



Astrophotography

Peter Kent, 28th September 2021



Subjects of astrophotography.

Easy

Hard

Subjects of astrophotography

Cheap

Expensive



Moon



Milky Way



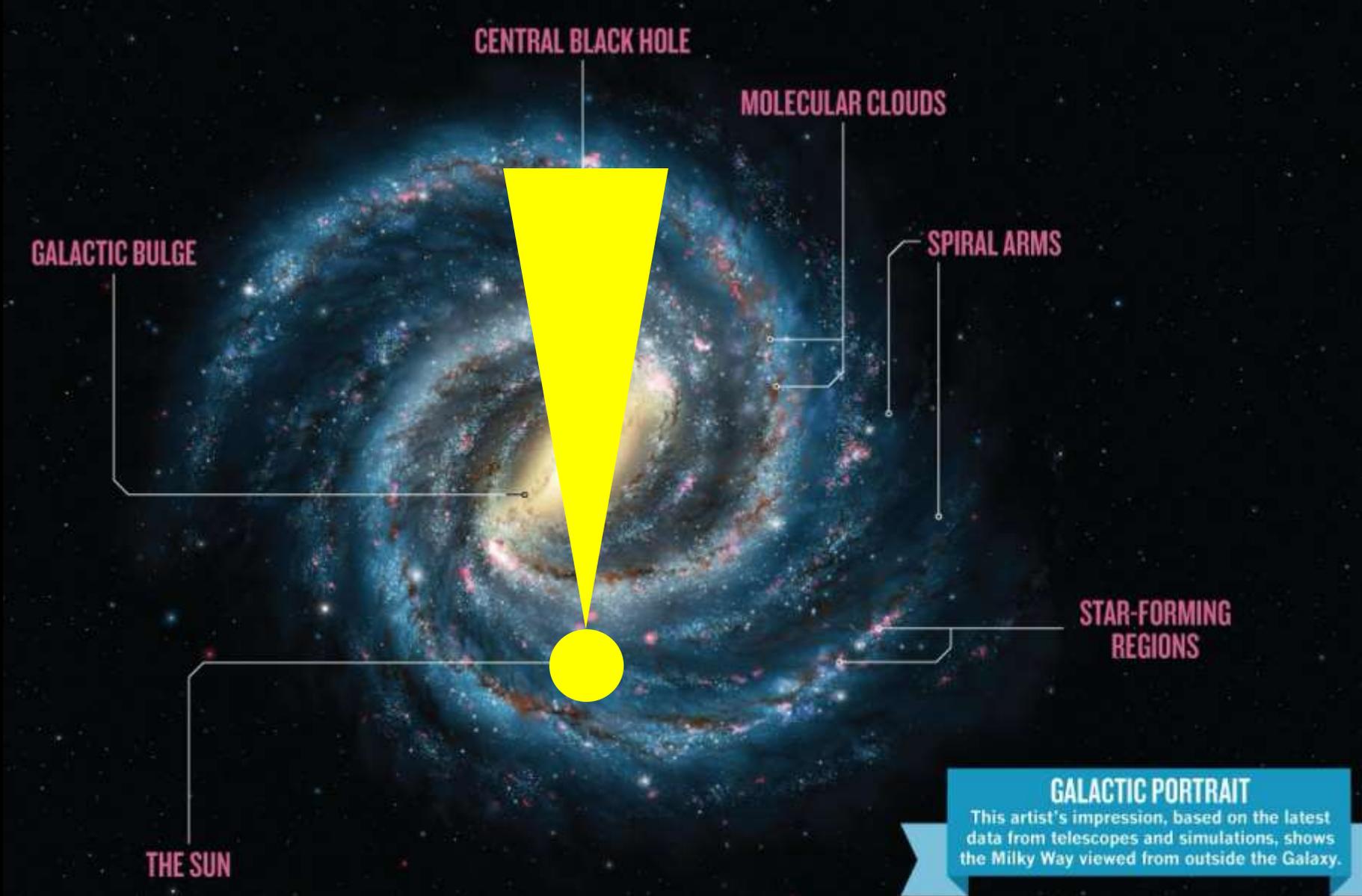
Deep sky objects



How does the Milky Way look?



