

DSLR Camera Workshop Notes

This document is a summary of the talk given on the Swindon Stargazers 2022 Star Party at Rouselands Farm near Brinkworth.

What are we trying to achieve ?

To gather as much sharp focussed light from the intended target and minimise other effects.

EXPERIMENT ! We're not looking for perfection – it takes long time to refine your skills & images - that's OK because it's the unique journey that we all take that makes it worthwhile!

Start a Notebook - record dates, temperatures, settings, targets.

You could start a second notebook which contains technical info that you gather over time but isn't related to any particular imaging session.

Torches:

Use a Red Light Torch (preserves night vision):

- Red Tape or Sweet Wrapper over weak torch
- Rear Facing Bike Lamp
- Dedicated Head Torch (rechargeable)

Cameras:

DSLR Cameras normally record date/time of the image into the image, as well as other useful info like ISO/Aperture & Exposure

The following are useful Features in a DSLR:

- Back Panel with Settings and Image Preview
- Panel Dimming Control
- Back Panel Rotation
- RAW image mode
- Remote Shutter Release Capable
- Ability to Embed data to picture
- Low Shutter Count (below 50,000 if possible)
- Ability to view previous images on back panel
- Zoom capability on previous images
- Image Histogram Function

Get used to finding & using your camera controls in the dark

Batteries:

Always charge after every use – don't wait until you need them to charge them.

Carry Spares - Label each one so you know which have been used already

- Single camera battery lasts up to 2-2.5 Hours
- With a multiple Battery Holder up to 4-5 Hours
- With a Battery Eliminator & USB Power Pack up to 8 Hours+

Lenses:

Sharpness is very important – check online forums for user experiences with specific lenses

Sharpness falls off the edge of lens - sharpest in centre

Wide angle (10mm - 50mm) for whole constellations / Milky Way / Astro-Landscapes

Medium Lens (50mm - 135mm) for parts of constellations / Large features like Nebulae

Zoom Lens (160mm upwards) for small objects like Moon Detail, Clusters, Remote Galaxies & Nebulae

Can make a light tube to avoid extraneous light in lens

Filters:

Can reduce local light pollution – need longer exposures

Can image without them for Broad Spectrum targets like Galaxies / Clusters

Most DSLR have built-in UV/IR Filter – removed for Astro-modified cameras. Removing IR filter can give better results for Hydrogen targets (Nebulae) but is not trivial to do. Still have good results with IR filter fitted.

Moon Filter can reduce Moon Glare

Never use anything but Solar filter for imaging the Sun

Focus:

Infinity on dial not always correct

Take image of stars then zoom in. Look for dots of light – discs of light are signs of poor focus. Focus cannot be

fixed in later processing so get it right before starting a session.

For Moon, focus either on stars first or on Moon terminator

Can also use Bahtinov Mask for good focus on bright star

When focus found, can fix the lens focus position with tape

Accessories:

Memory Cards – Use Class 10 cards where possible

Tripod - Sturdiest possible, Full Rotation, Use at lowest Height for stability

Intervalometer – Reduces camera shake, allows Long Sequence Programs easily, Long Battery Life, Buy for Camera Model (connector type)

Dew Heater - USB or 12V. Prevents dew forming on lens

Red Dot Finder – For use with DSLR use Hot Shoe Adapter, Helps Locate Targets (some use laser pointers)

Lens Hood - prevents stray light / Moon etc entering lens

Spirit Level – level the tripod before use. Very important when using Star Tracker or larger mounts

Exposures:

Manual Mode & either shutter speed to 2-30 seconds or B (Bulb) Setting with Intervalometer for longer (unless intervalometer built into camera)

ISO - Look online for Optimum Setting for each camera to reduce noise. Most are in region of ISO 800-1600

Aperture – Use lowest F-stop +2 to improve sharpness. If a f1.8 lens then set to f2.8 or f4

Avoiding Star Trails:

Star Trails caused by the apparent rotation of the Earth

The maximum exposure determined by Lens Focal Length (and partially the declination of the target)

- Exposure time= 500/focal length for Full Frame
- Exposure time= 300/focal length for Crop Frame

Example max time per exposure before Star Trailing:

- Crop camera with 20mm lens = 15s
- Crop camera with 50mm lens = 6s
- Crop camera with 80mm lens = 3.75s

- Crop camera with 120mm lens = 2.5s
- Crop camera with 200mm lens = 1.5s

Experiment!

