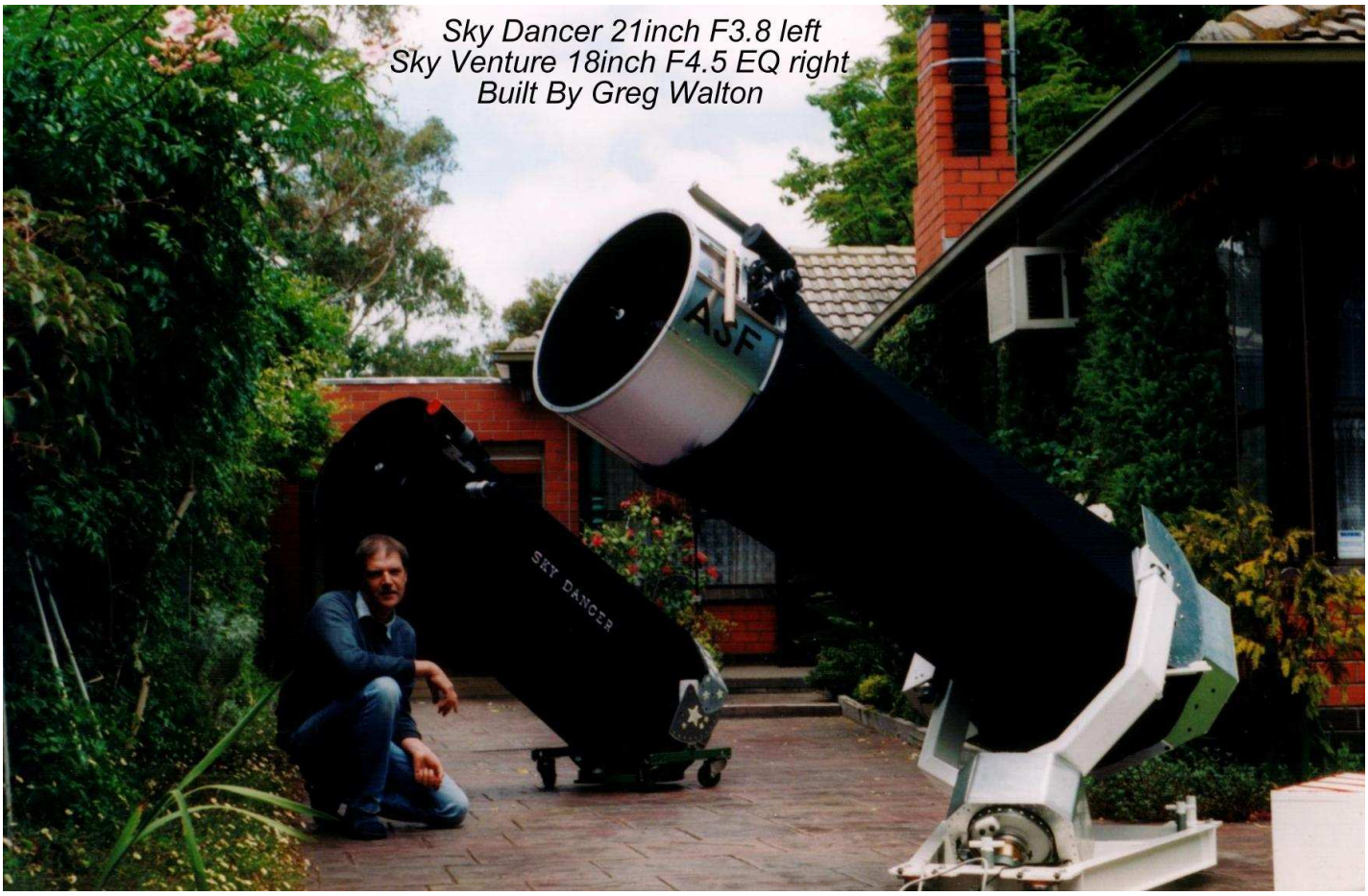
The Astro imager plus V1.1, by Greg Walton.

This is a beginner's guide to astrophotography and other stories I have done in the past.



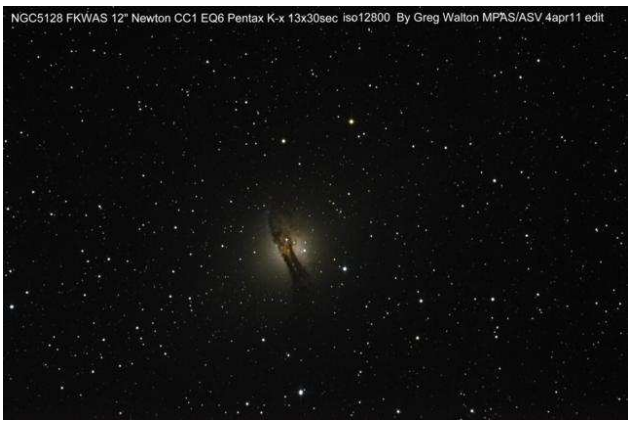
Astrophotography is a very challenging hobby, which I will try to simplify for you.
You can always Google key words for more detail information on the web.

Index for Astro Book, 16may2012

NGC5139

M16

NGC5128



M42

M17

The Astro Imager Plus is a work in progress; which I am continually up dating. All photos by Greg Walton.
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By Greg Walton 2 Irish court Bonbeach 3196 phone- 9773 0098 mobile- 0415172503

3. Were to begin?????

Astrophotography, with a camera and tripod, start with the basics and slowly work up to the more difficult tasks. There are so many things to photograph from wide angle images of the whole sky, to star clusters, nebulas and planets. So it's best to know what sort of imaging you would like to do before you spend any money. For a lot of people it is the journey, not so much the finished product. I'll try and take you on my journey, from cameras to building telescopes.

I thick everybody should start with a base model DSLR that is a camera that you can change the lens on. You can also sight through the lens you have attached, so you can see the field of view. I started with a second hand Pentax SLR film camera that could be bought cheaply. I bought 3 because I could have different speed film in different camera bodies. But with the new digital cameras you can change the film speed with the push of a button. So you only need to buy one digital DSLR camera. Some readers would already have this type of camera, because they do take better shots than compacted digital cameras and have much higher iso settings. Bigger lens let in more light and bigger sensors produce less noise.

SLR lens come in a large range of shapes and sizes. The Pentax uses what is called a K mount to attach the lens, some other manufactures use the same K mount like Ricoh. There are also a large number of lens makers that sold K-mount lens. The new Digital DSLR Pentax will accept any old Pentax lens or any K mount lens. That was the major reason I use the Pentax, for I already had a large collection of Pentax K mount lens and adaptors. Camera manufactures are always improving their product so you can easily up date the camera without up dating the lens. Unfortunately some other manufactures have change there lens mounting arrangement so when you update the camera you have to update the lens. Luckily for me Pentax have stuck with the same K mount.

In astrophotography the single focal length lens usually works much better than the new whiz bang digital zoom lens, because of the faster F ratio and less optical elements. Also a good test is to look at the back of the lens and you will see that the diameter of clear aperture is much large, often double or triple the diameter of a digital equivalent lens. The inverse square law says that if you double the diameter you get 4 times the light. In astrophotography speed is everything, the longer the exposure the more chances for thing to go wrong. The faster the lens the smaller the ISO setting can be used this reduces noise in low light situation. I have found old single focal length lens that second hand markets for a few dollars and some of these are my very best lens, just hold them up to a light and check if there are any scratches, dirt can be cleaned off but scratches can't.

Most cameras have a built in Infer red Filter (IR), which will reduce the amount of red in your shots. This can be removed at a cost. (Pentax & some Nikons have only a slight IR filter, which I would not remove.) Note that some of the very expensive high end cameras can not have they IR filter removed, as they have sensors that monitor the CCD which will not work once the IR filter is removed.

Photo of back of lens mentioned above, left is the new digital 18 to 50mm F3.5 zoom and right it old 50mm F1.7 lens, which works 4 times faster.

You can buy new fixed length digital lens if you have deep pockets most are around the $1,000.00 mark, I surgiest start with the cheap lens first.

4. How to use a DSLR for Astrophotography in brief.

Camera Features - High iso12800, Live-view, Interval timer or Continues shot mode, CMOS sensor, High definition video and 240v power supply. (2/3 sensor equals a lighter camera.) Cost $600 to $1000

Camera settings – Adjust view finder to suit your eyes, Switch to manual focus, High Quality Maximum, Highest mega-pixel setting, Noise reduction ON, Image stabilization OFF, Extended iso mode ON, 2 second delay ON, Reduce screen brightness to minium, Turn screen off & Auto white balance or cloud for time lapse.

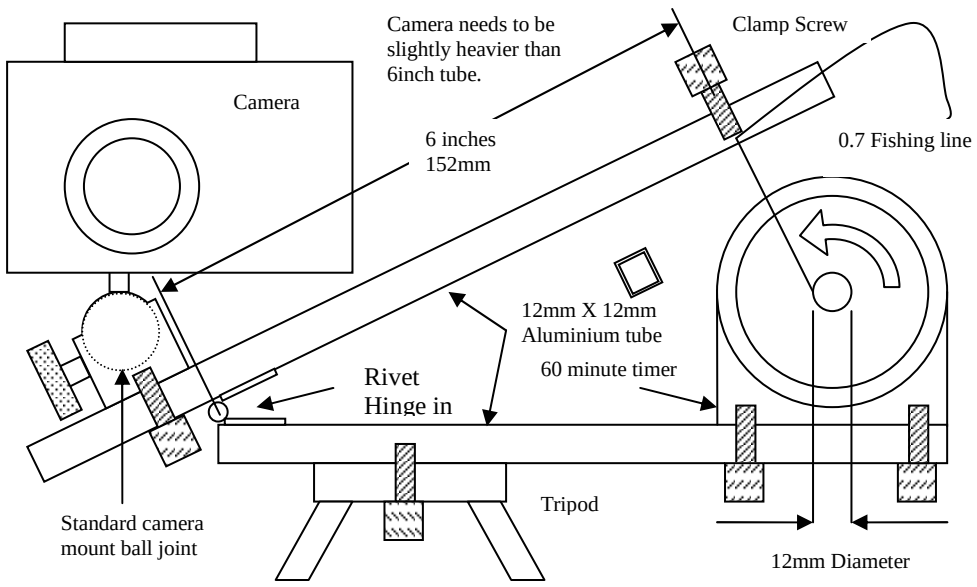
Most cameras have a built in Infer red Filter (IR), which will reduce the amount of red in your shots. This can be removed at a cost. (Pentax & some Nikons have only a slight IR filter, which I would not remove.)

Dew shields and 12 volt dew heaters will be needed on most nights, Cost $250. Hair drier can work too.

Which lens to use?	Pentax K-x 2/3 sensor Pentax K-r 2/3 senor Pentax ist 2/3 sensor 22mm x 15mm sensor		35mm Film Full frame DSLR 35mm x 22mm sensor		In this table the length and width are in degrees.	Mount
Lens	Length	Width	Length	Width	Rough guide	
18	80	50	100	70	Many constellations	Tripod
28	45	30	60	40	Large constellation	Tripod
50	27	18	37	24	Medium constellation	Tripod
80	16	11	22	17	Small constellation	Barn
135	10	7	14	10	Very small constellation	Barn
200	7	5	10	7	Large Star clusters	Barn
300	5	3.2	7	5	Pleiades M45	Barn
400	3.5	2.5	5	3	Eta Carina nebula	EQ6
500	3	2	4	3		EQ6
800	2.3	1.2	3	2	Orion nebula	EQ6
1000	1.5	1	2	1.5	Globular clusters	EQ6
2000	0.7	0.5	1	0.7	Full diameter of the Moon	EQ6
12000	Very small	Very small	Very small	Very small	Planets	EQ6
Note these are my old fixed length lens and I have roughly measured the degrees from my picture.						

Tripod, Kitchen timer tracker, Barn door mount or piggy-back the camera on an EQ6 or EQ5H mount.

1. Focus the lens 00
2. Set Camera to iso to 12800
3. Set 30 second exposure
4. Press Shot button.
5. If this shot is good.
6. Lock Shot button down in continues shot mode. or
7. Set interval timer to 46 sec
8. Set number of shots to 20
9. Press ok on start.
10. Press Shot bottom.
11. This will take 16 minutes.
12. You should have 20 shots.
13. For processing all these images into 1 image using Deep sky stacker. See pages 7 to 10.
14. To make a time lapse you will need 100 or more image.
15. To make a video from Jpegs.
16. See page 11.



Kitchen timer tracker Design by Greg Walton see page 55.

5. How to use the DSLR camera with a telescope in brief.

Attaching the DSLR camera to the telescope on an EQ6 or EQ5H mount cost $1,500

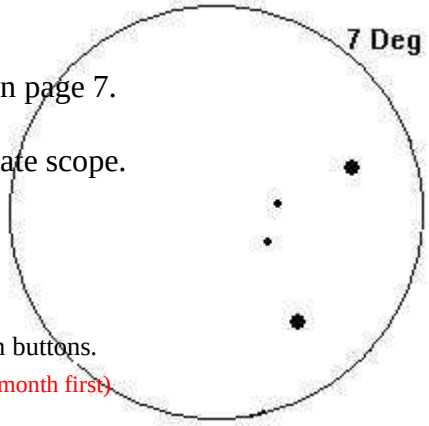
Newtonian 8” f4 $450 – Coma corrector, 15% increase in magnification with T ring adaptor cost $300 page 54.
Refractor ED80 $700 – Field flattener, 15% focal reducer with T ring adaptor cost $300 page 65.
Cassegrain $1,000 to $20,000 – 15% focal reducer with T ring adaptor cost $300
By adding a Dew shield or Dew heaters $300 you will extend your operating time. Hair drier will also do.

M = Mount EQ6

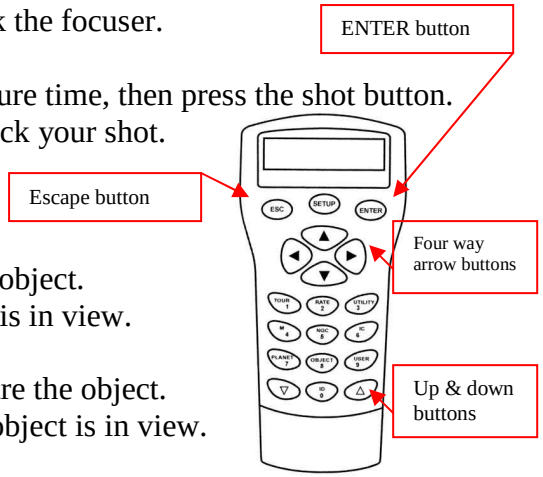
T = Telescope

C = Camera DSLR

M1 Check for backlash and adjust polar scope. (Once only)
M2 The tripod legs can sink into the ground (Pads), laser culminate Newtonian page 7.
M3 Balance the scope on the mount or slightly out of balance can help.
M4 South Polar alignment. Set angle of elevation, adjust left and right and rotate scope.
M5 Switch Power on and off to illuminate engraved screen in polar scope.
M6 Return the mount to the park position and Lock both axis’s tight.
M7 Switch Power on.
M8 Press ENTER button until location appears and enter your location.
M9 Press ENTER button then select normal or Day light saving. Use up & down buttons.
M10 Press ENTER button then set to month day and the year. (Most go wrong here month first)
M11 Press ENTER button then set the time in 24 hours.
M12 Press ENTER button and the correct time should appear.
M13 Then Press ENTER button until star alignment appears.
M14 Use the up & down buttons to select 1 star. Then Press ENTER button.
M15 Use the up & down buttons to select a star that you know is in the sky.
M16 Press ENTER button and the mount should move to that star.
M17 The mount will beep when it has located the star.
M18 Use the four way arrow buttons to position the star in the cross hairs of the finder scope.
M19 Slewing speed can be changed by pressing button number 2 Rate then, 3 for slow, 5 for medium, 8 for fast.
C20 Switch Camera ON
C21 Press LV Live view button.
T22 Turn the focuser knob till the star is at its smallest.
M23 Use the four way arrow buttons to position the star in the centre of the screen.
C24 Press the info button and use the thumb wheel to zoom in 10 times.
M25 Again use the four way arrow buttons to position the star in the centre of the screen.
M26 Press the ENTER button and the star will stop drifting.
M27 Successful alignment should have appear on the display of the hand controller.
T28 Again turn the focuser knob till the star is at its smallest, then lock the focuser.
C29 Press LV Live view button again to switch it off.
C30 Set camera iso to 12800, 2 second delay on and 10 seconds exposure time, then press the shot button.
C31 When your exposure is finished, press the preview button and check your shot.
C32 If you are happy with your shot.
M33 You can move the telescope to your desired object.
M34 Use the up & down buttons to select an object.
M35 Press the ENTER button 3 times and the mount will move to that object.
C36 Look through the view finder of the camera to check if the object is in view.
T38 If not look through the finder scope.
M39 And use the four way arrow buttons on the hand controller to centre the object.
C40 Again look through the view finder of the camera to check if the object is in view.
C41 If you are happy with the view.
C42 Set the exposure time to 30 seconds and press the shot button. Wait for the camera to take the photo.
C43 Press the preview button to view the photo. If you are happy with your photo you can take more shots.
C44 Press Menu 2 Find interval timer and set interval to 46 seconds, 20 shots and press ok on start.
C45 Then press the shot button and wait, this will take about 16 minutes.
46 You can use a kitchen timer set to 16 minutes to alert you when the 20 shots are complete.
C47 Switch camera off and remove SD memory card from camera.
C48 For processing see Deep sky stacker or Jpegs to video.



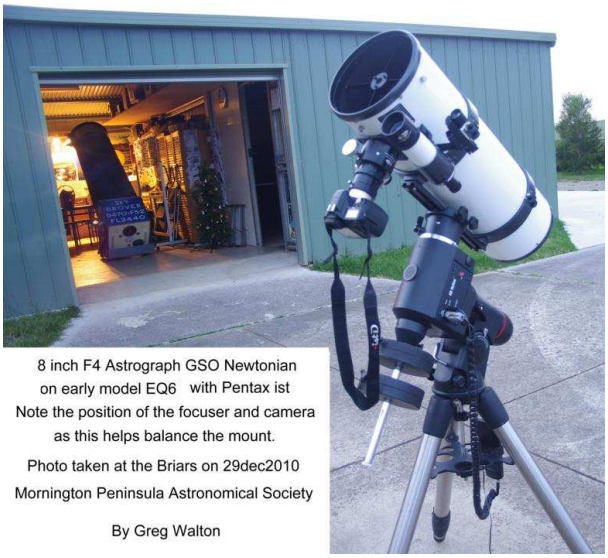
Octans South Pole



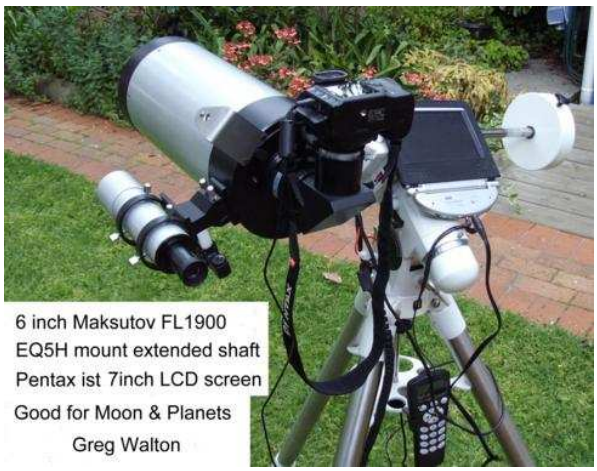
If you us continues shot mode.
Hi = high speed & Li = low speed
As your shots are usually, 30 seconds either Hi or Li will work.

6. How to use the DSLR camera with a telescope part 2.

I made this bracket to hold the shot button down with a plastic screw as not to damage the button and have found this is very reliable. Cable type remotes have batteries that fail and plugs that come lose especially if the telescope is moving. I often go to sleep and leave everything running, the bracket has never failed me but cable remotes regularly failed, leaving me with no photos. Also pictures of 2 of me Newtonian telescopes which I use for imaging, note the position of the camera, I found the scope balances best with the camera in this position. The 12 inch is only usable when there is no wild but can still be used as a Dobsonian, it is by far my best imaging scope. The 8 inch is easiest to use and transport, wind is less of a problem so this scope I us the most. The 6inch Maksutov I mainly us for the moon & planets.



8 inch F4 Astrograph GSO Newtonian
on early model EQ6 with Pentax ist
Note the position of the focuser and camera
as this helps balance the mount.
Photo taken at the Briars on 29dec2010
Mornington Peninsula Astronomical Society
By Greg Walton



Most Newtonian telescopes need a coma corrector to extend the light cone farther out of the focuser, so the light can reach the camera censer. Newtonian astrograph can get focus without the coma corrector, but the images you take will suffer coma, that it out of shape stars in the corners of the image. So you will need to add a spacer to the Newtonian astrograph when using the coma corrector.

7. The laser aligning a Newtonian.

When you buy your Newtonian telescope you will notice it has adjusting knob and screws. Most telescopes leave the factory only roughly line up, knowing that in transport things will change any way. So it is up to you to line up the optics. I have bought many new telescopes and very few have come with instructions, why?

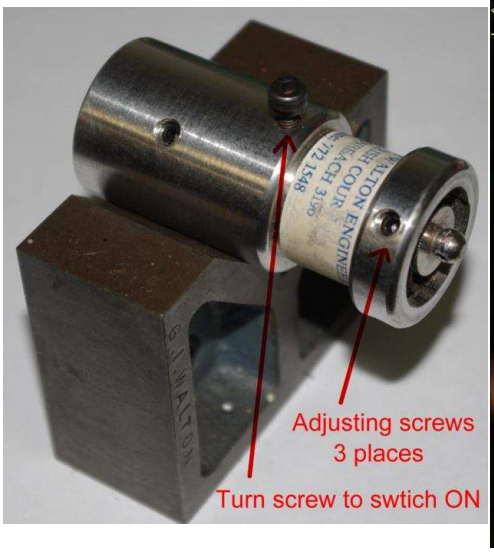
1. Once you have bought the laser calumniator, you will need to test it to see how accurate it is. Some will come with a Vee block. Attach the Vee block to something solid. By placing the laser on the vee block and rotating it slowly whiles aiming it at a wall about 8 metres away, to see if it draws a circle. If it does you will need to adjust it till it makes the very smallest of circles or no circle at all. There should be 3 adjusting screw around the outside, by loosening and tightening the screws by a small amount, you can slowly make the circle smaller and smaller. This is a bit tedious and can wast a whole hour. See photo below.

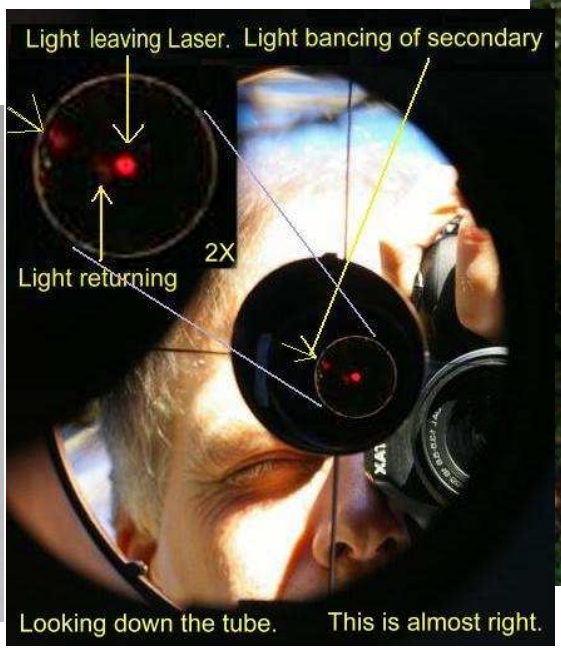
2. Now the laser is ready. We place it were to eyepiece goes and switch it on, the beam of light should hit the centre of the secondary mirror (diagonal) and bounce off and then hit the centre of the primary mirror. You will need to loosen and tighten the 3 adjusting screws in the middle of the spider, till the beam of light hit the centre of the primary mirror, most have a small circle. Some times you will need to slightly rotate the secondary by loosening the centre holding screw.

3. Second stage is to get the beam of light to bounce off the primary mirror and back to the secondary mirror then on to the front face of the laser. You will notice there is 6 adjusting knob at the back of the Newtonian, 3 are locking screws which you just back off 2 turns, there often paint white. Then you will need to loosen and tighten the other 3 adjusting screws, till the beam of light returns back to its source. Sometime it is faster and easier if 2 people work together. Now retighten the locking screws while making certain the beam of light stays aligned.

4. A Dobsonian should stay aligned all night, but a Newtonian on an equatorial mount will change as it point to different parts of the sky. For the primary mirrors is never held tightly as this could bend the mirror, so they tend to move, which messes with the alignment. So calumniate the telescope while point at the part of the sky you wish to image.

5. Refractor may also require calumniating from time to time, place the laser were the eyepiece goes and switch it on, the beam of light should hit the centre of the front lens, if not you will need to loosen the screws that hold the focuser and move it till the beam of light hits the centre of the front lens, then retighten the screws. I have often had to file the screw hole larger to make this happen. Generally you only need to do this once unless you drop or over load the telescope.

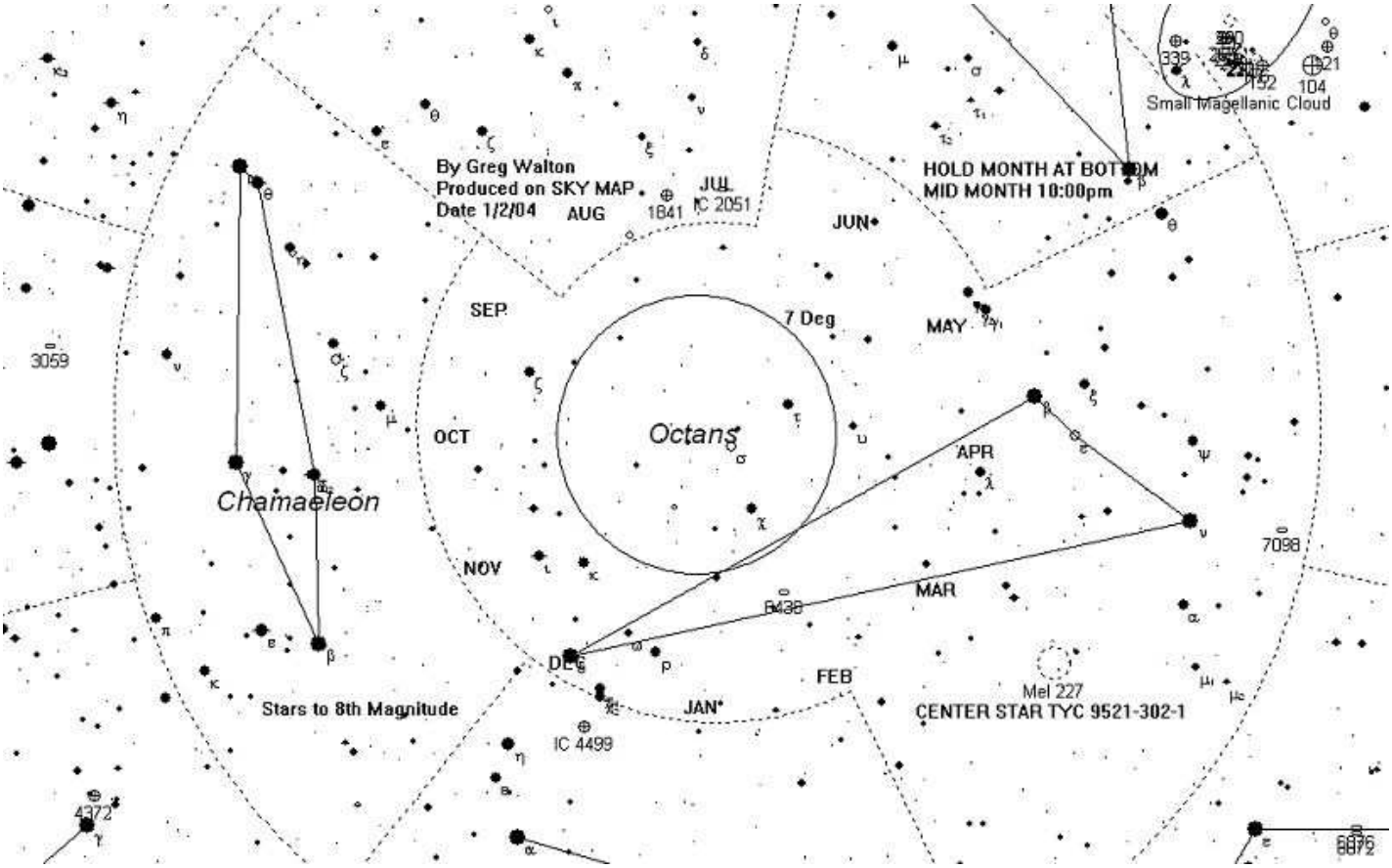


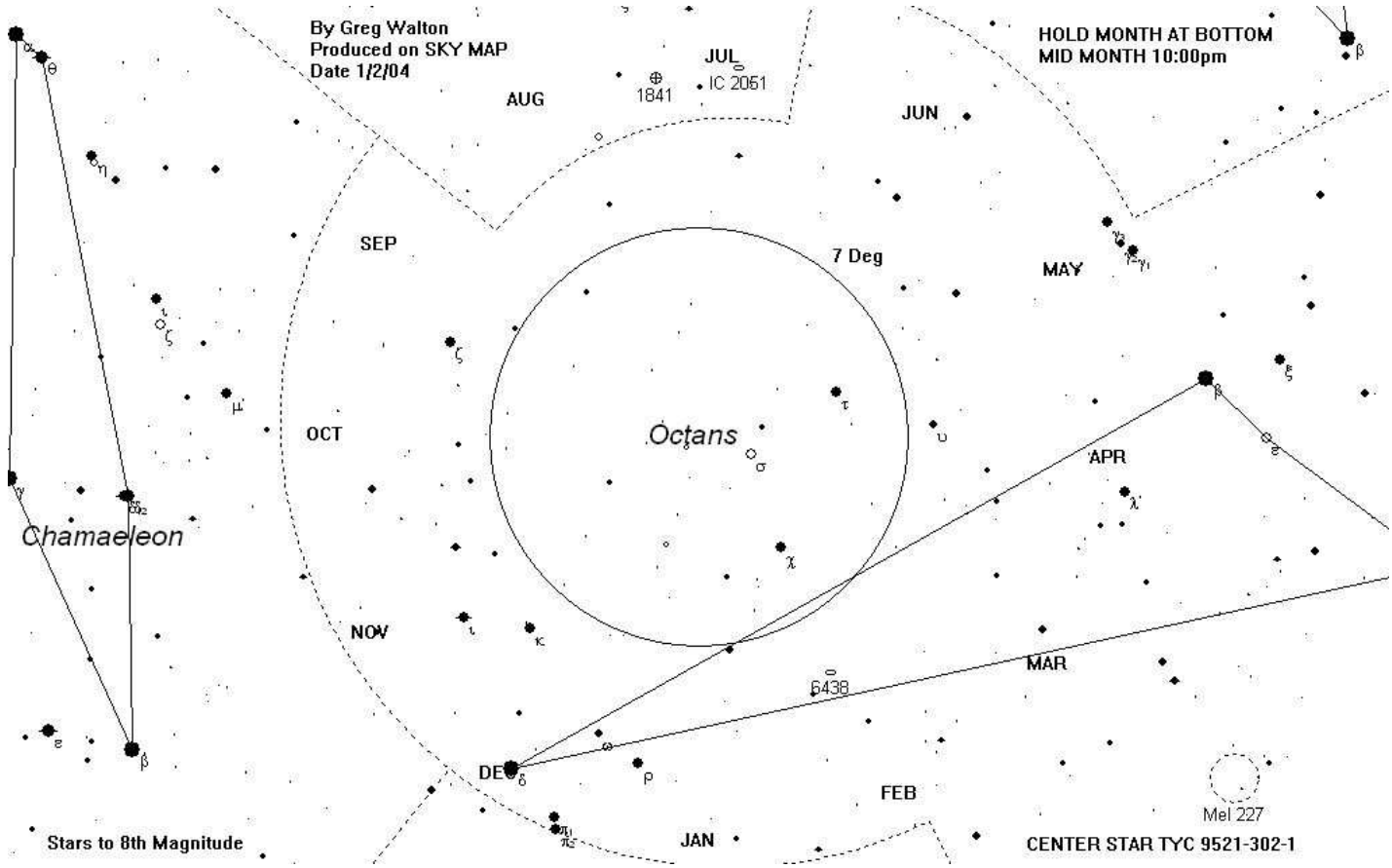


Note the best way is to find someone who has done this before and watch them.

8. Finding the South Pole constellation Octans.

Here are 2 maps which are handy for finder the south celestial Pole. The centre 7 degree circle, this is what you would see through a pair of binoculars. By holding the appropriate month at the bottom at 10pm it will give you the correct orientation of Octans.





