

Picture This

(Imaging the Night Sky)

Beginners April 2019 - Steve Harris

This presentation was given to the Newbury Astronomical Society
Beginners Section on Wednesday 17th April 2019.

Astronomers like to use their telescopes
Generally they tend to like computers
and may also like to do some photography
Astro-Imaging can combine all three

In our modern age of technology there is a great interest in science in general but particularly in astronomy. There are now many facets to the hobby of astronomy involving many branches of modern technology. This technology is more readily available to the interested amateur now than any time in our history. Scientific instruments such as a good telescope that fifty years ago would have cost what an average man earned in a year can now cost closer to the average earnings in one month. The quality of these instruments has also improved enormously. They also have the advantage of modern electronics including computerised goto guidance systems.

Most amateur astronomers have some interest in computers and with the availability of many types of good quality cameras at very reasonable prices, have an interest in photography. Combining all this modern technology has produced a great boom in the branch of astronomy we now know as astro-imaging.

On a clear night go out and image

On the cloudy nights process the images

There are three main ways to use a camera to take pictures of the night sky, these are:

- 1 Direct imaging and with the camera on a tripod.
- 2 With the camera fixed to a telescope mounting.
- 3 Taking pictures through a telescope.

What camera do we need?



Mobile Phone



Compact Digital Camera



Digital Single Lens Reflex (DSLR)



Advanced Webcam

If a mobile phone is being used, some method of fixing it steady must be devised or purchased. This can be as simple as securing the phone to a steadying fixture using elastic bands.

A compact digital camera has similar attributes to the mobile phone but has a bigger and better lens and the camera generally has more built in functions.

One distinct advantage it does have over the mobile phone is that it can be easily mounted on a tripod. This provides greater stability when taking picture using a long exposure.

The DSLR (Digital Single Lens Reflex) camera is the camera of choice for astro imaging. It is versatile and can have the lens changed easily to increase magnification.

A webcam can be used with a telescope to capture a short video. The individual frames of the video can be combined to produce a single good quality image.

Mounting a Camera on a Tripod



Camera Mounting Plate

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Mounting a Camera on a Tripod



A DSLR mounted on a Tripod

A DSLR (Digital Single Lens Reflex) camera is really the best camera for taking astronomical images for a number of very important reasons

- 1 It is designed for mounting on a tripod.
- 2 Its lens assembly can be changed to suit the image.
- 3 It has a multitude of special functions.
4. It can be operated remotely to avoid movement.

Camera Mounting Bracket



A shop bought mount for a Compact Digital Camera

A mobile phone or a compact digital camera can also be mounted to take pictures of an object as seen through the telescope eyepiece.

This can be achieved (mainly when taking a picture of the Moon) by just holding the camera lens in front of the eyepiece and using the image on the camera screen to centralise it.

Obviously this can be made easier by mounting the camera over the eyepiece.

Compact Camera Mounting Bracket



These types of mountings can be found on websites by searching for :
camera brackets for telescopes.

Mobile Phone Mounting Bracket



Various mounting devices can be purchased for mobile phones so it is worth checking astronomy and photographic websites and of course mobile phone centres.

Mobile Phone Mounting Bracket



The mounting vastly improves the images taken through telescopes.
A Bluetooth mobile phone remote shutter operator can also be purchased from these sites.



There are three alternative ways to attach and use a camera with a telescope and its mounting.

The first is to simply use the telescope to support and direct the camera to the object to be imaged.

The image above shows a DSLR mounted 'piggy back' on a small refracting telescope.

It does not matter that the camera is on its side the image can be rotated on a computer.



The DSLR (Digital Single Lens Reflex) camera is versatile and can have the lens changed easily to increase magnification.

It can also be fitted with a remote shutter button to reduce vibration.



The Lens Assembly can also be removed and an adaptor fitted to enable the camera to be mounted directly to the eyepiece focuser to allow a telescope to be used as the main lens.

The picture above shows a DSLR with the camera lens removed and a telescope focuser adaptor fitted.

This is a very easy task, the camera has a lens release button that when pressed allows the lens to be twisted and released from the camera body.

The adaptor is simply clicked in and twisted until it is engaged and clamped in position.

The adaptor above is shown with an infrared / ultraviolet filter fitted to prevent these unwanted rays reaching the chip to spoil the image.

The DSLR is versatile



Accessories Required for Astro-Imaging

The image above shows a remote shutter button to reduce vibration.