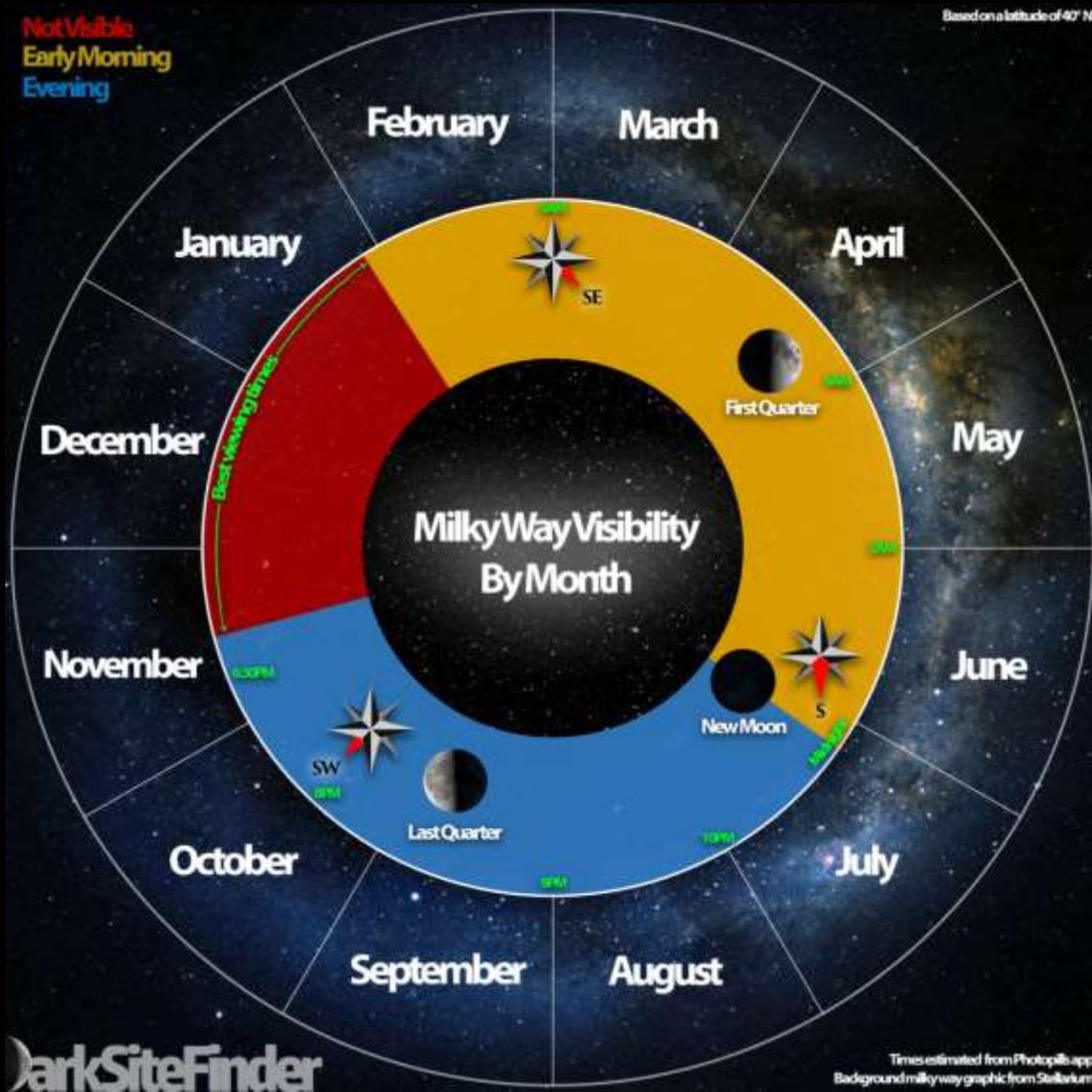
But... we're in the Milky Way, aren't we?



GALACTIC PORTRAIT
This artist's impression, based on the latest data from telescopes and simulations, shows the Milky Way viewed from outside the Galaxy.

Planning – season, location,
and weather.

Planning – Milky Way season.



- In the northern hemisphere...
- July-August. Little darkness between sunset and sunrise.
- September-November. More hours of darkness, and at a 'reasonable' hour.
- Aim for nights where there's little moon in the sky.

Planning – location, location, location.

- Aim for locations where there's little light pollution. CPRE have a good UK map at <https://nightblight.cpre.org.uk/maps/>. For international locations use <https://www.lightpollutionmap.info/>.
- Think about items you might want as foreground interest (a building, tree, etc.) using [Google Maps](#) and street view.
- Ideally find somewhere close to a car park with an easy walk – to avoid accidents in the dark (take a torch and spare batteries, and a friend).