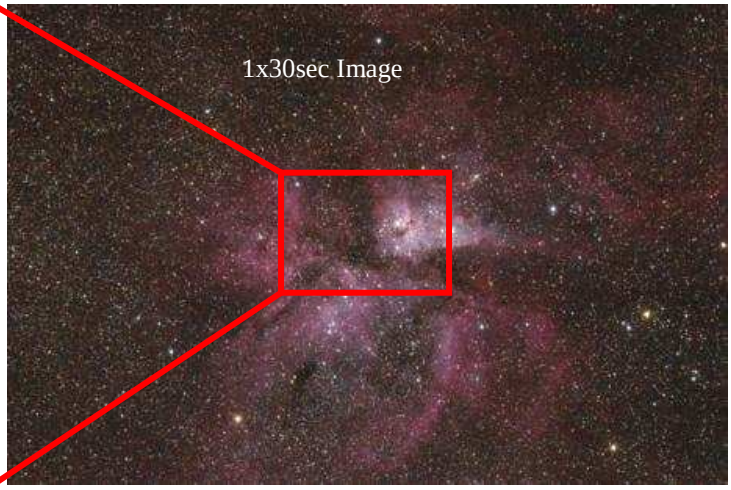
Note that the view through the polar scope is up side down and back to front.

9. To stack or not to stack? Deep Sky Stacker.

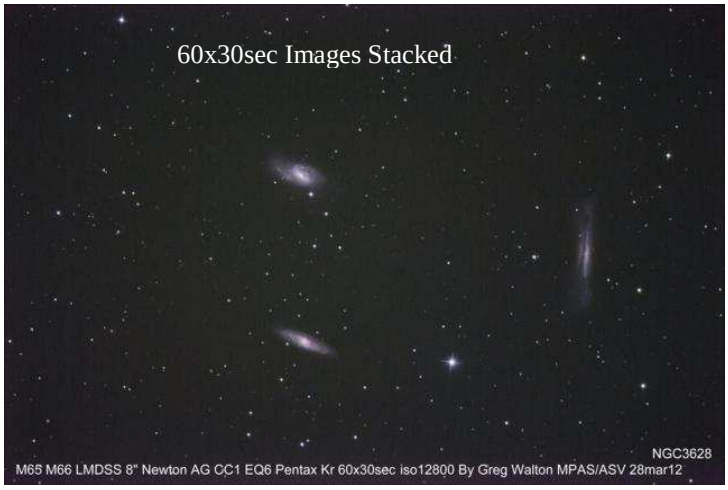
In Astro photograph we usually take multiple images of the same object and merge them to make one excellent quality smooth image. These 2 images on the right look very simular the above one is a single image while the bottom one is 130 images stacked, but when we zoom in we can see the bottom images is a much better quality.

The top image is a single 30sec exposure at iso12800 which looks grainy.
The bottom image is 130x30sec exposures at iso12800 which looks much smoother.

These images were taken with ED80 refractor with field flattener and Pentax Kx on EQ5H go to Mount.

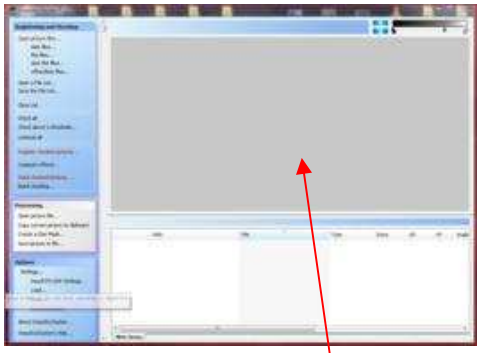


These images below were taken with 8” Newtonian AG with CC1 and Pentax Kr on EQ6 go to Mount.

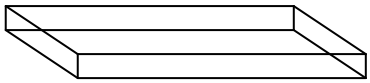


Warning note, that your computer will need to be well ventilated and the processors will get hot.

10. Stacking Jpegs with Deep Sky Stacker.

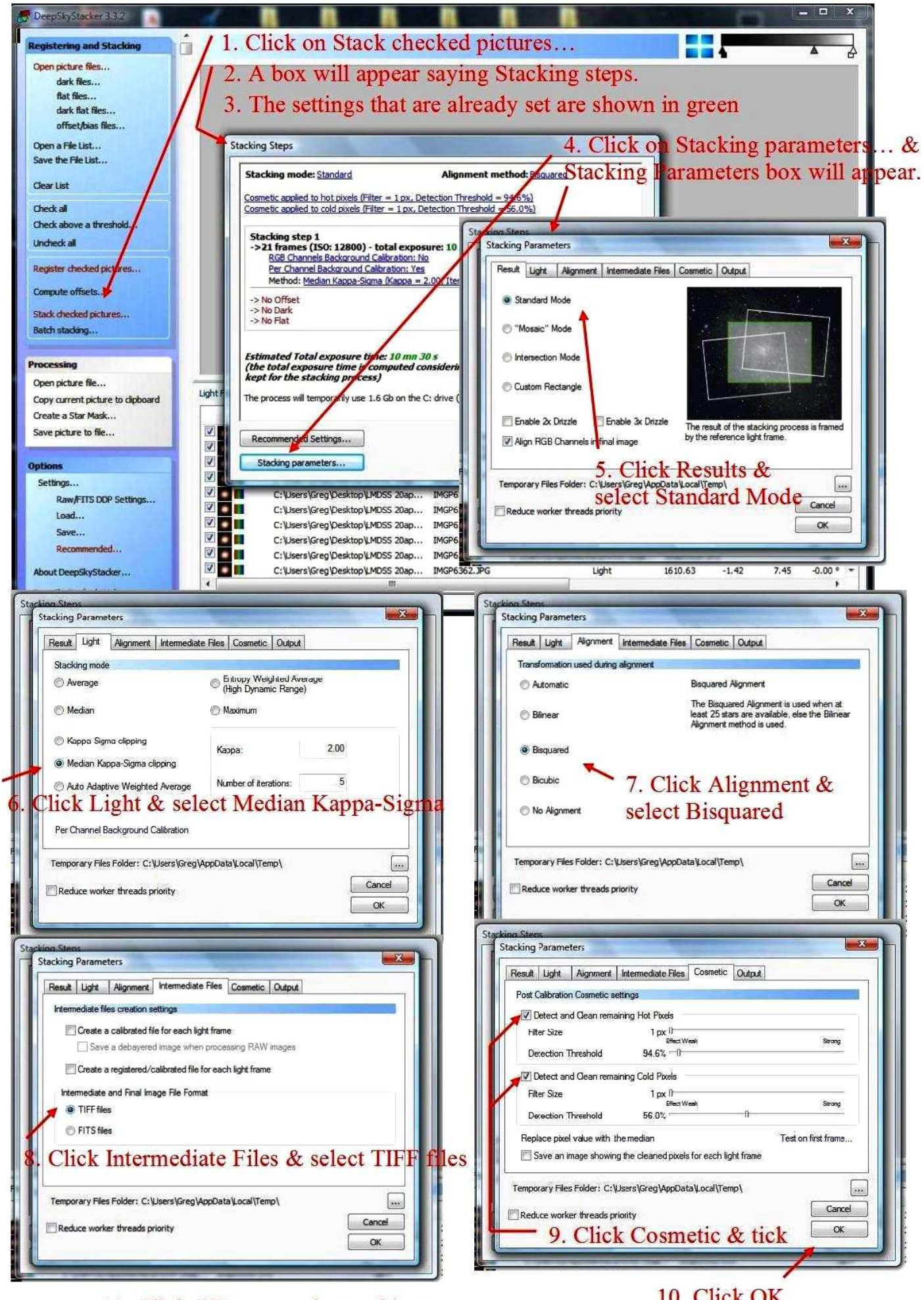


Please angle laptops away from people and there telescopes.



1 Make a folder with the name of the location and the date, eg Ballarat 20aug11
2 Make a folder with the names of each of the objects in order that they were taken,
3 Eg. 1 M10, 2 M11, 3 M12, 4 NGC2070, 5 NGC253, etc
4 Do this when you are taking the photos or the day before.
5 Sometimes is hard to remember what objects you have taken the previous night.
6 When you copy the photos from your SD card.
7 You can start with the first set of photos and drop them into folder number 1
8 And the second set of photos into folder number 2 and so on.
9 Now that all the photos have been copied into there folders.
10 You will need to open each folder and check each photo.
11 Make shore that the stars are small and round.
12 Things can go wrong like the scope may have been bumped or wind shook the scope.
13 Even people walking around the scope can shake the scope, especially when set up on concrete.
14 Green laser, car head lights, people's heads and clouds are also good ways of spoiling a photo.
15 Delete all the spoilt photos.
16 Click on Deep Sky Stacker (DSS)
17 Select all the photos from the first folder.
18 Drag and drop them into the large empty blue panel on DSS.
19 A box will appear asking, add Files as Light frames. Click on OK
20 Check that all the boxes in front of the files are ticked. ☑
21 Click on Stack checked pictures… in red.
22 A box will appear saying Stacking steps. Click on Recommended Settings.
23 The settings that are already set are shown in green.
24 You can change them or click on OK. This will return you to the previous panel. See next page.
25 Then click on OK. And the staking will commence.
26 This will take sometime 20 shots will take 20 minutes, 70 shots can take 2 hours.
27 The more star the longer it will take. Time can be reduced by changing the setting.
28 First it will register the pictures and then it will stack the pictures.
29 Once your stacked picture appears you will need to adjust the settings in the lower panel.
30 Click on RGB/K Levels.
31 First slide the colour pointers along so all colour curves are on top of each other in the centre.
32 Click on Luminance.
33 Slide all points all the way to the left then all the number should be zero.
34 The black line should start in the bottom left corner and go strait to the top right corner.
35 Click on apply. Your finished Picture should appear to darken with more contrast.
36 Click on save picture to file…. in Black.
37 Save as panel will appear. Find your folder and give your finished picture a name. Click on Save.
38 Note if you are not happy with the result you can change the recommended settings and stack again.
39 Find your finished picture and drag it to MP Viewer. MP Viewer will open your picture as a TIF file.
40 Click on save as. You can resave your pictures as a Jpeg by changing the Save as type. Click Save.
41 Now you can open your picture with iphoto or similar soft ware to edit it.
42 Open your stacked picture with iphoto.
43 Adjust colour balance brighten for Nebulas.
44 You can defocus your picture to remove a grainy looking back ground with out spoiling the stars.
45 Adjust gamma to change the amount of colour then adjust contrast, too no more than 20.
46 Then adjust brightness. Add some writing about the picture, eg
47 M8 Ballarat 8" Newton AG CC1 EQ6 Pentax Kr 20x30sec iso12800 By Greg Walton 20aug11
48 It's easy to get carried away and over adjust the finished picture. No when to stop!!!
49 Click on Finish then Click on Save, then show it to your friends.
50 There are many different photo editing softwares and even more way to edit your pictures.
51 Best to find what works for you, good luck.

11. Deep Sky Stacker & how to change the stacking settings to my preferred settings.



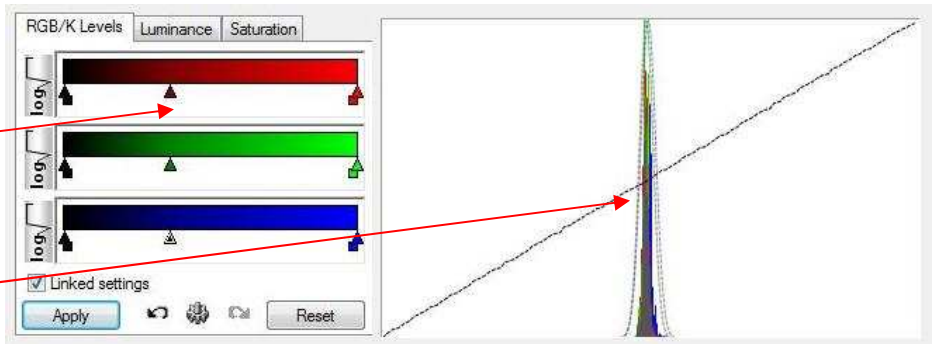
12. Editing your stacked images before saving them with DSS.

Now once you have successfully stacked all your images, you will notice the finished image looks washed out.

For Nebulas and star clusters.

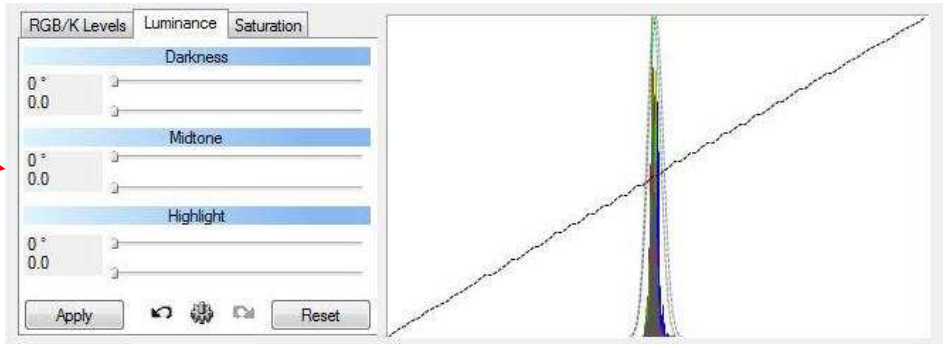
Move all RGB/K levels until all colours are in the centre of the right pain.

All colours now should be on top of each other.

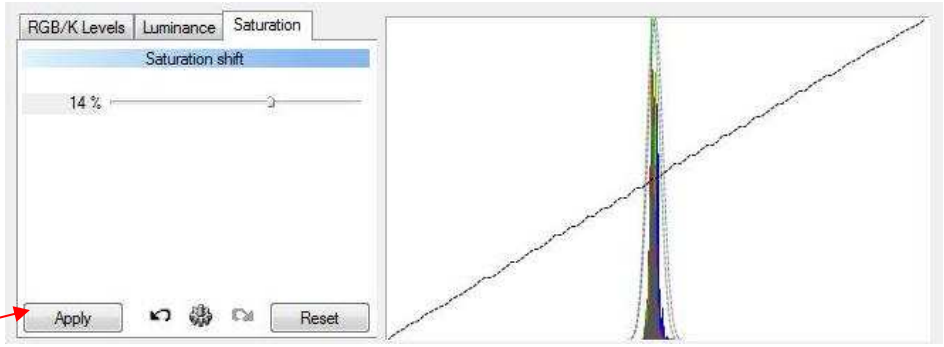


Move all the luminance levels all the way to the left or set at zero.

There should be a black line from the bottom left corner to the top right hand corner of the right pain.



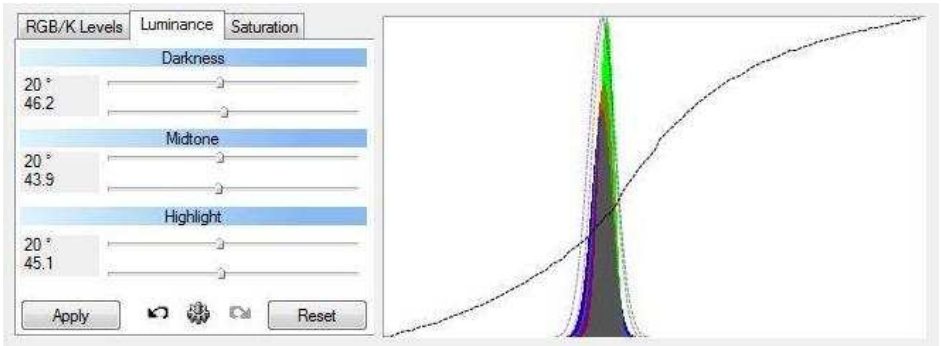
You can also adjust the saturation level which increasers or decreases the amount of colour in the image, this only works on images that have colour like nebulas. I find a maximum of +14% usually works best.



Then Click apply, this will take a moment.
Then save the adjusted image to the same folder as the original group of images.

For Galaxies, I found its best to set all the Luminance to 20deg 45 to retain the outer structure.

Then again save the adjusted image to the same folder as the original group of images.



Before you close DSS you may wish to make more adjustments to the levels and save them in the same folder but with a different name. Best to make more adjustments and save them all, once you close DSS is hard work to make more. You can always delete all the adjusted images that are not up to the standard you require.

Find your finished picture and drag it to MP Viewer. MP Viewer will open your picture as a TIF file.
Click on save as. You can resave your pictures as a Jpeg by changing the Save as type. Click Save.
Now you can open your picture with iphoto or similar soft ware to edit it.
Photoshop, Paint or Gimp can also convert your images to different types.

13. Help and Hints for Deep Sky Stacker.

Sometime DSS false because the computer does not have enough free memory space (make more space)

To higher iso setting (25600) can make too much noise and DSS sees the noise as stars. You will need to darken all the images by the same amount say 50% before stacking or re image the object again at a lower iso setting say 12800 with noise reduction on or 3200 with noise off.

You can split your images into 2 or 3 groups of 20 images and then stack each group, then stack the finished images. A typically number of images needed with iso12800. Star cluster 20 Images, Nebulas 20 to 50 images and Galaxies 50 to 70 images. Note you will need to take more images than you need because some will be unusable. 20 shots = good, 50 to 70 shots = very good, 120 shots = best but only slightly better. Use only for very special objects. Note that the lower the iso the less number of images you will need because they will have less noise.

Usually the first 1 or 2 images and last image, have out of shape stars (delete these images)
Cause is back lash in gears or touching the camera to start continues mode. Also wind will shake the telescope making the stars drawing lines on the image, you will need to seek and destroy these images. The bigger the scope the more images you will need to destroy. Use a smaller telescope on windy night.

Images taken with Azimuth type telescopes can be stacked if batches of images are kept to a minium, say 20 and the over all run time is no longer then 20 minutes. Also some guiding would help, but adds another lay of complication. With Cassegrain type telescopes the focal length is long, usually more then 2000mm and the position of the stars can changes on the image. Often the stars do not line up and DSS will produce double stars in the corners of the image. A field de rotator can be fitted to these types of telescopes, but adds another lay of complication.

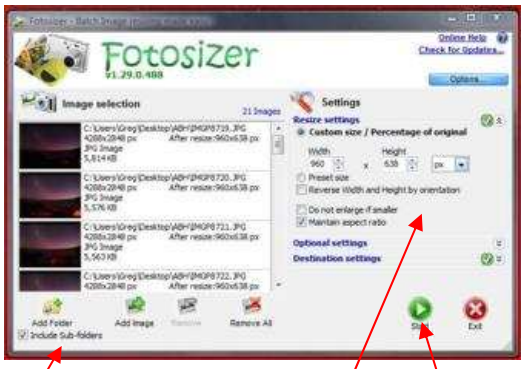
Staking images of different iso settings usually can be done. Start with a small number of images and increases until DSS fails. But sometimes you will need to stack them to batches.
First stack all the 12800 together and then stack all the 6400 together and, then stack all the 3200 together. Then you can stack all the finished stacked images to produce one final image. Note the higher the iso the more images you will need to smooth out the image, with iso 400 you will see it has almost no noise so will not need stacking, so it would be a total waste of time taking more than 10 to 20 images.

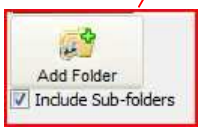
As the telescope cools down the length gets shorter so adjust the focus after the first batch is complete or your whole nights work could be for nothing. I like to image objects that are directly over head as these produce the best images, because you are looking through the lest amount of atmosphere. Of corse drew can fall into the telescope more easily looking straight up, drew heater or hair driers will be needed at sometimes. Also you need to be mind full that the telescope could impact the mount in curtain situations, like going to have coffee then coming back to find a collision has stopped the mount. Also cables getting snagged are a common. Mounts sinking into soft ground can puts the polar alignment out.

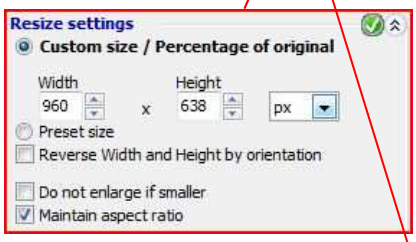
MPAS at Border Stargaze 2008

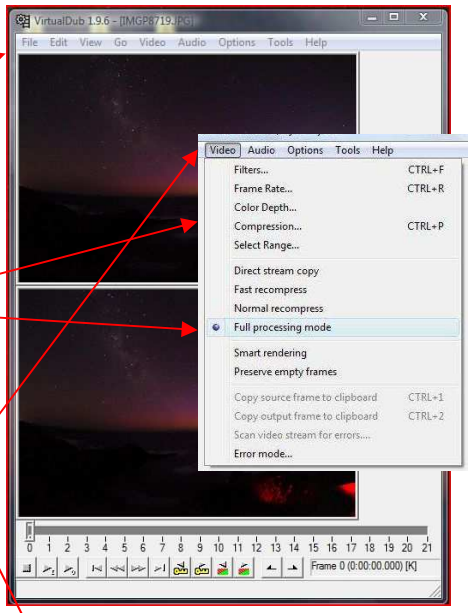
14. Make a Video from Jpegs.

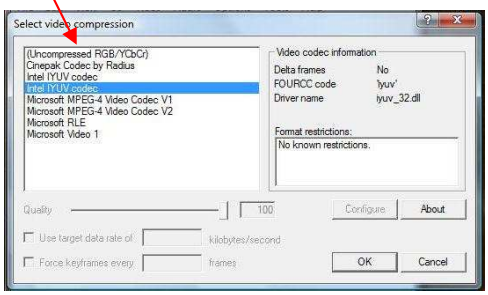
1 All you need is a Camera (Pentax Kr DSLR) and Tripod.
2 Select and frame your subject.
3 Take a series of photos.
4 Using Continues shot mode (Best at night) or interval timer.
5 For night time shots with wide angle 18mm lens set a F4.
6 Select manual mode and a high iso 6400 setting for 30 seconds.
7 Noise reducing on and interval timer set to 46 seconds.
8 For day timer shots with wide angle lens.
9 Select green mode and an iso 100 setting.
10 With interval timer set to say 30 seconds to 5 minutes.
11 Once you have taken your photos remove SD card and
12 Place photos in folder on computer.
13 Make a copy of your photos as the originals will be lost.
14 If mega pixels are to large reduce with Fotosizer.
15 Run Fotosizer.
16 First click on add photos then select your photos.
17 Or just drag the folder to the large empty panel.
18 Click on resize settings and adjust width and hight to say 25% or adjust
19 Pixel size 480x320=Poor, 640x480=Good, 960x638=Very Good
20 With time you will find the best Pixel size that will suit your camera and computer.
21 Click on destination and select same as original.
22 Then click on start.
23 The finished photos will have replaced the originals.
24 Run Virtual Dub.
25 Click on file. Then click on Open video file or Control + O
26 Then find your resized photos and click on the first photo in folder.
27 Your photos should be now loaded up.
28 Click on Audio. Then click on import Audio file.
29 Find sound track. Sound is optional. Mp3 works Best. WAV is OK.
30 Click on Video. Check that Full Processing mode is on.
31 Then click on Compression.
32 Select Uncompressed RGB/YCbCr for Highest Quality or
33 Select Intel IYUV codec for High Quality at half file size or
34 Select Microsoft MPEG-4 Video codec V2 for least Quality but good for send videos to friends over the internet.
35 You can also use Filter to edit your video.
36 Click on Video. Click on Filter. Click on Add and a list of filter will appear, select as many as you like, eg (Reduce by half)
37 Click on file. Then click on Save as AVI
38 Select the destination for your new video file. Then Click Save.
39 It will take a minute to make your video.
40 Find your new video.
41 Click on it and admirer your handy work.
42 If it does not play open with VLC player. Or try QuickTime.
43 If it stalls or moves slowly you may need to reduce the size of your photo even more, or adjust the resize filter.
44 Before closing Virtual Dub. You can run Virtual Dub as many times as you like making many Videos of different sizes and effects.







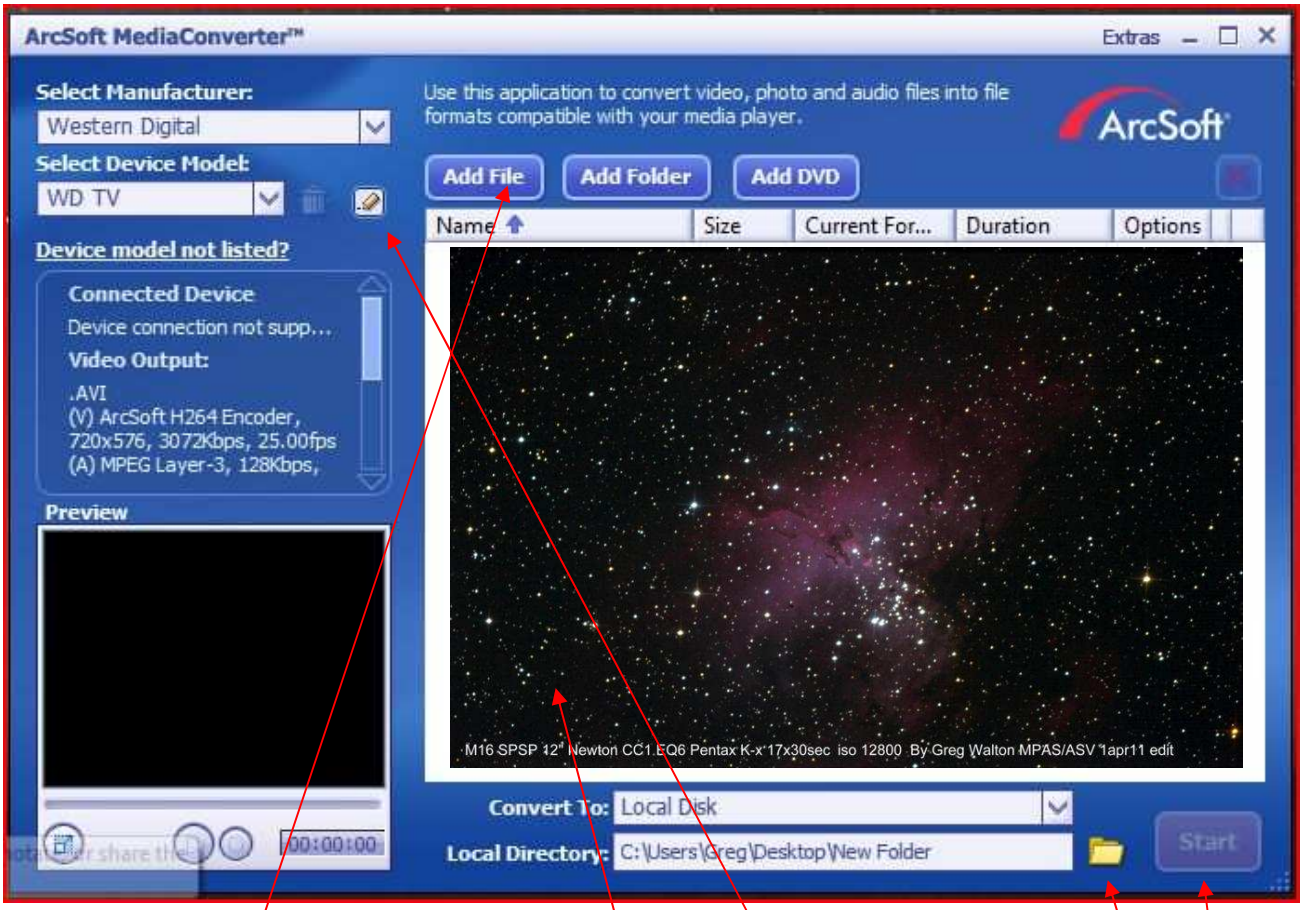




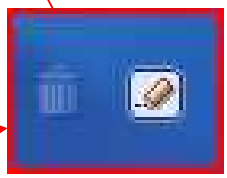
Some hints on how to fix things that go can wrong with, Virtual Dub.
All Jpegs must be the same Pixel size & roughly the same Meg or KB. You can use Fotosizer to fix this.
All Jpegs must be in numerical order eg (1, 2,3,4,5, etc) Sometime deleting the first image can help.
Note if a number is missing Virtual Dub will not load up past the missing number.
See page 14. Renaming help and hints.

15. Make your Video, Pictures and Audio files smaller with Medi-converter 2.5

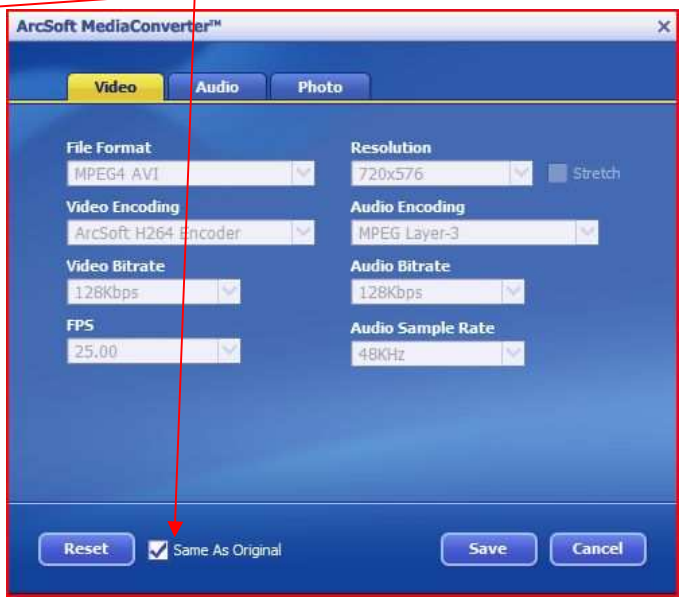
1 Your new video can be reduce to a small size even further with Medi-converter 2.5



2 Run Medi-converter.
3 Click on Add file
4 Find your new video file and click on it.
5 Or just drag your video file to the large empty panel.
6 Click on edit icon next to rubbish bin.



7 A panel will appear.
8 Click on Video and check that the Same as Original Box is Ticked or select Highest Quality.
9 Then click Save.
10 Select the location were your compressed video it is to be saved, see bottom folder icon.
11 It will make a Folder on the Desktop if you do nothing.
12 Then click start in the lower right hand corner.
13 This will take a few minutes.
14 Find your newly compressed video.
15 Click on it and admirer your handy work.
16 If you are not happy with quality
17 Change the Resolution and run again.



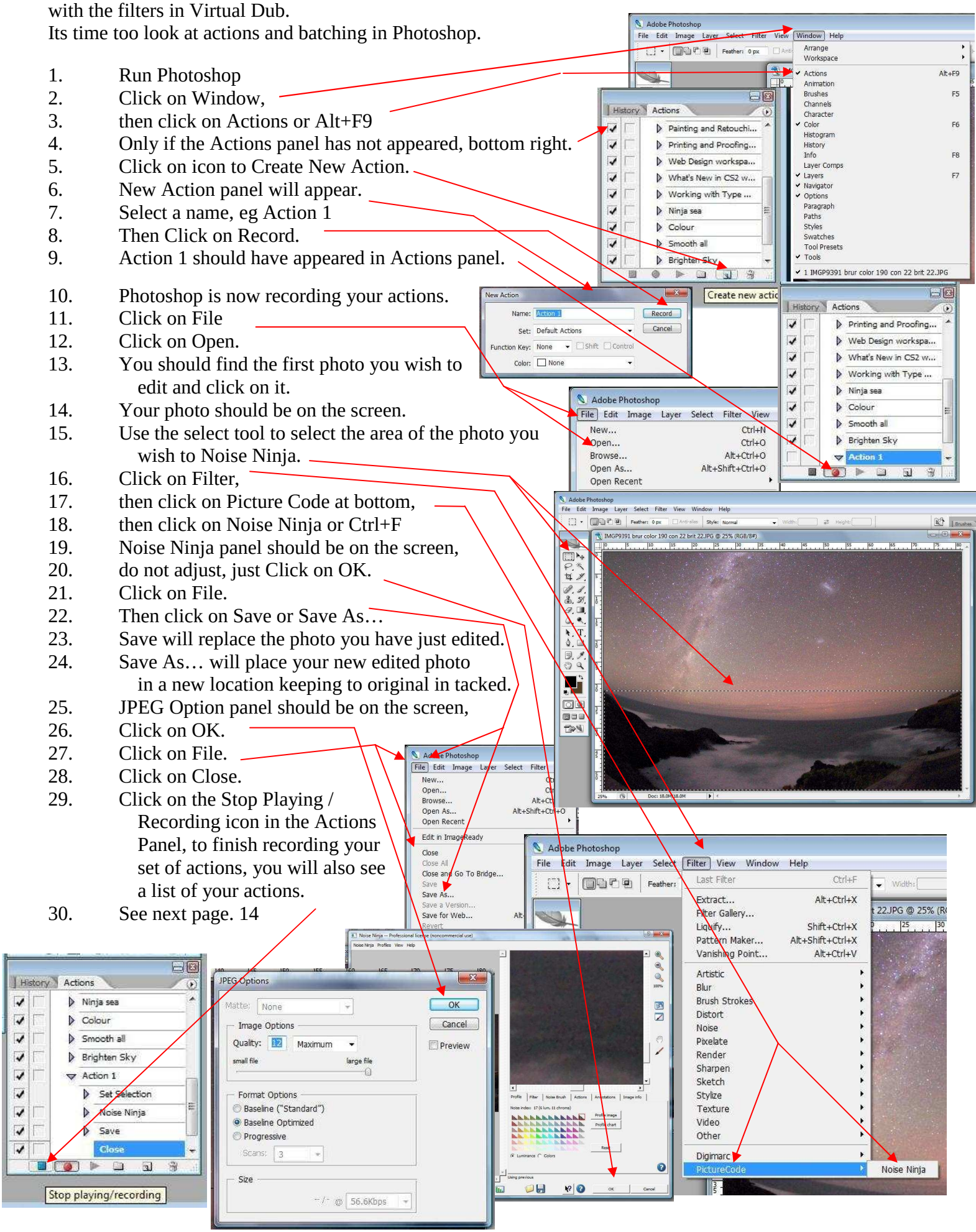
Medi-converter 2.5 can also resize your photos and Audio files.

