Photography Primer

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1. Introduction

The main objective of local camera clubs is to promote photography as a hobby. This includes assisting members to learn and develop their photographic skills. It isn't until you delve into photography as a hobby that you realise its complexities and its possibilities. It can be frustrating and rewarding in equal measure.

This document is called a 'primer' because it serves as a foundation for the novice and offers direction for the student of photography to bring everyone to the same basic level of competence. Therefore hopefully avoiding many of the frustrations whilst enabling students to achieve success in photography competitions, which form the basis for much of local camera club activities.

It could be argued that learning photography is as complex as learning to drive a car. It requires a combination of study and practice. Over time, with plenty of practice, the various aspects of photography can become second-nature thus not requiring conscious concentration. This 'primer' is intended to be a 'drivers handbook' for those wishing to learn how to drive a camera to achieve good pictorial effect in their photographs.

Because this is a foundation document it is deliberately camera-technology agnostic. However, it does through necessity explain some generic camera features to help the student photographer avoid some of the potential pitfalls associated with modern camera use.

At the end of this document there is a suggested reading list for those wishing to progress their knowledge to the next level. The photography student is encouraged to use their local library to borrow books on photography and art to see the works of famous photographers and artists as inspiration. Internet research serves as an excellent source of information from reputable sources such as Tate online, Wikipedia etc. To this end, this 'primer' document contains links to relevant websites to enable the student to do further self-learning.

Members of camera clubs are invariably willing to mentor and provide advice to other members wishing to learn more about photography so joining a camera club as a novice is a good idea.

Because amateur photography is about capturing light to create pictures for pleasure, this 'primer' outlines how that is done without going into too much technical detail which could be a disincentive to the hobbyist and amateur photographer.

2. Aperture

Cameras use a small hole, called an aperture, to allow the required amount of light onto the image sensor. The sensor is either electronic (semiconductor) or chemical-based (film). The size of the aperture is one variable (of many) which the photographer has control over. The photographer needs to know the effects of different aperture sizes (settings) thus be able to choose the one which gives the desired effect.

A large aperture lets in more light than a small aperture. This is obvious and logical. However, it also affects something called '**depth of field**'. Depth of field is the name used to describe the area and distance which is in focus hence appears sharp in a photograph. An object too close to the camera

will be out of focus and something in the distance will be out of focus. Between these extremes there is a range which is in focus. This range which is in focus is called the depth of field. The following photo of an oak bush cricket shows a very shallow depth of field:

If the aperture is large, the depth of field is small. If the aperture is small, the depth of field is large. This feature can be used to achieve good pictorial effect and mimics natural human vision. When a person looks at an object they naturally focus on that object. Other objects, particularly around the periphery of vision are not in focus so not seen as clearly.

The photographer can use depth of field to bring emphasis to the desired object or intended area and allow the other areas of the picture to become out of focus thus less emphasised and less distracting. Therefore, control of the aperture is necessary to capture an image which is natural and representative of human vision and fulfils the objective of the photographer.

There is arguably an exception to this goal. That is for technical or scientific purposes i.e. for a 'record shot'. When art and pictorial effect is not the goal of the photographer and a formal record is the requirement, the goal may be to get the entire image in focus all the way to the edges. Again, depth of field is important because the intent is to avoid any areas being out of focus, so control of the aperture is important.

Camera terminology uses the abbreviation **A** or **Av** to represent aperture or aperture value. The camera aperture is the area of the hole which allows light through to the sensor. The aperture is usually a circle formed by a diaphragm so the mathematical formula for the area of a circle applies i.e. πr^2

Since approx. 1949 cameras have their aperture settings marked with a standard set of values, namely:-

f2.8, f4, f5.6, f8, f11, f16 etc.

These standard aperture settings make life simple for the photographer because a change of aperture by one setting (known as a '**stop**') from f2.8 to f4 reduces the amount of light reaching the sensor by a half. So, changing the aperture '**A**' by two-stops from f4 to f8 results in a quartering of the light entering the camera i.e. half of a half is a quarter. Similarly, changing the aperture from f8 to f5.6 will double the amount of light entering the camera.

f8 is a typical mid-range setting and the photographer can choose to open the aperture more by changing to f5.6 or f4 etc, or to close the aperture more by changing to f11 or f16.
f8 allows a fair amount of light into the camera, suitable for typical cloudy days, and gives a reasonably good depth of field.

