Let's * Learn * About...

Photography & **KIELDER** OBSERVATORY Infinite Inspiration





What is Photography?

Photography is an art form, or practice, where the aim of the practitioner or artist is to capture or record light from a subject, or environment, with a camera to create an image.

There are countless ways to capture light and countless subjects to snap in the world of photography which is why it is such a powerful medium for expression.

The first photograph was taken in 1826, and the practice quickly developed. Initially photographs had to be developed on a light sensitive paper, until 1888 when 70mm, and then 35mm camera rolls were developed. These could fit in your pocket until development!

Modern cameras are now largely in the form of mirrorless cameras, and DSLR's (digital single lens reflex). These are incredible devices with highly sensitive sensors, and lens with varying focal lengths (we will talk about these camera terms later!). There are also specialist cameras that exist.

Your mobile phone also has a camera capable of photography, and we will explore together how DSLR's and camera phones differ but can be used as a medium to achieve the same artistic outcomecapturing starlight.



Types of Photography

There are lots of different types of photography, such as

- Wildlife
- Portrait
- Macro
- Still life
- Landscape
- Bokeh
- Astrophotography

There are lots of ways to express yourself and capture the world around you.

Photographers use diverse methods for each type for photography.

🔅 Thinking Box 🌣

Can you think of three more types of photography? What other events or things do people like photographing?











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Types of Cameras





Mobile phones are the newest type of device that has gathered an impressive foothold in the photography market. They are incredibly compact, and new technology allows them to have some of the features of DSLR's that allow for the taking of impressive technical photographs, with a hit on performance due to size of the tech.

Film cameras, and other older cameras, offer a different and more traditional approach to photography. Whilst still allowing creative control, there are elements of these cameras that are most restrictive and of course the film needs to be developed.

DSLR's and mirrorless are the most common cameras used in today's photography market. They are very sensitive, allow full creative control, and lots of different lenses can be used on them. They range from starter cameras under £500 to specialist equipment costing in the thousands. These cameras can also have lots of accessories to increase their creative potential such as filters. They offer the greatest unrestricted creative potential together with image processing software can create magical images.



Let's Talk Shop

There are lots of confusing terms in photographyparticularly when you take the camera off auto! Here we will break them down and see how they affect what type of photograph you can take. Extra terms are in the glossary!

Back of the camera

1. Mode:

How much control you have over the image.

Manual (M): You choose all the settings for the picture. Aperture Priority (A): You only control the aperture of the photo, and therefore it's depth of field. The camera selects the other settings.

Shutter Priority (S): You only control the shutter speed of the camera, and therefore if you capture motion and light quickly or over a long period. The camera selects the other settings.
Program (P): The camera decides the settings, but you have the option of altering them.

Auto: The camera decides all the settings, with no input.

2. Shutter speed:

The shutter speed is a number, which tells you **how long the shutter is opened to let light into the camera**. The long shutter speeds let in lots of light and capture motion and short shutter speeds let in less light and freeze motion.

3. F number/ Aperture:

This number tells you how wide the aperture is, or how narrow. The aperture is an opening behind the lens, which can open wide or narrow. A wide-open aperture lets in lots of light and allows the camera to make the photo sharp past the focal point. The narrow aperture does the opposite: less light, shallow depth of field. Low number is a wider aperture, high number narrower aperture.

4. ISO

This is a value that starts low and doubles to a high value. **Each higher value brightens an image more and more**. But the higher this brightening value, the grainier the image will look.

5. Exposure compensation

This meter allows you to **make your exposure brighter** (plus values) **or darker** (minus values).

6. Shutter options:

This setting allows you to **set a timer** for photos, or to take continuous photographs.

Thinking Box

How would you decide your settings for these different scenarios?

1. Landscape in the sun

2. Catching a bird mid flight 3. A lighthouse at night



Focus on: Lens Settings Focal Length measurement:

So many dials and switches! What do they all do? affects how big the FOV is of the image.

Focus dial and window- adjust the focus of the image overall.

This switch allows you to go between auto focus, where the camera focuses the image, and manual focus, where you use the dial.



Examples of Settings

Because, you know, that was a lot of info...

Shutter Speeds

How shutter speeds are shown, and how fast or slow they are.





