



# A beginner's guide to Astrophotography

As UK Astronomy's resident Astro Photographer Wil Cheung has written a beginner's guide to help you with night time photography. If you would like to know more about Wil please visit <http://www.wilphotography.co.uk>

He has written this guide for anyone who is using a camera with the ability to manipulate the camera settings in particular; the ISO, aperture (f) and shutter speed.

The best time to use this guide to take night photos is when the interference of Moon light is out of the way, just like when you go stargazing. Have a check of the lunar calendar and work out the best time to go so the Moon doesn't wash things out.

## Scout your location

If you plan to take photos at night at a certain location for the first time, then I highly recommend scouting the location during the daytime. At night it can be far more difficult to navigate and to find a safe and secure spot for your shots. Using apps like Stellarium or Sun surveyor can help you 'fast forward' time and see where certain objects like the Moon or the Milky way rise for your shot to help with composition.

## Tripod

One of the main objectives is to be able to take sharp photos, so a tripod is in nearly all cases mandatory to reduce the likelihood of camera shake due to being handheld. I recommend considering investing in a good one for stability as with cameras and lenses good ones aren't cheap.

## The 500 Astrophotography rule

Due to the earth's rotation the skies 'move' and if you take a long exposure photo the stars will appear with trails, so we have a way of working out the maximum exposure time without this happening. This is called the 500 Astrophotography rule. It's simple to work out and it's 500 divided by the focal length of your lens at the moment you take the photo. For example: say you're using a Canon 5D III and a 50mm lens, then the 500 rule would mean you could take a 10 second photo before star trails occur ( $500/50 = 10$  seconds).

Be mindful that if you are using a telephoto lens then you would need to calculate depending on what FL you are using, e.g. 24-70 but using 70mm =  $500/70 = 7$  seconds. There is another thing to consider, if you're using a crop camera like a Nikon D3500 or a 750D Canon you need to apply the crop factor in to calculate your shutter speed limit. Nikon has a 1.5 factor and Canon 1.6 so a 50mm lens becomes 75mm for Nikon and 80mm for Canon.

*Phew, now that is the difficult bit out the way.*

## A photo of the night sky (General)

So now we have worked out the limits to shutter speed, lets go through the first steps to actually taking a photo of the night skies. Placing your camera onto a tripod, remember to turn off image stabiliser, and take your lens off Auto Focus and onto manual focus. As your camera will struggle to autofocus on stars. We now want to go on live view on your camera. Find a bright star, zoom in onto it and adjust your focus ring on your lens until the star is pinpoint. If you don't have a suitable bright star and have a light on the horizon etc you can use that. With your camera now focused to infinity, you can now play around with the exposure triangle to see what the best settings are for what you're taking a photo of.

## ISO Settings

Every camera has a limit on how high your ISO can be before you start to introduce significant noise on your capture. I usually would suggest newer cameras can reach 3200 comfortably but try and keep it around 800-1600.

## Aperture Settings

Ideally you want your aperture as wide as possible to let in as much light, however nowadays there are some really good but expensive lenses which may not require you so open your lens so wide. As a general rule the widest is best to enable you to keep the exposure time lower as well as your ISO settings. Prime lenses are ideal as they will usually be as wide as f1.8 or even f1.4.

## Timer delay

Your exposure settings are now ready, your camera is focused. Find the option to have a 2 second timer on your shots so that when you press the release button you can move away from the camera and reduce camera shake again, adjust the settings accordingly with your test shots.

## Star Trails

So, you want to take a photo of Star trails, the ones where you can see the movement of the stars in the sky. Do you just set your exposure time to as long as possible? Unfortunately, this would never be the case as the challenge would be you would likely end up picking up stray light and therefore your photo would end up being quite bright. So, to be able to create star trails photos you would need to set your camera up to get the right settings on a tripod. Use an external or if your camera has an internal intervalometer and then take many exposures usually at least 90 mins worth. Then using software like deep sky stacker you can merge your photos together to create one final image.

## Milky way

The Milky way is great to take a photo of but you must be aware of when the best time to try is. You need to take into account the lunar phase, you also have to be aware that it moves depending on the season. If your after the galactic core it isn't always visible. You often see these stunning images taken in the UK of the core, you then go out in December but your milky way isn't as stunning?! It's not because of your camera, its because the core simply isn't above the horizon. In the UK the best months are April to May in the predawn hours, and end of July to September in the evenings. Try the same settings as used in the general photos section mentioned earlier.

## Shooting Stars

Shooting Stars are fun to capture, the main tool you will need alongside your camera is an intervalometer. The key to shooting stars is setting your camera to take a long exposure of approximately 15 seconds or as long as your light pollution conditions allow it. An intervalometer will mean that you can set up your camera automatically to keep taking shots without having to manually click. You can set how many shots you want and the delay between each shot. I usually just set it at 15 seconds with a 1 second delay. At the end of the session typically 1 or 2 hours or even more, I then stop the camera and look through my captures in anticipation that it managed to catch some. Unfortunately nowadays there are so many satellites in the sky that when sorting through you photos be sure to check the before and after frames of a likely candidate to see if it is actually a satellite. They will still be visible in other frames whereas a shooting star most likely wont as they usually only appear for a split second.

But most of all Astrophotography is lots of fun, so go out play around and enjoy the night sky.



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