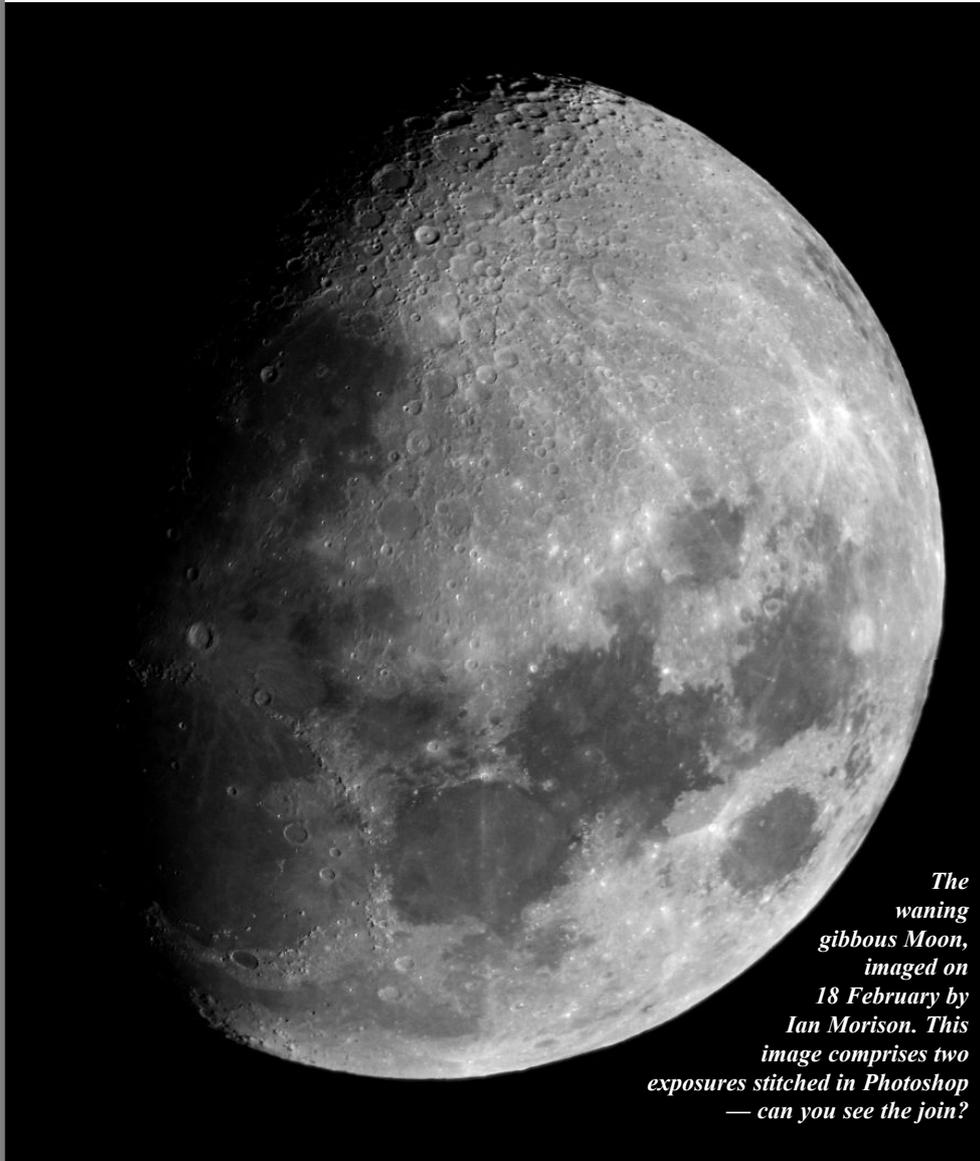


Making a start in astrophotography



The waning gibbous Moon, imaged on 18 February by Ian Morison. This image comprises two exposures stitched in Photoshop — can you see the join?

TAKING your own astronomical images can be very rewarding — and it needn't be very expensive. However, if you haven't already got a digital camera it's probably worth getting one; either a compact or, preferably, a digital SLR. Their prices have come down significantly in the last year or so and you do not need the very latest. To be honest, that means that you will also need a computer and some editing software such as Adobe Elements but there are freeware programs such as Registax that can be downloaded from the Web.