This shutter speed is 1/5000, a fraction of a second, faster than 1/4000 shown above. This is a very fast shutter speed.

This shutter speed is 1/125, or 125, a fraction of a second. It is faster than $\frac{1}{2}$ a second, $\frac{1}{4}$ of a second, and so on, as above.

This shutter speed is 20 seconds, meaning the shutter will be open to collect light for 20 seconds. It appears as: 20"

ISO

Here we see how the ISO value brightens an image. The left image is ISO 2500, the right image is ISO 10,000.



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F Number and size of Mechanical Aperture

We can see here how the higher the f number, the smaller the aperture of the camera, letting in less light due to a smaller opening.

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f/2	f/2.8	f/4	f/5.6	f/8	f/11	f/16	f/22	
MORE LIGHT LARGE OPENING						LESS LIGHT SMALL OPENING		
SHALLOW DEPTH OF FIELD						DEED DED	DEEP DEPTH OF FIELD	

🜣 Thinking Box 🌣

Remember, it's important to take time to reflect of what you've learnt, especially when it's such a lot of information!

Take some time now to write down:

- 1) The most interesting thing you've learnt
- 2) The most challenging idea you've come across
- 3) A way of making a difficult idea easy to understand- this could even be a picture!

Let's Practice! Taking a Landscape Photograph

The dashed line is the focal length of the lens. Here we have used a 24mm focal length. This gives us the field of view (FOV) of the photo. The sensor size of the camera also contributes to the FOV.

We don't need to worry about having a specific shutter speed for the photo to let in more light, as the environment is well lit by daylight. Shutter speed is set to autoand set itself to 1/125.



The f number (F°), or aperture, we have used in the camera settings gives us this wide depth of field (DOF), doing this means the whole image past the focal point appears sharp. The f-number here is 3.5 (auto).

Why is astrophotography different?

Astrophotography is a special type of photography which captures the stars, planets and objects in space using different methods. It produces beautiful and awesome images which are literally out of this world!

Astrophotography is very specialised because the photographer has to use all of the tools the camera provides them to correctly take a photo of stars. That is, the settings are all manual.

It means using all of those settings discussed above in creative ways to achieve one simple goal:

Let in as much light from the stars as you can.

Usually, the subject of your photograph is lit well by sources in the environment- this can be natural daylight, or artificial light like lamps. The camera can easily detect the correct setting to expose the image correctly using these light sources. However, at night, it is dark, and this means there is no light for the camera to pick up with automatic settings. The photographer needs to control how the image is taken so that we can see the stars.

Usually, most astrophotography is done with DSLR cameras We will take a quick look at how taking a photo of the stars differs from taking a typical photograph. However, because technology has advanced at a wonderful pace, it is possible to do astrophotography with mobile phones too!

Thinking Box

How could you use the shutter speed setting to let in more light?

- a) Leave the shutter speed on auto
- b) Make the shutter speed longer, so the shutter is open longer
- c) Make the shutter speed shorter, so the shutter is open for less time



Kielder Observatory at Night ©N. Lund, KOAS Camera: Nikon d810

Use a tripod to keep camera still

Let's Practice! Taking a Photo of Stars

Camera set to Manual

The dashed line is the focal length of the lens. Here we have used a 18mm focal length, which also helps to capture just a little bit more starlight. This gives us] the field of view (FOV) of the photo. The sensor size of the camera also contributes to the FOV. You can also be very clever with astrophotography and take lots of shorter focal length images to stitch together like a blanket.

Shutter speed in this image is really important, as a longer shutter speed lets in lots of light. The more seconds the shutter is open, the more starlight you get. Here, the shutter speed is 20 seconds. You can have the shutter speed as high or low as you like- but the other settings of aperture and ISO must be altered to help balance the photograph.



The f number (F°), or aperture, we have used here is the lowest number- the widest possible aperture, f2.8. This lets in the most starlight mechanically and gives us that wide depth of field.

Even though we have the help of a wide-open aperture (lowest number) and a long shutter speed, the darkness of the night and the faintness of the stars still needs a bit of help to show up well in our photograph. So, the ISO on this image has been set to 3200, brightening up the image without introducing too much grain on the image, which we call "noise".

