Photography through a telescope using a 35mm SLR camera

by Phil Sokell, product manager, Optical Hardware Ltd.

I've been asked a number of times recently about using our Olivon and Illusion telescopes with traditional 35mm SLR cameras. The internet is loaded with sites discussing 'digiscoping' - the use of digital cameras with telescopes - but I found little to assist the traditional camera user. So I decided to put this right, put pen to paper and write it myself.

But why would anyone want to use a 35mm film camera ? - We're in in the digital age and good quality digital cameras have never been more affordable. Digital cameras are quick, convenient and versatile. Our Olivon and Illusion scopes have incredibly easy to fit and use digiadaptors for most digital cameras, so why bother with 35mm ?

35mm SLR's have been around a long time, many of us have one, and probably a whole load of accessories to go with it, tucked away in a cupboard somewhere. Why not bring it out and give it a go with your telescope. Digital cameras are inexpensive but digital SLR's are still very much at the top of price scale, You can still buy 35mm SLR's brand new at very modest cost, and there are many secondhand bargains to be had. You can kit yourself up with a very good 35mm SLR for a lot less than the cost of a modest compact digital. Then there is image quality, despite advances in digital technology, a good 35mm film, well exposed and correctly processed, produces an image quality equal or better than the very best, top of the range, digital cameras. If you want a digital image from a 35mm film, they can easily be scanned, and many photo shops will make you a disc at the time of processing. All-in-all, there is still life in 35mm, why not give it a go.

Most of this is written for our Olivon and Illusion telescopes and Optical hardware custom build Astronomical telescopes, all of which have easy to use camera adaptors which can be used with both digital and 35mm SLR's. However some other makes of telescopes use similar adaptors (in fact Optical Hardware make scopes for some other brands) so you may still find my ramblings here useful, and for astronomers, our astro-scope camera adaptor will fit most telescopes using standard 31.7 eyepieces. Over on the right hand side I've written some technical background about 35mm cameras, it isn't possible to do an in-depth photography course in a 2-page leaflet, but I do hope you'll find this useful.

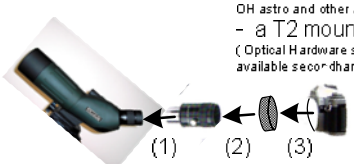
Fitting an SLR camera to an Olivon or Illusion scope is quick and easy, you just need the CAMERA ADAPTOR, this fits around the eyepiece and allows the camera to attach. These camera adaptors were introduced for Digital cameras but they are perfectly at home with 35mm SLR's, as they take standard T2 mounts.

What's a T2 mount ? – well when 35mm SLRs became popular in the 1960's and 1970's there were probably 15 or 20 different makes, each using it's own exclusive design of lens mount fitting. Independent lens makers needed a way of attaching their lenses to all the different makes of camera without having to make 20 different versions. The lens would be made with standard threaded fitting (called a T2) and then you buy a T2 adaptor to match the make of your camera. Easy. The system has been carried forward on our Olivon and Illusion cameras adaptors, we have T2 adaptors for all the popular digital cameras, but because it is standrad T2, you can also still get hold of them for all the older 35mm SLR's

Our Astroscope camera adaptor uses the same idea. It has standard 31.7mm tube fitting which we use on The Special build Optical Hardware scopes, but this will also fit most other makes of astroscopes too – and a T2 fitting to take just about all SLR cameras, 35mm and digital.

Getting started, you will require -

- A telescope which will accept a camera adaptor
  (Illusion and Olivon scopes, plus Optical Hardware special builds have camera adaptors available)
- SLR camera
  (with a TTL light meter and preferably manual override available, most have this facility, see later note)
- camera adaptor to fit the telescope
  (i100cam for Illusion 100ag / i77cam for 77 and 60ag / i50cam for 50ag / DCA for all Olivon scopes / CA for OH astro and other astro with 31.7mm Eptube)
- a T2 mount to fit your camera
  (Optical Hardware stock popular T2 mounts, and we can source older fittings, although many T2's are available secondhand at very low cost)



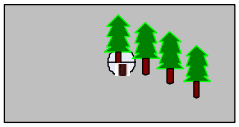
(1) Fit the camera adaptor to the scope.
(2) Fit the T2 to the camera adaptor
(3) fix the camera to the T2.