Quite an interesting thing to try first is to simply photograph the constellations. One can even begin by mounting the camera on a fixed tripod but, as the stars move across the sky surprisingly quickly, exposure times are limited. The closer to the celestial equator you are imaging and the longer the focal length of the camera lens the shorter the allowed exposure time. Thirty seconds is about the maximum

with a wide angle lens near the equator. Longer focal length lenses will require shorter exposures, but as one moves towards the North Celestial Pole, exposures can be made longer without the star trailing. One advantage of using a digital camera is that the images can be inspected very quickly so you can see what is the longest reasonable exposure.

In Photoshop or Registax it is possible to combine short exposures. In Photoshop one can open two images and lay one on top of the other with an opacity of 50%. When aligned one can flatten the two images into one. The same could be done to two further images and then the two resulting images could be combined in just the same way to give four stacked images. A point to watch: if the images are taken from a fixed tripod the sky will rotate. Either take the images very quickly or rotate the images in Photoshop to align them prior to stacking them.

If imaging from an urban environment you will find that the exposures will usually be limited in length by light pollution. As a large part of this is in the red part of the spectrum, one can sometimes do better by producing a monochrome image in which the red channel has been removed.

It is obviously better to use some form of tracking. One can make a 'barn door' mount — just two hinged pieces of wood with the hinge axis pointing towards the pole star. A rotating worm thread is used to move the 'door' open at just the right rate. Google 'barndoor mount' to find the instructions on how to make one.

A firm called AstroTrac has produced a modern version which can track accurately for two hours with the rotation of the thread being controlled by a small computer. However, if you already have a polar mounted telescope with a RA drive, then a little ingenuity will enable you to mount a camera on it — indeed, two of my telescopes already have camera mounting screws in place and the clamshell support for a refractor tube has one mounted on top. With a wide angle lens, the telescope body may actually get in the way, so I place a sturdy ball and socket joint in between the mount and the camera. The camera does not have to be pointing in the same direction as the telescope! Then longer exposures can be made without getting star trails.

What about using a telescope? The first thing is to be able to mount a camera so that an image can be formed on its CCD array. One technique involves projecting the image into the camera



Sky tracking made simple with AstroTrac.

lens using a normal eyepiece in the telescope focuser. Baader-Planetarium makes a very nice carriage (the Microstage Digital Camera Adaptor) which clamps around the eyepiece and has vernier controls to allow one to move the camera so that its optical axis is aligned with that of the telescope. These carriages do have a maximum size of camera that can be accommodated — large 'Bridge Cameras' will probably not fit.

An SLR camera can be mounted into either 2" or 1.25" focusers by using a T-mount adaptor. This is in two parts. One is a tube of appropriate size that inserts into the focuser and which has a standard thread at its outer end. Onto this thread has to be screwed the appropriate T adaptor whose bayonet couples to your SLR camera. Together they allow the camera to take the place of the eyepiece so that the image is focused on the CCD chip in the camera. Being able to inspect the image just after it is taken helps a lot in getting the focus right. If one is photographing stars then, when in focus, the tiny stellar images on the CCD screen at the back of the camera will only excite one pixel — which could be red, blue or green, so a perfectly focused image may well show coloured stars! This is good! (They will be correctly coloured in the output image though.)

A very good target to start with is the Moon as exposures of 1/50th of a second or less are needed. One does not even have to track the Moon so a fixed mount can be used. Most SLRs have a 'histogram' display which can be assessed to set the appropriate exposure. I always used a delayed action mode to allow any vibrations induced when the shutter is pressed to damp down. Two seconds seems about right.