Note - This is just a starting point to get you going and it's only limited by your imagination. Software like PhotoShop actions and Sony-Vagas can take you to a more profession level.

16. Editing photos with Actions and Batching in Photoshop, Part 1.

So you want to edit a batch of photos, maybe you have a video that looks grainy and you can not fix it with the filters in Virtual Dub.
Its time too look at actions and batching in Photoshop.

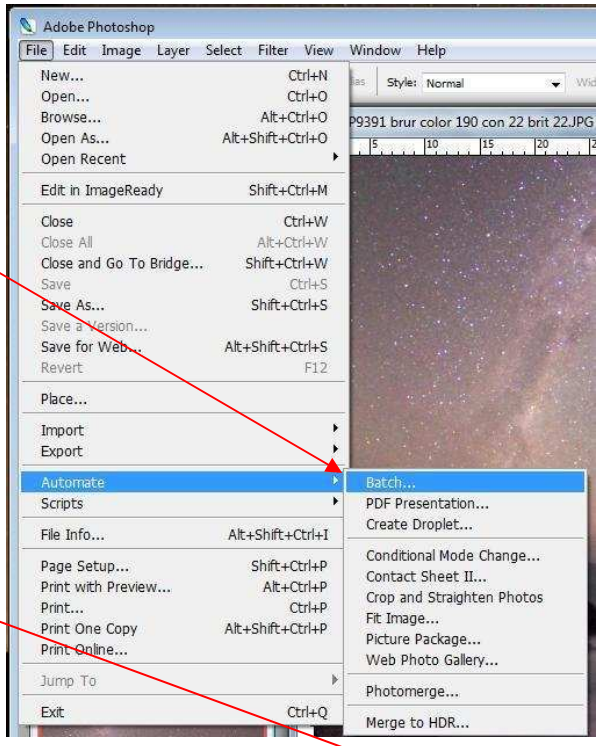
1. Run Photoshop
2. Click on Window,
3. then click on Actions or Alt+F9
4. Only if the Actions panel has not appeared, bottom right.
5. Click on icon to Create New Action.
6. New Action panel will appear.
7. Select a name, eg Action 1
8. Then Click on Record.
9. Action 1 should have appeared in Actions panel.
10. Photoshop is now recording your actions.
11. Click on File
12. Click on Open.
13. You should find the first photo you wish to edit and click on it.
14. Your photo should be on the screen.
15. Use the select tool to select the area of the photo you wish to Noise Ninja.
16. Click on Filter,
17. then click on Picture Code at bottom,
18. then click on Noise Ninja or Ctrl+F
19. Noise Ninja panel should be on the screen,
20. do not adjust, just Click on OK.
21. Click on File.
22. Then click on Save or Save As…
23. Save will replace the photo you have just edited.
24. Save As… will place your new edited photo in a new location keeping to original in tacked.
25. JPEG Option panel should be on the screen,
26. Click on OK.
27. Click on File.
28. Click on Close.
29. Click on the Stop Playing / Recording icon in the Actions Panel, to finish recording your set of actions, you will also see a list of your actions.
30. See next page. 14



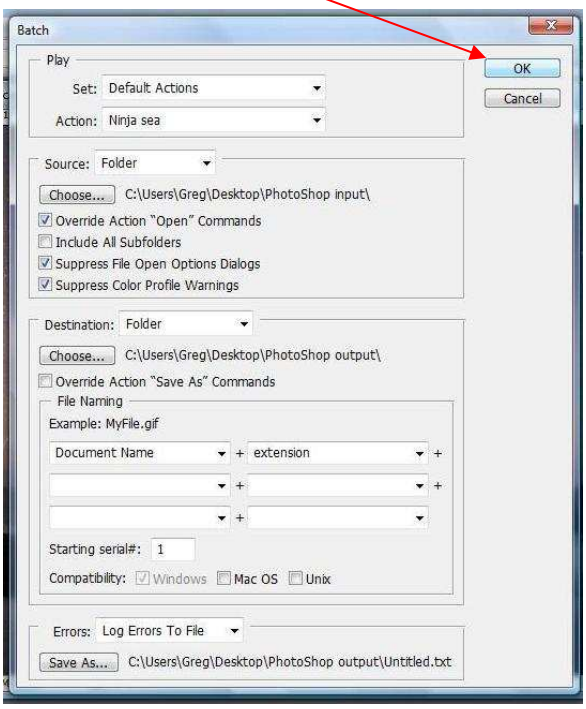
17. Editing photos with Actions and Batching in Photoshop, Part 2.

Now you have recorded your action it is time to uses them on other photos.

1. Run Photoshop.
2. Click on File.
3. Click on Automate.
4. Click on Batch.
5. The Batch panel should on the screen.
6. Set: Default Actions.
7. Action: Action 1
8. Source: Folder
9. Choose… the folder which contents your photos.
10. Destination: Folder
11. Choose… the folder were your photos are to go.
12. Tick Override Action “Open” Commands.
13. Tick Suppress File Open Options Dialogs.
14. Suppress Colour Profile Warning.
15. Click on OK
16. Now wait until all Photos are finished.
17. Open your destination
18. Check your Photos.



This is a very powerful tool saving lots of time.
You can make many different groups of actions.
To perform many different jobs.
This is just a starting point for you to build on.



Renaming help and hints.

Renaming your images for Virtual Dub can go wrong.

When using Views then large icon, the images sometimes gets renamed out of order and are useless for making your time lapse movie. It’s very annoying!
Use Views List when renaming for less trouble.

1. Click on first image.
2. Click on Edit.
3. Then Select all.
4. Add New Name eg; VS
5. Once complete you will need to
6. Rename first image only eg; VS (1)
7. Click on View then large icon.
8. Check images are in right order.

18. T-Ring adaptor.

You can buy for 30 dollars a T-Ring adaptor which has a thread inside which fits most old threaded camera lens, some of which are excellent quality like the Russian Helios brand. But some do not come into focus, so it is best to take your camera with you when buying lens, though on some lens this can be adjusted by losing the 3 small screws on the out side of the focusing ring, then you can turn the ring until it comes into focus and then retighten the 3 screws. I have found there are 2 standard threads, one metric and one imperial, that have the same diameter and look the same, but they do not screw together so watch out for this. I have reworked these threads on an old lathe, if I ready like a particular lens. The thread in most T Ring adaptors can be removed and the T Ring can be clamped strait onto just about any old lens with the 3 screws, you can also add new longer screws if there are too short.

You can also use the T-Ring to join the camera to a telescope, by threading it to a 2inch or 1 1/4” tube, which would slide into the focuser on a telescope, this method is called prime focus. Most telescopes work well with this method, except some Dobsonian focusers do not have enough travel to achieve focus. This can be fixed by installing a low profile focuser but these rarely work well because the weight of the camera hangs out a far way. The primary mirror could be move up the tube closer to the secondary mirror but you may find your eyepieces will not come into focus and may need to buy an extension tube. The old type Televue coma corrector can be threaded into the T-Ring this gives a 15% increase in magnification and brings the focal point farther out of the focuser so there is no need to change the focuser or move the mirror. See photo below.

Warning, always make curtain to line the dots up, as some T ring can go in the wrong way and once this happens you may need too saw the T ring up to get it out. The Pentax has a spring clip inside the camera body that will stop the T ring from coming off; you will need to hold the spring clip down and turn the ring to get it off. This has happen to me twice now. If it happens with a lens you will need to smash the lens so you can get at the spring clip inside the camera, which is very bad.

19. Having trouble getting into focus. Adaptors

There is a multihued of other gadgets that can be used with the SLR camera like stepper rings which move the camera away from the lens. This is needed if you want to photograph something that is too close to the camera and lens combination. For instance with a 500mm lens the closest setting may be 30 meters but a bird in a tree might only be 20 meters away, then you will need to add a 12mm, 20mm or 36mm stepper rings. Something small like an ant can be made to look bigger by adding all 12mm, 20mm and 36mm stepper rings, a macro bellows would do the same thing but would be a bit more versatile.

Photos of my stepper rings and microscopes.

Then there is a converter which double or triple the magnification like a Barlow lens would be use on a telescope. When photographing the planets I us a 2x and a 3x converter, because the planets are so small and need a lot of magnification or a very long focal length telescope, typical a 12 meter focal length would be needed if you wanted to see any surface detail on Mars. On cloudy nights I sometime attach the camera to a microscope, it's like going to another planet were the critters are down right scary.

In my photos I may mention a Tele-converter it is probably one of these below.

Photo of macro bellows below.

20. My favourite old Lens.

In my photos I usually mention a lens; it is probably one of these below.
These are my favourite lens, usually bought second hand for $20 to $50.

They all have the Pentax K mount and will fit any Pentax DSLR. They are of a fix focal length and are much faster or smaller F ratio than more modern zoom lens. They are made of glass and are much heavier than modern plastic lens; they also have aluminium housings and are built tougher than modern plastic housing type lens. I have noticed that these old lenses are much easier to remove dew from. The only draw back is you need to remember which lens you used with what settings for which photo, the modern digital lens record this automatically in the properties file attached to each Jpeg photo, plus a lot of other useful information, eg; time, date, F/stop, mega pixels, your name, and a lot more.
The longer lenses usually have a mounting point to attach them directly to the tripod to help balance them.

21. How wide is my lens?

You may want to capture a whole constellation and cannot decide which lens to use. Most planetarium software can give you the field of view in degrees for a part of the sky you wish to photograph. I like SkyMap but Starry night or Stellarium will do.

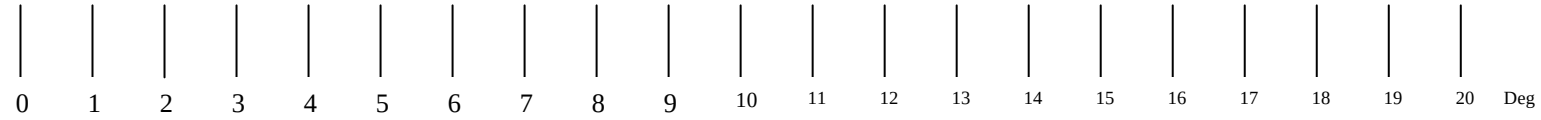
My Pentax K-x and Pentax ist has a 2/3 sensor that's about 22mm x 15mm in size. Were as the top end Digital SLR cameras have full frame sensors that are the same size as the old 35mm film cameras with a sensor that is 35mm x 22mm. Both have there advantages, the full frame DSLR take a bigger picture or wider field but are much heavier and will need a stronger mount and will tend to throw telescopes off balance. Were as the smaller Pentax K-x is much lighter and causes less strain on mount and telescopes, it has a 2/3 sensor that crops the picture, which gives a 1/3 magnifying effect. That is a 100mm lens would work like a 150mm lens. This is not all bad when using wide angle lens the corners of the image often suffer from coma. That is the stars are distorted out of shape or elongated and can also look like seagulls. The cropping effect would cut some of this away give a more pleasing picture. You can reduce the coma by stopping down the lens to a larger F ratio and increasing the exposure time. When using film I suspected that when you get your photos prints back from the camera shop, they have had some degree of cropping. So I think the Full frame digital prints are slightly bigger.

When viewing my night sky shots the lens length is often stated on them and can be used as a guide.

In the table below the length and width are in degrees.

Which lens to use?	Pentax K-x 2/3 sensor Pentax K-r 2/3 senor Pentax ist 2/3 sensor 22mm x 15mm sensor		35mm Film Full frame DSLR 35mm x 22mm sensor		In this table the length and width are in degrees.	Mount
Lens	Length	Width	Length	Width	Rough guide	
18	80	50	100	70	Many constellations	Tripod
28	45	30	60	40	Large constellation	Tripod
50	27	18	37	24	Medium constellation	Tripod
80	16	11	22	17	Small constellation	Barn
135	10	7	14	10	Very small constellation	Barn
200	7	5	10	7	Large Star clusters	Barn
300	5	3.2	7	5	Pleiades M45	Barn
400	3.5	2.5	5	3	Eta Carina nebula	EQ6
500	3	2	4	3		EQ6
800	2.3	1.2	3	2	Orion nebula	EQ6
1000	1.5	1	2	1.5	Globular clusters	EQ6
2000	0.7	0.5	1	0.7	Full diameter of the Moon	EQ6
12000	Very small	Very small	Very small	Very small	Planets	EQ6

Note these are my old fixed length lens and I have roughly measured the degrees from my picture.



By hold this scale at arms length it will give you a rough measurement in degrees.

22. Tripod.

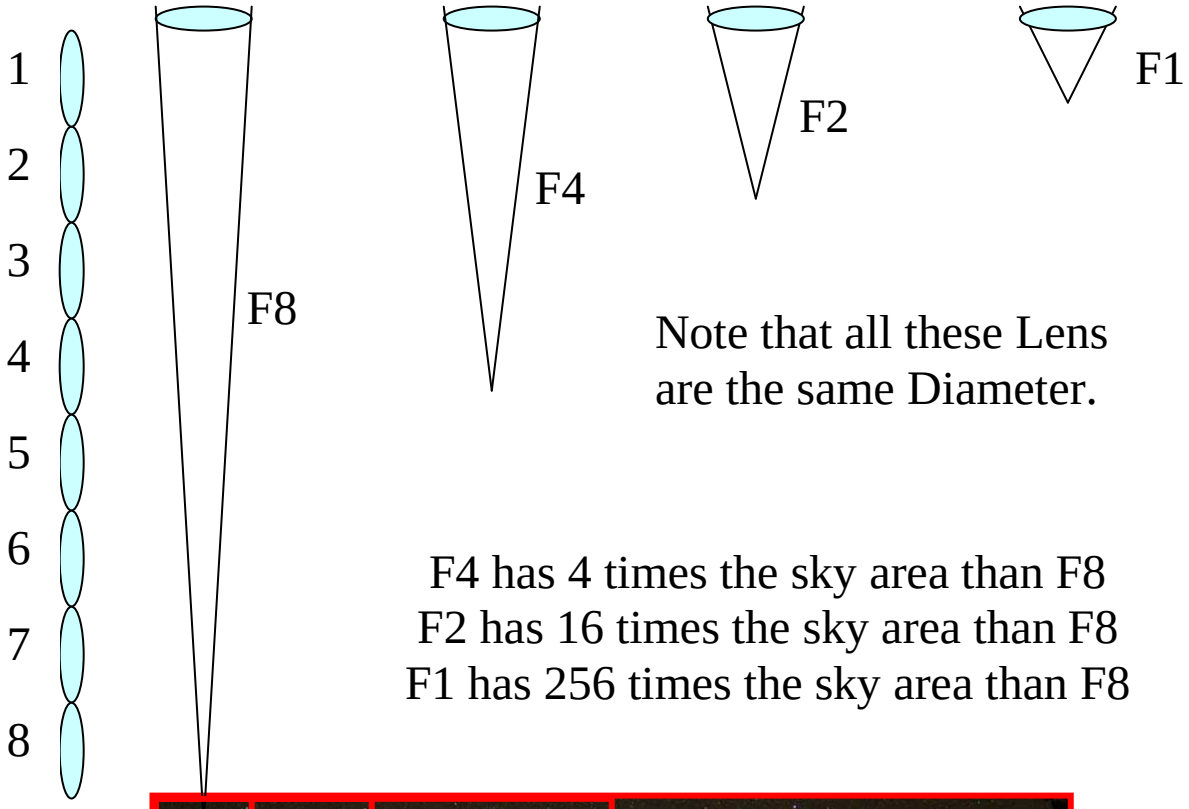
Shotting from the tripod can produce some of your best shots. You can quickly setup and move position, this is good when framing a particular part of the sky with foreground objects like trees and buildings. Sometime it is being in the right place at the right time. Like in this photo below, with the scorpion between the trees, distant town lighting up the horizon and the Milky Way across the top. This was done with a tripod and the Pentax-ist and a 28mm lens with an iso3200 for 30 seconds. You will notice the stars have only moved slightly, of corse the longer the lens the more noticeable the star drift is, because of the higher magnification. So the longer the lens the shorter the exposure time must to be if you don't want star trails. There are some new software packages that can bring the stars back to a round shape, like Star rounder.

Lens	Sec
28	30
50	15
135	6
300	3

Below a camera tripod set up for making a timing lapse video of a sundial. The camera was set in idiot mode and the interval timer was set to take a photo every 5 minutes. Then all the images were loaded onto Virtual Dub to produce a video. See page 11.

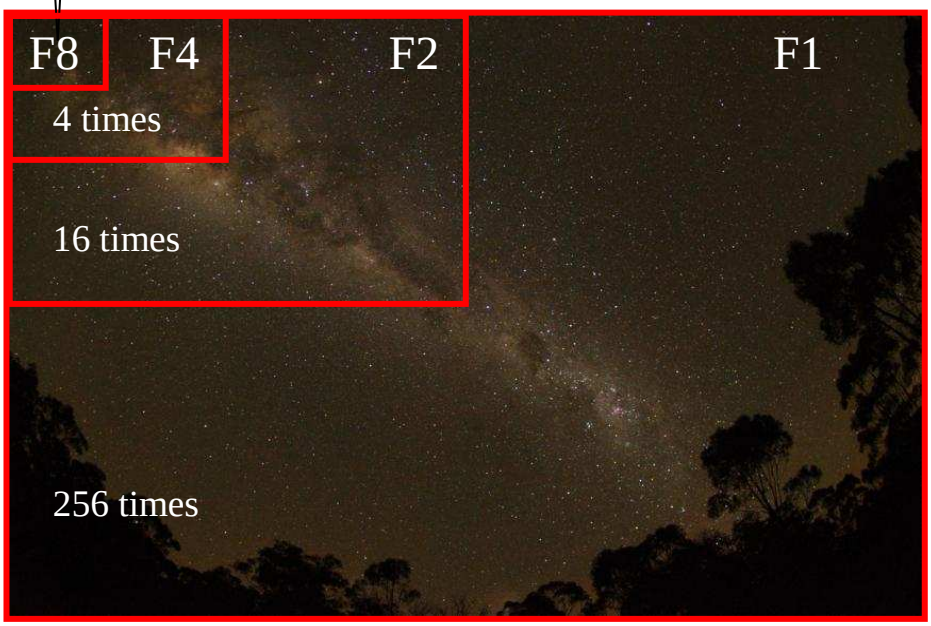
23. F Ratio or Speed want could this mean?

In astrophotography we are usually pushing the camera and lens to the limit, running high ISO settings for long periods of time. We very rarely stop a lens down; in the diagram below all Lenses are the same Diameter with different F ratios. The bigger the patch of sky the more light it contains and the brighter the picture will be. I hear you say what is an F ratio? It is how many times the lens diameter, can fit into the focal length of a lens. See scale on left. The boxes at the bottom of the page are a comparison of the amount of sky that can be seen with a curtain lens F ratio.



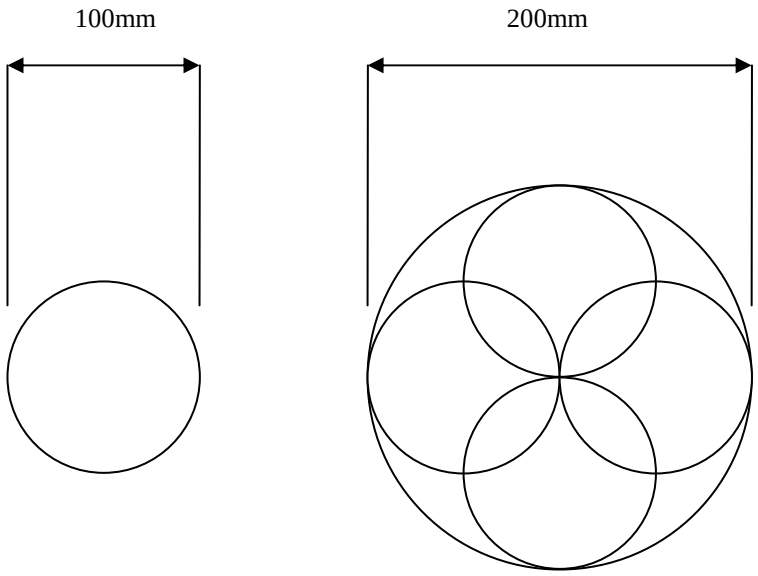
Note that all these Lens are the same Diameter.

F4 has 4 times the sky area than F8
F2 has 16 times the sky area than F8
F1 has 256 times the sky area than F8



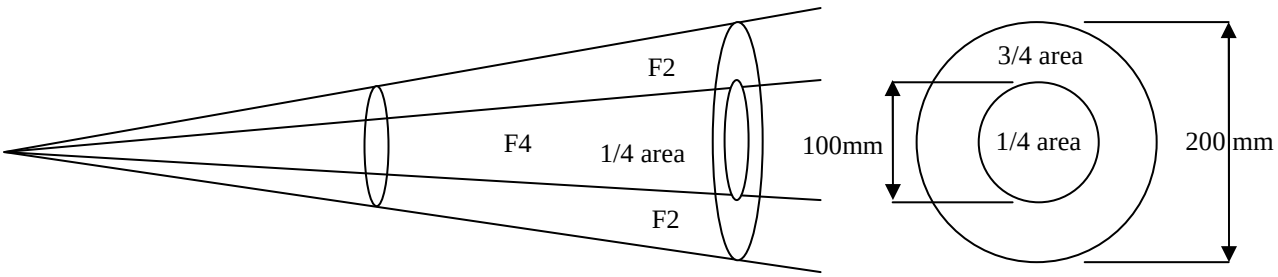
24. Aperture Rules.

The larger the telescope the brighter the image you see at the eyepiece and the faster we can take a photo. A telescope 200mm in diameter collects 4 times the light of a 100mm telescope. As you can see four 100mmm circles can fit in to a 200mm circle. See diagram below.



The inverse square law says when you double the diameter; the area will increase by 4 times. This work for us and we can take a photography in ¼ of the time.

But if we double the magnification, we will double the F ratio and we will be back were we started, because we will be looking at an area of sky that is only ¼ of the size, which would contain ¼ of the light. See diagram below.



So it's a balancing act between diameter and F ratio which determines the brightness of the image.

25. Telescope Focal Length Divided by Diameter equals F ratio

Focal Length of Lens or Telescope															
Lens	**200**	**300**	**400**	**500**	**600**	**800**	**1000**	**1200**	**1400**	**1500**	**1600**	**1800**	**2000**	**2400**	**3000**
DIA															
20	10.0	15.0	20.0	25.0	30.0	40.0	50.0	60.0	70.0	75.0	80.0	90.0	100.0	120.0	150.0
25	8.0	12.0	16.0	20.0	24.0	32.0	40.0	48.0	56.0	60.0	64.0	72.0	80.0	96.0	120.0
30	6.7	10.0	13.3	16.7	20.0	26.7	33.3	40.0	46.7	50.0	53.3	60.0	66.7	80.0	100.0
40	5.0	7.5	10.0	12.5	15.0	20.0	25.0	30.0	35.0	37.5	40.0	45.0	50.0	60.0	75.0
50	4.0	6.0	8.0	10.0	12.0	16.0	20.0	24.0	28.0	30.0	32.0	36.0	40.0	48.0	60.0
60	3.3	5.0	6.7	8.3	10.0	13.3	16.7	20.0	23.3	25.0	26.7	30.0	33.3	40.0	50.0
70	2.9	4.3	5.7	7.1	8.6	11.4	14.3	17.1	20.0	21.4	22.9	25.7	28.6	34.3	42.9
80	2.5	3.8	5.0	6.3	7.5	10.0	12.5	15.0	17.5	18.8	20.0	22.5	25.0	30.0	37.5
90	2.2	3.3	4.4	5.6	6.7	8.9	11.1	13.3	15.6	16.7	17.8	20.0	22.2	26.7	33.3
100	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0	14.0	15.0	16.0	18.0	20.0	24.0	30.0
112	1.8	2.7	3.6	4.5	5.4	7.1	8.9	10.7	12.5	13.4	14.3	16.1	17.9	21.4	26.8
125	1.6	2.4	3.2	4.0	4.8	6.4	8.0	9.6	11.2	12.0	12.8	14.4	16.0	19.2	24.0
150	1.3	2.0	2.7	3.3	4.0	5.3	6.7	8.0	9.3	10.0	10.7	12.0	13.3	16.0	20.0
175	1.1	1.7	2.3	2.9	3.4	4.6	5.7	6.9	8.0	8.6	9.1	10.3	11.4	13.7	17.1
200	1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0	7.0	7.5	8.0	9.0	10.0	12.0	15.0
250	0.8	1.2	1.6	2.0	2.4	3.2	4.0	4.8	5.6	6.0	6.4	7.2	8.0	9.6	12.0
300	0.7	1.0	1.3	1.7	2.0	2.7	3.3	4.0	4.7	5.0	5.3	6.0	6.7	8.0	10.0
325	0.6	0.9	1.2	1.5	1.8	2.5	3.1	3.7	4.3	4.6	4.9	5.5	6.2	7.4	9.2
350	0.6	0.9	1.1	1.4	1.7	2.3	2.9	3.4	4.0	4.3	4.6	5.1	5.7	6.9	8.6
400		0.8	1.0	1.3	1.5	2.0	2.5	3.0	3.5	3.8	4.0	4.5	5.0	6.0	7.5
450		0.7	0.9	1.1	1.3	1.8	2.2	2.7	3.1	3.3	3.6	4.0	4.4	5.3	6.7
500			0.8	1.0	1.2	1.6	2.0	2.4	2.8	3.0	3.2	3.6	4.0	4.8	6.0
550			0.7	0.9	1.1	1.5	1.8	2.2	2.5	2.7	2.9	3.3	3.6	4.4	5.5
600				0.8	1.0	1.3	1.7	2.0	2.3	2.5	2.7	3.0	3.3	4.0	5.0
800					0.8	1.0	1.3	1.5	1.8	1.9	2.0	2.3	2.5	3.0	3.8
1000					0.6	0.8	1.0	1.2	1.4	1.5	1.6	1.8	2.0	2.4	3.0

Comet Lovejoy from LMDSS Heathcote on 27dec11 by Greg Walton

26. Exposure Time over Telescope.

By looking at the chart below you can see that F4 at iso12800 gives Full illumination of the CCD in 30 seconds, no matter how big the telescope is. By doubling the focal length of any telescope you will reduce the illumination of the CCD by a quarter, so you would need to increase the iso by many times to fully illumination of the CCD in 30 seconds, or you would need to increase the exposure time by many times to fully illumination of the CCD. The problems with increasing the exposure time is that most DSLR cameras like the Pentax Kr reduces the iso to 1600 in Bulb mode, which you would need to use to expose longer than 30 seconds. Also you would need some sort of guiding because most telescopes will not track accurately beyond a couple of minutes. What is guiding? Well its a second telescope mounted to the first telescope, yes 2 telescope on the one mount, one imaging your object and the other one image a star (Guide star) watching it to see if it moves in relationship to the camera, then it telling the mount to move a small amount to correct for any drifts the star has made. Of corse this is an extra layer of complication which most people can do will out. With very long focal length telescopes like Cassegrain and Maksutovs you have little chose but to guide.

As I have said before, I always keep my exposures to 30 seconds. As wild, bad polar alignment, poor quality mounts, passing clouds, white lights, cables braking or getting snagged, computers bombing out, people trying to help and many other reasons, why its very hard work doing long exposures. Not to mention the added cost of a second telescope and guide camera plus the software, with all is problems. (I want to enjoy my astrophotography, not go crazy)

Exposure time and iso required for full illumination of the CCD, by my experience for common telescopes.

Diameter mm	F	Type	Focal Length mm	iso	Time in seconds	Amount of illumination	Mount	Notes
Fisheye	2.8	Camera lens	10	1600	30	Full	Tripod	No tracking
Zoom	3.5	Camera lens	20	3200	30	Full	Tripod	No tracking
Fixed	1.7	Camera lens	50	3200	15	Full	Tripod	No tracking
Fixed	3.5	Camera lens	200	3200	30	Full	EQ5H	
80	F7	Refractor	600	25600	30	Full	EQ5H	ED80
80	F7	Refractor	600	12800	30	Half	EQ5H	ED80
80	F7	Refractor	600	6400	30	Quarter	EQ5H	ED80
150	F12	Maksutovs	2000	12800	30	1/12	EQ5H	Guiding Required
200	F4	Newtonian	800	12800	30	Full	EQ6	
200	F8	Newtonian	1600	51200	30	Full	EQ6	
250	F4	Newtonian	1000	12800	30	Full	EQ6	
300	F5	Newtonian	1500	12800	30	Full	EQ6	
450	F4.5	Newtonian	2000	12800	30	Full	EQ Fork	MPAS 18inch
550	F3.6	Newtonian	2000	12800	20	Full	Azimuth-Goto	Alex's Dobsonian
200	F8	Cassegrain	1600	12800	30	Quarter	Azimuth-Goto	Guiding Required
200	F8	Cassegrain	1600	12800	30	Quarter	LX200	Guiding Required
250	F8	Cassegrain	2000	12800	30	Quarter	LX200	Guiding Required
300	F8	Cassegrain	2500	12800	30	Quarter	LX200	Guiding Required

27. Painting the foreground.

In the top photo while the camera it running I have lite up the foreground with a red torch with dramatic affect. In the bottom photo the telescope was lite by a red light in the shed to produce interesting affects, note the meteor or could be a uredium satellite?

28. What's gone wrong, Part 1?

1. Auto focus will not work in low light and the camera will not fire, so switch to manual focusing mode. I grow up with manual focus cameras, so most of the time my digital camera is in manual focus mode. Taking photos of wild life at night, you usually only get one shot. Most auto focus cameras flash the subject to get focus and scare it away. (See photo below right)

2. It is easy to operate the camera in day light, but in the night the buttons are hard in find, so take a red touch. My new Pentax Kr camera is white which is much easier to see the buttons at night. Also I think it's a good idea to try to visualize the buttons without looking at them, like a computer key board.

3. With the old film camera you could attach a shutter release cable so as not to sake the camera when pushing the fire button. Some of the base model digital cameras have no release cable option, but this can be over come by setting the camera too 2 second delay mode. What happens in this mode is when you press the fire button the internal mirror flips up, which you can usually hear. Then the camera waits 2 seconds before recording the image, this gives enough time for the camera and tripod to stop shaking. My Pentax K-x remembers that I want 2 second mirror lock up when I select M manual mode.

4. Some tripods are very flimsy and on windy nights hum, so you may need to add some extra weight. A plastic bag filled with anything it often used by field guys, one old guy keeps a plastic bag in a 35mm film canister for this job. I usually hang my camera bag on the tripod. If you are bush walking, you do not what to carry a big heavy tripod when a light weight one will do.

5. My tripod has a removable plate which attaches to the camera. I have forgotten this because it was attached to one of my other cameras. Make a list of all your gear; many times I have looked down the list to see I have forgotten something.

6. I have taken my camera out, but have forgotten to put the memory card back in after loading its contents on to the computer. I carry spares and often need to lend a SD card to somebody else.

7. My Pentax-ist and Pentax K-x use AA rechargeable batteries so I made a battery box and as the batteries go flat put them back in the box up side down, so I know which ones to recharge. I drilled 17mm holes in rows of 4 in a block of wood, because the camera takes 4 batteries. Also take to many batteries, in the cold of night they fail quickly. I also take 2 packets of lithium batteries for when every thing has failed. (See photo below left)

29. What's gone wrong, Part 2?

8. Some cameras will not let you select high ISO speeds, but you may find some were in the menu, an extended ISO mode; you will need to switch this no.

9. Many times I have forgot to change the iso from 12800 back to 100 when doing some day time photography, so I have producing a lot a grainy looking photos.

10. Beginners, you should check that you have noise reduction switched on, how this works is once the picture is taken, it takes a second shot (called a dark frame) with the same settings as the first, but with the shutter closed and then the camera will deduct this second shot from the first shot, producing a much smoother picture. With the older Pentax-ist every time you take a picture it will do the second shot, this will more than double the time needed to do the shot. So a 30 second exposure will take 66 seconds. With the newer Pentax K-x & K-r over all it is much faster because it does not take a dark frame second shot every time and must use the same dark frame, until a sensors in the camera detect a change, also the dark frame shot is shorter than the exposure time. So a 30 exposure may take only 36 seconds. Once you gain more expertise you will most likely take separate dark frames and deduce them your self.