- **Opening the aperture to f5.6 or f4 etc reduces the depth of field.**
- **Closing the aperture to f11 or f16 increases the depth of field.**

For self-study the photography student could research the Sunny 16 rule

Beware that most cameras now provide 1/3 **f-stop** increments so moving from f2.8 to f4 requires three clicks on the aperture control.

3. Shutter

Cameras have a mechanism called a shutter which is used to further control the light reaching the sensor. This can be either a mechanical shutter with moving parts or it can be an electronic shutter with no moving parts so completely silent. Some cameras may have both a mechanical shutter and an electronic shutter. Each shutter type has its merits and limitations.

In addition to the aperture affecting the amount of light reaching the sensor, the time the sensor is exposed to the light is significant; this is the purpose of the shutter. The shutter is like a door (mechanical shutter) or an on/off switch (electronic shutter). When the shutter is 'open' or 'on' the light can pass through the shutter, when it is 'closed' or 'off' the sensor has no light.

The camera's shutter controls the time that light is allowed to hit the sensor. Cameras typically cater for shutter times between 30 seconds and 1/4000 second. The following image was taken with a shutter time of 15 seconds causing the milky effect in the moving water:

Some high-end cameras have shutter settings that go up to 1/32000 second. The following photo of a scrambler was taken at 1/32000 sec. You can see there is no blurring or sign of movement of the wheels:

Cameras may also allow manual control of the shutter's open time. This is known as '**bulb**' mode '**B**'. i.e. the shutter is open for as long as the photographer holds the shutter button down. In the Victorian era the shutter was operated by a rubber bulb squeezed by hand, hence the name.

The time the shutter is open is most significant when the object to be photographed is moving. If the object to be photographed is moving and the photographer wants to capture it clearly the shutter has to be open for a very short time. This is called a 'fast' shutter speed such as 1/1000 second.

A typical shutter speed is 1/100 second. See the Sunny 16 rule for guidance.

Longer/slower shutter times such as 1/80 sec or 1/25 sec are needed if there is less light. A faster shutter speed, typically 1/1000 sec, is needed if there is a lot of light or the object to be photographed is moving, such as wildlife.

Cameras have their shutter settings marked with a standard set of values, namely:-

1/4, 1/8, 1/15, 1/30, 1/60, 1/125, 1/250, 1/500, 1/1000 sec etc

Each value is approximately half the value of that on the left. i.e. twice as fast.
Halving the shutter time will allow half the light through to the sensor. These settings are known as shutter '**stops**'. A change of one stop faster will halve the light, conversely a change of one stop slower will double the light hitting the sensor.

Beware that modern cameras often provide 1/3 shutter-stop increments so three clicks are needed to make a one-stop change.

The diligent photography student will realise that there is likely to be an inter-dependence between aperture and shutter speed. Indeed, there is. The photographer can double the light hitting the sensor by either opening the aperture one 'stop' or slowing the shutter by one 'stop'. This is designed to make life simpler for the photographer. The term 'stop' is used for the aperture settings and the shutter settings because a 'stop' means a halving or a doubling of the light reaching the sensor or film. Becoming familiar with the term 'stop' simplifies things for the photographer.

If the object to be photographed is moving or the camera is moving, the result is likely to be the same – a blurred image. These can be overcome by using a fast shutter speed. Unintentionally moving the camera whilst taking a photograph is called '**camera shake**'. Camera shake is undesirable and needs to be minimised or eliminated. Resting the camera on something solid or mounting it on a tripod will eliminate camera shake. Another way to overcome the problem of a moving object is to move the camera at the same rate the object is moving – this is known as '**panning**'. The result of panning is that the object will be sharp but the background will be blurred because it isn't moving with the camera and object. This can be used to achieve a good pictorial effect if done intentionally.

A camera usually has a lens that magnifies the light before it enters the camera. Some camera lenses may provide variable amounts of optical magnification, known as a zoom lens. The magnification is related to the '**focal length**' of the lens. The greater the focal length the greater the magnification. This optical magnification unfortunately magnifies any camera shake. As a 'rule of thumb' guide, to minimise camera shake the shutter speed should be the reciprocal of the focal length of the lens e.g. if the focal length is 300mm then the shutter speed should be 1/300 sec, or faster. Therefore, if a long lens is used the camera should be supported on something solid or mounted on a tripod.

