

ASTROPHOTOGRAPHY GUIDE



IMAGE CREDIT: ISS - EOROPAIDH

You may think taking photos of the wonders of our night sky is difficult but, thanks to advances in technology, it's never been easier.

Anyone can capture the night sky, with or without a telescope, and this guide will explain how you can do so by using the following:

- A digital SLR (DSLR) camera
- A compact camera
- A smartphone
- A webcam

Taking images of the night sky is really great fun and you don't need expensive equipment to do so. All you need is one of the items listed above and you can take fantastic images from the comfort of your own back garden.

IMAGING WITHOUT A TELESCOPE

This method is best for when you want to take images of large parts of the sky or skylscapes.

You can also use this method if you want to take photos of satellites passing overhead, such as the International Space Station (ISS), or meteors (shooting stars). In 2012, there are meteor showers visible from the UK almost every month from April, including the Lyrid, Eta Aquarid, Delta Aquarid, Perseid, Draconid, Orionid, Leonid, and Geminid meteor showers.

To image without a telescope you will need:

- A tripod
- A DSLR, compact camera or smartphone

Stars and other objects in the night sky are quite faint so you will need to take 'long exposure' photographs, where the camera shutter remains open for several seconds, to capture enough light to create an image.

Taking images with manual settings:

- To avoid camera shake and any adverse effects on your photo, you should place your camera on a tripod to stabilise it
- Every camera is different, so you may need to experiment with the settings, but as a rule of thumb, set your camera on a relatively high ISO value (this increases the camera's sensitivity to light) and set your exposure time to 10 to 30 seconds
- The longer the exposure, the more you will see trails or streaks from the stars in your image, even over a period of 10 to 20 seconds. This is because the Earth is rotating, which makes the stars in the sky appear to move. This rotation is picked up by the camera
- If you want to take longer exposures without the star trails, you will need to attach your camera to a special kind of mounting that tracks this rotation of the Earth
- If you only have a lightweight tripod, just pressing the shutter button might jog the camera, which will affect the images. To avoid this use your camera's timer, a remote shutter release cable or place a piece of black card in front of the lens and press the shutter. Wait a few seconds and move the card. This stops camera shake affecting the images
- Take multiple pictures with different settings of the same part of the sky; experimenting this way can give good results and leads to a greater understanding of your camera's capabilities
- If you want to attempt imaging without a telescope using a smartphone you will need to download a long exposure app for the device you use and buy a bracket for use with a tripod

Please note: Long exposure photography is not possible on some cheaper compact cameras; you will need to check your camera's specifications to see if it has this feature.

IMAGING WITH A TELESCOPE

If you want to take photographs of specific things such as the Moon, planets and deep sky objects, such as galaxies and nebulae, you will need to image through a telescope. Basically you are turning your telescope into a giant lens. Don't forget if you are attempting solar photography that you must not look at the Sun either directly or through equipment. For more detail, read our BBC Stargazing LIVE Guide to Viewing the Sun Safely.

There are two methods associated with imaging through a telescope:

- Afocal photography – Simply hold the camera to the eyepiece of a telescope (or binoculars) and take a picture of whatever is in the field of view
- Directly attach a camera to the telescope using special adapters

Afocal photography:

This method is incredibly simple and can be done with any camera and telescope; you can even purchase a simple afocal camera and smartphone brackets that let you take images without holding the camera with your hands. It is especially suited to smartphone and compact cameras and is great for imaging three of the brightest objects in our sky – Saturn, Jupiter and the Moon.

If you are using a bracket to hold the camera in place, you can do long exposures using the afocal method. Afocal astrophotography is very simple, but it can give amazing and quick results. Use the live view on your camera to focus the image on the screen of your camera or smartphone.

If you're looking to take photos of anything fainter than these objects, you will need to use a motor-driven telescope and the process will require much greater time and care to achieve good results.

Directly attaching a camera to a telescope:

Directly attaching a camera to a telescope can give very impressive results and can take your astro images to the next level. With a DSLR camera, this is achieved using a T-adaptor which are available from most good camera shops or specialist telescope retailers.

This method can allow you to move from taking a shot of the Moon in 30 seconds to a 30 minute or 30 hour (if you use stacking software) process, resulting in detailed layered exposures of nebulae or galaxies.



