loaded spare battery is a good backup.

Analog camera

There are many analog SLRs collecting dust in cupboards. With a wide-angle lens, they are useful for aurora photography. Load the camera with sensitive color negative or daylight balanced slide film (ISO 400 or higher; I have found that ISO 800 color negative film gives decent results). Set the shutter at B (Bulb) and the aperture fully open (smallest aperture number), focus at infinity, use a tripod, cable release, and off you go.

A fully mechanical camera is best for aurora photography. Mechanical cameras do not use a battery that can die in the cold or have indicator lights which can leak light on the film during the long exposure. Make sure the camera works!

When leaving film to the laboratory, tell that you want the film uncut; otherwise, the automatic film cutter can cut frames in the middle, because it does not see the frame border clearly in the almost clear negative. The best prints from the negatives you get by scanning the negatives in a film scanner and processing the scanned image in computer. When ordering prints from aurora photo files, ask the prints without corrections or the automat will probably make them middle gray.

The problem with analog cameras is that you cannot check the result immediately. You can photograph a whole cassette with the lens cap on, wrongly focused or exposed and find your error first after the film is developed.

Best site for aurora photography

is the darkest place you can find. Even a small village produces light pollution that makes the sky ugly green or brown, and a single city light can spoil your night vision. Ideally, the site has free horizon in all directions, but the northern horizon is the most important. In the middle of a frozen lake or some other field, at lakeshore or on a hill you have the best view to see and photograph auroras, let them be anywhere in the sky. At lakeshore you can get nice reflections in the calm water, if the lake is not frozen. Note: especially in the northern latitudes, the auroras can be overhead or even in the south.

If you want to have a beautiful landscape in the image, you can use trees or a not too bright-lit building as a prop, but usually artificially lighted buildings are overexposed, if the auroras come out right. At my summerhouse, I have made two exposures from the same position, one for the sky with the lights off, and the other, shorter one, for the house with lights on. It is easy to combine these two exposures in computer.

Camera settings

The white balance setting can be Auto or Daylight, but a light-polluted sky can call Tungsten setting. Check your first exposure for color and correct the WB setting if needed. In RAW file mode, you can set the white balance afterwards; in JPG, only limited changes are possible without spoiling the image. RAW, when correctly processed, gives less noise than JPG and the color depth is much greater in 16 bits per channel RAW images compared with 8 bits per channel JPGs. Use RAW if your camera has it, or better still, RAW+JPG.

Choose manual shutter speed around 10 s and the largest aperture (smallest aperture number), focus manually at infinity and select ISO 400 – 800; a camera with larger sensor will tolerate more – make experiments with your camera to find the highest ISO setting giving still tolerable noise. Photograph the sky, use 10 - 20 s exposures in these experiments, and check the results in computer monitor.

I have one high-end compact that does not focus manually at infinity despite saying so, and I had to find the right focus by trial and error. Always check your first exposures for focusing by magnifying the images on the camera monitor as much as possible. If your camera has live-view, you can check the focusing on the monitor in real time. Magnify the live-view as much as possible and focus on a bright star. When the focus is right, fasten the focusing ring of a DSLR lens with tape. Note: using tape on a compact camera lens does not help for keeping the right focus, and it can damage the camera.

Use the 2 sec self-timer to avoid shaking the camera when triggering the shutter. In most DSLR cameras, the mirror usually springs up immediately when you pull the trigger, and

the movement of the mirror does not shake the camera when the exposure begins 2 sec later.

If your camera has an integrated electronic spirit level, use it to get the camera horizontal. A small separate spirit level will do too. It is difficult to see the dark horizon against the darkish sky in the finder.

Under the flaming sky

When someone shouts “Auroras!” you take your camera bag, tripod and clothes you had ready and so you are in no time in the pre-selected site. Remember, often the best aurora show does not last long, so you must be in stand-by. It is wise to have the camera settings ready too, and have the note card for settings in the bag.