The focal length of the lens also impacts the depth of field. When using a short focal length lens such as a 'wide angle' lens the depth of field is greater than a 'telephoto' lens at a given aperture setting. This feature can be used to achieve good pictorial effects. For example, if the intent is to photograph and object such as a person and have the background appear larger and nearer but out of focus then a telephoto lens should be used. If the desire is to show the object or person and the background in focus then a wide-angle lens would be better due to its greater depth of field. The student photographer should experiment with this to become familiar with the effects of **focal length** on **depth of field**.

Modern cameras may have a feature called in-camera-stabilisation (ICS). This is technology to help eliminate camera shake. However, beware of in-camera-stabilisation because it can cause more

problems than it solves. As a 'rule of thumb' if the camera is hand-held and you are using a fast shutter the ICS can be turned on, but when the camera is on a tripod and the shutter speed is slow, ICS should be turned off. This may appear counter-intuitive. ICS will cause blurring on long shutter times because the camera is trying to compensate for movement that doesn't exist. This is normally mentioned in the small-print of the camera's user manual. Similarly, some lenses for interchangeable lens cameras have image stabilisation capabilities.

A novice (and sometimes not so novice) photographer is likely to move the camera slightly when the shutter button is pressed. This is a common cause of camera shake which becomes noticeable with slower shutter speeds and/or long lenses. Using a tripod or resting the camera on a solid surface can help eliminate camera movement when the shutter is pressed. Alternatively, using an in-camera timer or mechanical cable or wired or wireless shutter release system can eliminate the need to touch the camera to operate the shutter. These are all useful techniques to ensure the camera does not move when operating the shutter. The student photographer should practice these techniques for avoiding camera shake.

Camera terminology uses the abbreviation **S** to represent shutter. In some documents you may see the abbreviation **T** or **Tv** used to represent the shutter **time** or **time-value**.

4. Light Sensitivity and Exposure

The light sensor in a camera, be it an electronic sensor in a digital camera or the film in an analogue camera, has a certain amount of light **sensitivity**. The sensor or film also has a **dynamic range** which is the range of sensitivities between black (no light detected) and white (light overload) i.e. the ability to handle a wide range of light intensities.

As described above, the aperture size and the shutter time both control the amount of light hitting the sensor or film. How the sensor or film responds to the light is called the **sensitivity**.
To allow the photographer to control all aspects of image creation the sensor or film sensitivity, also known as film speed needs to be controllable too. Film is marked with an ISO number such as ISO 100, ISO 125, ISO 400 etc. Previously a DIN number (German) or an ASA number (American) was used but the ISO system is now universally used.

Each time the ISO number doubles, the sensor's sensitivity to light doubles, such that half the amount of light is needed to give a specific brightness in the final image. This is known as an ISO '**stop**'.

Beware that modern cameras often provide 1/3 ISO-stop increments so three clicks are needed to make a one-stop change (doubling or halving) in sensitivity. Therefore, modern cameras may have ISO settings of:

50, 64, 80, 100, 125, 160, 200, 250, 320, 400, 500, 640, 800, 1000, etc.

As is often the case in life, you seldom get something for nothing. The higher the ISO number the more noise (for digital sensors) or grain (for film) you get on the final image. It is therefore desirable to keep the ISO number as low as possible to minimise noise or grain on the final image. It is usually necessary to make a compromise between sensitivity and noise. High sensitivity with high noise vs low sensitivity with low noise is a decision the photographer has to make.

The amount of light hitting the sensor or film, together with the sensitivity of the sensor or film, defines the brightness of the image created in the camera. This brightness is often called the '**key**'.

This is analogous to a musical 'key' or 'audible frequency'. Light has a frequency and each frequency represents a colour. Black is an absence of light and white represents all the frequencies of light. Therefore a 'low key' image is dark and nearer the black end of the light spectrum and a 'high key' image is light and nearer the white end of the spectrum. Note: high frequency visible light is called ultra-violet and low frequency visible light is called infra-red. White light contains all the frequencies from infra-red to ultra-violet, so you can't achieve white or high-key images without including the blues and violet high frequency light.

Camera terminology describes the combination of light hitting the sensor and the sensitivity of the sensor, hence the brightness of the image, as the amount of 'exposure'. Therefore, combining the aperture setting with shutter time setting and sensor sensitivity results in an amount of 'exposure'. Too much exposure of the sensor to light results in a white image, no exposure of the sensor to light results in a black image. Exposing the sensor to light of specific frequencies results in images of a specific colour or range of colours.

The aim of the photographer is to use a camera to capture a range of colours or shades of grey to create the desired image. The object to be photographed reflects varying amounts of light which allows humans and animals to see it. A camera detects an image on its sensor which represents the light reflected from the object. The light is represented by a range of colours and intensities, which are frequencies and energy levels respectively.