This process should take less than 1 minute and you are ready to go

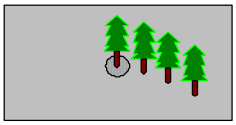
CAMERA BASICS – The SLR
35mm cameras have been around for quite some time, and since the 1960's SLR cameras have been in common usage. (35mm or 135 by the way, refers to the type of film)
SLR stands for SINGLE LENS REFLEX – this means that when you look into the viewfinder, you actually look through the same lens which the picture is taken through - a mirror reflects the image into the viewfinder. What you see in the viewfinder is pretty much what you get on the photograph. Most SLR cameras allow you change lenses – using a telephoto lens brings things in close, a wide angle lens lets you get more in the picture, but because you actually look through the taking lens, you see the real telephoto or wide angle effect. When you take a photograph with your SLR, the mirror flips up temporarily, the shutter opens and closes exposing the film, then the mirror flips back into place. The viewfinder is shut out during the picture taking process, however this happens very quickly.

LENSES
Most SLR cameras have interchangeable lenses. The 'standard' lens fitted to most SLR's whn they were supplied new was of focal length 50mm – and with a 50mm lens the view was neither enlarged or reduced. Lenses of focal length over 50mm are called telephoto because they make the image appear larger or nearer.
A lens of focal length 100mm would produce a magnification of 2x, a 200mm lens would produce 4x, a 300mm lens 6x, and so on.
Lenses of less than 50mm make the image appear smaller or further away, and so you get more in the picture – useful if you are in a tight corner trying to photograph a room full of people.
Zoom lenses became popular during the 1970's allowing variable magnification, a 100-400mm zoom allows variable telephoto from 2x-8x, and a zoom from 28mm-100mm allows quite wide angle through standard to 2x telephoto.
(Modern digital cameras use a different format to the 35mm film cameras, so the lens focal lengths are different – however, it is quite common to see lenses on digital cameras referred to in terms of their 35mm equivalent)

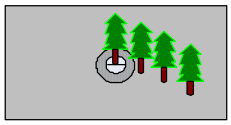
FOCUSSING
On most SLR cameras, focussing is achieved by twisting the focus control around the barrel of the lens. Because you are actually looking through the taking lens, you can easily see in the viewfinder if the image is in focus or blurred, and with a little practice, focussing becomes a very quick process.
Many SLR's have focussing aids built into the viewfinder which make focussing even quicker and easier, the two common types being 'split image' and 'microprisms'



Split image focussing.
The central area focus-aid splits a slightly out of focus image into two displaced parts



A 'microprism' focus aid area is a series of dots which clear when the image is in focus



Some cameras had a combination of split image an microprism focus aids.

Some very sophisticated SLR cameras even have interchangeable focus screens to allow the user to select different focus aids

AUTOFOCUS was introduced to SLR's In the 1980's and 1990's, increasing the speed and ease of use of this type of camera. For more serious photography however autofocus can be irritating, as the camera will focus on a part of the image, usually in the centre, which may not be the photographers choice. For this reason, most autofocus SLR's have a manual over-ride allowing the user to focus as above.

GETTING THE EXPOSURE RIGHT
Perhaps the most important things about photography is making sure the photograph is correctly exposed. Exposure is how much light gets on to the film, too little and the image is dark and shows no detail, too much and the photograph will appear burnt out.

On a bright day where there is lots of light you need to restrict the amount of light getting to the film. On a dull day, more exposure is needed. There are three ways of controlling exposure :-
1. Shutter speed
2. Aperture
3. 'Speed' of the film selected

Shutter speed is how long the film is actually exposed to light for, this is usually measured as a fraction of a second. Most SLR's allow control of shutter speed from at least 1 second to 1/1000 sec. The faster the shutter speed, the less light gets on to the film, and less exposure – but – a faster shutter speed allows you to 'freeze a moving subject, which can be useful.

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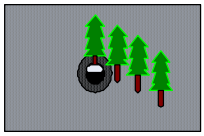
Focussing: (if your camera is autofocus, you will need to switch to manual)
You are looking through the taking lens so you can see pretty much what you are going to get on the photograph. You will however find that your focussing screen appears very dark and grainy, and you may find the central focus area blacks out - don't worry – this is perfectly normal with most SLR's and it's not a fault on your camera. Focus screens in SLR's are usually designed to work with smaller lenses and don't work so well with longer telephoto lenses, which is effectively what your scope has become. This grainy, dark appearance is ONLY on the screen and will NOT appear on your photograph. You'll need to use the edges of the focus screen, away from the blacked out area to focus, you can always centralise the image again after focussing. Using a powerful lens means focussing is critical, you'll need to practice to make perfect.