Erect the tripod, attach the camera and set a 10 s manual exposure, focus at infinity and set the highest usable ISO. Set the shortest focal length and select a WB setting (and RAW, if possible) you think is suitable and focus the camera, set 2 s self-timer and level the camera sideways with a spirit level if you have one and turn it upwards so, that the horizon is straight and in the lowest part of the image. Take the image and check the exposure, focusing and color on the monitor. Remember, that in darkness the image on the monitor seems much brighter than it really is. Change the settings if needed and take another picture until the result satisfies you. All this checking takes some time, but with wrong settings, you will get unsuccessful pictures or none at all. The more routine you have, the faster you are ready with preparations.

Use red light in your headlamp, and switch it off when exposing! With a wide-angle lens and the headlamp on, it is very probable to get flare or streaks of light on your or some other's image. Safest way is to learn to work without the lamp.

Then shoot until the show is over or the memory card is full (you remembered to have a spare card or two with you?) Do not be stingy with pixels. They are free and you can delete the failures.

If the lens begins fogging or the camera begins to freeze, attach the lens cover on, switch off the camera and put it under your coat until it warms up. Wiping a fogged lens does not help, the moisture will condense on it again, because its temperature is under dew point.

Remember to put the camera in the plastic bag before going inside and let it warm up slowly. Open the bag only when camera is at about the room temperature.

Conclusion

A modern camera is mostly automatic, made for normal photography in daylight or using flash. It is not made for aurora photography, and the automatic functions do not work. So you have to make the settings manually, and you need training for this. Do it or leave

photographing to others and admire the show. If you do not master your camera, you will lose both the show and photos. Anyway, photos never are the same as the real thing.

Some examples

All focal lengths are converted into 35 mm equivalent focal lengths.



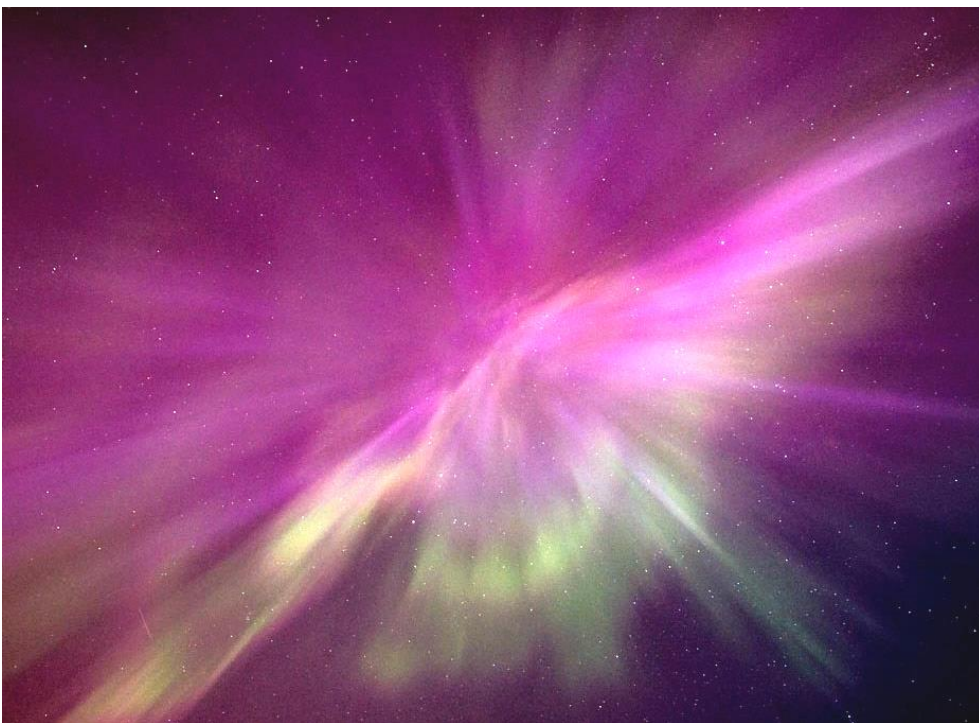
5 Mp compact camera (from 2002) 28 mm f:2.8 21 sec ISO 400.



SLR, 24 mm f:2.8 20 sec, ISO 1600 slide film, scanned.



SLR, 17 mm f:3.5 15 sec, ISO 800 color negative film, scanned.



APS-C DSLR 21 mm f:2.8 5sec, ISO 1600



APS-C DSLR, 180° fish-eye lens f:3.5 20sec, ISO 3200.



APS-C DSLR 21 mm f:4 6 sec, ISO 1600