By combining all the topics described above, photographic terminology uses the term '**Exposure Value**' (**Ev**) to represent the combination of aperture, shutter and ISO settings.

For a given ISO setting (sensor sensitivity), the three variables of Exposure Value, Aperture Value and Time Value can be represented by the following mathematical equation:

Ev = Av + Tv (for a given ISO setting)

This equation tells us that an increase in aperture value **Av** or time value **Tv** will result in a direct increase in exposure value **Ev**, for a given ISO setting. By using the concept of the photographic 'stop' to represent a doubling or halving of light we can say a one-stop change in aperture Av will result in a one-stop change in Ev. Similarly, a one-stop change in shutter Tv will result in a one-stop change in Ev. This is shown by the same Ev value on the diagonals of the following chart:

Table of Ev 'stop' values at ISO 100:-

ISO 100	Av 'stop'	0	1	2	3	4	5	6	7	8	9	10
Tv 'stop'		f1.0	f1.4	f2.0	f2.8	f4.0	f5.6	f8.0	f11	f16	f22	f32
0	1s	0	1	2	3	4	5	6	7	8	9	10
1	1/2	1	2	3	4	5	6	7	8	9	10	11
2	1/4	2	3	4	5	6	7	8	9	10	11	12
3	1/8	3	4	5	6	7	8	9	10	11	12	13
4	1/15	4	5	6	7	8	9	10	11	12	13	14
5	1/30	5	6	7	8	9	10	11	12	13	14	15
6	1/60	6	7	8	9	10	11	12	13	14	15	16
7	1/125	7	8	9	10	11	12	13	14	15	16	17
8	1/250	8	9	10	11	12	13	14	15	16	17	18
9	1/500	9	10	11	12	13	14	15	16	17	18	19
10	1/1000	10	11	12	13	14	15	16	17	18	19	20

It follows that increasing Av by one-stop and simultaneously reducing Tv by one-stop will result in no change in Ev. This is significant for the photographer because it allows the exposure to be maintained at the required level whilst either changing the aperture value to alter the depth of field or changing the time-value (shutter speed) to capture an image of a fast-moving object.

Sometimes there is not enough light to achieve the required Ev value despite altering the Av or Tv settings available in the camera. A photographer must then alter the light or select a different location with more light. This is explained in more detail below.

5. Focus

Focus is the sharpness of the image. This is seen, and measured by a camera, as edges of objects being represented by clear sharp edges. Focus is achieved by altering the position of the lens' **focal point** with respect to the sensor. The focus setting is directly related to the distance the object is from the camera.

Modern cameras usually allow for both manual control of the focus setting and automatic focus setting. A modern camera can automatically measure focus either by the sharpness of the edges in the image or the phase difference of light frequencies, and using an electric motor it can alter the position of the focal point to automatically optimise the sharpness of the image on the sensor or film. The camera can then 'lock-on' to that focus setting and stop adjusting focus once it has been optimised. It takes time for a camera to achieve focus so the photographer must be mindful of the camera's auto-focus speed and not operate the shutter until focus is achieved.

Beware that some cameras prevent the shutter being operated if the image is out of focus. If the camera needs time to auto-focus before allowing the shutter to open, this causes shutter-lag, a delay between the photographer's intent to operate the shutter and the moment the shutter opens. This can cause a photo opportunity to be missed.

Focusing (manual or automatic) can be difficult in low light conditions and where the object to be photographed does not have any edges or distinct features that allow the camera to lock-on.

Although conceptually quite simple, focusing can be tricky so it takes both practice and a good understanding of the principles to allow the student photographer to master it. Focus is particularly difficult when the object to be photographed is moving. Some modern cameras have powerful in-camera computing which can allow the camera to adjust the focus dynamically to track a moving object. Another technique to capture a moving object in focus is to pre-set the focus to a known location and wait for the moving object to reach that location then operate the shutter at that point.

As mentioned above, camera shake can cause an image to be blurred so it is sometimes difficult to determine whether the blurred image is caused by camera shake or poor focus.

The student photographer should experiment with focusing techniques and practice it to build the required skills and familiarity with the behaviour of the camera used.

Most modern cameras combine the automatic focus feature with the shutter button, on the theory that you must always focus the camera before operating the shutter. The more experienced photographer may want to separate the focus and shutter controls to allow the camera to be focused at one point in time, then to operate the shutter at a later time.