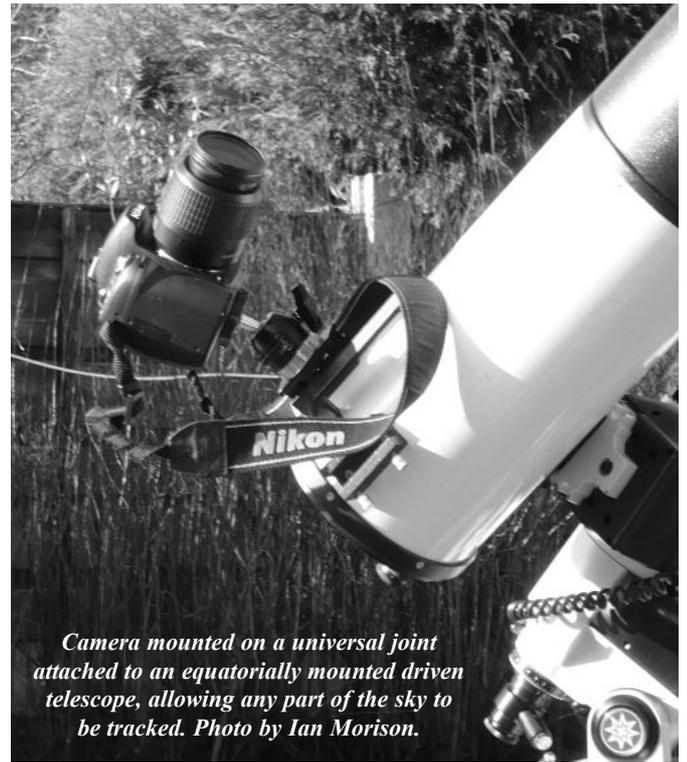
With a short focal length refractor you will find that the lunar image will be a bit small on the CCD chip. Larger images can be used if a Barlow lens is introduced before the camera. My Astronomica 2" ED Barlow can either be used as supplied, or the lens can be removed and screwed into the front of the 2" T-mount tube. As the separation of the Barlow lens from the CCD is different in these two options, this gives two further image scales.

Conversely, with a long focal length telescope (or with the use of a Barlow lens), the whole Moon may not fit onto the CCD chip. If two (or more) images are taken with the same exposure, it is not too difficult to combine them in Photoshop. Use 'canvas' to increase the size of one image and then move over a second image with 100% opacity to add an additional image. The Moon image on the facing page, taken on 16 February 2008, was done in this way. I cannot see the join! One can often improve the noise in lunar images by stacking several frames as described above. There is also a very nice noise reduction program called Neat Image that can be downloaded from the Web which can make an improvement as well.

I do hope this article puts you on the road to some great astro-photos!

Next issue:

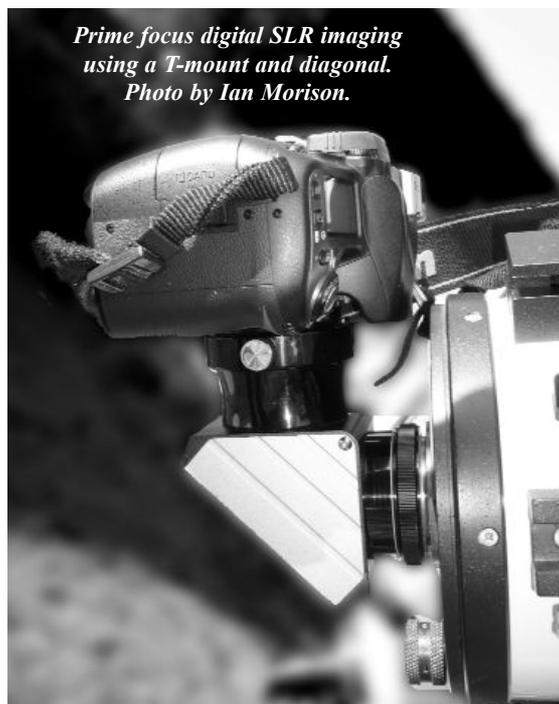
Maksutov-Cassegrains and a review of the Orion Optics OMC 250.



Camera mounted on a universal joint attached to an equatorially mounted driven telescope, allowing any part of the sky to be tracked. Photo by Ian Morison.



Camera mounted on a universal joint attached to a clamshell mounting ring. Photo by Ian Morison.



Prime focus digital SLR imaging using a T-mount and diagonal. Photo by Ian Morison.



The Baader Multistage Digital Camera Adaptor. Photo by Ian Morison.