

Astrophotography

A BRIEF INTRODUCTION TO IMAGING THE NIGHT SKIES BY CHRIS SARA

FOREWORD

If you want to share your passion for astronomy, then it is hard to argue against photography as being the best way to do it. Without the ability to capture what you see you are left to share your knowledge of the stars using only words. Words are very powerful and moving but even Shakespeare would struggle to capture the beauty of a deep space nebula in prose. There is plenty of room to wax lyrical about the stars, and what light may shine through yonder window, the east and the sun and moon that pales etc etc etc, but give me a nice picture in this instance.

The learning curve can be pretty steep when you delve deep into the techniques of astrophotography, but, you can keep it simple in the beginning. My first attempts were hastily captured images of Saturn and Jupiter using my phone held to the eyepiece of the telescope. They were nothing much in terms of photography but they demonstrated that it was possible to do more than look and remember.

I now have a reasonable range of equipment, much of which I'm still not sure how to utilise properly, but that doesn't matter because I will learn, and over time, I will become the photographer I want to be.

Be patient and persistent. Define what you want to be as a photographer, and above all, have fun with it, as you should with all astronomy.

Introduction

If you are keen to include astrophotography to your astronomy toolbox then there are many great books and online resources to get you where you want to go. I have only started my learning and can already see the steep learning curve required to get from basic images to magnificent deep space images dripping in detail and colour.

When I first setup my telescope I wanted to capture some images that were quick and easy. By simply holding my phone to the eyepiece I was able to capture the following images.



Here are images of the full Moon, Jupiter and its 4 Galilean moons, and Saturn with its rings.

I was very happy with what I had captured, and being only day one, I was sure I could get much better with a little practise

Getting Started

This is my simple guide to astrophotography for beginners. As with all things, knowing what you want to achieve is essential. I knew I wanted to be very good at astrophotography but initially it was about simple before fancy. I don't want to spend the time I should be looking at the stars, in front of a screen processing images of them, but I do want worthwhile images that show off my passion for astronomy.

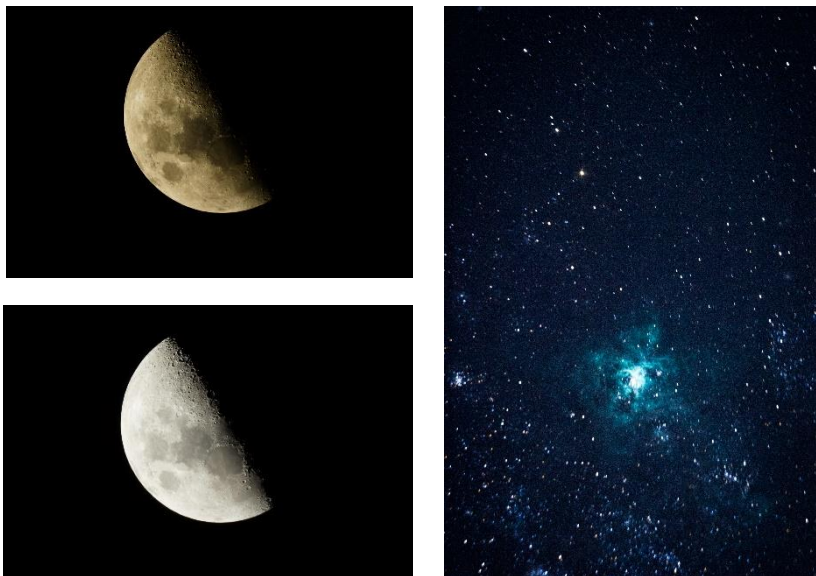
What kind of images to you want to take?

This is an important question because it will dictate the setup you require. You will already have a few things to get you started so utilise those to start and then grow from there. I'm very interested in creating some nice art, however, do I have the patience it requires to capture hours of images and then spend even more hours processing them to get that "great" image? At this time, I kind of don't. I want nice images that are reasonably quick to capture and can be done without too much playing around.

Utilising what you have

Most people have a phone with a camera so that is a good starting point. The images above show what can be done with a phone and telescope. If you are keen on astronomy you will want to get a telescope so playing with that setup is ideal. Holding still and focusing are issues, but there are basic brackets to hold your phone over the eyepiece.

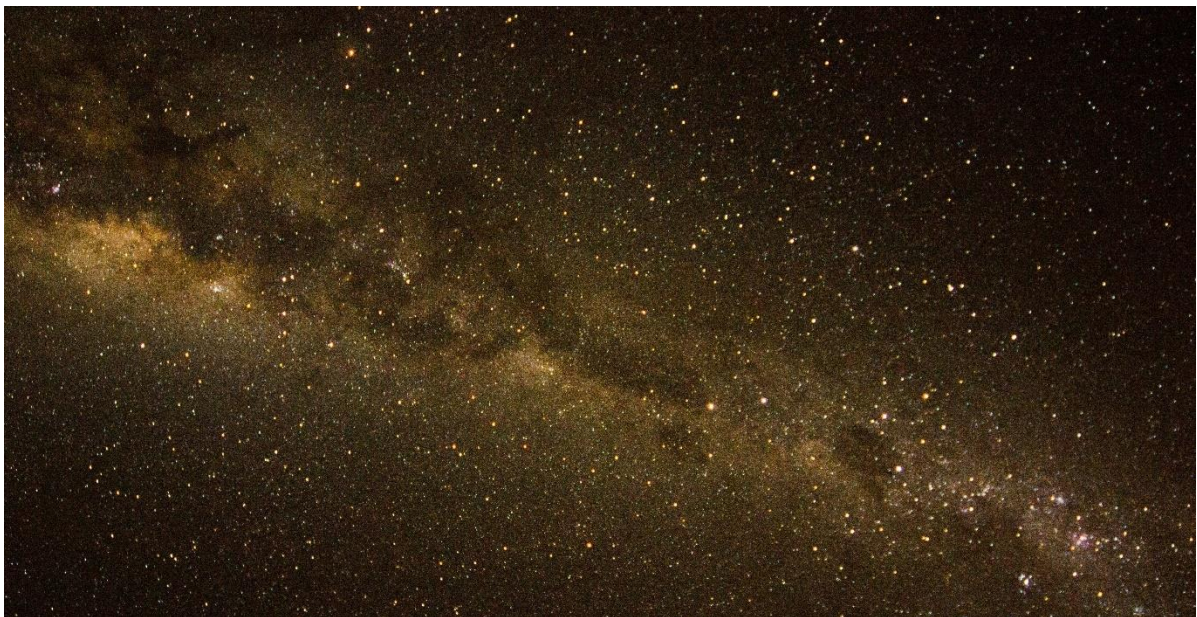
DSLR cameras are also very common and not that expensive these days. With a few adaptors you can replace your telescopes eyepiece with your camera. DSLR cameras have lots of useful setting which will allow you to capture better images than with a phone.