Some modern cameras have configurable buttons on the back panel which allow the photographer to assign the focus function to a dedicated **back-button** rather than to the shutter button. If the camera does not allow the auto-focus function to be assigned to a back button, instead of the shutter, it may allow a back button to turn off auto-focus instead. This allows the photographer to half-press the shutter button to get the auto-focus to lock-on, then to turn off auto-focus to hold

that focus setting, so pressing the shutter at a later time will not alter the focus and avoids shutter-lag.

The student photographer should explore and learn what their camera's focusing capabilities and limitations are and work within the camera's limitations. All cameras have limitations, regardless of cost.

The view-finder is where the photographer looks to see what the camera sees, in advance of taking the picture. The photographer's eye has to focus on the image in the view-finder. Because human eyesight varies from person to person the camera needs to allow some adjustment of the image in the view-finder. This is known as the '**dioptre setting**' of the view-finder. If the dioptre setting is wrong it will be hard for the photographer to see when the camera is in focus, making manual adjustment of camera focus difficult.
Note: dioptre is the word used to mean the reciprocal of focal length.

Modern digital cameras often have a screen on the back, either instead of or as well as the view-finder.

6. Lighting

Photography is all about using light to capture an image. The photographer must have an understanding of light in its various forms to be successful at capturing images using a camera.

As mentioned above, if there is insufficient light the image will be dark and if there is too much light the image will be too bright (over exposed). In reality, light is more complex than that.
Light is a natural phenomenon which is quite well understood by scientists and appreciated by all people and animals with sight. The student photographer should go a little further than having a basic appreciation of light and gain a good understanding of the various types of light and how they can impact the camera's ability to create an image.

For the photographer it is helpful to understand the following types of light:-

- **Directional light** = light hitting the object to be photographed from one direction
- **Diffused light** = light traveling equally in all directions
- **Reflected** or specular light = light bouncing off an object
- **Twilight** = semi-light at either dawn or dusk
- **Night light** = small areas of light in a generally dark environment
- **Window light** = light entering a building through a window or opening such as a doorway
- **Studio light** = one or more sources of artificial light either constant or delivered as a flash
- **Flash light** = one or more sources of artificial light delivered as a flash

Directional light is theoretically able to hit any of the six sides of a three-dimensional object. The direction may be back, front, left-side, right-side, top or below; or anywhere in between these points. In fact, assuming the object to be photographed is a sphere, directional light could theoretically hit any hemispherical area of the sphere. These types of light may be from either natural sources (e.g. daylight) or from artificial sources (e.g. studio lights)

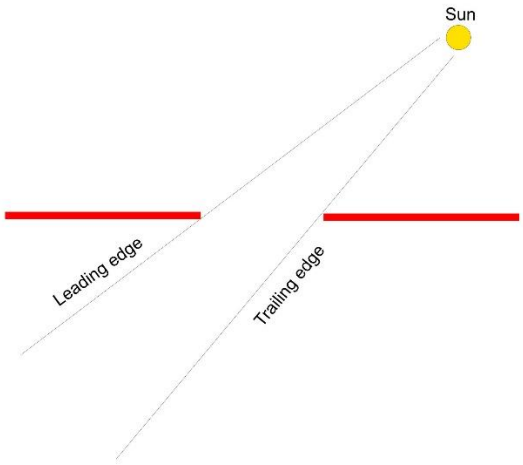
Diffused light is the opposite of directional light and has no particular direction, it is omnidirectional. This tends to light an object evenly on all sides simultaneously. Diffused light occurs naturally on cloudy overcast days or can be derived from artificial sources (e.g. studio lights fitted with a soft-box diffuser)

Reflected light can occur naturally or be deliberately reflected using a mirror or white or light coloured cardboard, aluminium foil, etc. This is useful for giving another direction to light that was unidirectional so the photographer can light two or more sides of an object from one light source.

Twilight occurs naturally at dawn and dusk. It has direction from the horizon so tends to cast long shadows if bright enough. It also tends to have a colour tint giving it an orange or yellow warmth which can give a beneficial pictorial effect.

Night light is predominantly artificial light from multiple sources in a wider expanse of darkness but may include light from stars and the moon. This gives photographers a particular challenge for achieving the optimum exposure in the presence of extremes of light and dark.