11. Clouds may not be all bad like these shots below of Eta carina and Orion lurking in the clouds.

Orion in clouds taken with Pentax ist 28mm lens ISO1600 30sec 9 Apr 2007 By Greg Walton MPAS Briars

30. What's gone wrong, Part 3?

12. The view finder on a DSLR needs to be focused to suit your eyes. I found the best way to do this, is to put the camera on a tripod then select green mode or fully automatic and take a photo. You can now look through the view finder and adjust it to suit your eye, knowing that the camera is in focus.

13. Remove the sky light filter from your lens before you do night time shots.

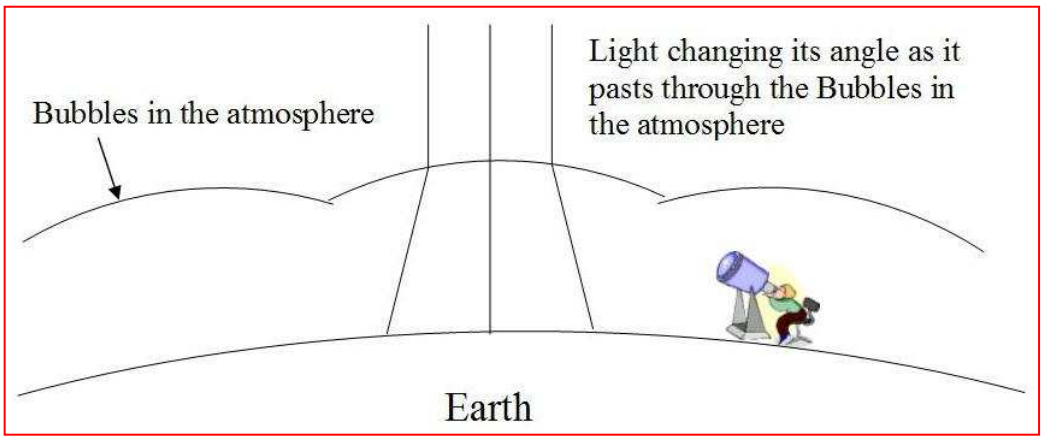
14. Select cloud mode for night time imaging. If the camera is set to automatic the camera will select the setting for you, but sometimes will select a different mode and your images will change colour from image to image. This is not good for time lapse photography.

15. Image stabilization is good for day time shots, but at night its best to switch it off. The camera will try to chase the star around the sky and drawing squiggly lines around them. This happens especially when shotting through a telescope. You will also hear the camera humming and wasting power.

16. Dew on the camera lens, I found a stubby holder worked well as a dew shield. You can also buy chemical hand warmers from camping stores these work good at keeping the dew away.

17. Why are my Star so big? On warm nights with high humidity when the stars are happily twinkling, they move around spreading the photons over a much larger area on the CCD. The closer you point your camera to the horizon the worse the stars wobble, because you are looking through a lot more atmosphere. At the horizon the atmosphere would be 10 times than the zenith. Work in with the conditions.

18. I have noticed while reviewing a series of photos taken one after another that the whole image moves around Left and Right also up and down. This has something to do with the atmosphere changing the angle of the light when it passes through it, changing the position of the image on the camera CCD. Most equatorial mount only operate the RA motor when tracking. Some telescope mount manufactures claim highly accurate tracking rates. It does not matter how accurate the tracking is if the star are jumping around. Guiding would be the answer. See drawing below.



19. One way to fix this problem is to us a guide camera, which monitors the position of the star it is tracking in the same location in the sky, then through a computer changes the speed and direction of the motors in the telescope mount. But this method is costly and complicated and prone to things going wrong. I try to keep the exposure time to a minium usually a maximum of 30 seconds, the longer the exposure the more likely something will go wrong. It is far better to take multiple shots of the same object, and then stack them with a computer program like Deep sky stacker (freeware) or CCD stack. I usually stack on Deep sky stacker, then convert the tiff to a Jpeg with MP viewer and edit with iphoto plus.

20. From my experience it's better to over expose than under expose, it's easy to dull a shot down on Photoshop or iphoto plus. It is very hard to brighten something up if it is never there. I dislike Photoshop for it takes forever to start up, were as iphoto-plus starts instantly. It is best to start with iphoto plus because it's so easy to use, but eventual you will probably move to Photoshop as you become more experienced and want more from your photos.

31. Interesting phenomena.

Always have your camera ready to catch rare events like these.

Contrails at night are rarely see, here there light by city lights, with Pleiades at centre.

Anticrepuscular rays are very rare; these rays are parallel but appear to converge on the opposite side to a sunset. We were looking east and the sun was setting in the west behind us.

The Zodiacal light is only seen a couple of times each year, when dust in the plane of the solar system is lit up by the sun just before sun rise or after sun set. They often rise to the zenith so a wide angle lens is best.

32. Lightning.

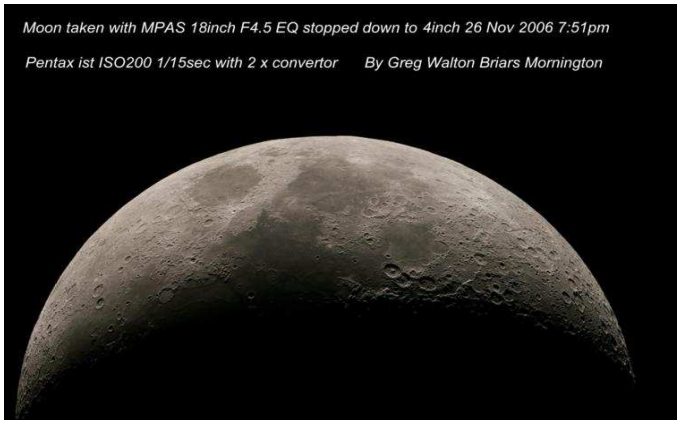
When taking shots of lightning it is best to switch noise reduction off, because while the dark frame is being done the best lightning bolts races across the sky. Also you would usually use a setting of ISO 100 which dose not produces much noise any way. To get the shot at the bottom, I took 300 10 second shot and only 5 of them had any lightning in them, it was also bucketing down rain at the time, so to keep the camera dry I set up under my veranda. I hear you say, what's lightning got to do astronomy. Sometime we setup the astrophotography equipment and then the cloud come racing over the horizon. We pack up very fast but it's not a total loss when we get shots like these.

33. How can we bring the moon closer?

We need a longer lens for this job; sometimes you can get the option of a twin lens kit with your Digital SLR usually an 18 to 50 Zoom lens and a second 70 to 300 Zoom lens. They are often an excellent buy, as to buy all these separately would cost 400 dollars more and well worth looking at. The longer 300mm lens setting would make the moon 6 times larger than the 50mm lens would and much more surface detail can be captured. But it is still nice to get other objects in the picture like the planet.

The moon is a very bright object and can stand a lot of magnification before you would need some form of tracking. A lens with a focal length of 2000mm would just fit the whole moon onto a 35mm frame on film or a full frame sensor that a top end Digital SLR camera has, the Pentax ist, k-x & K-r has a 2/3 sensor that would give a magnifying effect of 1/3 larger. So it would be 2000mm times 2/3 giving a focal length of 1388mm for the Pentax needed to fit the whole moon in. I thick it's time to find a longer lens we could used an old single length lens say 500mm and a 2 time converter or we can start looking at telescopes, maybe borrow one, there are plenty sitting around in cupboards or in sheds doing nothing. A Christmas present that could not be figured out or just lost interest. Nearly every body buys the wrong telescope first up, because they do not know what they want. I always say turn up at your local astronomy club and look what everybody it doing, you will find people already doing what you are trying to do and ask questions. Most people will gladly bore you to tears and giving you ten times more information than you can handle.

The Moon only reflects about 5% of the sun light that strikes it, even though it is the second brightest thing in the sky after the Sun. So we can uses high magnification with any type of tracking.



34. Ice rings around the moon.

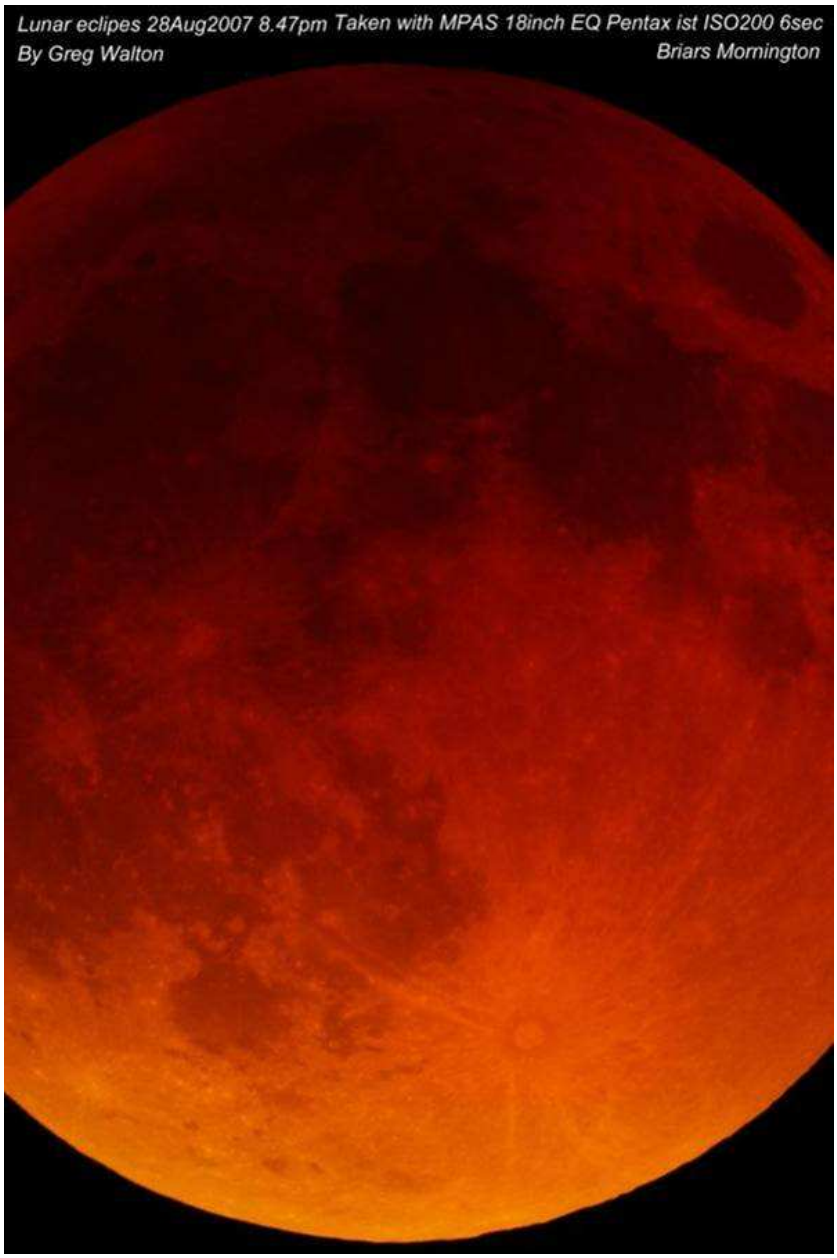
Sometimes strange atmospherically effects around the moon makes interesting shots, like rings around moon formed by ice crystals. They sometimes have rainbow colours. But these effects usually do not last long so you will have to move quickly if you want the capture then. I have seen pillars of light rising up either side of the moon rise, but by the time I have set up the camera they had faded. Also they are very large; you will need to set your zoom lens to 18mm or 10mm fisheye lens with 180 degree corner to corner view.

35. Lunar eclipses.

Lunar eclipses are great events, which are when the earth is between the sun and the moon. Sun light striking the earth's atmosphere bends around the earth but only the red light bends enough to reach the moon, turning it different shades of red as time passes. A good one occurs every few years.

One of the most interesting effects of a Lunar eclipses is that the sky around the moon becomes dark and star are visible moving in and out of maintains on the moon. Of cause you will need a telescope with 100 times magnification to see these stars. The only problem is other people trying to get a look through the telescope stop me from seeing.

You can see in the photo at the bottom the moon was close to the Milky Way.



36. Taking photos of the sun, can have its dangers seek experienced expert advice.

I'm always a bit concerned about putting magnifying lens between the sun and a very expensive CCD sensor, I thought may be its better to use some cheep film instead. So I tested if the sun could burn a hole in a piece of paper with a camera lens. I tried many camera lenses and not one of them did anything, not a mark or any discolouration. Maybe there are too many pieces of glass in a camera lens. Of cause people photograph sun sets all the time without burning holes in there CCD sensor.

We can project an image of the sun onto a piece of white paper in a box. Then photograph it with the digital camera on a tripod. I have had good success with this method. By the way never look at the sun with any Telescope, binoculars or any other magnifying devise. Also do not us a good eyepiece to project an image of the sun, they get hot and can melt or explode. Also do not even put any part of your body between the eyepiece and the paper screen. A friend left his new and expensive telescope out in the sun, smoke started coming out of it, when the sun pasted in front of it, the baffling inside started to burn, and so do not even leave a telescope unattended.

Sun spot 22Jul2004 taken with Pentax SLR 500mm lens 3 x 2 x convertors JMI solar filter ISO400 film 1/30sec scan from print By Greg Walton Bon Beach

But why photograph the sun, what is there to see? The sun goes through an 11 years cycle were it becomes more active, its called solar maximum and is when the sun reverses it magnetic poles, sometimes it has spots and some people record there numbers. I rather watch the sun and only photograph it if here were a lot of spots. Like this photo at left. These spots are 5,000 degrees were as the rest of the suns surface is at 6,000 degrees. The sun is 109 times the diameter of the Earth so you can see the dark stops here are larger than the Earth.

I have used thin plastic film type filters but found the view to be too bright. Leading me to think something is wrong so I stop using it and I have not used it since. Maybe the aperture of the telescope was too large and the f ratio too small.

I did buy a pair of solar eclipse glass from a telescope shop and found them a very pleasing view, I attached them to a stopped down pair of 10x50 binoculars for an even better view, see photo below.

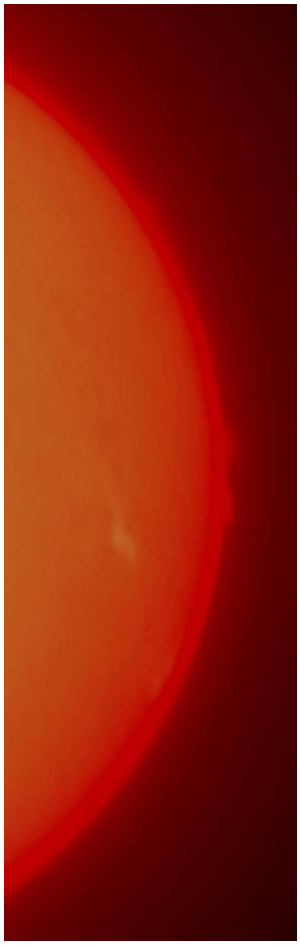
37. Solar Eclipse.

The sun is 400 times farther away than the moon but it is 400 times larger, so the sun and moon appears to be the same size in the sky. Solar eclipses have a known time and place. Usually a lot of planning, how the get their, what are we going to photograph and preparing equipment. Not to mention the cost. I rather leave this to the more dedicated. I have heard so many stories of equipment failed and cloudy skies. I'd rather wait for the eclipse to come to me, usually it's only a par shall eclipses and usually it's cloudy. But I still got something worthy enough to boring my friend with. A shark fin sunset, my old Ricoh 35mm film camera has a very good light meter that told the correct exposure setting. I set the camera lens on infinity and sighted the sun set with my eye 300mm away from the view finder as I did not trussed looking through any optical device at the sun. I was very happy when I picked the prints and seen this shot below.

I bought a JMI glass solar filter to look at sun spot, it has a thin metal coating which blocks most of the light from the sun. I am very happy with the view, but this filter can corrode very quickly, so best to keep them in a sealed container and inspect them before use each time. Look for scratches and corrosion can look like black dots. Also most important is to attach is very securely to the telescope, if the solar filter fell off your eye will be damaged forever. I do not like styrene foam the wind can blow the filter off to easy. Also never leave the telescope unattended. If you think a solar filter is doing you damage for any reason stop using it.

38. Taking photos of the sun with a DSLR and a PST.

To take photos of the sun with a PST you cannot just simply attach the DSLR with to normal system of a T ring with a 1 ¼" tube, as the DSLR will not come into focus no matter how hard you try. You will need to cut a 2 times Barlow lens in half some come with a join in the middle were they can be separated and the half with the lens will need to be jointed to the T ring some how. The 2 times Barlow lens will extend the focal point feather out to reach the sensor in the camera, it will also make the image larger. See photo below. Its not easy to get focus by looking through the view finder, I had to take a photo check and adjust many times to get focus and then I put the eyepiece back in locking it in a position wish was in good focus, I then measured the distance between the back of the eyepiece and end of the eyepiece tube. The gap was 2.2mm so I made a spacer that long, so I now get focus with the eyepiece and spacer, then I just drop the camera in and it is in focus every time. It is almost impossible to get surface detail and Prom enounces with the same exposure setting. See list

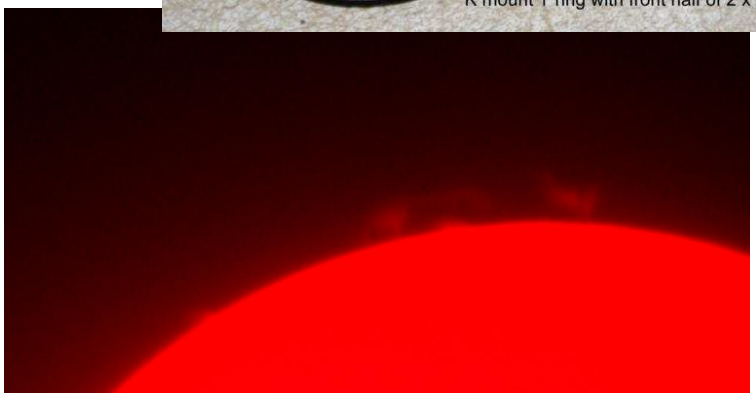


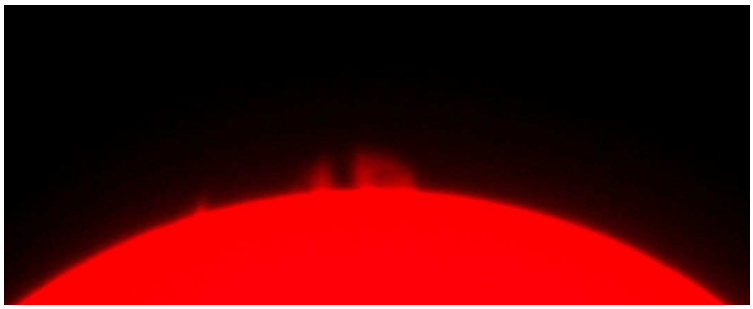
1/60 seconds at 400 iso Surface detail.

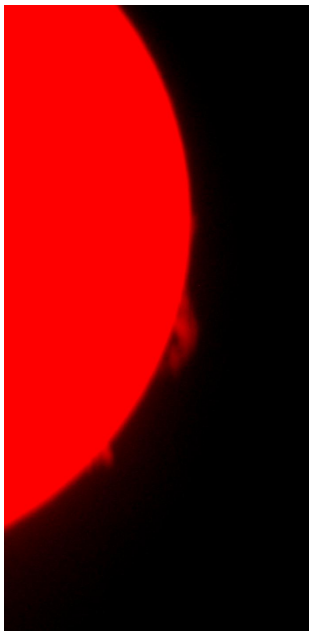
¼ seconds at 400 iso Prom enounces.

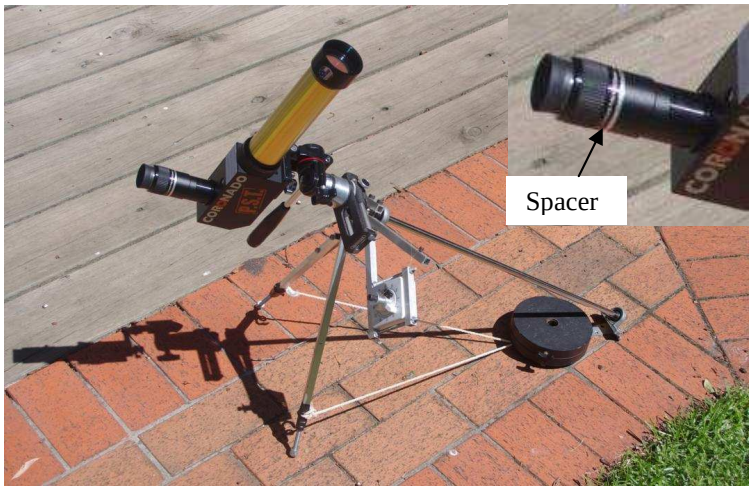
¼ seconds at 1600 iso Prom enounces and Surface detail see photo on left.

K mount T ring with front half of 2 x Barlow









39. The elusive Aurora.

Auroras accrue regularly at both poles. I live at 38 degrees south that 52 degrees form the South Pole which is about 5,000 Km. When the sun reaches its more active part of is 11 to 13 year cycle, there is a good chances to see an aurora, even from my latitude. They accrue when high energy partials from the sun enter the atmosphere. I keep an eye on the sun in these times, with an old 500mm camera lens with a special solar filter attached to the front of it and an eye piece which I have attached in stead of the camera. If I see lots of activity on the sun then there might be a change to see an aurora, especially if I'm out in the country away from city lights. I keep a SLR camera with 800iso film in the car all the time with a tripod, so I'm always ready. One evening I head for the local astronomy club with my 21 inch Dobsonian telescope, I only just got the telescope setup and someone said there is a slight glow in the south. I pulled my camera out in case, as the sky darkened the glow got brighter, yes we have an aurora. We all forgot about the telescopes and sat back in our chair and watched the show. Early on it was red and green then later the sky went brown with white bands moving through in. Knowing I had only 24 shots in the camera, I took 15 second photos every time it brightened, I used a 50mm lens but probable could have used a 28mm lens. Day's later people said there must have been a large fire to the south, the whole sky lite up. I told them it was an aurora, they said, why did you not phone my? These days everybody has a mobile phone so when the next one appears, I will ring everybody. There are aurora alerts you can register with but you might get a call a 2am. The stars in this photo above are the tail of the scorpion.

Ten years have past since I have seen an Aurora; now we are in the age of digital photography, any future Auroras will be gladly thrashed. I can't wait.

Well at last it's happened, an aurora in the digital age, visible from main land Australia. I often leave my camera running in the garden all night. I captured this auroral burst on a moon lite night, Wow.

40. Aurora Part 2.


Aurora at Elephant Rock Flinders 10mm Sigma Pentax Kx 30sec iso3200 By Greg Walton 21jan12

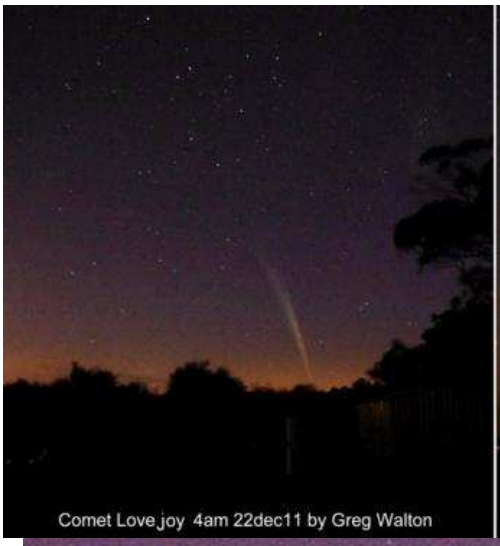
Ever 13 years the sun goes through a more active period when we get more auroral activity. That time is now. But how do we know when an aurora will strike? The internet just Google spaceweather.com this can alert you the likely hood of an aurora, its on a scale of 1 to 10 1 being nothing and 10 being pending dome, a 7 should be just visible from the south coast of Victoria in a dark location. But an aurora may only last 10 minutes, this means you will most likely be sitting there all night with cameras clicking. I often sleep in the car and pop out to check on thing every hour. The new DSLR are very sensitive picking up colours we cannot see, you will usually only see some light pillars moving back and forth along the horizon. In the image above I could not see any colour at all on the night it was taken. So take a photo check for any colour, don't give up some of the best auroras happen when everybody else leaves. I usually make a time lapse of the whole night and getting an aurora is just a bonus, most of the time we get the whole sky turning with planes, satellites and meteors going through the image. Best to use the widest lens you have for auroras can take up the whole sky. I buy up lithium batteries when on sale, as the rechargeable type fail half way through the night, particularly when cool. I also wrap a dew strap around the lens and plug it in to a 12v battery on the car, I want to get home.

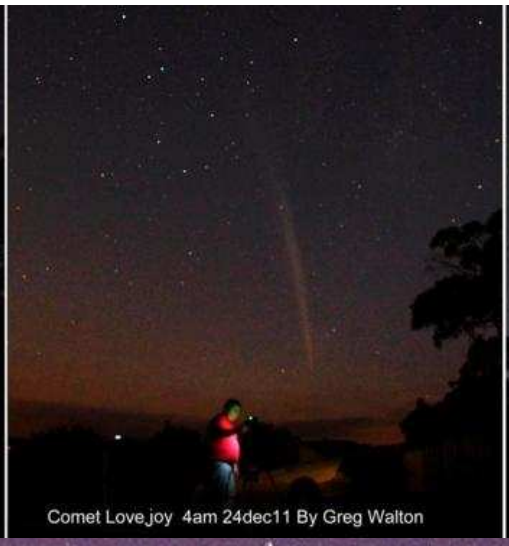

Air banding Elephant Rock Pentax Kx 10mm Sigma 10x30sec iso3200 By Greg Walton

41. Comet hunting.

Comets are one of the easiest things to photograph; visually they can be hard to spot. But point the camera were it is suppose to be in the sky and fire away, the smaller comets usually appear as a blue fuss patch. The bigger ones are white with some structure. I like my old 135mm lens and a tripod. You can go out night after night photograph them and track there movement across the sky, like I did with comet Mc Naught in 2007.

42. Comet Lovejoy movement at Top. Comet Mc Naught at bottom.

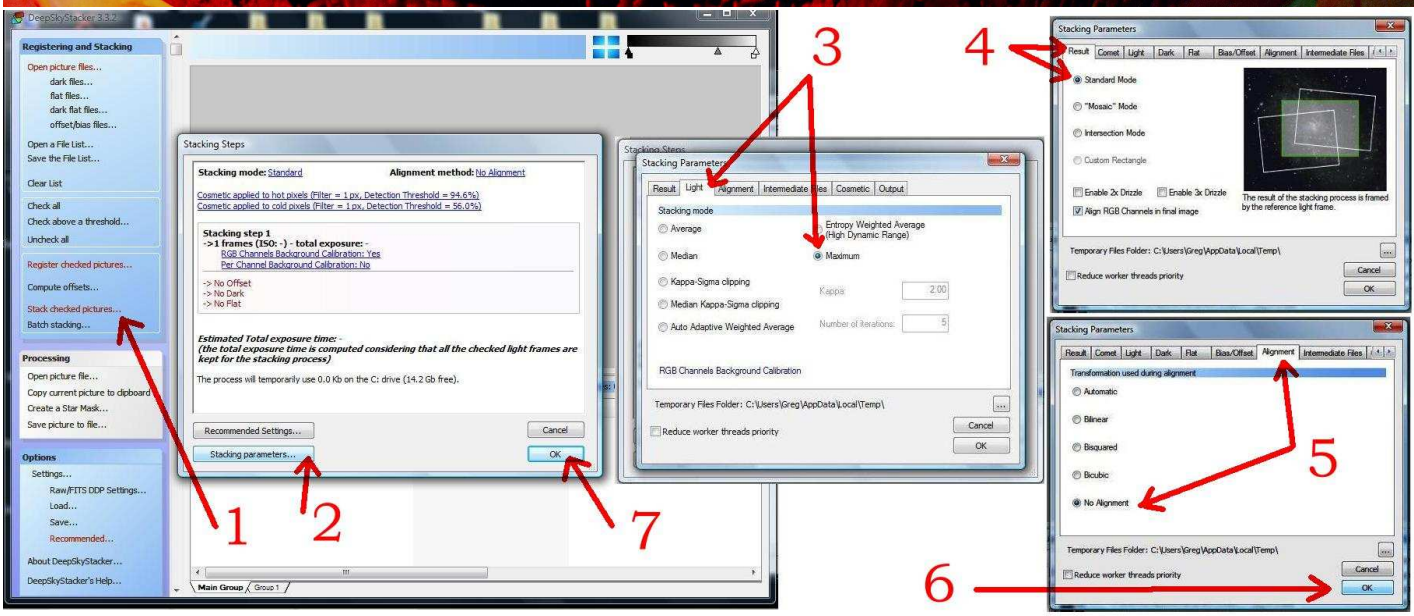




43. Star trails with film.

Here is a 1,000-second photo I took with my old Pentax ist with a 28mm fixed length lens, set at the lowest f ratio. The camera was set in B or bulb mode, I used a lockable remote to hold the shutter open. Once I released the remote the camera took another 1,000 second dark frame and subtracted it from the first shot giving a much smooth picture. So the total time took 2,000 seconds. The older DSLR like the Pentax ist have a lot of noise compared with the latest model cameras, so would not need the noise reduction on for newer cameras. If I had used the Pentax Kx at 200iso it would not have any noise, so the noise reduction it properly best switched off. Film camera can still do a good job on star trails and this would leave your DSLR for more important jobs, like taking images through the telescope. I found you could test the settings with the DSLR, then swap to the film camera with the same settings, using the same lens. A roll of 24 shots film would take 24 nights of star trails, is would be a shame to do all that work and find the setting were wrong. The scopes in the picture did not move because we were on a coffee break, but normally they would be a blur. Also it is best to keep all lighting to an absolute minimum, for this will wash out all foreground detail. Fisheye lens work best for is, as they capture a much larger part of the sky. By pointing the camera north or south will produce beautiful rings.

44. Star trails with the DSLR.

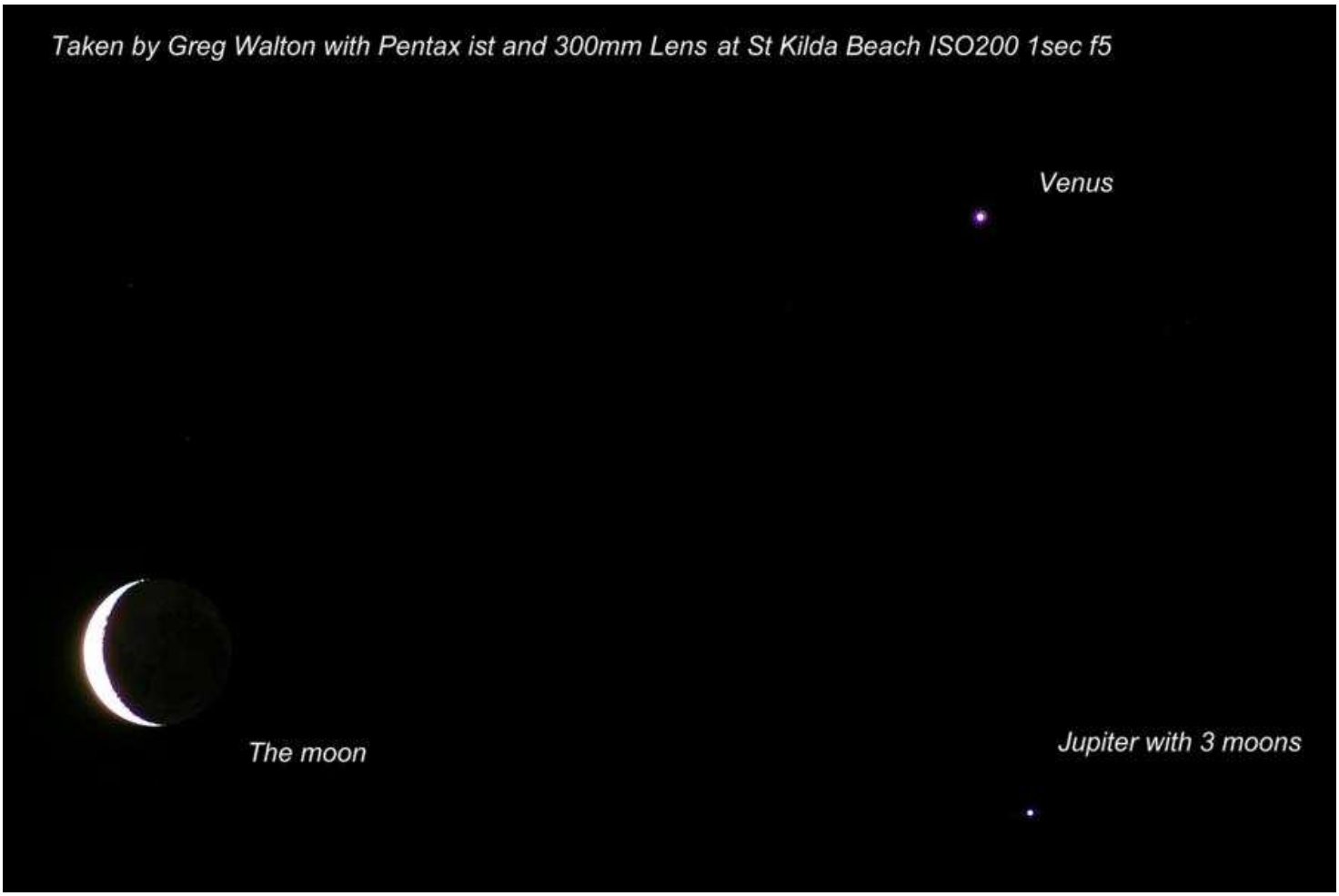


We can use a batch of time lapse photos and merge them into 1 image using Deep Sky Stacker.