The focus here is set to infinity on the lens, manual focus. The whole image from the grass to the horizon is focussed. We have not altered this setting, because we have the same need to focus the whole image, as in the landscape photograph.

Astrophotography with Mobile Phones

Although astrophotography may seem very technical compared to traditional forms of photography, mobile technology offers and simple and innovative way to take photos of the stars. It's good to have an understanding of how astrophotography is taken- if only to acknowledge all of that brilliance is now available at the click of the phone camera button!

The phone you will need to do astrophotography will be a newer generation phone; this can be a bit of a pain if you have an older model. You can use light painting if you are using an older model to photograph a nightscape.



Samsung Galaxy S20

Samsung's from around this generation onwards have a dedicated night mode up to 15 seconds exposure, with good dynamic range.

Don't worry if you don't have a newer model of mobile phone! You can use the existing features to pick up bright lights in the dark to make a creative, light-painted image! What is important is that you explore photographing darkness in a new, fun and artistic way.

Apple iPhone 11

Whether using standard or the pro range, the iPhone 11 onwards features night mode too. The newest models allow you to take night mode selfies, and time-lapses.



Google Pixel 4

Googles' "Night Sight" feature in the Pixel 4 onwards is one of the more impressive hereexposures up to four minutes, advanced features for composition and editing.

Huawei P40 Pro

The Huawei range offers both long exposures on auto and a dedicated night mode for particular needs, such as ultra-wide angle and zoom, and is considered one of the best in the market.







Finding night mode is easy: usually It pops up **automatically** and looks like a **crescent moon** symbol. Sometimes, you have to **swipe right** to access **advanced features**, and select the night mode. You can adjust the exposure time using a slider or let the phone choose. The phone will remind you to **hold still**. That's all there is to it!

Key Steps to Mobile Astrophotography

- Pick a place to photograph, find foreground such as trees or countryside so your stars shine over something! Use a torch to figure out where your phone is pointing.
- Find a way to keep the phone still- either prop it up on something or use a stand like a tripod with a mobile phone holder. You want it to be as still as possible when you push the button to take the photograph.
- Find the night mode button on your phone. Usually this comes up automatically in low lighting. You may have to swipe right to find the night mode.
- Take a test exposure. See if it is bright enough. See if the camera focuses properly.
- Adjust the focus by tapping on the viewfinder (the screen). Adjust the exposure by using a slider. Zoom in by using two fingers in a spreading motion on the screen, if you want to.
- If there is a "pro" mode for you to play around with ISO and f number, feel free! See what you can create.



If you have your own telescope, you could try to line your phone camera up with the eyepiece to take a picture of the moon! You don't need night mode for this. Just tap the moon to focus it. Steady hands are needed!



Think about what you can see in the sky. Is the moon or planets out? Are there any constellations you know, or can you create your own shapes in the sky? Is there a particularly bright or colourful star you have seen? You can download an app like Stellarium to help you identify the stars.

Think about how you got to your photo location. Is it far away from streetlights? Are there any natural features around you? How do you feel looking at the stars?

The Escape Velocity Mission

We at Kielder Observatory, as part of the Northumberland Dark Sky Festival, want you to:

Join us online for a photography, astrophotography and mobile photography workshop. You can find the details at <u>https://www.northumberlandnationalpark.org.uk/whats-on/</u> The workshop and project are completely free.

Venture into the dark sky park, near your home and in accordance with COVID19 guidelines, to take a photograph of the night sky with your mobile phone.

Document your experience of astronomy, stargazing, photography or even just your adventure into darkness. You can draw or paint a picture, take more photos, write a poem or short piece of writing.

Submit your photographs, and extra pieces of work such as your thoughts and experiences, to <u>natasha@kielderobservatory.org</u>, during the months of February and March.

Your work will be curated into an exclusive online exhibition to celebrate our dark skies, your creative and stargazing moments.

Find out more about Kielder Observatory, the UK's largest public observatory at: <u>www.kielderobservatory.org</u>



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Kielder Observatory Astronomical Society is a Registered Charity (No 1153570)



You can visit us online at www.kielderobservatory.org

Use this activity sheet to think about how you felt whilst stargazing and doing photography. You can write a poem or draw a picture. Think about what you saw, how it made you feel, and if you recognised anything special like a constellation.

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Tell us your stargazing story...

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