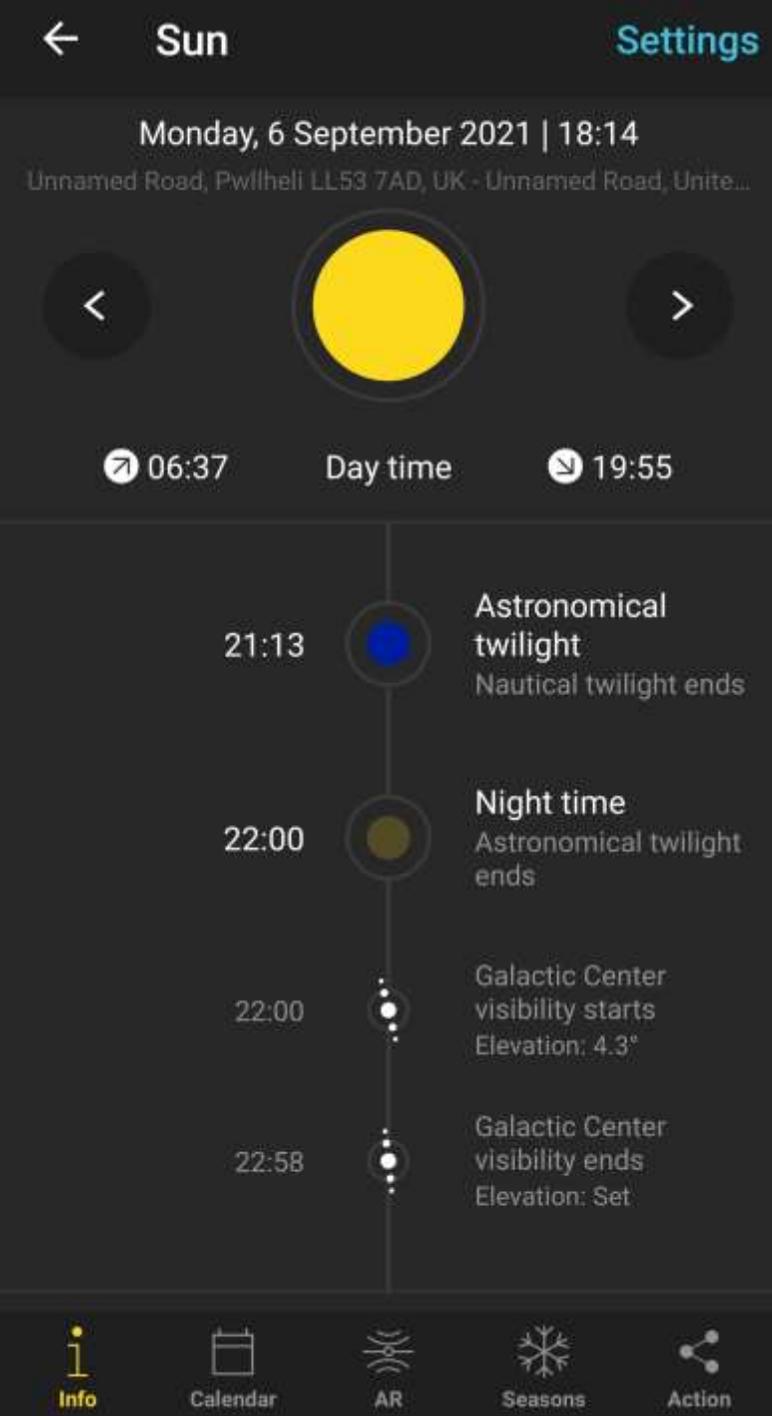
Planning – weather and time.

- Dry nights with little or no clouds cover are essential. Use the [Clear Outside app or website](#) to check the forecast for your location.
- Warm nights will make for a more comfortable experience, but humidity can lead to mist.
- Check the [PhotoPills app](#) for the time of Night Time, the time of the Milky Way core being visible, and the direction of it.



Clear Outside – clear sky planning.

1. Set your location (default is Exeter).
2. For your planned date and time look at the Total Cloud forecast (100 is bad, 0 is perfect).
3. You can also see other weather factors and even ISS passes.



PhotoPills – nighttime planning.