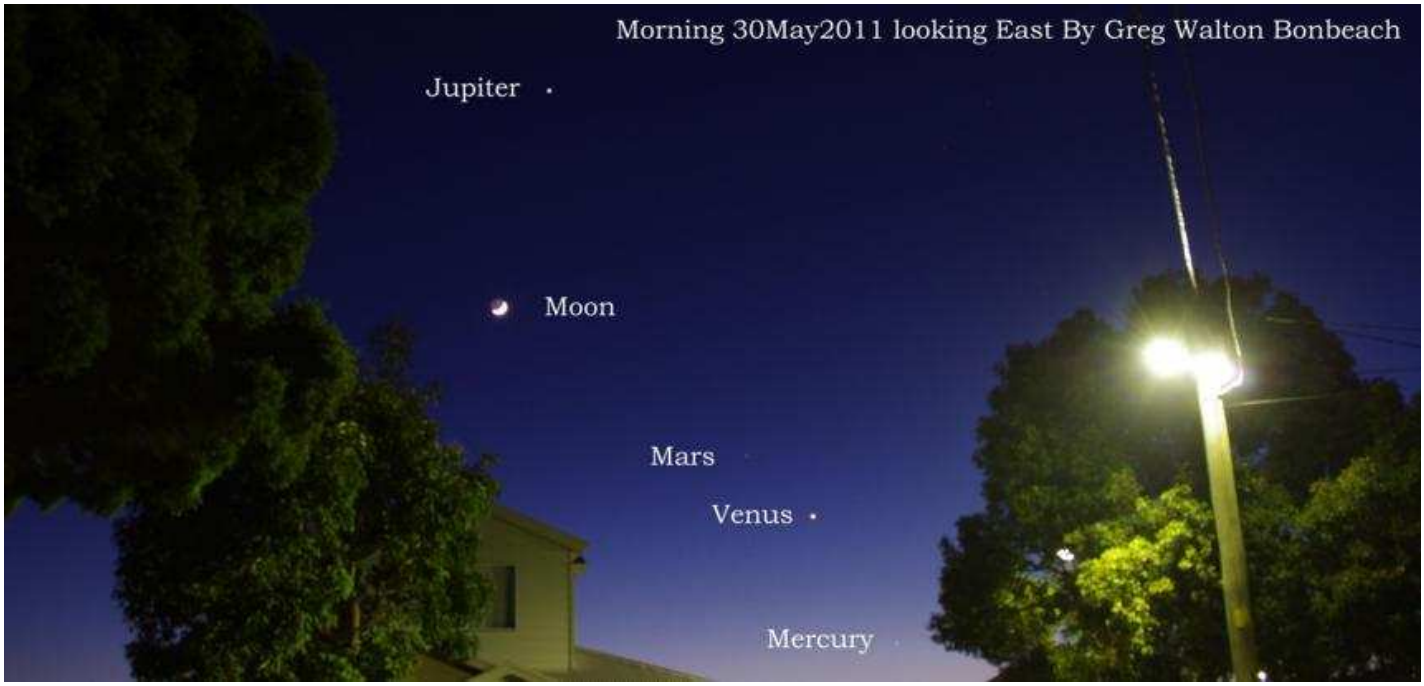
Run Deep Sky Stacker.

1. Click on Stack checked Pictures…
2. Then click on Stacking parameters…
3. Then click on lights & Maximum.
4. Click on then Results & Standard Mode.
5. Click on then Alignment & No Alignment.
6. Then click OK.
7. Then click OK.
8. The stacking will commence this will take sometime, 1 to 4 hours.
9. Once your image appears you can edit it as you would any other image.

45. The Sun, Moon and the Planets all move across the sky roughly following the same path, so occasionally they pass one another sometime making interesting pictures. Like this picture below, which was taken with an old 300mm lens on a tripod with the Pentax ist. Surprisingly I even got 3 of Jupiter's moons.



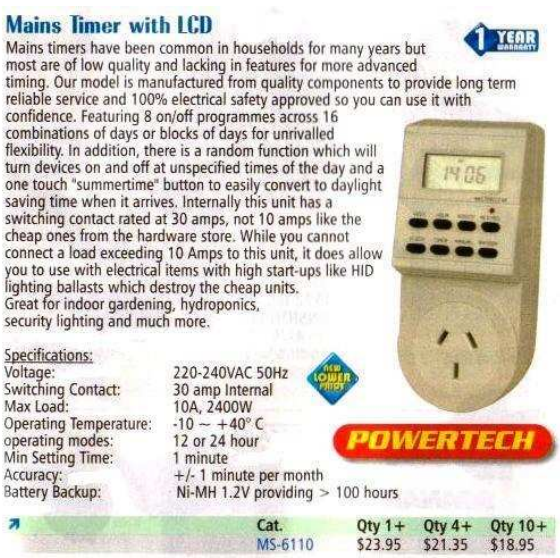
See how many Planets with the moon you can capture in one image. Like this image below with 4 Planets and the Moon in the early morning twilight on 30may2011.

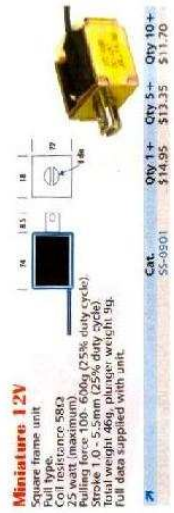


46. Home made digital timer for Pentax K-x.

This was done because the Pentax K-x has no remote cable port. You will need to make a bracket to hold the solenoid above the shotting button. I attached it to the flash mount Hot-shoe on the top of the camera see photo. The solenoid pulls the steel pin inside the coil, so the pin is at the top and drags the U shaped slider down firing the camera with a 4mm nylon screw too minimizing any damage to the camera. The power supply wires go either way when joining it to the solenoid. The clock time is reset to zero each time to start the sequence of shots.

List of parts purchased from Jaycar Electronics
Mains 240V digital timer Catalogue number MS-6110
Solenoid 12V 25watt max Catalogue number SS-0901
Power supplies 12V dc 0.4amps Catalogue number MP-3147





List of settings for most popular exposes times for astrophotography.								
When programming the timer select all days of the week. So you do not have to reset the day on the clock each time.								
I had to added 1 minute to the dark frame time because the camera usually takes 5 to 20 seconds to subtract the dark frame from the exposes								
Exposes		1 minute	2 minute	3 minute	4 minute	5 minute	10 minute	20 minute
Dark frame		2 minute	3 minute	4 minute	5 minute	6 minute	11 minute	21 minute
1	ON	00:01	00:01	00:01	00:01	00:01	00:01	00:01
1	OFF	00:02	00:03	00:04	00:05	00:06	00:11	00:21
2	ON	00:04	00:06	00:08	00:10	00:12	00:22	00:42
2	OFF	00:05	00:08	00:11	00:14	00:17	00:32	01:02
3	ON	00:07	00:11	00:15	00:19	00:23	00:43	01:23
3	OFF	00:08	00:13	00:18	00:23	00:28	00:53	01:43
4	ON	00:10	00:16	00:22	00:28	00:34	01:04	02:04
4	OFF	00:11	00:18	00:25	00:32	00:39	01:14	02:24
5	ON	00:13	00:21	00:29	00:37	00:45	01:25	02:45
5	OFF	00:14	00:23	00:32	00:41	00:50	01:35	03:05
6	ON	00:16	00:26	00:36	00:46	00:56	01:46	03:26
6	OFF	00:17	00:28	00:39	00:50	01:01	01:56	03:46
7	ON	00:19	00:31	00:43	00:55	01:07	02:07	04:07
7	OFF	00:20	00:34	00:46	00:59	01:12	02:17	04:27
8	ON	00:22	00:37	00:50	01:04	01:18	02:28	04:48
8	OFF	00:23	00:39	00:53	01:08	01:23	02:38	05:09

47. Easy to build Binocular chairs.

Most Bino's are designed to look at the horizon (Terrestrial) very few come with 45 or 90 degree eyepieces and these are very costly. So I had to come up with some way of holding the Bino's and be able to look through them at the zenith (straight up). First I tried the camera tripod but these were to low and hard to aim at the object, plus I would end up with a bad neck trying to look through them. The second thing I tried was the trick of looking down into a mirror laid on a table, which was much easier on the neck but my arms quickly became tied, also the sky was up side down and all the stars were double stars because I used an ordinary mirror that was aluminized on the back instead of the front. The third thing I tried was to lay on my back and rest the Bino's on my head, this worked best so far, until I wanted to look at an object close to the horizon. I then thought I should get a declinable car seat and put it on a swivel base, then motorize it all and mount the Bino's on a bracket in front of my nose. With a push of a button I could move around the sky. But it all looked like too much work.

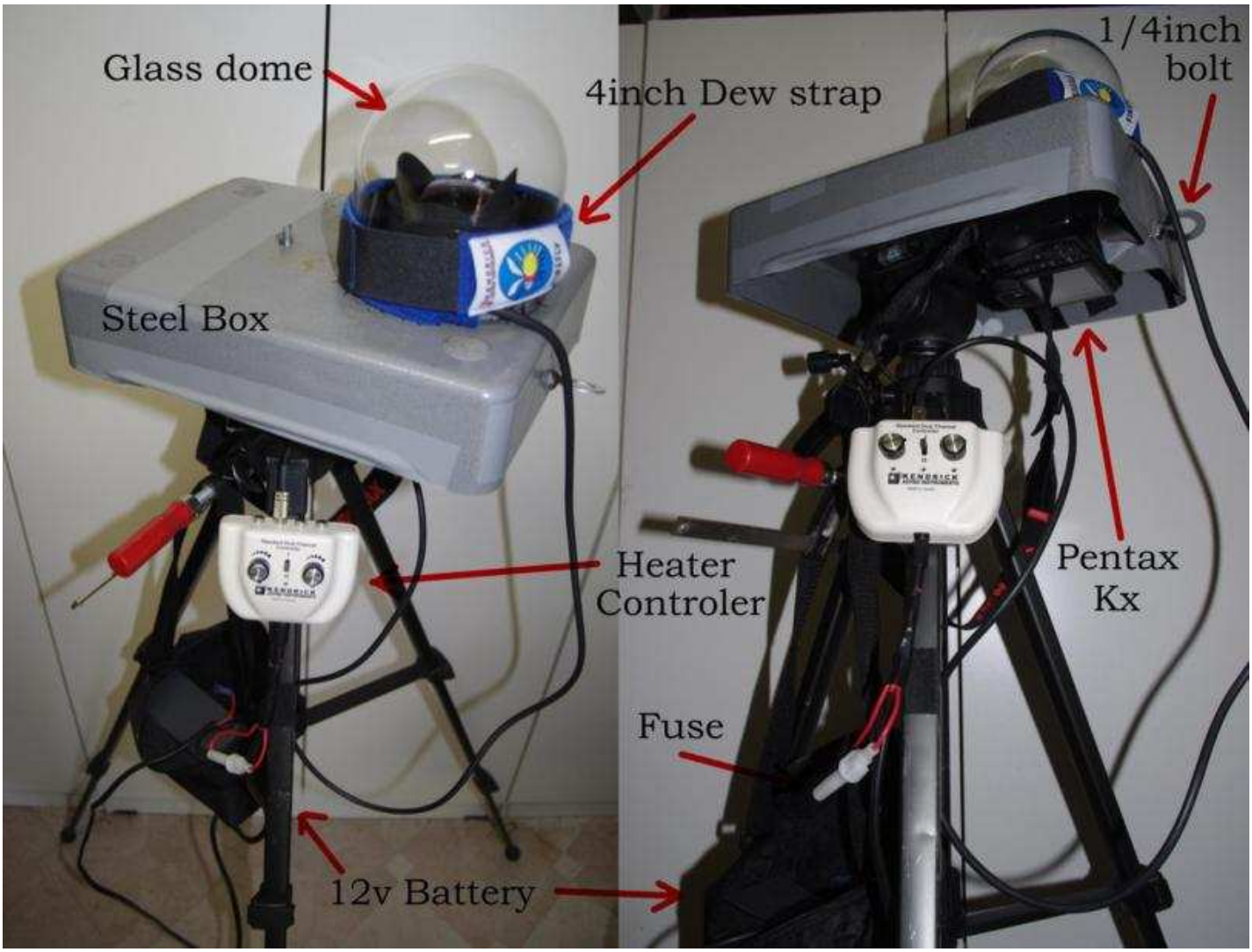
Then I came across a metal framed declinable chair in an Opportunity shop for $30 and it had a swivel base. I thought to myself, that's it, I can make this work. I would not need electric motors; my legs can do the job of steering the chair. So I dragged it home and fitted a bracket to hold a pair of 80mm Bino's. I also added a 300mm long spring with a diameter of 25mm at the rear to balance the weight of the Bino's. (Photo 7) Then I found when I leaned all the way back, I could not lean forward again, because of the extra weight of the Bino's. So I added a strong spring under the chair to help me lean forward. (Photo 7) I added 4 knobs to the mounting bracket, (Photo 8) so I could adjust the angle of the Bino's quickly. I found as I lent back in the chair, I tended to slipped down lower in the chair. (Photo 1 to 5) I had to compensate by changing the angle of the Bino's, so when the chair is all the way back, the Bino's are looking straight up at the zenith. The chair is light weight in construction, so it's easy to move around or take to a dark sky site. I thought about adding wheel, maybe when I'm 90.

I have also added a pair of 100mm Bino's to one of these chairs and have spent many hours at a time looking at the sky with no ill affects. My only complaint is that every body who comes along wants to test the chair and I can't get them out. I have found these types of chairs are quite easy to come by at $50 and have bought 5 in the last year, so I am shore there must be a lot around. I used 25mm U bolts to attach the balance bars to the steel frame, at the top of the back rest, by adjusting the tension on the nuts I can get the right amount of friction when adjusting to the desired angle. I bent the balance bars to a slight S shape, to make it easy to get into and out of the chair. The balance bars are made from 22mm round steel tube 1.5mm wall thick, and is easy bent or flattened in a vice. I am shore anyone could make this chair and improve upon it.

48. Camera glass dome.

I often leave my camera out side imaging the sky all night while I am in bed asleep, but there is the risk that it may rain and camera would be destroyed. So I made a cover with a glass dome, which I picked up in an op shop, it was made of thin glass with no major distortions. I guess it was the cover for a brass clock. It is 100mm in diameter and 1800mm high which was too high to be any use so I had to shorten it, which I did with a diamond saw on an angle grinder. I cut it so the front face of the lens was level with the start of the curve. Then I found a steel box the right size (old cash box) and cut a hole to suit the dome and silicon it in place. I drill a hole through the side of the box for a ¼ inch bolt to mount the camera on. I fitted Velcro to the inside of the box, so the heater controller and camera 240v power supply can be mounted on the inside to keep them dry.

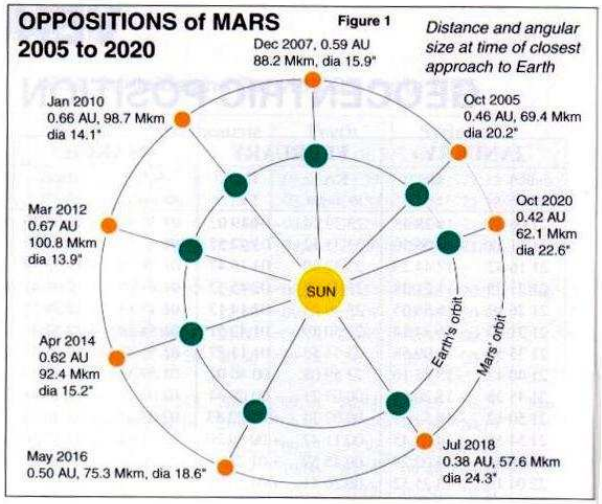
I used is almost all of the time as many times I have set it up under clear skies to find when I awake it is raining, it has save the camera many times and I am very happy with it. Also I have cool videos of rain hitting the dome. It would be good for catching lightning. The dew controllers cost $150.00 and will power up to 4 straps in 2 zones. The dew straps come in many lengths from 2inch diameter costing $50.00 to 16inch diameter costing $150.00 you can also join them together for even longer straps. They do not use much power so the battery will last many nights.

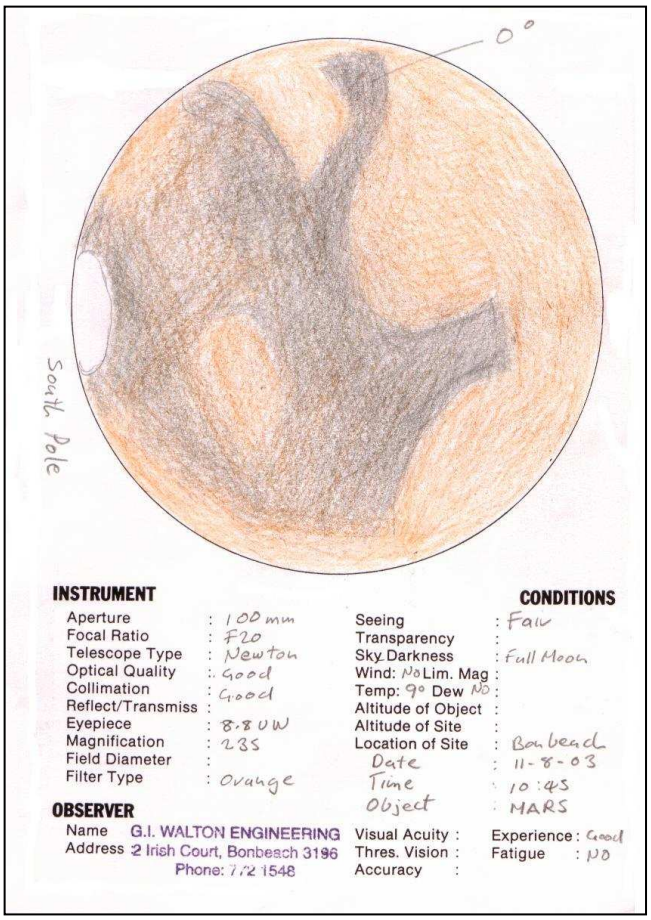


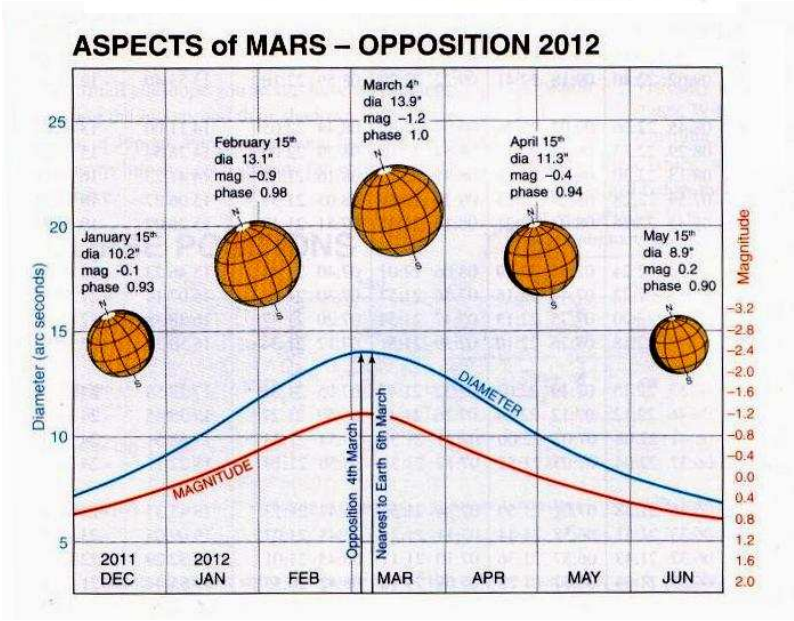
My EQ5H mount needs 2amps but I use a 4amp mains power supply, so I can run 2 dew straps on my ED80 refractor at the same time.

49. Drawing the Planets.

Photographing the planets close up is very difficult, much easier is to draw them. You will need a telescope with a magnification of 150 times and the planet would need to be more than 30 degrees above the horizon as the seeing conditions or atmosphere will blur your view. It's best to draw them when there in opposition, meaning at there closest to us. This occurs when the planet is in line with the earth and the sun, see Figure 1 below right from the very good publication Astronomy 2012 Australia. You can make a standard drawing form, like one below left. Once you have made a series of drawings you can bring them all to 1 picture as the one at the bottom. You can see the polar cap on mars shrinking and that mars goes through phases like the moon.





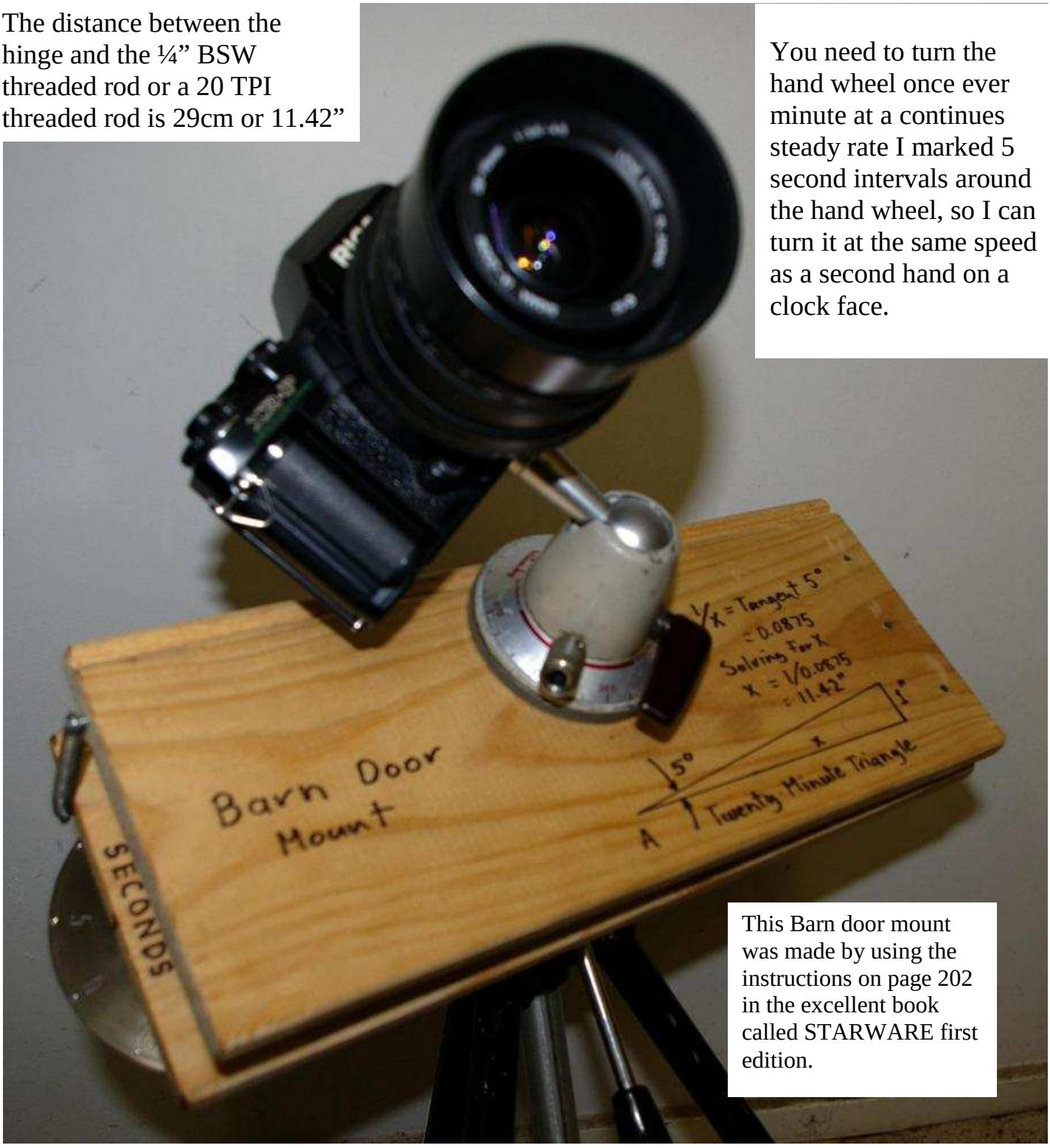


50. The Barn door mounts, Part 1.

The planet Earth turns once on is axis every 24 hours. (Minus 4 minutes) We need some way to stop the Earth from turning, because it's messing up our photos. How can we fix this? We need to mount the camera on something that can turn in the opposite direction of the Earth at the same rate.

We can build a simple tracking devise call a Barn door mounts. The hinge will need to be Polar aligned with the North or South Pole; you will need to site along the edge of the barn door. The major problem I see with the barn door mount is they are never heavy enough and as you turn the hand wheel you tend to shack the camera blurring the photo. We would probably need something that weighed as much as a barn door. See photo below.

The distance between the hinge and the ¼" BSW threaded rod or a 20 TPI threaded rod is 29cm or 11.42"

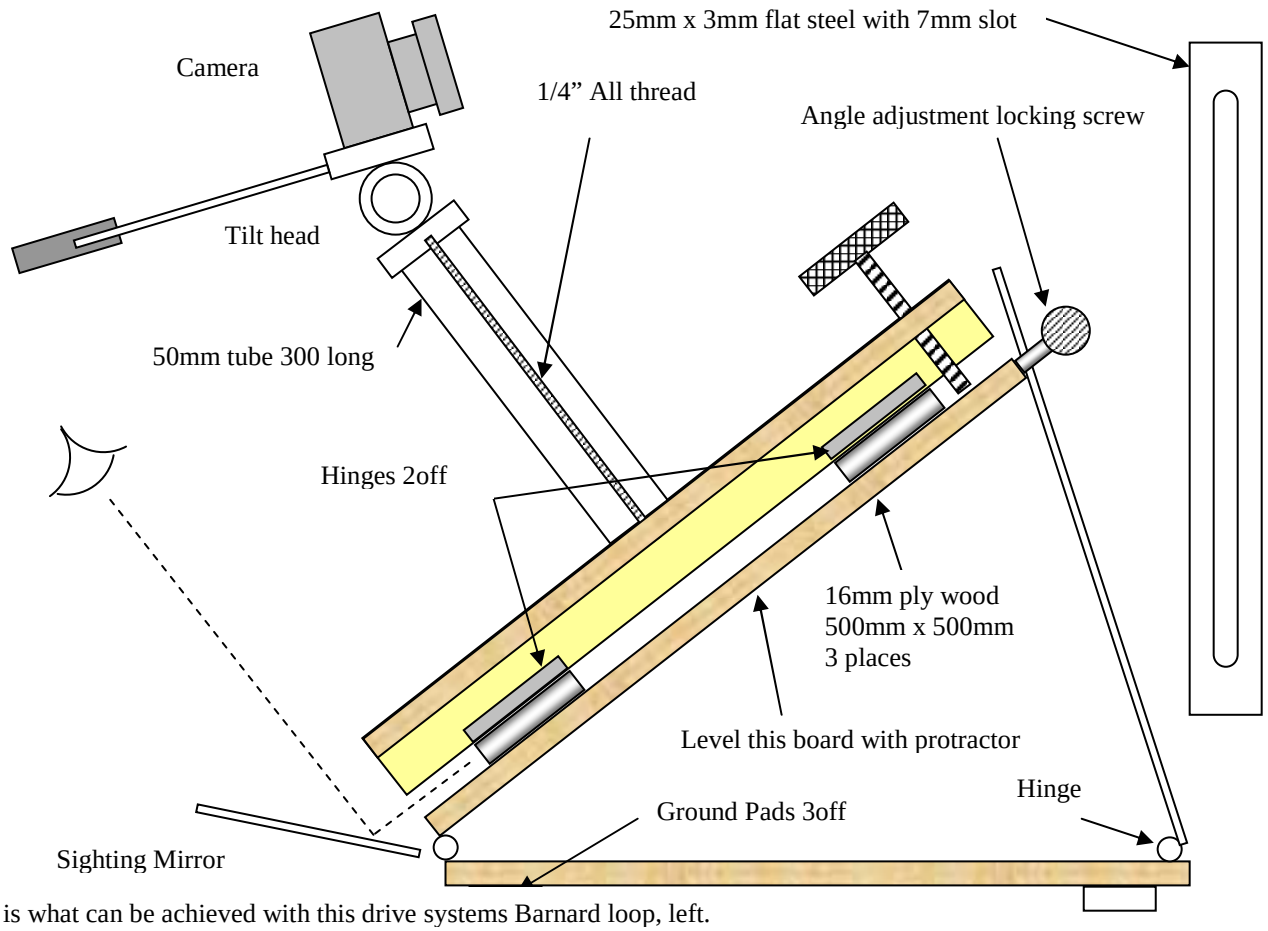


You need to turn the hand wheel once ever minute at a continues steady rate I marked 5 second intervals around the hand wheel, so I can turn it at the same speed as a second hand on a clock face.

This Barn door mount was made by using the instructions on page 202 in the excellent book called STARWARE first edition.

51. The Barn door mounts, Part 2.

As a cheap way of getting in to astrophotography, I built this barn door tracker from scrounged materials. The criteria was, it had to be portable, must fold flat for ease of transport but be heavy enough that it would not sake when turning the drive wheel. I decided to build it so it sat straight on the ground. Making it much more stable than attaching it to a camera tripod only disadvantage is I would be sitting on the ground. Also it may be hard to see the screen on the back of the digital camera. So I added a spacer tube 300mm long and then I attached a tilt head off a broken camera tripod to the top of the spacer tube. Another problem is it would be very hard to sight along the hinge to polar align it. This was solved by placing a mirror at the back so I could look down on it which worked very well. See photo below.

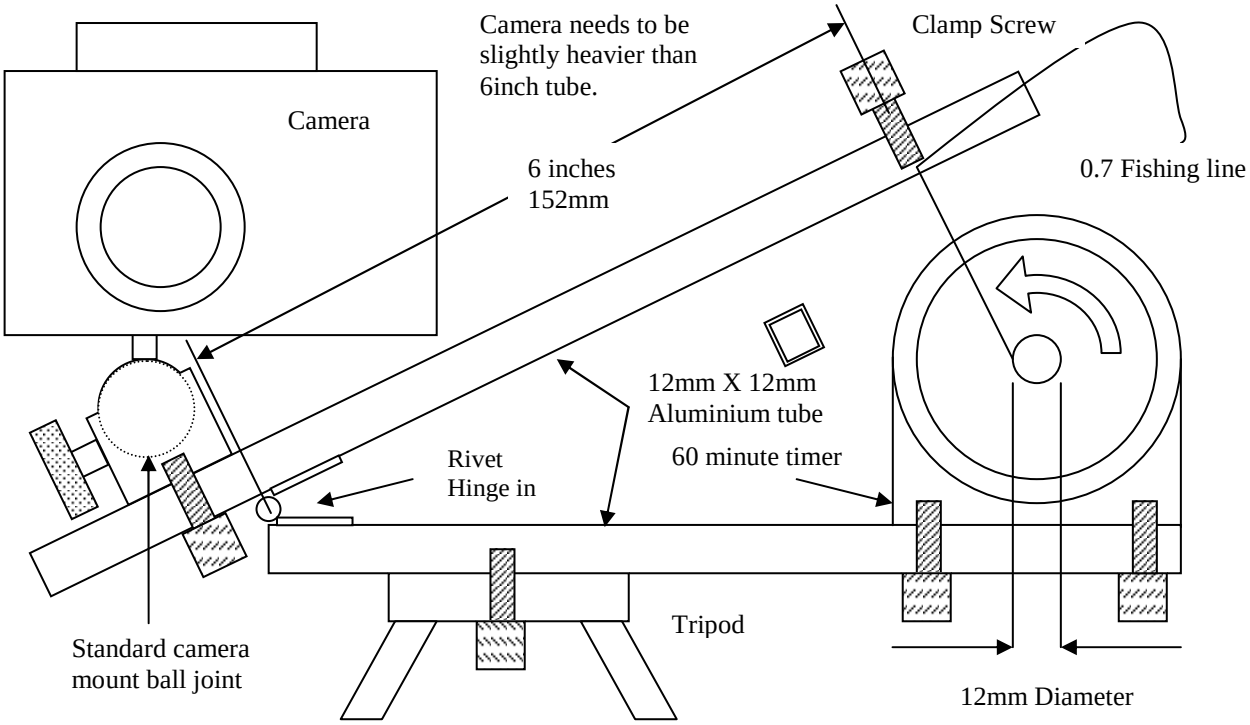


This is what can be achieved with this drive systems Barnard loop, left.