Window light usually has two edges, the leading edge and the trailing edge. Assuming the light is directional and not at exactly 90 degrees to the window, the leading edge is where the angle between the direction of light and the inside wall is less than 90 degrees (an acute angle). The trailing edge is where the angle between the direction of light and the inside wall is more than 90 degrees (an obtuse angle). See following diagram. The photographer can choose whether to use the stronger light on the leading edge of the window or the softer light on the trailing edge of the window. The further away from the window into the room the object to be photographed is placed, the softer the light.



Studio lighting is a subject for the student photographer to study as a subject in its own right. With multiple artificial light sources, each with controllable intensities and positions and directions, diffusers and reflectors the photographer has full control of the light sources. Even the colours of the lights can be controlled.

Flash lighting is a particular form of artificial lighting which can be used in a studio, indoors or outdoors. To use flash lighting the photographer would normally use a low ISO setting and small aperture setting to eliminate ambient light then set the flash gun to give as much light as is required to achieve the correct exposure. Some cameras have a flash light built-in. This is convenient but does not give the photographer much control of the light intensity or direction. A stand-alone flash gun's output can be measured using a light meter and adjusted manually or automatically by using direct electronic communication between the camera and flash gun to allow the camera to tell the flashgun when it has received enough light. This is called 'through the lens' (**TTL**) control of the flash gun. This is only achievable when the flash gun and camera are compatible. If a multi-way cable or wireless transmitter is fitted to the camera, or optical sensors on the flash guns, it is possible for

multiple flash guns to be synchronised to light the object to be photographed from multiple directions simultaneously. Synchronising the flash from the flash gun with the shutter is an important aspect of flash photography. If the shutter speed and flash speed are not compatible some undesirable effects can be seen, such as a black bar across the image. This 'primer' document does not explain flash photography in detail so the student photographer is encouraged to study it as a topic in its own right.

The above types of light can be used individually or combined to create the lighting effects desired by the photographer, provided the photographer understands the different types of light and how to control them.

Some modern cameras may have the ability to display a graph (called a histogram) which shows the area (number of pixels) of light across the tonal range from black on the left of the histogram to white on the right of the histogram. In addition to showing area of each tone of light from black to white it can also show the area of the primary colours of light: red, green and blue (RGB), from dark to light. The histogram provides the photographer with a lot of information about amounts of light, colours, exposure and clipping in one simple graphic image. The student photographer is encouraged to read their camera manufacturer's documentation to understand what the histogram tells them.

The word **chiaroscuro** (based on the Italian words for light and dark) has been used for centuries to describe the range of light and dark areas of a picture or painting. See chiaroscuro in Wikipedia for a more detailed explanation. Photographers now use this word too. The human eye naturally gravitates to the light or the dark areas of a picture. This can be used by the artist or photographer to achieve good pictorial effect. By ensuring the main object or subject of the picture is well lit and the less important areas of the picture are in the shade, the photographer can lead the viewer to concentrate on the picture in the intended way.

7. Pictorial Effect

Having described light and how a camera and photographer can control it to create an image, this 'primer' document now goes on to explain the different types of image and their uses.

A camera can faithfully reproduce an image of an object or a view. In its simplest form the camera creates a 'record' of the object or view taken. This is appropriate for historic, technical or scientific purposes which require a 'matter of fact' image, known as a '**record shot**'. Such images are usually lacking in artistic merit.

Therefore, from the earliest days of photography in the Victorian era, photographers such as H P Robinson turned to the great masters of art for inspiration for photography (Turner, Constable, Moore, Rembrandt, etc). A group of Victorian era photographers formed an organisation called the Linked Ring whose aim was to promote photography as an art form. The Linked Ring eventually became the Royal Photographic Society. Camera clubs also encourage members to create images with good pictorial effect as well as high technical quality images.

Using a camera to create an image with good '**pictorial effect**' e.g. a picture which gives pleasure to the viewer, is the objective of photographic competitions.

Art is intended to give pleasure to the observer. It may or may not be a true likeness of the original object or view. Truth to reality in art is important. However, the photographer should do as the artist does and aim to represent the subject of the image to its best effect.

A student of photography would be well advised to also study art and the works of the great masters such as Turner, Constable, Moore, Rembrandt, etc. The rules of good pictorial '**composition**' can be seen in the works of the great masters, when you know what to look for. e.g. Rembrandt was the widely recognised master of lighting effect in his paintings. The student photographer could research something called 'Rembrandt lighting'.