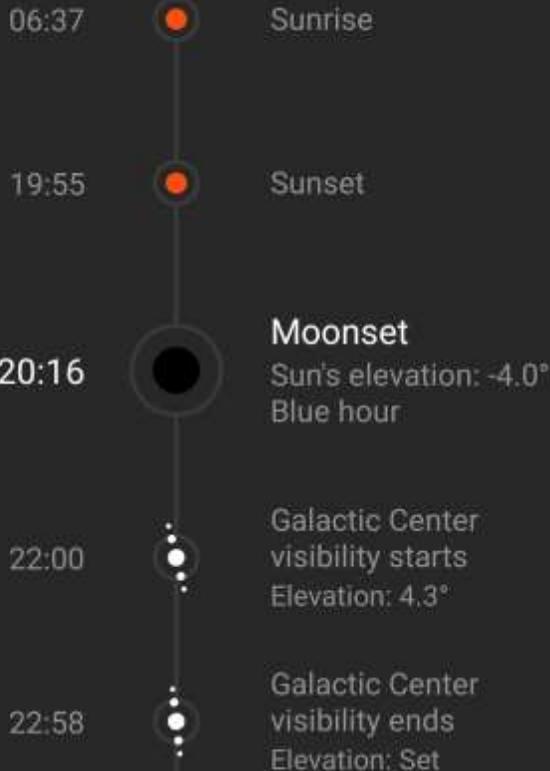
1. Go to the Sun module.
2. Check when Night Time starts for your chosen date and location.
3. You can also see the sunset time and Milky Way times.

Monday, 6 September 2021 | 18:24

Unnamed Road, Pwllheli LL53 7AD, UK - Unnamed Road, Unite...

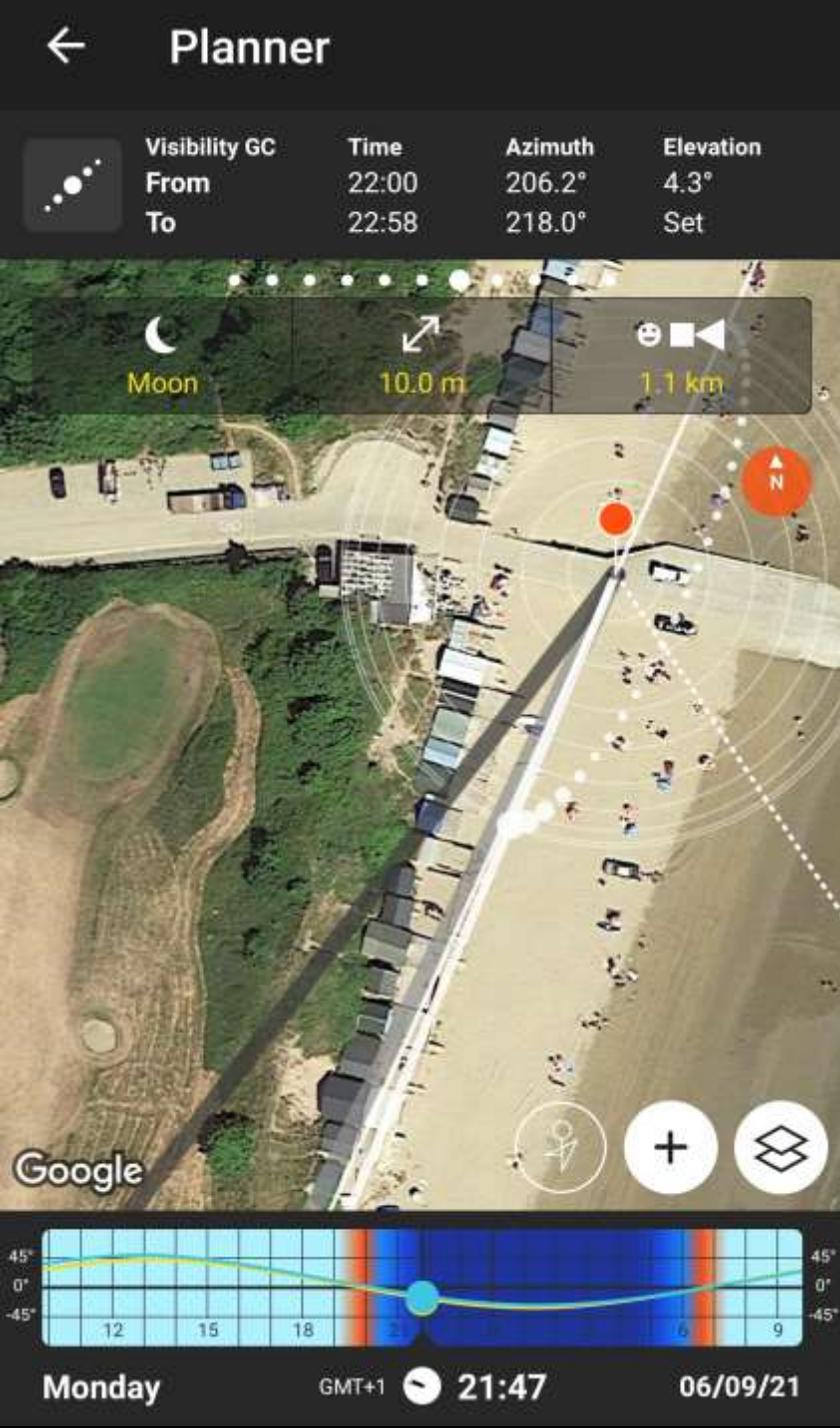


05:21 Waning Crescent (0.3%) 20:16



PhotoPills – moon planning.