The DSLR camera shown previously also has a 'video out' outlet that allows the image, the camera is waiting to expose, to be displayed on a larger screen such as a TV monitor.

This feature is a great improvement over trying to see the image on the camera's small 'built in' screen.



The image above shows the DSLR fitted to the focuser of a 120mm Skywatcher refracting telescope.

It also shows the remote shutter operating button that is a really good accessory to reduce vibration when shooting images.

It is worth pointing out the camera strap is looped around the finder scope mounting in case the pinch screws holding the camera should slip and drop the camera.



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The Advanced Webcam



An Orion StarShoot IV Planetary imaging camera

Using a webcam to produce images of the night is a brilliant method of imaging developed by amateur astronomers.

Not only does this method produce stunning images of the Moon and planets it is great for those of us who have an interest in telescopes, photography and computers.

This method requires imaging outside, on any clear nights. Then cloudy nights can be spent processing the images.

A webcam is a video camera and is used capture a minute or two of video, normally in the .avi format.

Between 1000 and 3000 individual frames (pictures) are usually collected. The video is downloaded and saved directly to the hard drive on the laptop.

If each individual frame is examined it will appear to be of a fairly poor quality due to the movement of the air in our atmosphere.

This is caused by heat rising, natural air movement and areas of turbulence.

The effect can be seen when we look at a star that is located low over the horizon where air movement is at its most prominent.

A webcam fitted to a Skywatcher 120 Refracting Telescope



The webcam is fitted directly to the telescope as a lens

The image above shows a webcam attached to a telescope and connected to a laptop via the USB connection.

It is of course necessary to first point the telescope so the target can be seen in the eyepiece.

Then the eyepiece is removed and the camera fitted in its place.

When the webcam software is opened it appears with a window to show what the camera is going to capture.

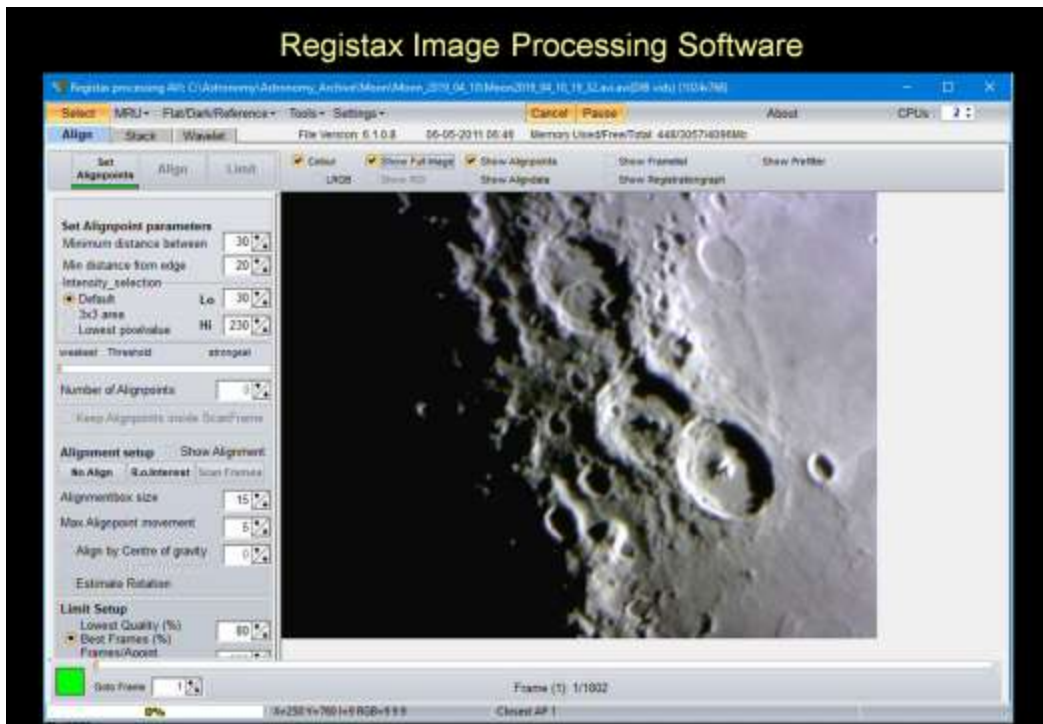
It will be necessary to focus the image using the telescope focuser and centralise the target.

By collecting a video of short exposure frames the amount of movement is minimised.