For Longer exposures use Star Tracker

Imaging Session:

Choose Target:

- Which Lenses you have
- Target size & brightness
- Imaging Location - dark as possible – check links below

Install **Stellarium** on PC - see what is available that night & size etc – what to image and still avoid the moon

Install **Carte-du-Ciel (Skymap)** on PC and print out target detail to Star-Hop to target when looking at stars

Choose Weather:

- Wind frequently dies down after dusk but will cause vibrations in tripods if still present
- Don't wait for perfect cloud free nights – forecasts are frequently wrong locally
- Twinkling stars indicate large air masses moving – gives poor seeing. We prefer still stars.

Frames/Subs:

Take a minimum of Light and Dark Frames for each target you image. When you are comfortable with Lights & Darks then try adding Flats

Lights - images of the stars! As many as you can.

Darks – same settings as Lights but cover lens with cap. Records - camera noise (take minimum of 10)

Flats – Use Aperture Priority setting (dependent on light for good exposure) and a uniform light source across the frame (mobile phone with white screen or similar) over the whole lens. Records blemishes in images - dust motes, vignetting etc (take minimum of 10)

Start with setting optimum ISO for your camera. Then go two up from minimum f stop (aperture). Then set maximum exposure time you can for the focal length of your lens. Try a test shot. Review the image and view the histogram. If it is squashed to the left (under exposed) or to the right (over exposed) then adjust either the aperture or ISO appropriately. Keep trying this until you arrive at a compromise setting. Take your lights and darks.

It's up to you whether you take the Darks / Flats at the end or beginning of the session

If you can save images to different folders on your memory card then save all images for a target into one folder. You may want to use the 1st folder for your rough images on all targets, then switch to a different folder to records Lights/Darks/Flats

Use hard ground if available. Stand away from the tripod - ground movement will likely show on the image.

Avoid touching the camera – use a remote release or (better) an intervalometer. In that case set an initial delay of 10s to allow time to start the sequence and put the intervalometer down long before images start capturing

If clouds appear then do the Darks/Flats

Routine

Have a routine for setting up the same way every time. Write it down and refine it as you use it. It could look like

1. Level Tripod
2. Polar Alignment *
3. Level Axes *
4. Test Focus on a bright star
5. Move to Target
6. Find right Exposure (ISO / F Stop / Length)
7. Begin taking Lights (then Darks / Flats)

* Only needed when using star tracker or mount

Lucky Imaging

For Lunar/Solar then use the video function of the camera

Capture 2,000 frames per video. Use different processing software to extract the best images (e.g. Autostakkert and PiPP)

Stacking:

Software to add images together to Increase Detail and Contrast / Remove noise. Lunar/Solar is Lucky Imaging

Free – To Stack Stars –

- Sequator (great for beginners) /
- Deep Sky Stacker
- ASTAP

Paid – To Stack Stars –

- AstroPixelProcessor (£80 1 year)

- PixInsight (£220)
- Affinity Photo (£48)

Free – For Lunar/Solar

- Registax 5/6
- PiPP (converts video formats)
- Autostakkert

Most offer 30-60 day free trials

Processing:

Software to bring out the stacked Image Data into usable pictures

Free

- GIMP
- RawTherapee
- Siril

Paid

- PixInsight (£220)
- Affinity Photo (£48)
- StarTools (£45)
- Nebulosity 4 (Free/£90)
- Photoshop (£££)
- Startools (£45)

Most offer 30-60 day free trials

Useful Links:

Club Site:

- <http://www.swindonstargazers.com/>

Club Facebook Site:

- <https://www.facebook.com/swindonstargazers>

Astronomy Tools (Calculators) – Try “Field of View” Calc

- <https://astronomy.tools/>

Plate Solving:

- nova.astrometry.net (Free)

Dark Sky Finder:

<https://www.lightpollutionmap.info/>

Trevor's useful Astro Site:

- <https://astrobackyard.com/>

Equipment Exchange:

- <https://www.astrobuysell.com/uk/>

Download Stellarium:

- <https://stellarium.org/>

Download Carte-du-Ciel

- <https://sourceforge.net/projects/skychart>

v0.2 Damian Ohara (Swindon Stargazers)