Exposure:
A normal camera lens has an aperture control (the f numbers) , which allows you to stop down to restrict the amount of light coming through the lens. When you use a telescope as a lens, there is no aperture control and the lens is effectively always at full, wide open, aperture. This is a good thing, because you will need as much light as possible through the scope. The way you control exposure is by the shutter speed of the camera, when there is a lot of light you will require a fast shutter speed, in low light a slower shutter speed. Nearly all SLR cameras have built in light meters which work through the lens and many have automatic exposure control which should work normally through the telescope.

Nearly all metering cameras work perfectly well. There are a few exceptions where manufacturers have engineered them to not function unless an own brand lens is fitted but these are quite rare (so far we've only encountered the Nikon F60, there may be others, please let me know if you come across any) If you have one of these, you'll have to treat it as a non-metering camera, see note below.

If your camera has programmed auto exposure (eg Canon AE1pA1/T90/ some Nikons) use the aperture priority automatic mode or manual. If your camera is a 'shutter priority automatic' like a Canon AE1,or Konica models, you will need to use the manual exposure control. Nearly all aperture priority automatics (Canon AV1, Olympus OM's, Pentax ME's Minolta X's,and many Nikons, etc.) work fully in automatic mode. All manual exposure cameras should work as normal.

If your camera does not have a through the lens light meter, or is one of the few which doesn't operate, then we can provide equivalent f stop values for our scopes operating at various magnification, which you can then use in combination with a separate hand held light meter. To be honest though this process is slow, and for the cost of a good secondhand SLR with a working meter, you may be as well buying a different camera.
For models which do not function when fitted to a non own brand lens, you can attach to the scope via the filter thread of the camera lens, rather like fitting the scope to a digital compact, though this is not ideal.

The camera exposure system should tell you which shutter speed to set, or on automatic models, do this for you. The more light, the faster the Shutter speed you will need to use. You need a fast shutter speed to help get sharp pictures so try to work on bright sunny days with the sun behind you. Using a faster film speed will help if you have to photograph in lower light but there is a trade-off, faster films are usually a little more grainy so cannot be enlarged quite so much. Long telephoto lenses, including your telescope, do not let through as much light as a lower power lens, and this means that required shutter speeds can be quite slow. New users often find this surprising, however it is a perfectly normal optical effect and not a fault on your camera or lens. It does however mean that great care has to be taken to keep the camera / telescope combination very still when taking a photograph.

Keeping it still.
You have two problems to contend with – movement of your camera and movement of your subject. Lets look at your subject first. When using a powerful telescope any movement will be magnified, so photographing moving subjects will be difficult. You must use a fast shutter speed to 'freeze' the movement but as discussed above fast shutter speeds are not easy to achieve unless it is a very bright day. If you are photographing birds or nature, take two or three shots, this way, hopefully you'll get one without movement.
For fast moving subjects like sports action or aircraft, you will have to use a very fast film speed (800asa -1600asa) – your photographs may be a little more grainy, but this is better than being blurred.
Even with a perfectly still subject you still have the problem of camera movement. Most camera users would struggle to hand hold a lens of 10x magnification or above without considerable camera shake. The best support is a tripod, and the heavier the better. Lightweight tripods may be easier to carry but these will still allow the camera to shake. The solid tripod we supply with EQ mounts on Optical Hardware special build astronomical scopes are very Stable. For Illusion and Olivon scopes try an Olivon TR154, 159 or 189 tripod Pressing the shutter release will cause camera shake too, if your camera will take one, use a cable release, these are not expensive and a great benefit.

Other factors:
Try to keep the sun behind you, if you have to shoot against the light NEVER look directly into the sun, and if the sun is not in view but in front of you, reflection may reduce the image quality. Illusion and Olivon scopes have a built in lens hoods, pull this out to reduce reflection. Multicoating on all of our scopes helps cut UV. On a hot sunny day haze can be a problem, unfortunately there is nothing you can do about heat haze, moving hot air can cause light to appear to 'wobble' and if you are photographing long range your photograph quality will be reduced. Don't forget to load a film into your camera and now you are ready to photograph. Have fun

Illusion telescopes by Optical Hardware

Aperture is the opening through which light gets to the film. 'stopping down' to a smaller hole lets less light through the lens, but having a smaller opening increases the depth of focus, which may be important if you wish to keep both foreground and background in focus. This is called 'depth of field', and is a useful tool for a keen photographer. Apertures are measured as 'f' numbers, f2 is quite wide and lets through more light than a higher f number, such as f11 or f16. The bigger the 'f' number, the smaller the opening.