It is however in the smaller details on the image that the 'blurring' effect is most noticeable.

Each feature on the image recorded will appear slightly different on each frame.

Our task is to average out this movement by combining all the separate frames into one image.



To process the captured video a free app called ‘Registax’ needs to be downloaded from the internet.

Registax has a screen to display each frame of the video in sequence.

The default is for Registax to carry out the processing almost automatically but it can be adjusted to provide as much individual control and input as is required.

Registax performs three operations: It will identify features on one frame and will then align those features with every other frame.

Then it will limit to only the best frames and finally will stack all the aligned frames into one image.

The Constellation of Orion Image by Nicky using a DSLR



The image above was taken using a DSLR fitted with its standard lens.

Images using DSLR and a Skywatcher 120 Refractor



These two images were captured using a DSLR fitted directly to the focuser on a 120mm refracting telescope.

The images have not been processed, they are as they were downloaded from the camera to the computer.

The Moon Imaged using DSLR and a 12" Meade LX200



This image was captured using a DSLR fitted directly to the focuser on a 300mm / f10 Meade LX200 telescope.

The image has not been processed, it is as downloaded from the camera to the computer.

The Moon Imaged using DSLR and a 12" Meade LX200



This image was captured using a DSLR fitted directly to the focuser on a 300mm / f10 Meade LX200 telescope.

The image has not been processed, it is as downloaded from the camera to the computer.

A composite image of the Moon using three Images



This image was created using three separate images captured using a DSLR fitted directly to the focuser on a 300mm / f10 Meade LX200 telescope.

The images have not been processed, but have been aligned using with each other using the Paintshop application on a computer.

The Moon imaged using a webcam and a 12" Meade Telescope



The image above was generated by combining 1802 separate video frames using Registax.

Telescope Workshop

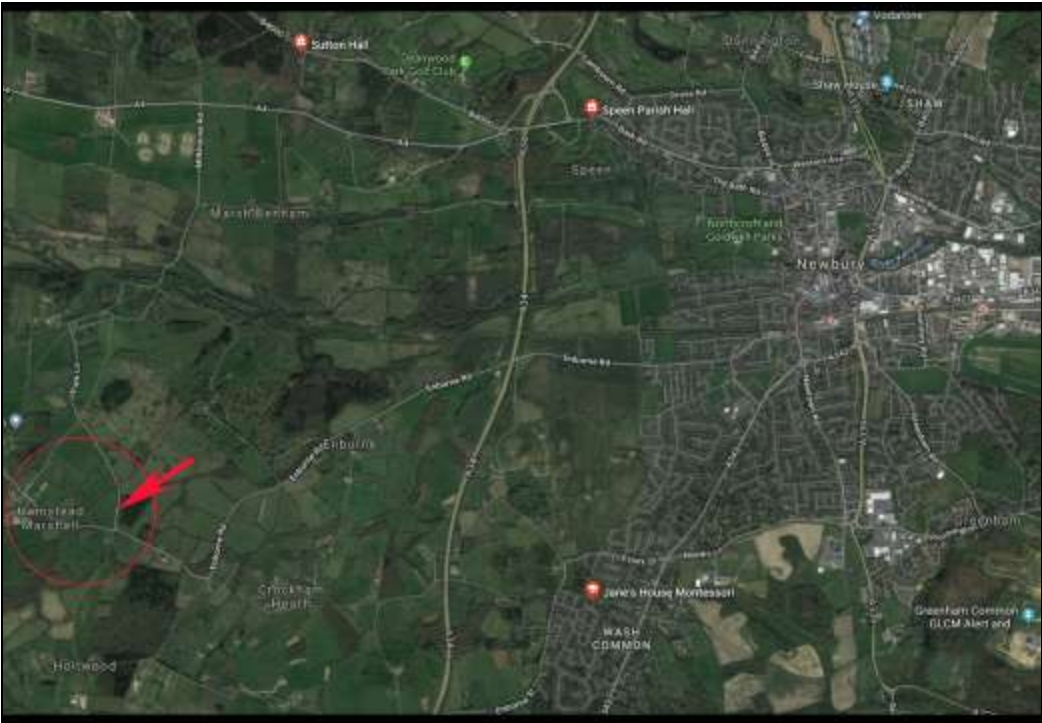
Friday 26th April 2019

At Hampstead Marshall Village Hall

Starting at 19:30

Postcode: RG20 0HR

Details: www.naasbeginners.co.uk







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