The aspiring photographer should aim to apply those same rules of '**composition**' to make photographic images which are pleasing to the eye. The rules of composition can be broken but the photographer should do so knowingly. Success in photography is not easy to define or measure or achieve but it can be measured in terms of consensus of opinion by multiple viewers or a panel of judges who are experienced photographers or artists.

This 'primer' document does not explain the rules of pictorial composition in any depth because there are many books and internet sites which go into great detail about the following aspects of composition:-

- Balance
- Unity of purpose
- Pyramidal forms
- Variety
- Repetition
- Backgrounds
- Chiaroscuro
- Rule of thirds
- Rule of odds
- Rule of space
- Gestalt perception
- Colours harmony, colour contrast and the colour wheel

A good explanation of composition in visual art is available on Wikipedia.

8. Photography Procedures

Each photographer should devise their own techniques and procedures for creating pleasing photographic images. This document gives the following suggestions for the student photographer to consider and try:

A simple three-step process for creating images may comprise of the following steps:-

1. The Idea = the concept for the image, identifying the time and place and object
2. The Capture = operating the camera and lighting to obtain the intended image
3. The Realisation = post-processing and mounting of the image to realise the original idea

1. **The idea** for an image may be based on what someone else has done before, with or without modification. Good designs are often based on research of what has been done before and enhancing it. Alternatively, it may be something new or significant in some way. Pictures should tell a story and/or convey emotion.

2. **The Capture** of the image requires competent control of the camera and other variables external to the camera such as lighting, background and composition. A photographer should consider the lighting first, then consider the background then consider the composition **in that order.** These are then realised into an image by careful control of aperture, shutter, exposure and focus settings of the camera.

3. **The Realisation** of the image comes with developing, post-processing and printing or projecting the image to achieve the original idea or intent.

When capturing the image the **lighting** (natural or artificial, direction, etc), the **background** (depth of field, etc), the **composition** (pyramid forms, lines, balance, unity, rule of odds, colours etc), the **exposure** (high-key, low key, chiaroscuro, etc), then **focus** and **framing** of the image are the variables the photographer needs to learn and practice until they become second nature and instinctive, like driving a car. These should be considered in this sequence to form a simple memorable procedure.

Using planned and rehearsed procedures can greatly simplify, hence speed-up, the photographer's actions to achieve the desired result. The features and controls built into modern cameras have been designed and have evolved over many years to give the photographer the ability to control multiple variables in a convenient way. Like cars are designed to have equivalent controls in similar positions for the driver, cameras have similar controls despite who made it. This allows an experienced photographer to pick up any camera and use its main features immediately.

Modern cameras have the following primary controls:-

Auto – Fully automatic mode
P – Program mode
A – Aperture priority mode
S – Shutter priority mode
M – Manual mode

Auto is the fully automatic mode which is designed to allow the camera to decide the optimal settings. The camera decides the best compromise. This is useful if the intent is to be able to simply point and shoot. As with most things in life, compromise may not achieve what is required or intended by the photographer. For a novice to get their camera off the Auto mode it is necessary to understand the other modes available.

P - Program is a semi-automatic mode where the camera calculates the exposure value **Ev** and offers the user a range of feasible aperture **Av** and shutter **Tv** settings. This mode allows the user to set the ISO setting then scroll through a limited range of **Av + Tv** values that give the required exposure **Ev**. The user can choose a faster shutter speed with wider aperture hence less depth of field or a slower shutter speed with a greater depth of field. The ISO setting is also under the control of the user so an increased range of feasible Av + Tv values can be achieved by the user manually increasing the ISO setting, at the expense of more noise on the final image.

A - Aperture priority mode is where the camera allows the user to manually set the aperture (to choose the required depth of field) and the camera calculates the required shutter speed **Tv** to achieve the required exposure value **Ev**. The ISO setting is also under the control of the user so a faster shutter can be achieved by the user manually increasing the ISO setting, at the expense of more noise on the final image.

S – Shutter priority mode is where the camera allows the user to manually set the shutter speed (to capture fast moving objects) and the camera calculates the required aperture **Av** to achieve the required exposure value **Ev**. The ISO setting is also under the control of the user so a smaller aperture can be achieved by the user manually increasing the ISO setting, at the expense of more noise on the final image.