1. Go to the Moon module.
2. Check the Moon percentage (lower is better).
3. Check Moonset time.
4. You can also see Milky Way times.



PhotoPills – location planning.

1. Go to the Planner module.
2. Set the date and time, and set the Milky Way layer to be visible.
3. Check the direction of the Milky Way core (between the light and dark grey lines) to plan your foreground interest.
4. Check the overhead Milky Way (white dots).
5. Swipe the time chart to see changes.

Planning recap.

So, you've found...

- Yourself in Milky Way season.
- A night with only a little moonlight.
- A great location that's really dark and is within each reach of the car.
- A night where there's no cloud and it's warm, but not too warm.
- The time and location of the Milky Way.

Phew!

OK

Better

Best

Equipment and results

Cheap

Expensive



Automatic

Mobile phone
+ tripod
+ app

Single photo

'Proper camera'
+ tripod
+ photo editor

Multiple photos

'Proper camera'
+ tripod
+ photo editor
+ stacking software

Tracked photo

'Proper camera'
+ tripod
+ photo editor
+ stacking software
+ head level
+ tracker

A close-up, dark photograph of a camera's lens mount. The lens mount is black with white markings for focal length in feet (ft) and meters (m). The numbers are arranged in a circular pattern. A white text overlay is centered on the image, reading "Camera settings (single photo or multiple photos)." The text is in a clean, sans-serif font. The background is dark and slightly blurred, focusing attention on the lens mount and the text.

Camera settings
(single photo or multiple photos).

Before you go - prepare your camera.

- Turn off:

- High ISO / long exposure noise reduction.
- Turn off image stabilisation.
- Manual focus assist / peaking.

- Turn on:

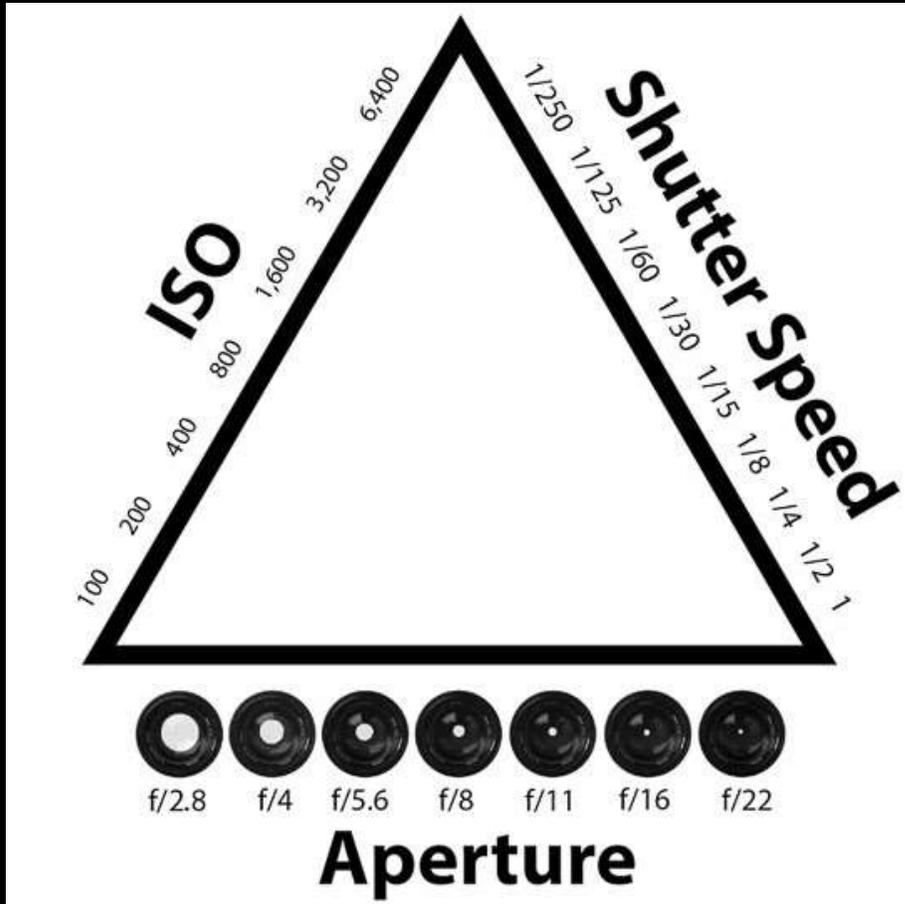
- Bright monitoring (Sony).
- Two second timer (or use a remote control).
- Raw files (uncompressed).