There must be a better way? Then came a brain storm, the next tracker was to be made with a 60 minute kitchen timer with a piece of ½' copper pipe glued to the centre of the dial and with a piece of fishing line linking it to a wooden leaver at 6" from the hinge. This would give a reduction ratio of 24 to 1. If I got the ratio right it would drive the camera at a rate of one turn every 24 hours. See photo at left surprisingly this only took me 1 hour to build and it worked well.

52. The Barn door mounts. Part 3 the Kitchen timer tracker.

We need something more portable then a Barn door. If we had some way of turning the screw without touching, the mount could be made a lot lighter. So I re engineered it, instead of turning a screw which drives the 2 boards apart. I used a 60 minute egg timer and a piece of fishing line to winch the 2 parts together or apart, depending on which pole you are looking at of cause. Its all about ratios like the barn door mount. The distance between the hinge and were the fishing line attaches, which is 6 inches this is equivalent to a 12 inch wheel so the wheel on the egg timer would need to be ½ inch minus the diameter of the fishing line which would be 12mm, this would give a 24 to 1 ratio, meaning the 12 inch wheel would only turn at one 24 of the speed of the egg timer. This was very successful but you had to keep the balance on the light side or the timer was not strong enough to move the camera, I was limited to short lens like 50mm length, anything longer than 135mm was just too heavy. But with persistence I'm shore anyone could make longer lens work too. The timer rings you when it has stoped, so I nick named it the Dingaling tracker. See drawing and photos below.



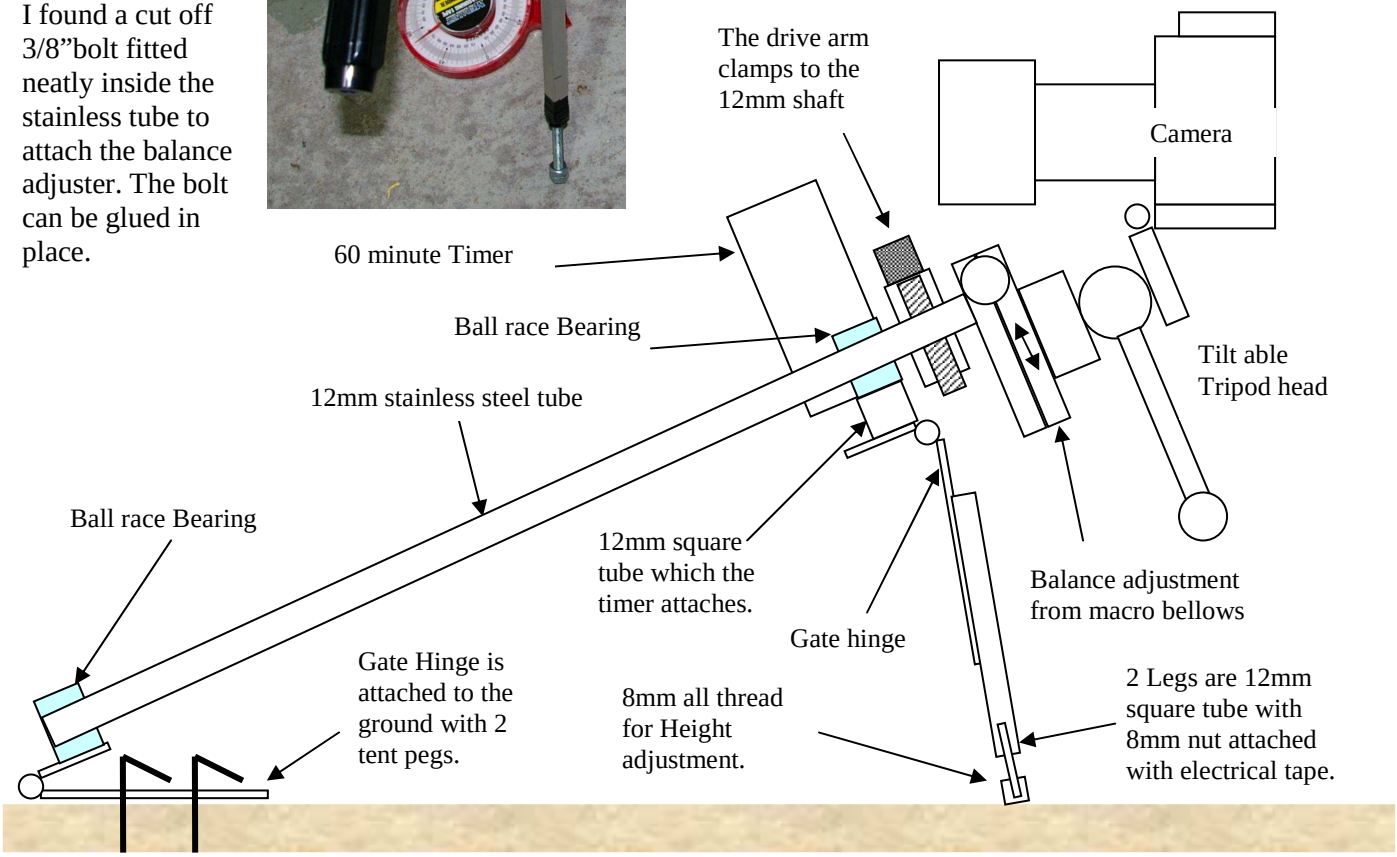
53. The Barn door mounts. Part 4 the Kitchen timer tracker.

With a little thought I have come up with a better and more versatile design of my Kitchen timer tracker. It is based around a 12mm shaft and 2 ball races with a gate hinge attached to the lower bearing were 2 tent pegs can be fitted to secure it to the ground. The upper bearing attached to 12mm square tube which the timer attached too with a gate hinge which attaches to 2 folding legs with 8mm all thread inserted for height adjustment. The drive arm clamps to the 12mm shaft which holds to fishing line at 6inches from the centre line of the 12mm shaft. I use a compass to find the South Pole and then I use a protractor that works by gravity, to set the angle of the shaft to the correct declination.

The main trick is to balance the whole rig so there is the minium tension on the fishing line. So it does not stall or make the timer run to fast. I found I could also clamp a camera to the shaft.

Read part 3 to gain knowledge on how the drive works or better still build the simple tracker first.

I found a cut off 3/8”bolt fitted neatly inside the stainless tube to attach the balance adjuster. The bolt can be glued in place.



54. Most popular objects & fax

OBJECT	Distance from Earth	Diameter	Rotation	Around the Earth	Temperature	Speed
MOON	384,392 km	3,476 km	27.32 days	27.32 days	-150C to150C	0.51
SUN	149,600,000 km	1,402,500 km	29 days	365.256 days	5,800 K	170

PLANET	Distance From **SUN**	Diameter	Rotation	Around the **SUN** in	Speed	Moons	Brightness
Mercury	57,910,000 km	4,878 km	58.65 hours	87.97 days	47.86	0	0 Mag
Venus	108,200,000 km	12,012 km	243 hours	224.7 days	35	0	-4.4 Mag
Earth	149,600,000 km	12,750 km	23.93 hours	365.256 days	29.78	1	
Mars	227,940,000 km	6,786 km	24.62 hours	686.98 days	24.12	2	0.4Mag
Jupiter	778,330,000 km	142,984 km	9.8 hours	4,332.71 days	13.06	62	-2Mag
Saturn	1,426,980,000 km	120,536 km	10.6 hours	10,759.5 days	9.64	65	-0.4Mag
Uranus	2,870,990,000 km	51,118 km	17.9 hours	30,685 days	6.8	22	5.5 Mag
Neptune	4,497,070,000 km	49,500 km	19.2 hours	60,190 days	5.44	11	8 Mag
Pluto	5,913,520,000 km	2,300 km	6.4 hours	90,800 days	4.74	1+2	14 Mag

STAR	Ra	Dec	Distance in LY	Mag	Colour
Proxima Centauri	14h30m	-62d42m	4.2	11.0	Red
Alpha Centauri	14h40m	-60d50m	4.3	-0.3	Yellow
Beta Centauri	14h4m	-60d22m	460	0.6	White
Alpha crux	12h27	-63d5m	360	0.9	White
Sirius	6h45m	-16d42m	8.6	-1.5	White
Antares	16h30m	-26d25m	330	1.0	Orange
Betelgeuse	5h55m	7d24m	310	0.5	Red
Castor	7h35m	31d53m	46	1.6	White
Aldebaran	4h36m	16d30m	68	0.9	Orange
Canopus	6h24m	-52d41m	1170	-0.7	Yellow
Rigel	5h15m	-8d12m	910	0.1	White

KEY	
N	Nebula
O	Open cluster
G	Globular cluster
Gx	Galaxy
P	Planetary Nebula
d	Degrees
h	Hours
m	Minutes
Km	Kilometres
Mag	Brightness
LY	Light Years
Speed	Km per Second

OBJECT	Ra	Dec	Degrees	Mag	Distances in LY	Size in LY	Speed
LMC-Gx	5h23.6m	-69d45m	11x9	0.1	180,000	17,000	313
SMC-Gx	0h52.7m	-72d50m	4.6x2.7	2.3	190,000	9,000	175
Coal Sack	12h53m	-63d	6.7x5	none	500	60	
M4-G	16h23.6m	-26d32m	0.57	5.9	10,000	100	
M7-O	17h53.9m	-34d49m	1.33	3.3	800	20	
M6-O Butterfly	17h40.1m	-32d13m	0.5	4.2	1,300	6	
M8-N Lagoon	18h3.8m	-24d23m	1.5x0.65	5.8	5,000	110	
M16-N Eagle	18h18.8m	-13d47m	0.55x0.45	6	5,900	28	
M17-N Omega	18h20.8m	-16d11m	0.75x0.6	7	5,900	300	
M20-N Trifid	18h2.6m	-23d2m	0.46	6.3	5,000	60	
M22-G	18h36.4m	-23d54m	0.55	5.1	7,800	75	
M31-Gx Andromeda	0h42.7m	41d16m	3.2x1	3.4	2,500,000	125,000	-68
M33 – Gx Pin wheel	1h33.9m	30d39m	1.2x0.6	5.7	2,400,000	50,000	
M42-N Great Orion	5h35.4m	-5d27m	1.17x1	4	1,500	30	
M44-O Praesepe	8h40.1m	19d59m	1.7	3.1	580	17	33
M45-O Pleiades	3h47m	24d7m	1.8	1.2	380	12	
M46-O+2438-P	7h41.8m	-14d49m	0.43	6.1	3,200	24	
M57-P Ring Nebula	18h53.6	33d2m	0.02	8.8	1,600		
M83-Gx	13h37m	-29d52m	0.15	7.5	15,000,000	80,000	514
M104-Gx Sombrero	12h40m	-11d37m	0.22x0.07	8.3	41,000,000	100,000	1,083
55-Gx	0h15.1m	-39d13m	0.5x0.1	8.1	4,000,000		125
104-G 47 Tucanae	0h24.1m	-72d5m	0.83	4	15,000	220	
253-Gx Silver Coin	0h47.6m	-25d17m	0.43x0.1	7.6	11,000,000	80,000	250
2070-N Tarantula	5h38.6m	-69d5m	0.8	8.3	180,000	3,000	
3372-N Eta Carinae	10h43.8m	-59d52m	2	6	6,000	200	
3532-O	11h6.4m	-58d40m	0.83	3	1,300		
3621-Gx	11h18.3m	-32d49m	0.15x0.1	9.2	20,000,000	125,000	650
4755-O Jewel Box	12h53.6m	-60d20m	0.17	4.2	7,600	23	
4945-Gx	13h5.4m	-49d28m	0.3x0.08	8.8	16,000,000	100,000	560
5128-Gx Ham Burger	13h25.5m	-43d1m	0.45x0.3	6.7	14,000,000	50,000	545
5139-G Omega Centauri	13h26.8m	-47d29m	0.83	3.9	16,000	230	
6752- G Pavo	19h10.9m	-59d59m	0.3	5.3	13,700		
7582-Gx Grus Quartet	23h18.4m	-42d22m	0.5	10	62,000,000		
Milky Way has100,000,000,000 stars			360x360		30,000 to centre	100,000	

55. Location in Victoria, MPAS and Eyepiece magnification chart.

Location	Latitude	Longitude
Adelaide	-34 55’ 0”	-138 34’ 0”
Alice Springs	-23 41’ 59”	-133 52’ 12”
Bonbeach	-37 48’ 0”	-145 8’ 0”
Briars - MPAS	-38 16’ 23”	-145 2’ 30”
Brisbane	-27 30’ 0”	-153 0’ 0”
Canberra	-35 17’ 59”	-149 7’ 47”
Heathcote-ASV	-36 45’ 0”	-144 40’ 0”
Hobart	-42 53’ 59”	-147 18’ 0”
Melbourne	-37 21’ 0”	-144 58’ 12”
Nil	-36 30’ 0”	-141 46’ 0”
Perth	-31 58’ 0”	-115 48’ 0”
Rye	-38 25’ 0”	-144 50’ 0”
Sydney	-33 54’ 0”	-151 10’ 0”

Mornington Peninsula Astronomical Society

General Meetings are held on the 3rd Wednesday of each month except December at 8 p.m. at the Peninsula School, Wooralla Drive, Mt Eliza Melway 105 F5 (Drive to Senior School at rear)

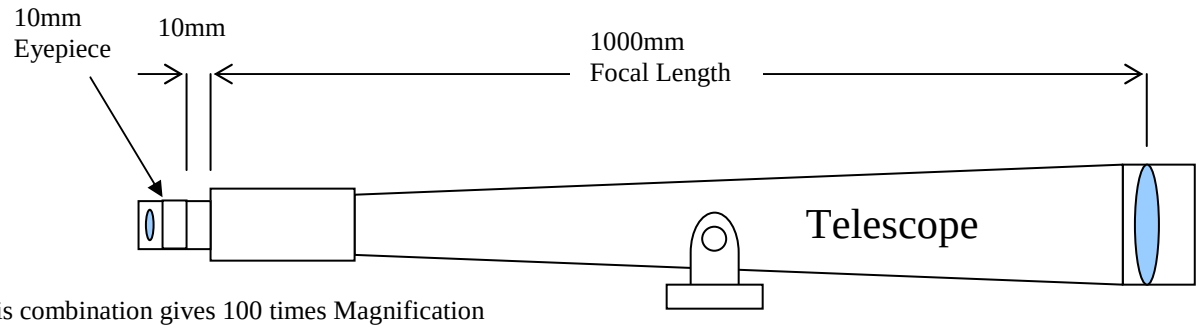
Public viewing nights are the 1st Friday of the month regardless of weather at The Briars.

Members viewing nights are Fri & Sat all at the MPAS Viewing Site at the Briars.

Nepean Hwy Mt Martha. Melway 145 F12

www.mpas.asn.au email: welcome@mpas.asn.au

Neil Armstrong was the
First Man to walk on the Moon 20/07/1969



This combination gives 100 times Magnification

		Focal Length of Telescope																		
		300	500	600	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2200	2400	3000	4000
Eye piece	FL																				
Plossl	55	5	9	11	15	16	18	20	22	24	25	27	29	31	33	35	36	40	44	55	73
Plossl	40	8	13	15	20	23	25	28	30	33	35	38	40	43	45	48	50	55	60	75	100
Panoptic	35	9	14	17	23	26	29	31	34	37	40	43	46	49	51	54	57	63	69	86	114
Plossl	32	9	16	19	25	28	31	34	38	41	44	47	50	53	56	59	63	69	75	94	125
Plossl	26	12	19	23	31	35	38	42	46	50	54	58	62	65	69	73	77	85	92	115	154
Plossl	24	13	21	25	33	38	42	46	50	54	58	63	67	71	75	79	83	92	100	125	167
Panoptic	22	14	23	27	36	41	45	50	55	59	64	68	73	77	82	86	91	100	109	136	182
Plossl	20	15	25	30	40	45	50	55	60	65	70	75	80	85	90	95	100	110	120	150	200
Panoptic	19	16	26	32	42	47	53	58	63	68	74	79	84	89	95	100	105	116	126	158	211
Orthoscopic	18	17	28	33	44	50	56	61	67	72	78	83	89	94	100	106	111	122	133	167	222
Nagler	17	18	29	35	47	53	59	65	71	76	82	88	94	100	106	112	118	129	141	176	235
Nagler	16	19	31	38	50	56	63	69	75	81	88	94	100	106	113	119	125	138	150	188	250
Panoptic	15	20	33	40	53	60	67	73	80	87	93	100	107	113	120	127	133	147	160	200	267
Ultra Wide	14	21	36	43	57	64	71	79	86	93	100	107	114	121	129	136	143	157	171	214	286
Nagler	13	23	38	46	62	69	77	85	92	100	108	115	123	131	138	146	154	169	185	231	308
Plossl	12	25	42	50	67	75	83	92	100	108	117	125	133	142	150	158	167	183	200	250	333
Plossl	10	30	50	60	80	90	100	110	120	130	140	150	160	170	180	190	200	220	240	300	400
Nagler	9	33	56	67	89	100	111	122	133	144	156	167	178	189	200	211	222	244	267	333	444
Ultra Wide	8.8	34	57	68	91	102	114	125	136	148	159	170	182	193	205	216	227	250	273	341	455
Radian	8	38	63	75	100	113	125	138	150	163	175	188	200	213	225	238	250	275	300	375	500
Nagler	7	43	71	86	114	129	143	157	171	186	200	214	229	243	257	271	286	314	343	429	571
Plossl	6.5	46	77	92	123	138	154	169	185	200	215	231	246	262	277	292	308	338	369	462	615
Plossl	5	60	100	120	160	180	200	220	240	260	280	300	320	340	360	380	400	440	480	600	800
Radian	4	75	125	150	200	225	250	275	300	325	350	375	400	425	450	475	500	550	600	750	1000
Radian	3	100	167	200	267	300	333	367	400	433	467	500	533	567	600	633	667	733	800	1000	1333

		Barlow	Barlow	Barlow	Barlow	Barlow	Barlow	Barlow
Orthoscopic	40 Deg Field							
Plossl	50 Deg Field							
Radian	60 Deg Field							
Panoptic	68 Deg Field							
Nagler	82 Deg Field							
Ultra Wide	84 Deg Field							

MAGNIFICATION CHART FOR TELESCOPES

BY GREG WALTON
2 IRISH CRT BONBEACH 3196
Phone: 9773 0098

Telescope Focal Length Divided By Eye Piece Focal Length = Magnification

Produced on Microsoft excel

15/02/2007

56. How to use a camera lens as an Eyepiece.

Cameras such as SLR have removable lenses or interchangeable lens. The best lens for this purpose is a 28mm, 35mm or 50mm.

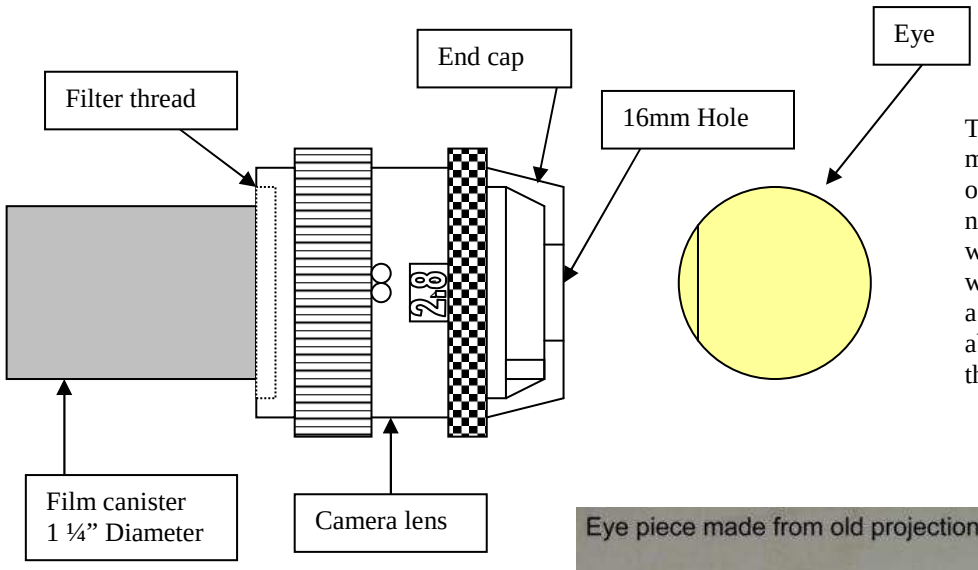
WARNING the end of the lens that attaches to the camera can have sharp metal parts that can damage your eye, so cover these parts with something soft. Often lens come with plastic end covers, you could drill a 16mm hole through the centre of the cap and attach this.

We must be able to attach this lens to the telescope by the thread in the front of the lens. This thread is normally used to attach filters. Threaded rings to suit this thread can be bought for about $9.00 and glued to a film canister with the bottom end removed, as this will fit neatly inside a 1 ¼" focusers.

Before we can use the lens we must adjust the settings. Set the lens to the maxim F ratio (say 2.8) and set the distance focusing to maxim distance (Marked 00)

Now attach the lens to the telescope by the front end and view through the back of the lens with eye protection in place. (See warning above)

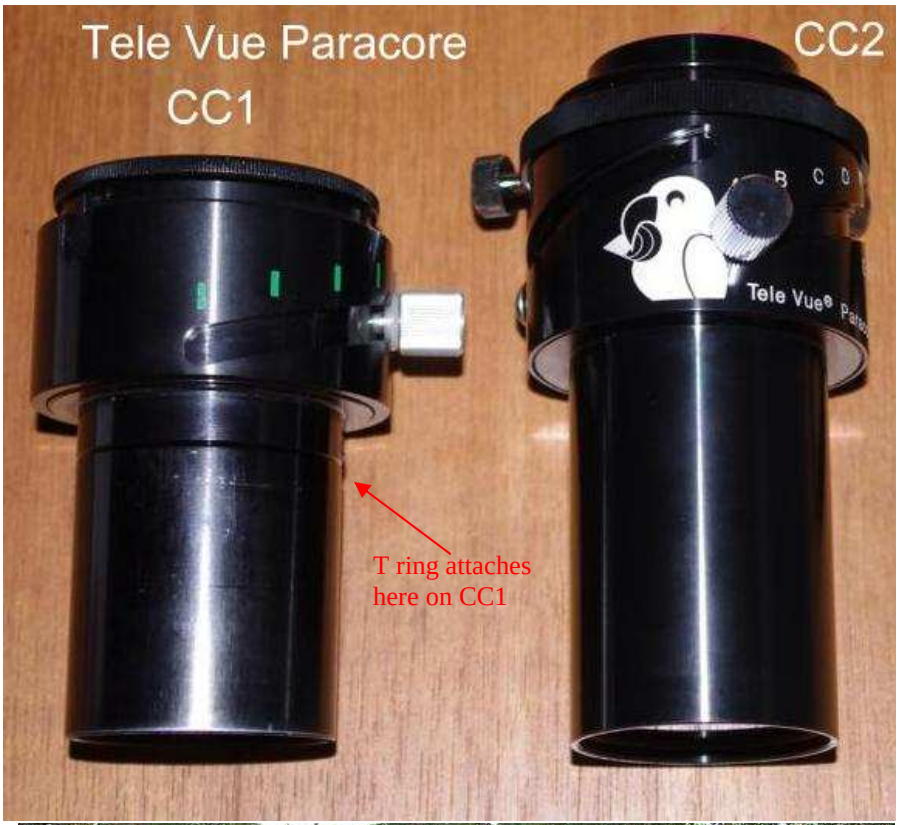
Adjust the focuser, as if it were a normal eyepiece, you will need to adjust the position of your eye to eliminate the dark stop in the centre, which is created by the secondary mirror in a Newtonian or Cassegrain type telescope, practice on the Moon. The eye will be about 25mm back from the lens, which will suit people who wear glasses. See diagram below.



This extra large eye piece below was made from an old projection lens out of a TV. It work very well and show no coma at all, you can look through it with both eyes at the same time, so who needs a bino-viewer? Though it is a bit on the heavy side and needs about 30 house bricks on the back of the scope to balance it.

57. Using the Televue Coma corrector. By Greg Walton 2000

Only eyepieces with less than 150 magnification suffer coma. The 8.8mmUW and 14mmUW will not show any coma because of the built in Barlow lens, if the stars look fuzzy it is because the seeing conditions are not good enough. I find that most nights that 100X magnification is best I can manage, only 1 out of 3 nights can I use 150X magnification and 1 out of 10 nights can I use 200X or more magnification which I would use on the planets, moon and planetary nebulas any how. We can stop down the large telescopes, with short F ratios (like 18" F4.5) to improve the image for planets and the moon. With an of axis mask 20" in diameter with a 4" hole near is edge and positioned between the vanes of the spider, this would give a F20 ratio. And for bright open clusters use a disc 10" in diameter at the centre, attached to the centre bolt in the spider this will remove most of the coma at low power or 100X magnification. Test on M7 with and without the mask and you should see a big improvement. The 10" centre mask will also collect most of the dew, which would settle on the secondary mirror, so you can observe longer. If you look at NGC104 at 100X without the 10" centre mask the coma will not be noticed if the Globular is in the centre of the field, for the sky is dark around it. Generally the wider the field the more coma is seen. So why bother with wide field eyepieces and they cost 10X more in price. Orthoscopic eyepiece shows almost no coma and cost about $60 but the field is only 40 degrees. My view is wide field eyepiece cannot be justified.



So why do people buy them? (Dobsonian don't track) the wider the field the less time spent adjusting the position, with a ½ degree field eyepiece the Moon moves out of view in 2 minutes. By the time it takes to change a filter the object is gone.

So why buy a coma corrector? At $500 it had better do something. It has no benefit for eyepieces over 150X magnification because it is not needed, for wide field eyepieces around 110X magnification it removes most of the coma but for wide field eyepieces around 70X it removes half of the coma. The 10" centre mask can do this better but want about the light loss I hear you say? Well the coma corrector may reduce the light getting to the eyepiece by the same amount.

The Televue coma corrector (parracore) can be used as a photographic aid as it has a thread so it can be attached to a 35mm SLR camera, which I find very useful. It also increases the magnification by 15% and also extends the focal point further back out of the focuser, which is good, because most cameras will not focus without it. Of cause the masks can do this just as well or better if you can focus the camera.

I use Televue coma corrector with assorted masks. In the end it is the skill of the operator to get the best out of the telescope, by whatever means possible.

Note some of the new type one coma correctors can not be unthreaded to fit the T ring so a camera can be attached. Please explain?

Note that with the type two coma correctors you may need to buy an adaptor and over size T ring, only Canon & Nikon available.

58. Building Sky Drover 18” Dobsonian Telescope. Part 1

Why on earth did you build such a large Telescope? I have been asked this many times. Well I never ever intended to build a Telescope in my life it just happened. When I was 4 years old my father would take the family fishing at night, I would lie on my back and look at the stars trying to make shapes in the stars. Every one knew the pot (Orion), Southern Cross and the seven sisters, but I saw speedboats, cars and rocket ships. I left school at 15 to work in my father’s small engineering firm where I did an apprenticeship in fitting and machining. So most of my life, I have had an interest in machines and how they work. I would buy books on machines, the universe was just another machine to me, so I ended up with a lot of books on the universe and the machines which studied the sky. A life long friend of the family is **Ken Marriott** an electrician and one day whilst working at my home mentioned he had a mirror out of a telescope, it was 18 inches in diameter and 2 inches thick. I raced to my bookcase to find all the books I had on telescopes **(there was a lot).** So work stopped and the rest of the day was spent pouring though the books and talking telescopes. In one of the books was a picture of **John Dobson’s** with some of his telescopes, we soon leant all about Dobsonian? Reading a book by **Tom Clarke** we thought that an 18” telescope was a baby and every home in the USA had one. So Ken went to see **Roger Davis** at the Binocular and telescope service centre to buy a secondary mirror, focuser, eye pieces and Roger checked the mirror and said it would be OK. Soon Ken was back at my workshop with all the goodies. A bit more head scratching and we decided the **Tom Clarke** design would be right for us, a trust tube with a upper cage that fits inside the mirror box for storage.

First we made the secondary mirror holder and spider from steel (these could have been bought) then we built the upper cage from ½” square aluminum tube, very easy and very light. We found a disc (see diagram A) then I rapped the ½” tube around the disc 1 ½” times, because it will spring open to about the right diameter. After cutting to achieve the right diameter, we joined the ends by sliding a piece of 3/8” diameter aluminum X 40mm long inside one end about 20mm, but I bent a curve in it first to match the hoop. I then drill a 1/8” hole through the tube and dowel 10mm from the end, then I hammered a1/8” Roll pin in and filed flat. (A Roll pin is hollow spring steel so it will not fall out) Slide the other end over the 3/8” dowel and drill and pin, now we have a hoop (see diagram B)

Next I cut 6 spacers of the same ½” tube to join the 2 hoops (Note the ends must be square). Then I cut 12 pieces of 3/8” diameter aluminum rod at 40mm long and drilled a 3.5mm hole 20mm deep in one end, must be dead centre, then tap 4mm about 12mm deep. I slipped one in each end just below the face and pinned as before but 30mm from the end. (see diagram C). Now we used dividers to mark the position of the holes in the hoop. Before bolting in the 4 spacers, I drilled the cross-holes, which the spider attaches to (See note S). The other 2 spacers hold the focuser so we have to work out the distance between them and drill 4 holes in the hoops haft way between the spider vanes. Assemble the cage so we can work out the position of the focuser then drill and screw the focuser in place. Before installing the spider I lined the cage with .25mm thick sheet aluminum and pop riveted in place, now we can fit the spider. I made 4 angle brackets to attach to the lower hoop, so when I joined the trusses, its centre line would be in line with the centre of the ½” square tube (See diagram T). I could have just cross-drilled though the lower hoop, but I would have had to make the mirror box larger. And I wanted the clamp blocks inside the mirror box. The whole telescope had to fit though a standard door way.

How did you get the focal length? We placed the mirror in the sun and burnt a hole in a piece of wood and measured that distance. 99” divided by 18” = F5.5. But Roger worked this out be other means and said the secondary mirror you will need is a 3.1” which I have got.

Next I made a 9 point flowing mirror cell from 6mm aluminum plate, I calculated this myself but I will not explain now. I made the mirror box to **Tom Clarks** design but instead of using plywood, I used plastic coated craft wood, I got cheap of cuts almost the right size. If I had used plywood it might have been lighter but then the bearings would have been higher or I might have had to add balance weights.

Next I made 8 aluminum clamp blocks 4RH+4LH to clamp the 22mm diameter aluminum tube for the trusses, and then I made 8 trusses by flattening one end and drilling a ¼” hole through the flat. I made a jig to cut them accurately to length, by bolting each truss in the jig by the ¼” hole then cutting to length. I know that there all the same, so I can put any truss in any position and know it will be accurate. I joined the upper cage, trusses and mirror box with mirror in place. I then laid it all horizontal and found the balance point on the side of the mirror box. I made the Altazimuth bearings 200mm in diameter X 30mm wide from aluminum and cut slots for adjustment. I used chopping board plastic for the bearing pads, it worked well. (I can still hear screaming from the kitchen). Now I can make the rocker box knowing the height of the bearings. All timber joints are with 63mm long screws but no glue, I might wish to get it apart one day. Next I made the usual Dobsonian ground board.

I supported the edge of the mirror with 50mm diameter rollers which I made and placed them in the 4 corners of the mirror box, this meant when adjusting the primary mirror it would not drag. So it must be in contact with the 9-point mirror cell all the time.

Then I dragged it out side for a look at the moon, but the focuser could not focus. I move the eyepiece back by hand out of the focuser, just white light. Out came the screwdriver and I removed the draw tube so the eyepiece can fit inside the focuser. It slid in 40mm eyepiece **WOW** craters.