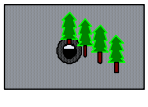
Film speed measures how responsive a particular film is to light, this is measured in ASA, typically films are 100ASA, 200ASA, 400ASA, - sometimes 800 and even 1600. A faster film allows you to work with faster shutter speeds and smaller apertures and obtain still the correct exposure. The drawback is faster films tend not to be so good for enlargements as they show more 'grain'. On most SLR cameras you have to set the film speed on dial when you load the film, though some later models read the speed automatically from a code on the film cassette itself.

Getting the right exposure is a balancing act – you have to take into account how much light there is and then weigh up the importance of a having a fast shutter speed, or smaller aperture and choice of film. Most SLR's have built in light meters to help the process and many modern ones have fully automatic exposure which make this process very easy – and of course you will usually have the option of overriding some or all of the automatic exposure system to achieve a desired photographic effect.

USING 'BIG' LENSES
One of the attractions of an SLR camera is being able to fit a long Telephoto lens. For nature photography, sports, aircraft and a wide range of other uses a powerful telephoto lens can be a great advantage.
As mentioned above a ' telephoto' lens is anything with a focal length above 50mm, a 400mm for example gives about 8x magnification. 500mm gives 10x and 1000mm, 20x. These lenses are readily available for most SLR's though good quality long lenses can be quite expensive. There are however some issues with using long telephoto lenses :-

(1) KEEPING IT STILL
Powerful telephoto lenses magnify your subject but they also magnify movement – if your subject is moving, even very slightly, this movement will be 'magnified' People don't stand still for long, Birds rarely sit perfectly still and tree branches move In the wind. This movement will transfer into a blurring on your photograph.
Keeping your camera still is vital too, you can't hope to hand-hold a camera with a lens any more than 300-400mm (6x-8x) if the camera moves even slightly when you take the photograph, the telephoto will magnify the movement and the image will be unclear. With a normal 50mm standard lens you can easily handhold at 1/60 or even 1/30 second, but with a 400mm lens, 1/500 or 1/1000 would be necessary. Using your telescope as a lens is the equivalent to a lens of 1000mm or more, impossible to hand hold and a support of some kind is essential. There are various clamps and chest supports available (Optical Hardware have a range of such accessories for our scopes, but they can also be used with camera lenses) There is nothing better than a good solid tripod, like an Olivon T154 or 189, the heavier, the better. Lightweight tripods are easy to carry but still allow some camera shake, especially with the clunk of your SLR's mirror-shutter mechanism, and perhaps the motordrive kicking in. To minimise camera shake, try a cable release as this helps reduce camera movement.
The best way is to use the **fastest shutter speed you can,** as this will limit any movement Remember, the bigger the lens, more 'shake' happens, and the more effort you'll have to put into keeping it still.

(2) GETTING IT IN FOCUS
With long telephoto lenses focussing is more critical. Using fast shutter speeds means you'll probably have to have the aperture wide open which makes depth of focus very small. You have to be precise or your photograph will appear blurred.
To make things more difficult, the focussing aids probably will not work with a lens over about 10x (500mm). This is because the split image and microprism type focus aids are set up to work with popular lenses, usually 400mm and less. With a powerful telephoto you often see the focus aids blacking-out. An additional problem is that the focus screen may appear dark or grainy making it difficult to see the image clearly - It isn't a fault on your camera, it's just the way the focus system works. Don't worry, this darkening is only on your focus screen, your photograph will not appear like this, you'll need to practice focussing using the screen edge.



Often when using long telephoto lenses, the focus screen can appear dark and grainy, and the focus aids in the centre may black-out. It is not a fault of your camera and a normal optical effect with longer lenses. This effect is in the viewfinder only and your photographs will not appear like this. You will need to focus using the edge of your focus area

(3) GETTING ENOUGH LIGHT
You need the fastest shutter speed you can to 'freeze' movement, but fast shutter speeds mean having the aperture wide open, which reduces depth of field and makes focussing critical. Long telephoto lenses do not let through as much light as standard lenses, and this makes focussing difficult too. Try to use long telephoto lenses on bright sunny days, with the sun behind you. Use faster film speeds (400ASA or above) – fast films can be more grainy, but modern film stocks are very good. Above all, enjoy. The experience of getting it right is fun and the results rewarding