Before you go – what to pack.

- Camera and lens.
- Tripod.
- Torch (with red light mode).
- Mobile phone.
- Cleaning cloth.
- Remote control.
- Warm clothes, hat, gloves.

Fully charge your batteries (camera, torch, phone) and take spares if you have them. Batteries drain quicker in the cold.

In the field settings – the exposure triangle.



- Manual Mode - don't be scared!
- Shutter speed - Use the NPF Rule (use the Spot Stars feature in PhotoPills).
- Aperture - F1.8-2.8 are best, but it depends on your lens. Start with the smallest number.
- ISO – 1600, 3200, 6400, or higher. Start with 6400. But read up on ISO invariance.

← Spot Stars

Camera

Sony a7 III >



20 mm



f/2.0



0.00°



Default

Max exposure time

NPF Rule

11.74s

It takes into account the megapixels of your camera.

500 Rule

25s

Classic rule. It fails with most recent cameras.

PhotoPills – NPF vs. 500 Rule.

1. Go to the Spot Stars module.
2. Enter your camera body and lens details.
3. The time (seconds) is the maximum exposure before stars will start to blur.
4. Use this as a guide to configure your camera.

In the field settings – manual focus.

- Possibly the trickiest bit - autofocus won't work, and infinity isn't necessarily infinity!
- Select manual focus and use focus zoom if you have it.
- Find a bright star and manually focus until it becomes sharp, then don't touch the focus ring.



Test your settings and go for it!

- Take a test photo – use a longer exposure (double or more) than the NPF rule suggests; this will allow you to check your composition and position of the Milky Way.
- Next, use the NPF rule exposure time and you should have a Milky Way photo.
- If the photo is too dark or too light, change the aperture and/or ISO as needed. You can change the exposure time but don't get blurry stars.

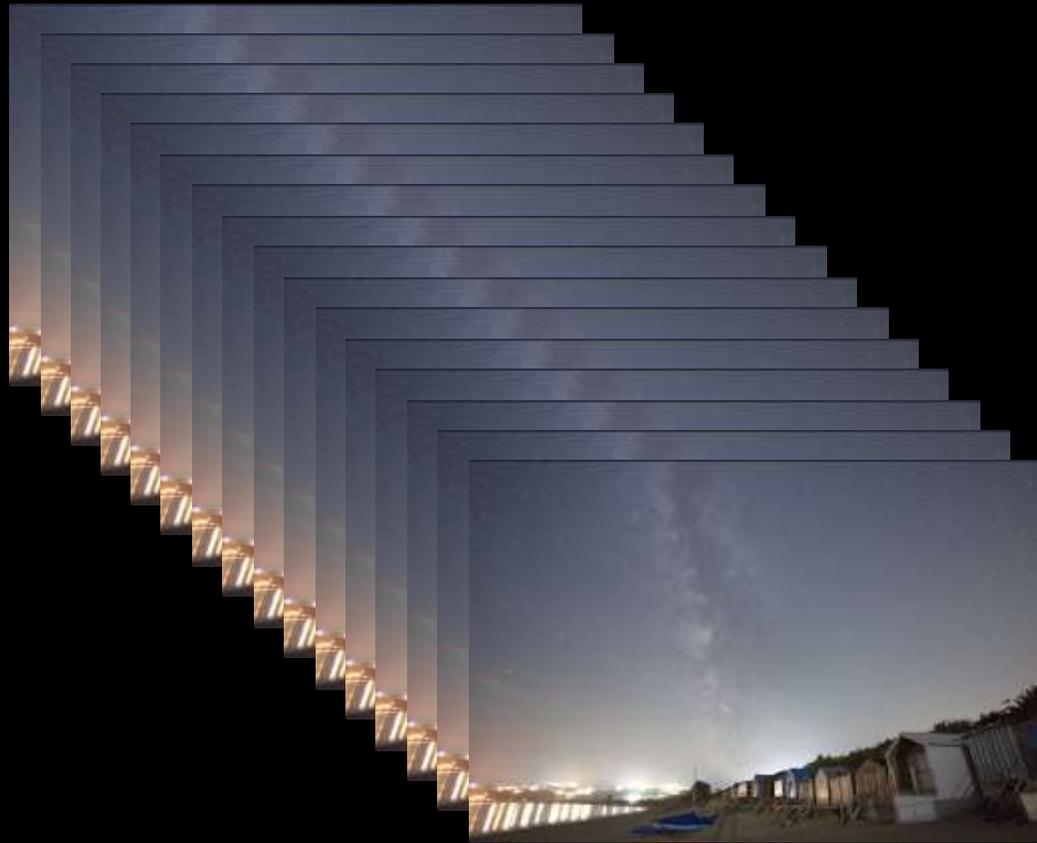
Taking multiple photos for stacking.