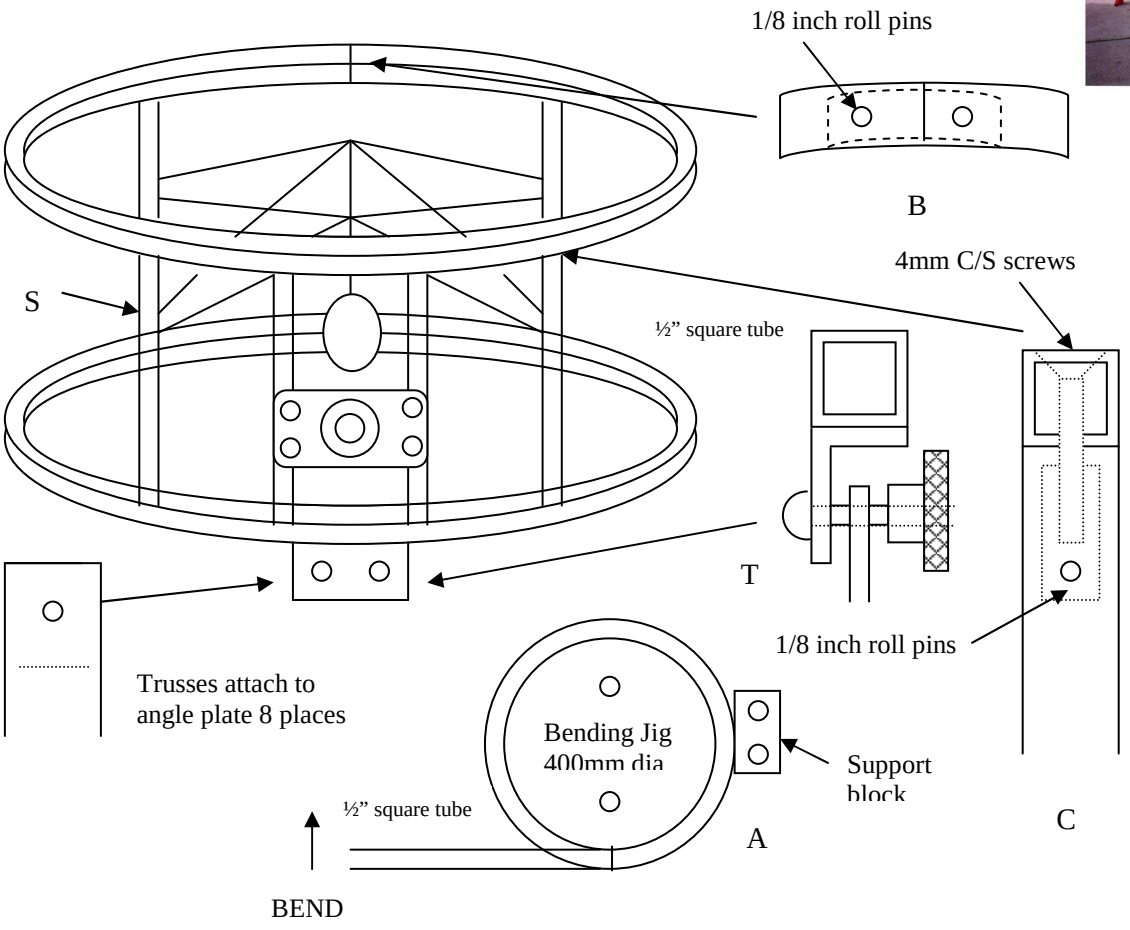
59. Building Sky Drover 18” Dobsonian Telescope. Part 2

I almost froze to the telescope that 1999 winter night. Next day I went for broke and cut 50mm of all the trusses and fitted the Quick finder, that night was marvelous except all the neighbors turn up to hog the eye piece, they said we though you had gone mad standing on a ladder all night.

Next day we made the black material sock and I painted the mirror box black in side. Every day we made some improvement. I fitted half a pair of binoculars for a spotting scope and I glued a piece of fuse wire behind the eye lens for a sight. We broke the first rule in Dobsonian building, never leave the scope on wheels, but we had worn the ground pads out in the first month by dragging the scope here and there. I am surround by 15 metres tall trees every new object meant moving the scope. So rubber swivel wheels were fitted. If I found a clear spot I can place bricks under the ground board so the wheels do not touch the ground. One windy night though the scope was blown down the road when we looked away. When we caught up with it, it was still focused on the same object. That year the scope got a lot of use we are very happy with it.

I joined the **Astronomical Society of Frankston now Mornington Peninsula Astronomical Society**, a good bunch of people. Some of them almost fell over when I said the 18” Dobsonian is my first scope and the only scope I have ever looked through. I have been asked where the 18” mirror came from? Well, one day Ken was working at a school, they said they were having a clean out. And that mirror with cast iron housing would be going to the tip. Ken asked if there were any other parts, they said no. ‘Some body gave it to the school 10 years ago, and you can have it if you like’. Ken likes collecting things so he dragged it home.

Recently we found a journal on **Telescope making in Australia** and we seen a photo of a lost telescope, the 18” **Robert Wigmore** built 109 years ago in Melbourne. It had a cast iron equatorial mount. In the photo it showed the cast iron mirror housing, it looks exactly the same as our cast iron housing. But the Wigmore 18” scope was said to be F7 or 8, and our 18” mirror is F5.5. In the photo of the Wigmore scope, it does not look like F7 or 8 to me. Maybe someone can clear this up for us some day.



60. Building SKY DANCER 21 inch Dobsonian, part 1.

Here we go again building another telescope I never intended to build. I saw an ad in Sky and Space magazine. For sale 21.5" mirror F3.8 or F20, what could this all mean? Well I rang to find out. The primary is 3" thick and, it came with 2 secondary mirrors, One 4.5" Diagonal which would give us F3.8 and one 4" Cassegrain which would give us F20, that's a focal length of about 11 meter's. Quick approved from Val and the mirror was in my workshop, were it sat for 5 months while I worked out the design. It must be light, fast to assemble, easy to use and fit through a standard doorway. The primary mirror weighs 40 kg so this meant I would have to reduce the weight every where else, if I had any chance of making it portable. Because of the weight of the primary mirror the bearings will be close to the mirror; this meant a very short Mirror box. Being such a short F ratio and by keeping the mirror close to the ground, I did not need to use a ladder, I only need 1 step when the telescope is looking strait up.

I found some aluminum channel 175mm X 25mm X 3mm thick, this would make the sides of the Mirror box. I decided on an eight-sided Mirror box, this would be compact and strong. I used 1.5mm aluminium sheet for the top and bottom. I made the 18 point floating mirror cell from 6mm Aluminum plate, which I calculated my self because the primary mirror is an odd size.

I decided to make the upper cage the same as the first 18" telescope, which I built from ½" square tube, but I would not line it with aluminum sheet this time. (See building the 18" telescope) I would just make the material cover long enough to cover the whole telescope. We sewed a stainless steel hoop in to the top end of the cover.

The hoop which is 10mm smaller in diameter than the upper cage couldn't slide down over the upper cage. We used Velcro to attach the cover to the Mirror box. The black material we used is called Ripstop its glossy on one side and flat Velvet on the other; it is almost 100% light block out. I attached the focuser to ½" square tube that had a slot milled in one side, with a sliding nut inside the tube, so we could move the Focuser to line up with the secondary mirror. (See Diagram A) The 8 rods are riveted in pairs so they would line up automatically with the screws on the upper cage. (See Photo E) The 8 aluminium clamp blocks were bored at an angle of 4 degrees to suit the angle of the rods and where made as left and right handed pairs.

The primary mirror has a 4" hole through its centre; this meant we could not use a laser to culminate the telescope by placing the laser in the Focuser, so we had to devise another system. By aiming the laser at the primary mirror, I found we could bounce the laser beam to the secondary and on to the Focuser, where I had attached an opaque screen with a small dot at its centre. If the laser is held square to the axis of the telescope, the laser beam will always strike the dot on the screen; no matters were it is positioned in front of the primary mirror. If it's not culminated the laser will miss the dot. So some adjustment is needed. This system also tests the position of the secondary mirror, as the laser beam traces the edge of the primary mirror it should simultaneously trace the edge of the secondary mirror. (See Diagram B)

Building the mount. After reading many books on Dobsonian mounts and building one as the book said, I realized that most Dobsonians were built with little engineering expertise. The books say make it heavy, but the 21.5" mirror was already too heavy, so I had to make it light and strong as possible. I did this by using the least number of parts, and keeping it as close to the ground at possible. The Ground board I replaced with 3 steel bars welded in to the shape of a Mercedes logo. (See Diagram D) The Rocker box I replaced with a steel ring with 2 arms to hold the Mirror box. (See Photo C) I glued Laminex to the under side of the steel ring as a bearing face. Most Dobsonians have large inclination bearing to increase friction, but I used small 50mm diameter bearings with tension adjusting screws to increase the friction and to save on space, so the scope would fit through a standard door way.

61. Building Sky Dancer Part 2.

Lost in space. I made setting circles from 1.5mm sheet aluminum, the Azimuth circle is marked 360 degrees around the edge and is attached to the shaft which is welded to the Ground frame. The Altitude circle has 90 degrees marked around its edge and is attached to the side bearings on the Mirror box. I attached a bulls eye level to the Rocker frame. I tapped 3 10mm holes at the ends of Ground frame so the telescope could be jacked up so the wheel would not touch the ground and the telescope could be leveled.

With the telescope on the launch pad we are good to go, then we can switch on the laptop and ark up the sky map software, then set the time and location, (Melbourne latitude –37 48 longitude –144 58) then click on a star that we knew is in the sky. The computer calculates the Altitude and Azimuth co ordnance in degrees from the time, location, Right ascension and Declination. Then I race to the telescope too find the star, centre it in the eyepiece and adjust the 2 setting circles to the co ordnance the computer gave me. I would do this twice on the same star to double check. Then we click on another star and move the telescope to the new co ordnance. Look in the eyepiece to check if the star is there, If not something must be wrong, recheck everything. The first 6 times I did this were not very successful. The time or location was wrong or the telescope was not exactly level, this telescope being **100kg** would sinks into soft ground meaning its no longer level. Usually the Operate is faulty not the system. But maybe these computer programs don't compensate for the refracting (Bending) affect of the atmosphere, so it is best not to set up on a star near the horizon, nor is it best too set up on the stars directly over head, as there azimuth degrees change to rapidly. Even after getting the whole system perfectly aligned, directly over head is best avoided. The **Altitude circle** only needs to be set once, (Horizon is Zero) so each time the telescope is used I only have to set the **Azimuth circle. (North is Zero)**

What about the view? At first the view was slightly disappointing most eye pieces showed a lot of coma (the stars at the edge of the field were comet shaped) I found that Orthoscopic eyepieces worked the best but had a narrow field of view about 40 degrees. I bought a 22mm Panoptic hoping this might work but it did not, about $500 down the drain. I asked around and was told I needed a coma corrector about $600, so I bought it and it did remove most of the coma, but not all. By experimenting with aperture stops I could eliminate the entire coma. So I found rather than blocking light from the edge of the mirror which would be the loss of too much light. I found by placing a 12" disc over the centre of the mirror had the greater effect, with the least loss of light, which made the telescope equal to an 18" telescope. So most of the time I use the 12" disc. Only when I am tracking down faint galaxies do I remove the disc; most galaxies are fuzzy blobs anyway so no difference is seen. I found high-powered eyepieces worked well without the coma corrector and a **2X Barlow** also removed the coma. Also to my surprise an old 50mm camera lens did not suffer any coma at all but was not a wide field of view, See using camera lens as eye pieces page 53. It was only low to medium powered wide field eye piece that suffered coma see page 54.

After a bit of experimentation the telescope works well. I named the telescope **SKY DANCED** because sometime it feels like I'm dancing with it.

Note the 100mm hole in the mirror

Diagram B

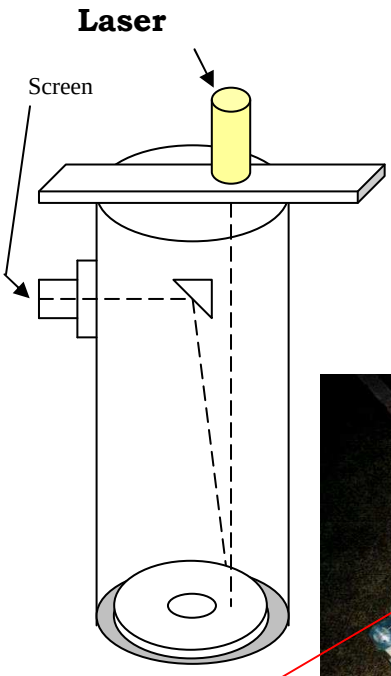


Photo E

Photo D 10mm threads Ground Frame

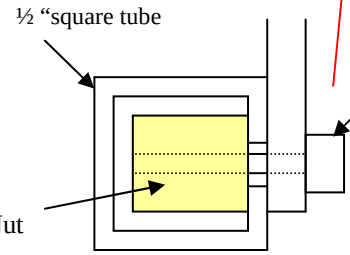
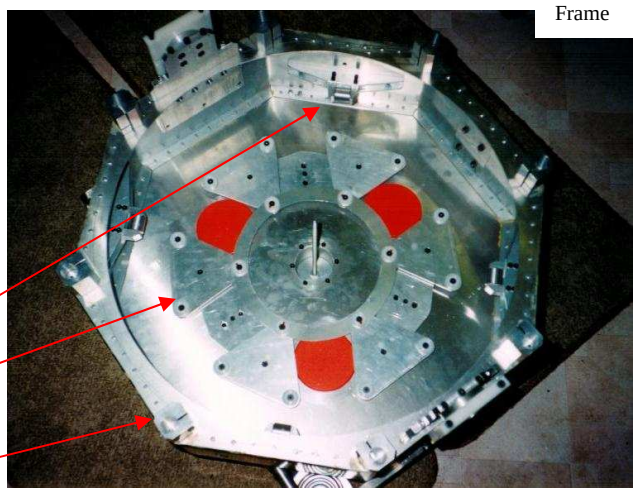


Diagram A



Rollers 4 places.

18 Point mirror flouting cell.

Clamps 8 places.

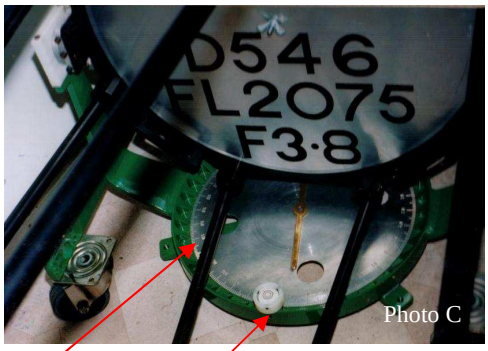


Photo C

Setting circles

Bubble level

62. Building Sky Venture, the18inch ASF/MPAS Telescope.

The Astronomical Society of Frankston has need of a large telescope and observatory ever since they lost there last observatory. A long time member of the Society, Ken Bryant built an 18" Dobsonian telescope after meeting John Dobson when he visited Australia. Ken built this telescope from plywood and handy angle steel, the mirror he bought from Galaxy optics in1996, it's 50mm thick. Ken had not long finished the telescope when after a short illness he passed away. His family donated the telescope to the Astronomical Society of Frankston, which the society appreciated but they really needed a telescope that could find and track objects across the sky.

So the Society asked if I would rebuild the telescope like my 21.5"telescope but on an equatorial mount with motor drive for tracking. I said yes but it will take 6 months. So here we go again building another telescope. When I built my 21.5" Telescope I had to buy too much aluminium which I used on this telescope. I first built the mirror box and upper cage, and then I found the focal length by moving the 2 parts back and forth till something came into focus, and then I measured the separation and made the rods that length plus 50mm. Then I set the telescope up on a temporary mount on wheels so I could test the telescope. It was OK, but I had to shorten the rod by 60mm so a camera could be used at prime focus. I also made the upper cage so it could be rotated, for when the telescope is on an equatorial mount the eyepiece could end up in a position that would be impossible to use.

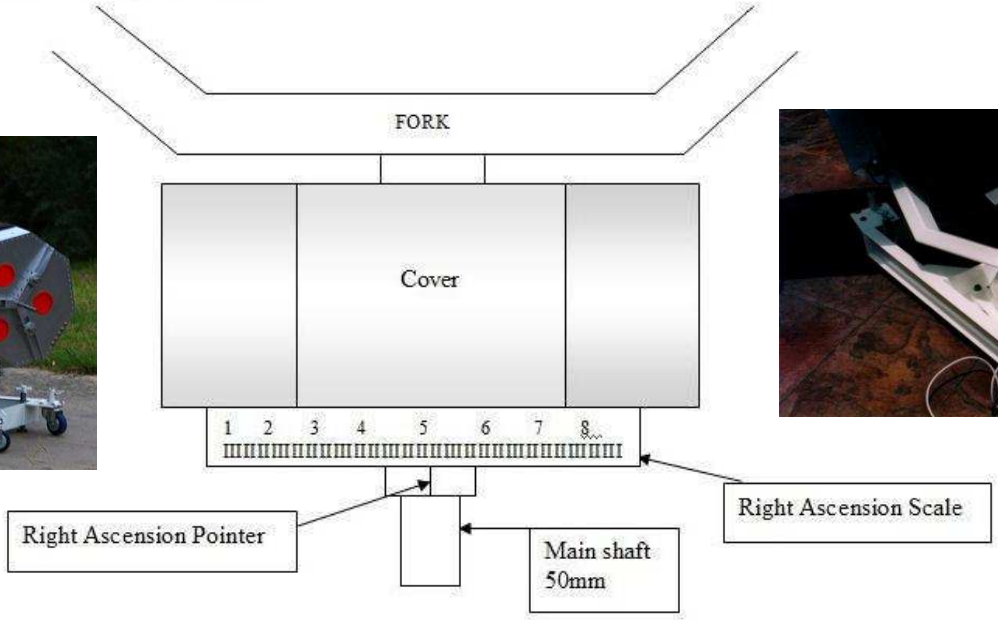
I decided on a fork mount because we needed to keep the telescope as close to the ground as possible. Even then we would need to cast a pocket in the slab 100mm deep and attach it to the bottom of that. The main fabrication is steel that supports the RA bearings and main shaft, which attaches to the fork, made from steel tube 50mm by 100mm by 3mm thick. We used stepper motors to drive the telescope in both axis, the RA axis has a ratio of 84,000:1 and the Dec axis has a ratio of 42,000:1. The two main gears are 200mm-diameter bronzes with 360 teeth, driven by a 12mm by 1.75mm pitch stainless steel thread. The secondary gear on the RA axis is 80mm diameter aluminium with 240 teeth driven by 6mm by 1mm pitch stainless steel thread. The secondary gear on the Dec axis is 40mm diameter aluminium with 120 teeth driven by 6mm by 1mm pitch stainless steel thread.

These 6mm threads are joined to the stepper motors, which I bought at Jaycar at $50.00 each. They come with a circuit board control kit that needs to be soldered together. A 240V ac to 12V dc 2amp transformer powers the motors. When assembling the circuit boards instead of attaching the ON/OFF switch, reverse switch and speed control pots to the circuit board I placed them in a remote control box. This can be held whilst looking through the eyepiece, so adjustments can by made to the position and tracking of an object. This would by needed if objects were to be photographed. In the control box I fitted 2 speed control pots for the RA axis with one switch to change between pots, so one pot (Red) can be set to counter the Earth's rotation and the other pot (Blue) can be used to make positioning adjustments. Theirs only one speed control pot for the Declination axis (Green).

But what about the view? I found the view to be slightly sharper than my 21.5" Dobsonian but I could see faint galaxies in my 21.5" Dobsonian that I could not see in the ASF 18". It also suffered coma, as does my 21.5" Dobsonian. I found my Televue coma corrector fixed this problem and I could easily see the sixth stars in the trapezium in Orion Nebula. I bought for $39 a pair of 7 x 50 Binoculars and cut them in half, then attached one half to the upper cage. I found this easier to use than the straight through finder scopes. I also attached a One-to-one sight to the upper cage and a wooden handle to steer the telescope. I attached a S/S shaft to the back of the mirror box to hold balance weights in case a heavy camera is used at the eyepiece. I fitted setting circles to both axis. (See Using Setting Circles) The RA main 50mm shaft can only be rotated one full turn, this is to stop the wires that run through the main shaft to the Declination axis motor and control board from being damaged. Both axis have friction clutches so the telescope can be moved without undoing any locks. I fitted a camera mount to the mirror box, which would also hold a guide telescope for photography. I named the telescope SKY VENTURE because astronomy is one big adventure.

63. Sky Venture, using the setting circles.

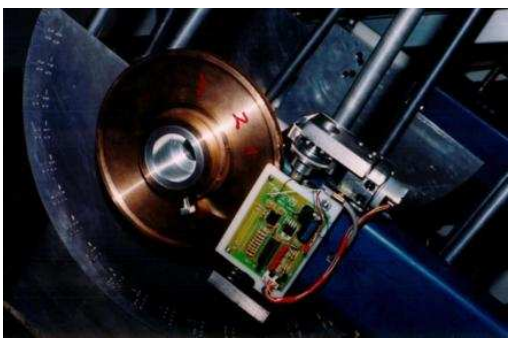
Find a star in the sky that we know the Right Ascension and Declination of. Then find and center it in the eyepiece and adjust the 2 setting circles to the co ordinates of that star. I would do this twice on the same star to double check. Then we can move the telescope to another star we know the Right Ascension and Declination of and look in the eyepiece to check if the star is there, If not something must be wrong recheck everything. Its best not to set up on a star near the horizon, the refracting (Bending) affect of the atmosphere may cause errors. So it is best to set up on the stars directly over head. The Declination circle only needs to be set once (On installation of the telescope). So each time the telescope is used the Right Ascension circle only has to set. But if the tracking is not accurate, this will need to be reset periodically, until accurate tracking is achieved.

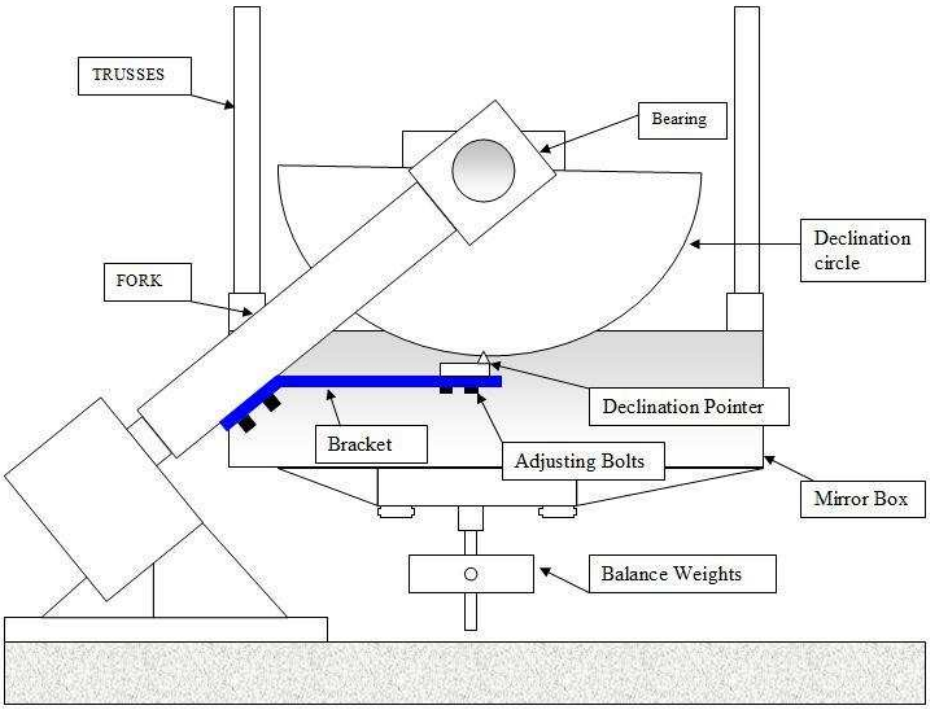


The Main shaft is attached to the fork, which is attached to the telescope. The Right Ascension scale is attached to the Right Ascension gear by a friction clutch so as the gear moves the Right Ascension scale moves with it. The Right Ascension gear is attached to the Main shaft by a friction clutch. When the telescope is moved by hand the Right Ascension gear and Right Ascension Scale do not move. The Right Ascension Pointer moves with the Main shaft by a friction clutch, so it moves with the telescope.

The RA main 50mm shaft can only be rotated one full turn; this is to stop the wires that run through the main shaft to the Declination axis motor and control board from being damaged. Both axes have friction clutches so the telescope can be moved without undoing any locks.

The Declination circle is attached to the telescope mirror box. The Declination pointer is attached to a bracket with adjustment slots that is attached to the fork.



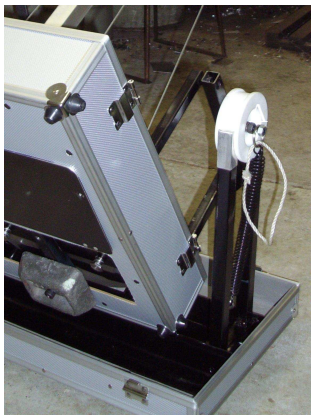


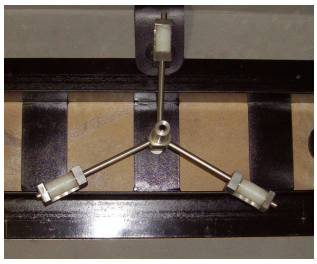
64. Building Sky Transformer, the 12” brief case scope.

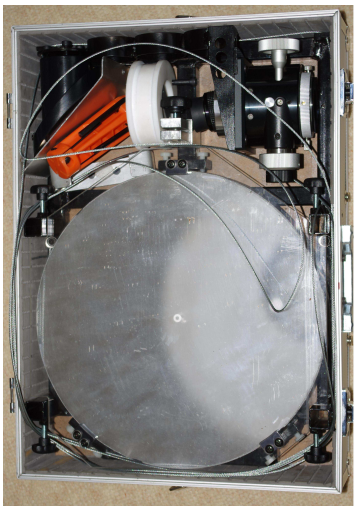
I have always wanted to build a brief case telescope after I read a story on such a telescope in an old astronomy magazine. It was an 8inch with many parts and poles to assemble. But 12 years pasted before I had start on it, all I had to show was some scribal on scraps of paper. I realized that a 12inch mirror fitted snugly into a standard brief case but with little room for anything else, but I was determined that the whole telescope must fit into the case, with no parts left outside of the case. Also I must be able to assemble it in less than 10 minutes. A 12inch Dobsonian telescope is fairly large and once you put it in your car there is little room for things else like a wife and Kids, but a brief case is hardly noticeable in the boot of the car. Also it would be handy to take on a bus or a plane. I decided to uses a cheap aluminum camera case for it has square corner and is 20mm thicker than a standard case.

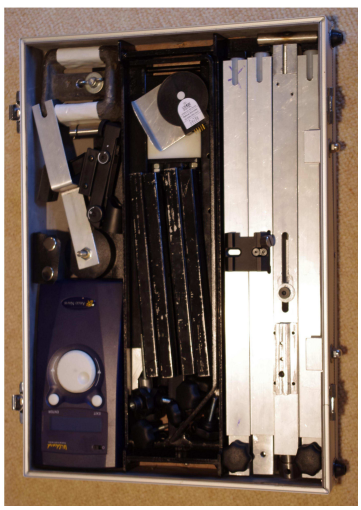
By putting the mirror and is floating cell to one end of the case, there would be room to store the 2 inch focuser and secondary mirror, both linked by 3 ring spider at the other end of the case. A cover made of Perspex is placed over the mirror, with the material shroud on top. The lid is only 45mm deep and most of the structural parts will need to fit into this area like, poles, ground board, encoders, Ago Navis with on/off switch ground flush, cables, red dot finder, Alt and Dec bearings folding frame. The case would need to be part of the scope, so the bottom part of the case would become the mirror box and the lid would be the rocker box, of cause both would need to be strengthened. I soon relied I could only have one pole which broke down into 4 parts each 420mm long, made from 25mm square aluminium as this would automatically find the same orientation each time it was assembled. But one pole would not be strong enough so I would hold it in place with permanently attached cables, like the mast on a yacht. With one knob at the top of the pole to tension all 4 of the 2mm cable at the same time, this worked well and was very strong. The 9 point floating mirror cell could only be 20mm thick, made from 20mm square tube and would also hold the Dec bearings, the mounting point for the 4 piece pole and strengthen the case. I cut a door in the bottom of the case to gain access to the 2 culmination bolts and too provide cooling. The material shroud has a 3/16”dia stainless steel hoop sewn into the top, which attaches to slots in the top of the pole.

I bought a 12” F5 GSO Dobsonian to dismantle, rather than buying the separate parts, as this was cheaper than buying the parts separately. My plan was to use the mirror cell that came with the scope but it was too large. The only parts I used were the 12” primary mirror, the secondary mirror with its holder, the 2” 10:1 Focuser and 4 eyepieces. The 50mm finder scope would not fit into the case so I swapped it for a red dot finder. The Dec bearings are both different, as one needs the fold down into the other. I had to attach a spring to increase friction and balance the scope (See below A). The ground board is assembled from 4 parts all locked together with one screw (See below B). A flat steel bracket bolts to the top of the Dec bearing to hold the Argo-Navis at a comfortable height for the operator. I machined a keyway along one side of the focuser mounting plate which fit into a keyway on the mast, making a strong connection between the too. So the focuser is held in place with one 6mm thumb screw and should always be in the same place each time to aid with culmination. The secondary mirror is permanently attached to the focuser by 3 50mm diameter stainless steel rings 20mm long weld together in line (spider), so when looking through the eyepiece you would not see any diffraction spikes around the stars very much like a refractor. The scope weighs 25Kg so I had to replace the plastic handle with a metal handle which bolts through the case and into the mirror cell. I am very happy with the way it works, even though the movement is a little on the light side, just means it cannot be used on very windy nights. I am hoping that one of the telescope manufactures will one day make this scope, so everybody can have one, or make a conversion kit for the standard type 12” Dobsonian. I would be willing to help with the design. Thew it would be very hard to improve the concept but some small features could be improved, if I ever built another I would replace all steel with aluminium. Also the telescope could be split into 2 cases to make it easier carry. I named it Sky Transformer like in the movies were an alien changes into a truck, but here a telescope changes into a camera case.









65. The Field trips and a List of things I take.

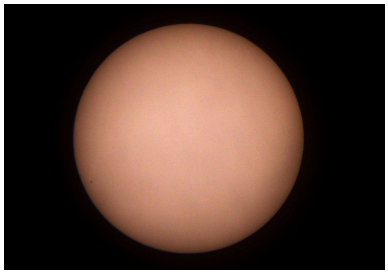
Many times I have packed my car and then looked at the list below to find I have missed something.

1 Telescopes 8inch Newtonian AG, finder scope, Coma corrector, T Ring,
2 Telescopes 12inch Newtonian, finder scope, Coma corrector, Extension tube, T Ring,
3 Eyepieces, Barlow, Filters, laser culminator,
4 Telescopes ED80, Focal reducer, finder scope, 90deg diagonal,
5 Dew straps, heaters controller, hair drier, dew shield,
6 Compass, protractor,
7 Mount EQ5H, tripod, draw bolt, counter weights, hand controller, power cable, 240 power supply 4amp,
8 Mount EQ6, tripod, draw bolt, counter weights, hand controller, power cable, 240 power supply 4amp,
9 12 volt Battery, 12 volt Battery charger, 12V to 240V invertor,
10 Cameras, lens, SD cards, Batteries, Battery changer, 240 power supply, continues shoot bracket, cables,
11 Camera Tripod, mounting plate,
12 Tables, chairs, Maps, pen,
13 Extension leaded, power boards,
14 Computer, Mouse, 240 power supply, Red screen, USB memory sticks, bag,
15 Freezer suit, coat, hat, scarf, gloves,
16 White and red touch, batteries, Multitool, matches,
17 Coffee, tea, sugar, kettle, cups, spoon, milk, esky, biscuits,
18 ood, plastic plates, cutlery, Water,
19 Mobile Phone, Mobile Phone charger, money, reading glasses,
20 sun glasses, sun hat,
21 Drugs, headache tablets, bandaids, Club Port,
22 Tent, tent pegs, foam mattress, pillow, sheets,
23 Toilet paper, soap, tissues, razor, tooth brush, tooth paste,
24 Cloths, towel, shoes, thongs,
25 Bino-chair, Binoculars, dew shield,
26 Drop sheets and pegs, hammer,
27 21” Dobsonian, ladder, loading ramps, hex keys,
28 12” brief case scope, Argonavus, encoders, cables,

66. Video imaging part 1.

You can video the sun, moon and most of the planets easily and the very brightest stars, but deep sky object are way to dim. You would need an image intensifier or a very expensive Security camera the sort that a secret government department would use. As the exposure time is very short, usually 25 frames per second there is not much time to collect photons. There are many different camera and ways to attach them to a telescope here are a few. Best to attempt this with a tracking mount; it can be done with a telescope that does not track for a short time, after about ten seconds you usually have enough frames to stack all frames together with software like Registak to make one high quality image.

Handy-cam, you can use a video camera like a handy-cam or a compact point and shot, with a bracket to hold it in front of the eyepiece. These cameras are stand alone, no need for cables, computers and power supplies. I found I had to zoom in to get focus and have the eyepieces and camera almost touching; external light can get in to this gap. I found the auto focus like to fight me and the manual focusing has no fine adjustment, so best to get it as close as you can and then adjust with the focusing on the scope. Also the other problem is that the camera will try to help to adjust the brightness levels, but if the moon is too bright you will need to stop the telescope down, or for the planets increase to magnification, see page 66. Usually you can only record for 1 hour, limited by the tape, which you would need when videoing a lunar eclipse or occultation. As these cameras also record sound at the same time it best to keep the sware words to a minium. You can buy a universal mounting bracket to hold the camera in front of the eyepiece; some have a handy feature that they can swing the camera out of the way so you can look through the eyepiece to get focus. They also have adjustment knobs so you can line up the camera with the eyepiece. They are some what flimsy and often need modifying to get them to work, but for $40 you can't complain. Most people have either one of these camera already, so it's a cheap way to get in to astrophotography, even if you do not have one of these cameras a mobile phone with a built in camera can work surprisingly well. This universal mounting bracket shown below is definitely not strong enough to hold a DSLR. This is not the easiest way to get video or images; I have often wasted all day or night mucking around trying everything to get the whole thing working, the DSLR is much easier.