M - Manual mode is where the camera allows the user to manually set everything, including the shutter speed **Tv**, the aperture setting **Av** and the ISO setting. This means the photographer has to determine the exposure value **Ev** that will result from the chosen settings to achieve the correct exposure value Ev. Modern camera normally show the amount of under or over exposure when using the manual mode, based on the camera's built-in light meter. The manual mode gives the photographer full control of the four main variables of Ev, Tv, Av and ISO. This mode is appropriate when the photographer has plenty of time to choose the settings and measure the available light by some means, either using the in-camera light meter or other means such as a separate hand-held light meter. Manual mode is normally used in a photographic studio where the photographer has full control of the lighting and other variables. Therefore, manual mode is not ideal for photographing fast moving objects such as wildlife, unless it is done in fully controlled conditions such as a studio.

So which mode is best?

Photo-journalists may have specific business pressures to obtain images quickly and send them back to their newspaper immediately. They tend to have their camera set to capture files in both JPEG and RAW format so the JPEG file can be used or sent immediately. They would typically use the A - Aperture setting to allow them to control the depth of field and let the camera control the other variables. A flash gun may be used to add more light to the subject hence get a faster shutter speed. The flash gun would normally use TTL mode.

Fine art photographers may also use the A - Aperture priority setting to allow them to control the depth of field and they may not worry about the shutter speed because the camera can often be used on a tripod to allow longer shutter times.

Wildlife photographers need to capture fast moving objects so would tend to use the S – Shutter priority mode and be less concerned about the depth of field but also use a tripod to minimise camera shake which is magnified by using a large telephoto or zoom lens.

Portrait photographers normally have enough time and control of the lighting to allow them to use the M – Manual mode, particularly if the portraits are taken in a studio where lighting, props (such as chair, table, etc) and background are controllable. The portrait photographer would normally want to minimise noise or grain on the image so would choose a low ISO setting.

Therefore different camera modes suit different situations. This is an important decision for the photographer to make. The student photographer is encouraged to try all the modes and decide which mode they prefer for which situation.

9. Post-processing

Modern digital cameras often allow the image to be captured in one or more file formats. Top of the range cameras allow images to be stored using a manufacturer-specific raw file format. These raw files contain a lot of information about the image and allow a greater range of post-processing adjustments than other file formats.

Modern digital cameras also allow the image to be stored in a compressed format called JPEG or JPG, either instead of or as well as raw format. JPEG files are ready to be viewed so very convenient. Raw files need to be 'developed' on a computer and converted to another format such as TIFF or JPEG for viewing. The raw file from a digital camera is equivalent to the negative from a film camera.

The images from a digital camera can be transferred a computer for post-processing. A number of software products are available for processing digital images on a computer. A few of the more popular software packages are: 'Photoshop', 'Affinity Photo' and 'On 1'. These software packages vary in price. GIMP (the GNU Image Manipulation Program) is widely recognised as the best free image processing software. These software products can process the raw file formats from the main camera manufacturers as well as JPEG files. They can then save the images in other file formats such as TIFF etc. JPEG files are compressed so are smaller and more convenient. TIFF files are not compressed so do not lose image quality. The student photographer is encouraged to understand the various file formats available and choose the most suitable. For example, the camera could be set to store images in raw format, these can be transferred to a computer to be 'developed' and converted to TIFF (or other loss-less format) for storage. The TIFF images can then be converted to JPEG format for transfer or digital projection.

10. Conclusion

The reader of this 'primer' document may well be somewhat daunted by the number of variables they need to understand and control to achieve the photographic images they desire. As mentioned above, the photographer needs to work out their own preferred camera settings, procedures and methods of working to simplify the number of variables down to manageable number. Practice allows control of the variable to become second nature and instinctive, like an experienced driver doesn't need to consciously think about changing gear, leaving the driver to concentrate on the road and route. The same holds true for photography; it can take years for a photographer to control a camera instinctively, leaving them to concentrate on the desired image. If the student photographer realises it takes skill and experience over time to create great images, it becomes a very rewarding long-term hobby, or professional career! An experienced photographer can achieve a good standard of living doing what they love, when they have mastered the required competences.

11. Recommended Reading

<u>The books of:</u>
H P Robinson in the late 1800s, particularly:
"Pictorial Effect in Photography; Being Hints on Composition and Chiaroscuro for Photographers"

Michael Freeman, particularly:
"The Photographer's Eye"
"The Photographer's Mind"
"Perfect Exposure"
"Fifty Paths"

Susan Sontag's "On Photography"

Don McCullin, particularly his recent work on landscapes and still-life.

<u>The web sites of:</u>
The Royal Photographic Society: http://www.rps.org/
The Tate gallery: https://www.tate.org.uk/art
Magnum: https://www.magnumphotos.com/
Art UK: https://artuk.org/

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