- Take many photos (5-20, or more) in quick succession using exactly the same settings. Don't touch that focus ring!
- Take a single long exposure of your foreground interest – don't change the composition, but do change focus and settings. You could light the foreground with your torch.
- Use Sequator to stack the first set of photos (the sky) then use your photo editor to merge the output with your foreground photo.
- You could even create a timelapse with all your photos.

A person wearing headphones is seen from behind, sitting at a desk in a dimly lit room. They are looking at a large computer monitor that displays a photo editing software interface. The interface shows a grid of photo thumbnails on the left and a larger preview area on the right. The person's hand is near their face, possibly adjusting the headphones. The overall atmosphere is focused and professional.

Stacking and editing photos.

1 - Stack the sky photos.



Use Sequator to stack 16 photos of the sky into a single image - reduces noise / interference, enhances stars and Milky Way.

2 – Layer in the foreground.



Use Affinity Photo to layer the long-exposure foreground photograph with the image generated by Sequator.

3 – Edit the colours and detail.



Use DXO PhotoLab to edit the image from Affinity Photo – boost the colours, contrast, and other levels to your taste.

A silhouette of a person standing in a doorway, looking out at a sunset over a landscape. The person is holding a suitcase. The sky is filled with colorful clouds, and the landscape below is dark and silhouetted.

My three-year learning journey
to get a decent Milky Way photograph

September 2019 - Gorge du Tarn, France.

Single shot - 20 seconds, F4.0, ISO 10,000.

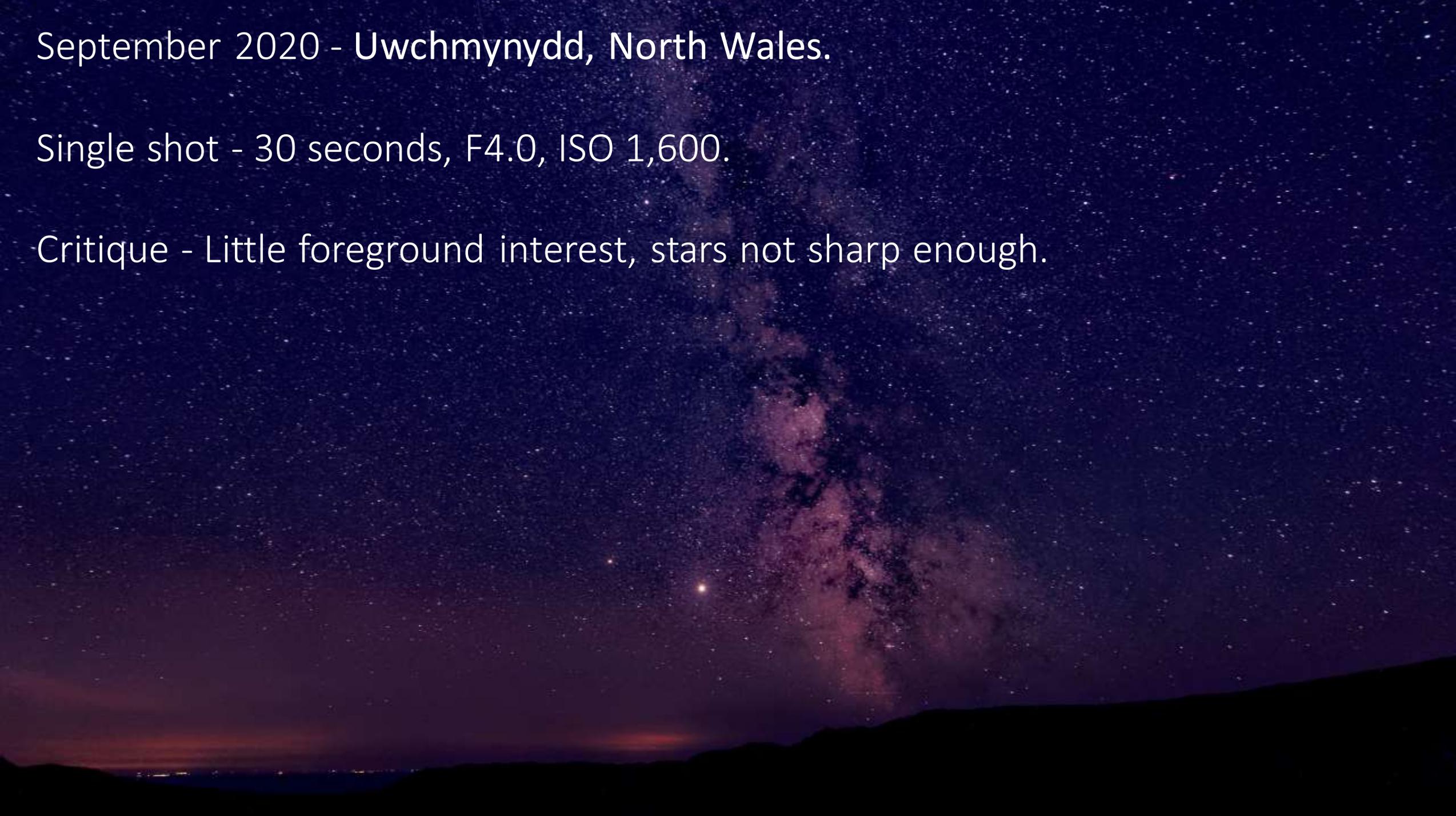
Critique - Milky Way visibility poor. Foreground orange from streetlights, attempted to de-colour but tops of trees didn't work (my poor editing skills).