THE MOON IN FAIRY DUST – SHAURYASHAURYA



NGC2244 IN ROSETTE NEBULA – PETER LOPEZ

As well as a telescope, you will need:

- A webcam – for imaging bright objects, such as the Moon and planets
- DSLR camera – for high detail deep sky imaging
- Laptop computer

Webcam imaging:

Many amateur astronomers photograph the Moon and planets using webcams. Using special adapters, these fit in place of the telescope's eyepiece and give a video stream of the object, effectively taking hundreds or thousands of images in a short time. A few specific models are well suited to astro-imaging as they work in low-light conditions, so ask a reputable astronomy supplier or astrophotographer for help in buying one. You can expect to pay from £50 up to £140 for a starter webcam. A cheaper monochromatic camera will require an infrared filter for best results.

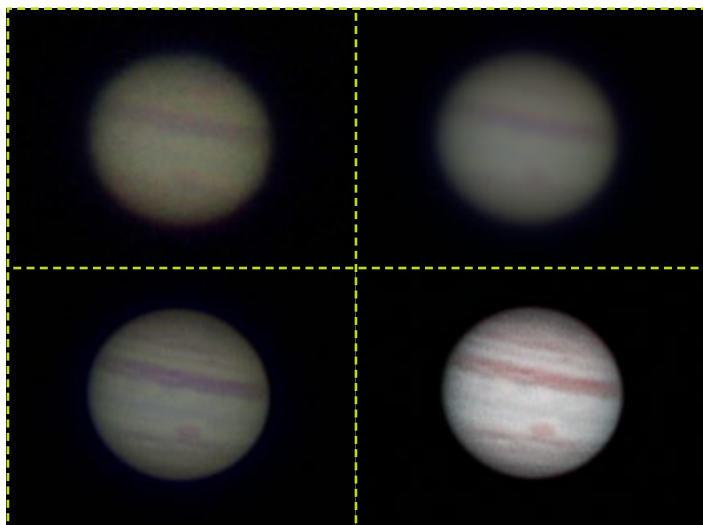
- The webcam is connected via its cable to a laptop. Using your webcam software, the object to be imaged is brought into focus and then with free image-capture software, a short 20 or 30 second video of the object is taken
- Once you have your video, you can go indoors and process it using 'image stacking software' which is available to download free from the internet
- This software takes each frame of your video and aligns and stacks them, cleverly removing blurry, turbulent frames and renders a crisp, sharp, still image of the object you shot earlier
- This method gives fantastic results for lunar and planetary images

Deep sky imaging with a DSLR:

If using a T-adapter, do check with your telescope supplier first that your telescope has the focusing range to allow you to focus a camera attached using this method.

- Due to the sensitive nature of a DSLR, very long exposures can be achieved with cameras attached to telescopes that have mounts that track the movement of the stars
- These separate images can then be stacked, combined and manipulated in photographic software to give breathtaking deep sky vistas of nebulae and galaxies. Many of these images show incredible detail, beauty and depth of colour

An individual image can take many long exposures and many hours of processing to get the desired results. Astrophotography is basically about trying to collect and work with every single photon of light, from objects millions of light years away sometimes. You may not even see the object with your naked eye visually through a telescope because it is so faint but the photographic results can be amazing.



REGISTAX: MAKING THE INVISIBLE VISIBLE - MARK KILNER

IMAGE THE SKY FROM YOUR POCKET

Many of us own a DSLR or compact camera, but many others own a smartphone with a built-in camera.

This means more and more of us are able to image the night sky, right out of our pockets, as well as through more technical methods such as the use of webcams and powerful cameras attached to guided telescopes.

You can experiment with different targets and techniques using your phone, from imaging the Moon and International Space Station, to creating amazing star trails and even time-lapse photography of aurorae and noctilucent clouds, polar mesospheric clouds in the upper atmosphere, visible in a deep twilight. All you need to do is experiment and see what happens.



NOCTILUCENT CLOUDS AND THE TELESCOPE BOY - MLWATS

Download long exposure apps for your smartphone, get your cameras and telescopes out and have a go. It's not as difficult as it sounds and the results can be rewarding, amazing and fun.

Why not share your images with other professionals and amateurs in the BBC Sky at Night and Stargazing LIVE Flickr group? There's a great community of astrophotographers sharing tips so get involved in the online discussions. And if you're seeking face-to-face advice, visit your local astronomical society and find out their tricks for getting great astro images.

To see Mark Thompson trying his hand at astrophotography, check out the How-To Videos at bbc.co.uk/stargazing

All astrophotography sourced at the BBC Sky at Night with Stargazing LIVE Flickr group

Credit: Guide by Adrian West, VirtualAstro