Here is a photo of the sun taken with compact point and shot digital camera.

Web cam can be used with or without there lens like the security cameras and connected to a computer. These were very popular and a cheap way of getting into astrophotography. They have a small low quality sensor, which has a cropping effect so this makes the planets look much bigger or magnified; this works well with short telescopes. But the new generation DSLR cameras, with they high definition video mode have made it much easier and reliable to capture video of the sun, moon and most of the planets easily and the very brightest stars.

67. Video imaging part 2.

Security camera can be used with there lens and an eyepiece or without there lens mounted directly into the focuser. They can also be attached to the back of just about any SLR camera lens. They usually come with a video out RC connection, to plug into a video recorder VCR or TV and are powered by a 12 volt battery or 240 volt ac power supply. One of the big advantages is you can record for a very long time without stop, most VCR can record for 6 hours on a 3 hour tape. Most security cameras have a small low quality sensor, which has a cropping effect so this makes the planets look much bigger or magnified; this works well with short telescopes. Some of the newer cameras can be connected to a computer. There sensors also come in, colour or black and white. The more sensitive they are the more they cost. I have bought this type of camera for under $50.00 and used them with great success. The only problem is mounting the camera, as there are usually no standard adaptors available. A popular method is to glue a 35mm film canister with the bottom cut out of it to the front of the camera, this will fit nicely into a 1 ¼" focuser. Or if you have some skills, you could make an aluminium housing for the camera, with a standard universal camera thread as pictured below. Also a popular method is to house the camera inside an old SLR film camera body with a fitting that fits your telescope and camera lens. I have see fans and water cooling added to this camera increasing they sensitively and reduce they noise. During the transit of mercury we were able to sit back and watch it on TV. I have even attached it to a microscope and made a video of critters swimmer around in pond water and tiny insects on flowers. This can give you many hours of fun and does not cost a lot of money. Like the Handy cam it will try to help to adjust the brightness levels or light balance, so if the moon is too bright you will need to stop the telescope down, or for the planets increase to magnification, when attached the camera to a SLRL camera lens you can adjust the F stop to get the correct light level.

Here the camera is just drop into the diagonal and plugged into a LCD screen from a portable DVD player, it's very handy for showing the moon or planets on public nights.

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There is also wide range of video camera designed especially for astronomy. These cameras do not have a lens in front of the sensor; they come ready to drop into the focuser on the telescope with software and cables to connect to your computer. There sensors also come in many different sizes most are small also in colour or black and white. The more sensitive they are the more they cost. I will not talk about these as is would be a whole book in its self.

68. Video imaging part 3.

You can see in the photo at right that the DSLR sensor is much bigger than the Security camera.

DSLR used in high definition video mode. This is the easiest and most versatile camera of all; these cameras are stand alone and have no need for wires, VCR or computers. Once you have recorded your movie, just move the SD card to your computer and watch your movie or start work on it. When recording video the memory card it fills up very quickly, so DSLR are not the best choice if you wish to make a long video. We get around this by use a video out cable and plug this in to a VHS recorder, then when you turn on the live view the signal will go to the VHS and TV monitor. As these cameras also record sound at the same time it best to keep the sware words to a minium. The sensor in the DSLR is much larger than all the other cameras so has the least amount of magnification, so can be used with very long telescope to capture the planets or very short telescopes to capture the moon. Like the Handy cam it will try to help to adjust the brightness levels or light balance, so if the moon is too bright you will need to stop the telescope down, or for the planets increase to magnification.

DSLR can be attached to a telescope in many different ways. Can also be used with or without a lens and an eyepiece, this is call eyepiece projection.

Some eyepieces come with the standard T ring thread; I cut the thread on this 22mm Panoptic.

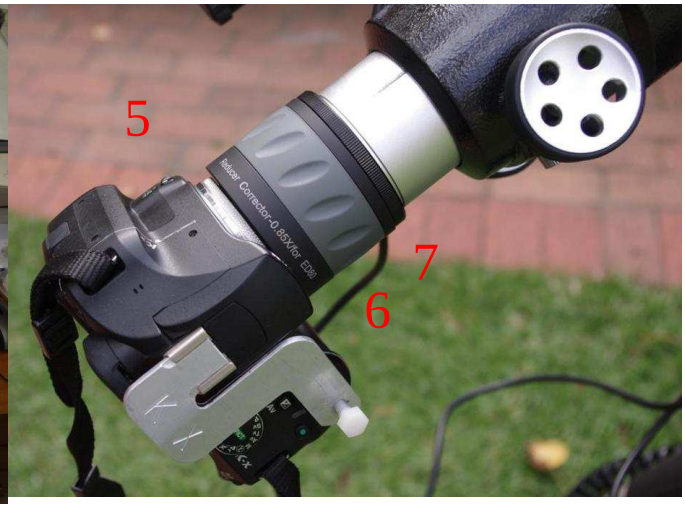
Or a simpler method is without a lens or eyepiece mounted directly into the focuser, with a T ring and a 1 ¼” or 2” tube, this is called prime focus. So the telescope becomes the lens, this system give the least amount of magnification. I often use a standard 2X or 3X converters between the T ring and the camera, to increase the magnification for imaging the planets. This system makes a strong reliable connection between the camera and telescope. Shown here with a diagonal to help space the camera the connect distance away from the telescope or else a spacer would be needed.

See next page, Focal reduce field flattener.

69. How and why to fitting a focal reduce field flattener and DSLR to an ED80.

A Focal reduce field flattener cost $250.00 and is well worth it, for it makes the telescopes focal length short by 15% and removes the curved view, which you may have notices when looking through the eyepiece when removing the telescope at the same time, the stars in the middle of the image seem to lift up. This is call barrel distortion and it makes in hard to join 2 or more images together. Also this makes a very strong connection between scope and camera.

1 Remove eyepiece and diagonal.
2 Loosen lock nut.
3 Unscrew 2” holder.
4 Screw on field flattener.
5 Attach camera.
6 Rotate camera and FF to desired angle.
7 Tighten lock nut.
8 Hung camera strap over finder scope.



70. Travel scope made from a camera lens.

The art of telescope making in Australia has almost disappeared, with the large range of very cheap high quality telescopes coming from Asia, there is no financial gain to be had any more. There is only a hand full of people making telescopes like myself, usually of a kind that can't be bought. Here is one you can make for very little cost.

Now that the DSLR camera has made the old film camera obsolete, there is a lot of old lens lying around doing nothing. We can easily convert them into a small telescope, by adding an eyepiece, were the camera went. I made an adapter to suit the Pentax K mount as I have a lot of this type of lens. There is no need for a focuser as this can be done with lens. Also when looking at the moon you can use the F stop to reduce its brightness. Simply put the whole thing on a tripod and you have a very portable travel scope. I also added a cheap red finder to make it more users friendly. I have a 500mm long lens with a 60mm objective, which I take on holidays; amazingly from a dark location I can see galaxies with it. This is also a telescope that can be smuggled on board when you promised you would not be doing any astronomy this holiday. It's a good grab and run scope which I take to school viewing night, I found kids like this scope and seem to more easily relate to it than the bigger telescopes. I also have a solar filter with can be added to the front to give us a good view of the sun; making it one of me most used telescopes. I once used this every day to look at sun spots before I got my PST and used it for the transits of Venus and Mercury. I also adapted a 90 degree view from a SLR camera to the eyepiece, making it more user friendly. I can attach a video camera to it and view the moon on a small LCD screen, See page 63.

Solar filter

Sun in the smoke Sunrise at Bonbeach Pentax kx 300 lens by Greg Walton 17feb09

71. Converts a video into a single image with Regi-Stax.

The 3 images of Saturn below were all taken with 200mm Big Blue refractor which has a focal length of 2400mm. Note how image size and brightness change when we increase the focal length.

Once you have your video of a planet, sun or moon. You will need to load it onto your computer.

If you were using the Handy cam, I found it was easier to rerecord the video on a DVD recorder; this produced a high quality video on a DVD and could easily be loaded onto the computer. Some of the newer Handy cams record onto a memory card, this is even easier.

If you used a DSLR or compact point and shot, it's just a matter of moving the memory card to the computer. I seen a friend record a video on his mobile phone and then sent it straight to his computer at home, to easy.

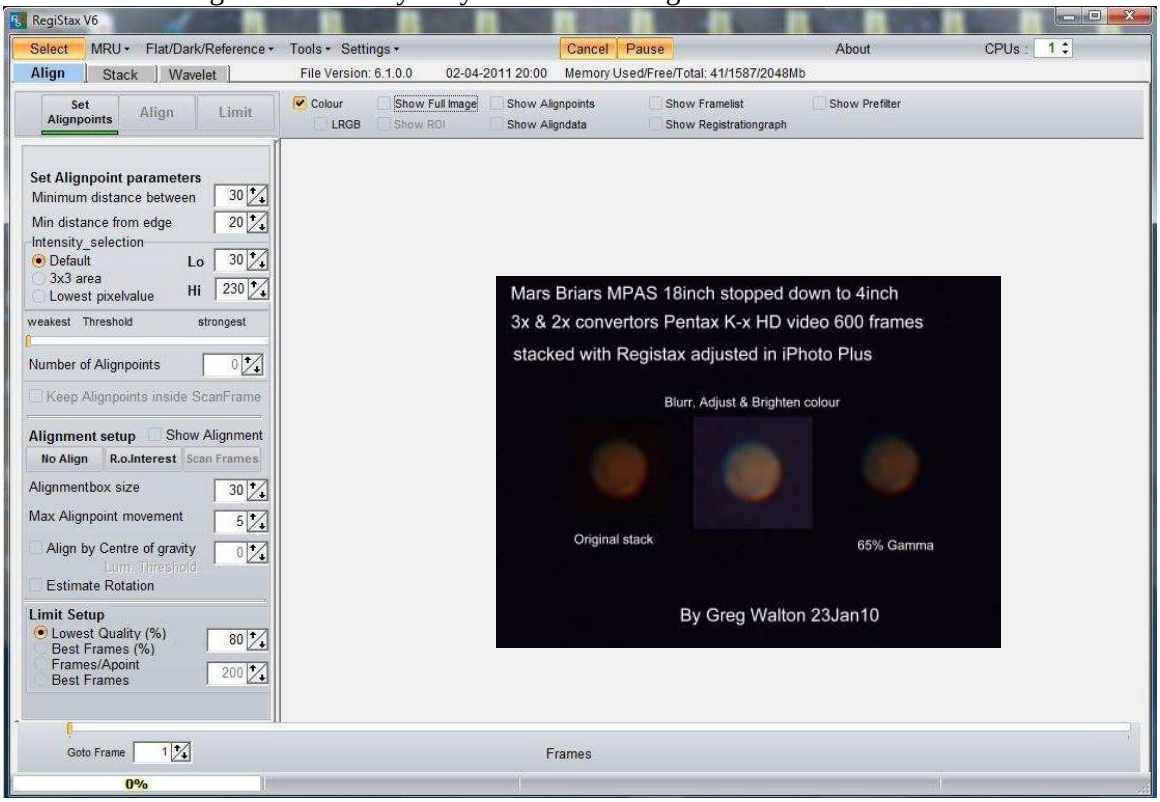
If you used the security camera and have the video on a VHS tape, you will need some way of getting it to the computer, I tried a cheap conversion device which plugged into the RC out jack on the VHS recorder and the USB socket on the computer but I found that the quality of the video the computer received was very poor. I found it was easier to rerecord the video on a DVD recorder; this produced a high quality video and could easily be loaded onto the computer. If I was out in the field were there was no power, I found I could record the video onto the handy cam using the input setting. Some of the newer Handy cams record onto a memory card, this is even easier.

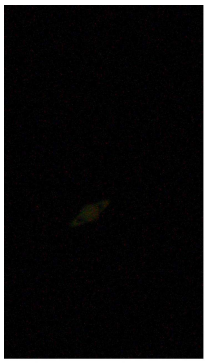
If you used a web cam or a video camera designed especially for astronomy, it would already be on your computer.

I successfully installed Regi-Stax 5 on my Windows XP computer, and with a bit of mucking around everything worked OK. I successfully installed Regi-Stax 5 & 6 on my Windows Vista computer, but when I tried to load up a movie it bombs out. I successfully installed Regi-Stax 6 on my Windows 7 computer and everything worked OK.

Regi-Stax 6 seemed idiot proof, it prompted me what to do and I did not adjust any of the settings.

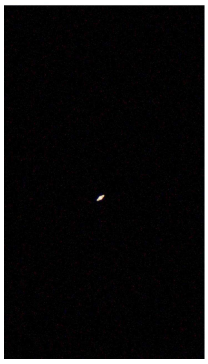
1 Run Regi-Stax 6
2 Click on Select orange, and find your video.
3 Click on Set Align points under lined in green, move cross to centre of planet and click on it.
4 Click on Align under lined in green, to start image Alignment.
5 Wait for percentage bar bottom left 100%.
6 Click on Limit under lined in green.
7 Click on Stack under lined in green.
8 Wait for percentage bar bottom left 100%.
9 Click on Save image and Save as panel will appear.
10 Select file name and Save as type eg; JPEG
11 Click on Save.
12 Your image is saved ready for you to start editing it.





Saturn 14400mm FL Pentax Kr Video with 3X & 2X convertor too Dark

Saturn 7200mm FL Pentax Kr Video with 3 X convertor Best



Saturn 2400mm FL Pentax Kr Video Prime Focus too small and Bright

72. Filters slider.

I must admit, most of the time I do not use filters, only when my back is to the wall and I can't see what I am looking for, do I resort to using a filter. A good example is the horse head nebula, which needs the Hydrogen Beta filter to see it at all.

I found most people do bother with filters either, too much screwing and unscrewing in the dark, have I got the right filter or not? Bugger I have dropped it, were did it go; it will be coated in dust now.

The answer was to make a filter slider. I only own 1 1/4" nebula filters as they are less than half the cost of the 2" nebula filters at $400.00 each. Not cheap 4 filters would be $1,600.00 which is a lot of money for something that does not get much use.

So I came up with a design that uses the Televue coma corrector. I discarded the part that holds to eyepiece and made a new part with a slot that I can slide my filter through, just in front of the barrel of the eyepiece. I made 2 sliders each with 5 holes, one for nebula filters and one for coloured filters. A spring loaded ball locates the filters. Now with this new toy I use my filters all the time, and happily slide them back and forth testing which one gives me to best view, in the order below.

1 LPR or Light pollution Reduction - removes yellow sky glow produced by street sodium lighting.
2 UHC or Ultra High Contract – Best all round nebula filter.
3 Oxygen 3 or 03 or Ozone – Good for nebulas that only emit light at that frequency.
4 H-Beta or Hydrogen Beta – Limited use mainly the Horse head nebula.

The coloured filters are mainly for the planets and can bring out features that would not be seen.
I found it was a very personal choice as to which colour to use on want planet.
Note that Imaging with filters is usually done with Black and White cameras.

Photo top right is the Televue 2 inch 2X Big Barlow this I have modified to suit my filter sliders. An aluminium sleeve slides down over the slot when the filters are not being used.

Photo right is the Televue type 1 Coma corrector which I have modified to suit my filter sliders. An aluminium sleeve slides down over the slot when the filters are not being used.

Note the plastic screws to hold the eyepiece. Televue please get this into production.

73. Microscope.

Most amateur astronomers have spent a substantial amount of money on high quality eyepieces, but want to do with them when the clouds hung around of months. Build a microscope which using your eyepieces and get your family and friends involved. The astronomy eyepieces are many time superior to the eyepieces on a bought microscope. All you need is a 50mm camera lens and a piece of 2” plastic pipe about 150mm long, which a 2” eyepiece can slide into. The longer the tube the more magnification you will get and the less light you will also get. I use an old macro bellow for the tube, it’s much more versatile and you can attach a DSLR camera. Also you will need a hight adjustable stand and a light. You can fine adjust the focus with the 50mm camera lens and adjust the light level with the F stop ring. Most microscopes have their light sores from underneath the specimen, but we will have the light shining down on our specimen, as this is best for looking at every day items like money, rocks, shells, seeds, leafs, flowers, etc. Some of the most uninteresting looking things are the most interesting under the microscope. Attach a DSLR camera and fire away.

I found an old wooden slide storage box, which is perfect for storing my specimens; I used a hot melt glue gun to attach them to card board square cut to suit the box.

74. Which Telescope should I Buy? I have been avoiding this one.

This is one of the worse questions to be asked? Most would say an 8inch Dobsonian at $450.00
A Dobsonian is a Newtonian reflector (Mirror) telescope on a simple gun turret mount made from MDF, this telescope does not have any motors so cannot track, also you will need a map of the sky and to learn it.
Yes I agree, because this type of telescope is the easiest to use and will give you the best view of the sky, for the least amount of money, and if you lose interest you can always sell it off for say $250.00 at no great loss.
But if you spend $10,000.00 you better take the time to know what you want, most telescopes sit around doing nothing.

Most buy the wrong telescope the first time, I think we need to ask more question?

1 Like how much can you afford?
2 Done you want to do astrophotography and what are you going to image?
3 Do you like being cool and bitten by mosquitoes?
4 Portability, how strong is your back?
5 What car do you drive?
6 Were can you store all your gear?
7 How committed or interested you are?
8 How understanding is your partner?
9 Are your kids interested? Yes, blame it on the kids.
10 How much spare time do you have?


10 inch Dobsonians

The best place to start is with warm cloths, a reclinable chair, sky chart, Binoculars and a DSLR camera on a tripod.

The trial run, I usually say hang out with us to see if you like this hobby. A lot of people see some romance under the stars on a warm summer's night with meteors racing across the sky and a bottle of wine pondering the big questions, like is they other life out there on other planets? But astronomy and astrophotography is very challenging hard work. Loading the gear into the car then unloading and setting up. Standing at the eyepiece for hours or keeping cameras running. Then at nights end dismantling every thing and packing it back into the car and then unpacking when you get home, then removing dew and dust and recharging batteries. Then down loading SD cards and working with your images, which may take a week of all your spare time. And then making plans for your next big night.

Most people want a refractor, a telescope that uses lens, but these will cost 10 times as much as a Newtonian reflector. Most refractors suffer chromatic aberrations meaning false colours like in a rainbow around objects like the moon. Newtonian reflectors do not have this problem but needs culminating from time to time, or realigning the mirrors with a laser, see page 7.

Here are 3 of my Basic set up for astrophotography and a list of there approximant costs in Australia $0.0

Set up	Cost	Set up	Cost	Set up	Cost
8inch Newton AG GSO	450	ED80 Refractor Orion	700	7 x 50 Binoculars	70
Case	150	Case	125	Reclinable chair	50
Coma corrector Type 1	330	Field flattener	250	Sky chart	50
Tee ring	30	Tee ring	30	Tripod	100
Mount EQ6	1,500	Mount EQ5H	1,100		
Power supply 4amp	100	Power supply 4amp	100		
Dove tail plate	40	Dove tail plate	40		
Laser culminate	70	Dew heater straps 2 off	130	Dew heater straps	60
Hair Drier		Heater controller	150	Heater controller	150
		Finder scope	75	Battery	50
		Diagonal 2inch	100		
Red Dot Finder	45	Red Dot Finder	45	10mm Lens $500 to $1,000	?
DSLR Pentax Kr	600	DSLR Pentax Kr	600	DSLR Pentax Kr	600
SD cards	40	SD cards	40	SD cards	40
DSLR Power supply	100	DSLR Power supply	100	DSLR Power supply	100
Eyepiece 25mm	100	Eyepiece 25mm	100		
Laptop	500	Laptop	500	Laptop	500
Freezer suit	170	Freezer suit	170	Freezer suit	170
Leads & power boards		Leads & power boards			
Total	4,225	Total	4,355	Total	1,910

Yes it all mounts up and these are only the most basic set ups.

75. How big and old is the universe and where do we sit in it, explored by Greg Walton?

1. As an amateur astronomer I am asked many questions about life on other planets, gravity and the universe, after twenty 25 years of head scratching and sleepless nights, this is the best theory I can come up with at the moment.

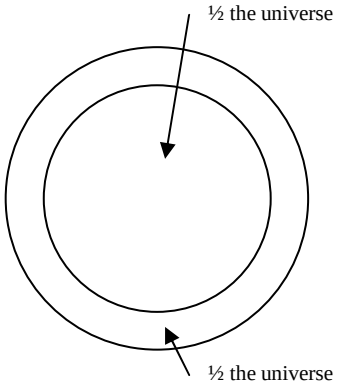
2. To infinity and beyond, when I was 6 years old I asked my father how big is the universe? He said it went forever to infinity. I tried my hardest to comprehend forever and asked myself, how something can be that big. If something went forever anything should be possible no matter how far fetched it was. I thought if I travelled in a straight line I should come across someone who looks and sound the same as me and is doing exactly the same thing at the same time as me. But if anything is possible then coming to the end is possible too or coming right back were I started must be possible.

3. How big is the universe? Most books quote that we can see 13 billion light years back in time; does that mean the universe is 26 billion light years across? The light set off on it journey 13 billion years ago. But due to the expansion of the universe, the light source has move away from us in that time and could be 70 billion light years away from us by now. That could mean the universe is 140 billion light years across. And now the edge of the universe could be moving away from us at a speed faster than the speed of light, so we can not see beyond this limit, no matter how big a telescope is built.

4. How old is the universe? We are told if the universe was infinitely older, light would have had time to travel from all corners of the universe and the sky would be much brighter. Star light has not had enough time to travel from everywhere in the universe so it must be only 13 billion years old. The missing Dark matter could be blocking the light from getting to us, in which case it could be older. Like standing in a forest where you can not see past the tree. We are also told because the universe is expanding if it was infinitely older, if would have already expanded out of sight and the sky would be black. So it is very hard to get an accurate answer to this question, as we have not found all the dark matter. Empty space is not quite empty were told it has 1 atom per cubic metre, which does not sound like very much, but space is so large there could be enough atoms in the empty space between the galaxies to make more galaxies.

5. The Hubble space telescope was pointed at the same patch of sky for a week to try and see back in time to the start of the universe, what they got was an image full of galaxies. This was repeated on a different patch of sky and got a very simular image of countless galaxies. Some of the most distant objects are quasars which are now known to be galaxies with very bright cores that can shine through the interstellar dark matter. At their core lays a black hole which is feeding and what we see is stars being ripped apart and consumed. Or possible two or more black hole circling around each other, like sharks circling will catch more fish (stars) then on there own. This is probable due to the merging of young galaxies at the early stages of the universe.

6. How can we know if we are at the centre of the universe? It does not matter in which direction we look; the universe all looks the same. We are told that we are at the centre of the universe because everywhere is the centre, this I do not under stand at all. If the universe is a sphere it would have a centre. If we were just tossed in to the universe we could end up anywhere, by the law of averages we should be at its edge because most of the mass is they. The chances of being at the centre would be very slim. See diagram at right. The area of the centre circle is equal to the area of the out ring so we would have a 50/50 chance of ending up in one or the other areas. I am guessing that we are at the edge of something much bigger than we can realize, and if we are at the edge we must be the one who is racing away at almost the speed of light, due to the expansion of the universe.



7. An atom spins, the planets spin, the solar system spins, the galaxy spins, so does the universe spin? We would need to look in at least 6 direction 90 degrees apart, but because we are on the inside of the universe this could be very difficult.

8. I am not curtain about ripples in the back ground radiation left over from seeds in the Big-Bang, as the differences are very small, 100,000 of a degree? I can not see how such a small value can help us. A lot of work has been done I hope it's not in vain.

9. The conclusion is that as a species we have not yet evolve enough to work this out. If we were a battery chicken in a shed on a farm without windows we would think the universe ended at the walls. Maybe the edge of the universe is the wall and something is coming to eat us, KFH.

76. Gravifuel or gravity is a fuel theory, explored by Greg Walton, Date 28apr2012.

1. The over view, most people think of gravity as an attracting force between any 2 or more objects, like a pair of magnets that want to stick together. But if you reverse the magnets they become a repelling force, so why can't we do the same with gravity and make anti gravity. I have read in many books about the Graviton, which it a hypothetical partial which carries the force of gravity, why have we not found it yet? Does gravity travel at the speed of light? A lot of work has been done; some think that gravity can not catch up to objects travelling faster than the speed of light at the edge of the universe, so the universe will expand forever. Can Gravity waves be detected & why have we not found them yet? What is the Grand unification theory and why have we not done this yet? A theory of everything would links together all 4 fundamental forces, the Electro magnetic force, Gravity, Strong and weak atomic force with quantum mechanics. What about the Big Bang theory, how can everything come out of something smaller than an atom and what triggered it? Sound like the work of God or let's put a Bandaid on it, till we can think up something else. I think Dark energy, worm holes, alternative universes, String theory and 11 dimensions in time and space, are too far fetched and probably do not exist. What is dark matter? This is matter in the universe that we have not found yet or missing mass, but we are finding more all the time. What about the Big crunch theory? Everything coming together at one place at one time should be possible, but were told that every thing is speeding up & the universe is expanding at a faster and faster rate. According to this the Big-Crunch could not happen at all.

2. Many times in the past, people have looked for the invisible and undetectable force that powers everything, sometimes called Ether which flows through everything. **Albert Einstein** added **Ether** to his General theory of Relativity to help balance his equation and then took it out, stating that this was his biggest blunder. But some wish to put it back in and call it dark energy to account for the speeding up of the expansion of the universe. Dark energy is a very small repelling force or energy that can't be seen or detected on the small scale but on the large scale pushes everything apart increasingly faster. We have detected this speeding up.

3. We now need a Timeline of Fuel, Energy consumed, Force. The fuel comes first, the energy being consumed comes second and the force is a by product. We will call this fuel Gravifuel from now on.

4. A hydrogen atom is said to have a half life of 2 hundred billion year. What makes an atom spin for such a long time and what is powering it? I think Gravity is the fuel, which power everything. This Gravifuel flows in to all atoms to keep them spinning. Gravifuel could be the ether a force that is everywhere, like being in a tank of fuel and that fuel flows into atoms to power them and keep them spin. Everything is sitting in this Gravifuel, as the Gravifuel is consumed everything is dragged along by the Gravifuel. Meaning the movement of the Gravifuel is the force of gravity. This also helps to explain the stretching of space time, as the Gravifuels speed would vary for place to place. The bigger objects like galaxies would need more Gravifuel, so the more Gravifuel will be flowing in. The movement of the Gravifuel towards a galaxy will drag everything that sits in the Gravifuel towards the galaxy. This is why gravity can only attract. As to repel would need energy to be unconsumed by the atoms, which is impossible. This is also why Gravity is such a weak force but can act over massive distances. You are probably asking how can the Gravifuel get into the centre of a star, it would need to past through too much matter, the neutrino is a practical which reacts weakly with matter and comes from the centre of the sun and passes right through the earth. So I think it should be possible that the Gravifuel could flow to the centre of the sun, for it too would only react with matter very weakly. Which we do observe as gravity is the weakest force.

5. **Albert Einstein's** General theory of Relativity and Gravity is a fuel theory or Gravifuel, are very simular in the way they behave. **Albert Einstein's** fixed the speed of light and made time variable. Were told light has no mass, but behaves like is has mass because its path is bent by gravity or light is following space time which is bent. Light is an electro magnetic wave, like waves on an ocean they will follow the curvature of the earth. If Gravity is a fuel that flows into mass, light would be bent as it travelled through the Gravifuel. Like when light travels through glass it is also bent. Light would travel a very simular path through the Gravifuel as Albert Einstein's space time theory.

6. What about a black hole? Every thing that every fell into a black hole is still their, because the fuel is still pouring in which is dragging every thing in with it. I have never liked the drawings of black holes that look like a funnel or a bend in a sheet of rubber; I see a black hole as a single point with every thing moving towards it from every direction with a spinning whirl pool being generated around its core. The Gravifuel must be able to move faster then the speed of light because as it flows into a black hole, it drags all light in with it which can not travel faster than gravity, which we have observed. If the Gravifuel is consumed faster than it can flow in to a black hole at, an areas of less pressure would be created, but probably on a very small scale like inside a black hole. If the atoms in a black hole were starved of the Gravifuel then the atoms may fall apart more easily, so ending up with a small volume of smashed atoms with a large mass.

7. How fast can the Gravifuel move at? Maybe 1% faster or maybe twice as fast, we should be about the do something to measure this. There probable is a speed limit at which the Gravifuel can flow; I think it is around 1% faster than the speed of light, as this could help to explain the expansion of the universe. If the Gravifuel moves too fast it may spill away from us too quickly.

8. If the Gravifuel was at a lower pressure on the out side of the universe, it could expand out wards. But what if the Gravifuel is at a lower pressure on the inside of the universe, because it is being used up, then the universe would contract in wards, the Big-Crunch.

9. As the Gravifuel is depleted at the centre of our universe, the Gravifuel would flow inwards making the universe contract, the Big-Crunch. But this is not what we see; everything is speeding apart increasingly faster. But if our Universe is something small flouting around in something very large, and that very large was expanding out wards because it has no edge or boundary. Like when you spill a bucket of water on to a flat surface it spreads out or expands in all directions, could it be that the universe has been spilt? So then on a large scale we would have expansion and on a small scale we would have contraction, which is what we have observed.

11. If Gravity is a fuel you would think that the Gravifuel could have waves in it. Though waves in the Gravifuel should be possible, I think they are probably too small and longer to be detected. As the Gravifuel would behave more like a liquid, it would tend to cancel out any waves much faster than if it was like a light wave.

10. I can see that most galaxies look like water spiralling down a plug hole. At the moment you pull the plug out of the bath the water just sits there and it takes a few second before the vortex starts. The conclusion is that elliptical galaxies are at that moment before the vortex starts.

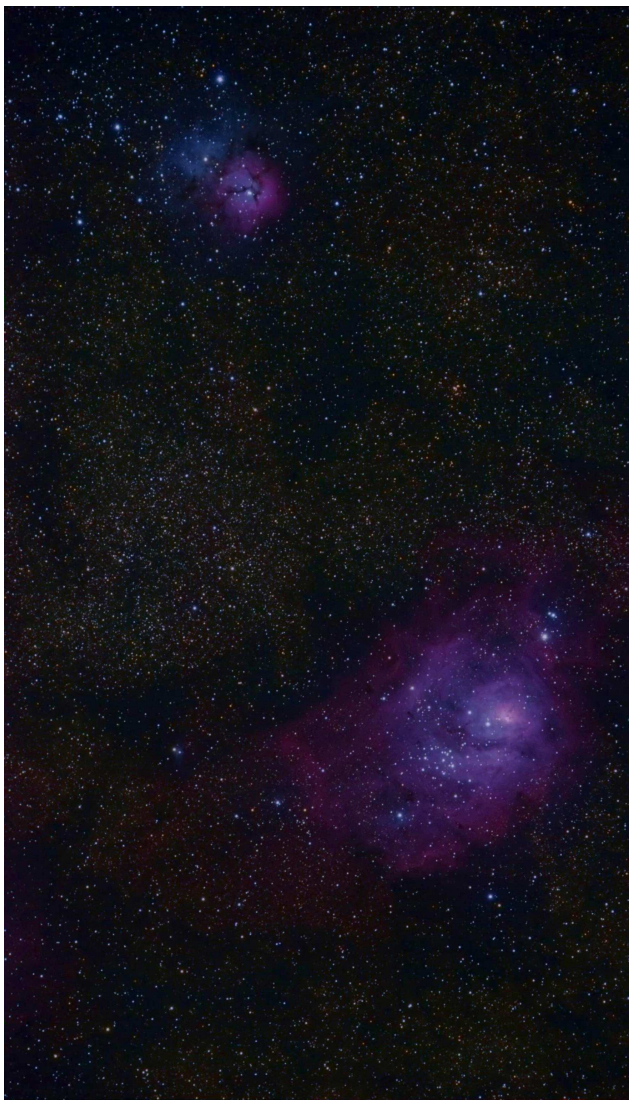
12. Could we collect the Gravifuel? We already harness gravity to make hydro electricity & use energy from the sun made by gravity.
13. Is it possible that atoms could be dragged towards the Gravifuel in some situations?
14. Do atoms behave like a sponge soaking up the Gravifuel and which part of the atom does this?
15. Is our whole universe spinning and are there other universes in the Gravifuel?

I hope this is used for peaceful purposes only.

Index for Astro Book

M45

M20



M8

M65

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The Astro Imager Plus is a work in progress; which I am continually up dating. All photos by Greg Walton.
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78.

One of my best images is M31 taken at Albury under near perfect conditions with ED80 refractor on EQ5H mount and Pentax Kx, it was only 9 to 11 degrees above the horizon.