September 2020 - Uwchmynydd, North Wales.

Single shot - 30 seconds, F4.0, ISO 1,600.

Critique - Little foreground interest, stars not sharp enough.



September 2021 - The Jam Pot, Myntho, North Wales.

10 photos - 10 seconds, F1.8, ISO 1,600. Merged in Sequator.

Critique - Corners of image not clear and dark (vignette), cloudy sky, and foreground lights too bright.



September 2021 - Abersoch beach, North Wales.

Sky – 16 shots - 10 seconds, F2.0, ISO 1,600. Stacked in Sequator.

Foreground - 1 shot - 30 seconds, F11, ISO 1,600. Light painted with a torch.

Sky and foreground images merged in Affinity Photo.

Critique - Left hand side of beach needs more lighting.



A photograph of a library aisle. The shelves are filled with books, and several light bulbs hang from the ceiling, creating a warm, dimly lit atmosphere. The text "Resources." is overlaid in the center of the image.

Resources.

Resources – Alyn Wallace.

- Main website - <https://alynwallacephotography.com/>
- Really useful blogs and videos:
 - [PhotoPills tips](#)
 - [ISO invariance](#)
 - [Astrophotography with a mobile phone](#) (also watch this [BBC Click video with Sarah Cruddas](#)).

Resources – apps and websites.

- PhotoPills - <https://www.photopills.com/> (how-to guide [here](#)).
- Clear Outside - <https://clearoutside.com/> (how-to guide [here](#)).
- Sequator - <https://sites.google.com/view/sequator/> (how-to guide [here](#)).
- Light Pollution maps:
 - UK map - <https://nightblight.cpre.org.uk/maps/>
 - International locations - <https://www.lightpollutionmap.info/>

Milky Way Cheat Sheet

Planning.

- Milky Way season and little or no moon in the sky.
- Location with dark sky and close to a car park.
- Good weather forecast and clear skies.
- Check time and location of Milky Way.

Packing (for single shot or multiple exposure)

- Camera.
- Lens.
- Tripod.
- Torch (with red light mode).
- Mobile phone.
- Cleaning cloth.
- Remote control.
- Charged / spare batteries.
- Warm clothes, hat, gloves.

- Turn **off**:
 - High ISO / Long Exposure Noise Reduction.
 - Turn off Image Stabilisation.
 - Manual focus assist / peaking.
- Turn **on**:
 - Bright Monitoring (Sony).
 - Two second timer (or use a remote).
 - Raw files (uncompressed).
- Settings:
 - Manual mode.
 - Shutter speed – Use the NPF Rule (use PhotoPills).
 - Aperture – F1.8-2.8 are best, start with the smallest number.
 - ISO – 1600, 3200, 6400. Start high, between 6400 and 10000.
- Focus:
 - Manual focus. Use any 'focus zoom' feature, find a bright star and focus until it becomes sharp (infinity on your lens might not be infinity).
- Take trial photos to check composition and quality, tweak settings and retake.
- For stacking, take 5-20 photos of the sky for stacking, one or more of the foreground for merging in.