The above images illustrate that with only a little effort you can generate good images with a DSLR and telescope setup. The Moon images were taken in the same session and by playing with shutter speed, ISO and f/stop values you can capture great details. The Tarantula Nebula image was one of first deep space images and it didn't take long to get to this point.

The next step is using dedicated CMOS and CCD cameras in conjunction with computer software to capture and process images. I have started playing with these but as I stated earlier, the learning curve can be quite steep. How far you want to take your photography will depend on the amount of time and money you want to expend.

There is also astrophotography that utilises a camera and tripod. With a wide-angle lens you can image nightscapes. The Milky Way is a great example of this technique. This is excellent fun and very accessible as there is no need to have a telescope.



These images have been played with to enhance some features but nothing complex. I have taken them with a DSLR camera on an equatorial mount. That means I can have longer exposure times as it takes away the star trails.

Since you are photographing at night there are other issues to be mindful of. These include:

- Cooler weather, so having warm cloths is important.
- Harder to see so have a torch and do some location scouting during the day.
- Know your equipment as adjusting setting in the cold and dark can be awkward.
- Cooler weather can affect battery life and dew may cause image quality issues.
- You may have long exposure times so have a comfortable spot to wait.
- Finding objects in the night sky can be hard through the viewfinder of a camera. This is where a good knowledge of the night skies comes in handy. This ties astronomy to astrophotography.

DSLR Basic Settings

The three main settings that you will need to understand when using a DSLR camera for night photography are “Shutter Speed”, “Aperture (f/stop)” and “ISO”. The main issue is that at night it is, of course, dark. Excepting for the Moon, generally objects you are wanting to photograph will be small, dim, or both.

You will need to set your camera to the manual setting (M) and use manual focus as auto focus will struggle in dark conditions. A tripod will also be needed as the shutter speed will be longer meaning camera movement will be a factor in capturing steady images.

A simple explanation of camera setting is as follows:

- **Shutter Speed** – This controls the amount of light your camera lets in. The longer the shutter is open the more light collected. For capturing images of the Milky Way long exposure times are required. Play with varying times to see what looks best. Longer times will require a tracking mount to eliminate star trails; unless you are specifically wanting to create that effect.
- **Aperture** – This is the opening in the lens that lets light in. It is expressed in *f-stop* or *f-number*. The lower the number the greater the opening You generally want as low a *f-stop* as possible for astrophotography. The *f-stop* you can achieve will depend on your camera and lens.
- **ISO** – This is the setting that allows you to brighten images. The higher the ISO setting the brighter an image will be. There is a trade off using higher ISO settings; images will be grainier (noise) as ISO is increased. If you can obtain the brightness you want with shutter speed and aperture then keep your ISO setting as low as possible.

Advanced Astrophotography Options

There are more complex ways to create images with increased detail and colour. These are more involved than using the setting in your camera and require additional software or equipment. The main technique used is something known as “stacking”.

Stacking is layering multiple images to achieve an increased amount of data that is then processed to product a final image. You will need to capture video files or take large numbers of still images, with dark frames and light frames to calibrate images. This is an area that requires a bit of computer knowledge and a lot of time and patience. If this is where you want to take your photography then explore the internet for the products that suit your needs and which are compatible with your equipment.

A reasonable amount of time will be required to learn how to best utilise these advance techniques, but the results are undeniably rewarding. Most of the images you will come across in print or online will have been captured, manipulated and/or enhanced using computer software.



Milky Way image processed in Lightroom

There are many people who are very passionate about astrophotography and they have produced many excellent programs to capture and process images. It is designed for the purpose of astrophotography and will aid you immensely if you want to go that far.

Summary

I'm by no means an expert and I'm not attempting to educate you in the skills required for astrophotography. You will need to explore the field in a lot more detail and seek advice from who ever is willing to show and share their knowledge. I always look for inspiration from other and when you see what is achieved with a little effort you are encouraged to continue. For me a lot of fun comes from playing with different aspects of photography and looking to achieve more by experimenting with my equipment and doing things that good old fashioned kiwi way.

My advice is to experiment with different setups and get to know your equipment and its limitations. Once you start creating the images that you desire you will be happy to spend more time and maybe even more money to improve your setup and skills. Everyone starts from a place of little knowledge, and only through trying do we get better; even failures offer valuable lessons.

Enjoy the skies through your lens and share what you see; after all, that is why we take photographs.