# Table of Contents

## Chapter 1

Introduction to Digital Photography 4

The Digital Camera 5

Sensor Formats 6

Types of Digital Cameras 8

- Compact ‘Point and Shoot’ Cameras 8
- Bridge Prosumer Cameras 9
- Digital SLR Cameras 9
- Cross Section of an SLR Camera 10
- Mirror-less Interchangeable Cameras 11

Choosing a Camera 12

Camera Resolution 13

Essential Features of a DSLR 14

Advantages and Disadvantages of Digital Photography 17

## Chapter 2

Understanding your Camera 19

Focal Length 19

Focal Length and Magnification 19

Different Types of Lenses 20

## Chapter 3

Exposure 25

Aperture 25

Shutter Speed 26

Exposure Programs 28

ISO Sensitivity 34

Metering 35

[www.toehold.in](http://www.toehold.in)
<table>
<thead>
<tr>
<th>Chapter 4</th>
<th>Focussing</th>
<th>41</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AF Sensors</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>AF Points</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>AF Lock</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Autofocus Modes</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>AF Point Modes</td>
<td>44</td>
</tr>
<tr>
<td>Chapter 5</td>
<td>Image Stabilization</td>
<td>45</td>
</tr>
<tr>
<td>Chapter 6</td>
<td>Depth of Field</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>Circle of confusion</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Bokeh</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Effect of depth of field on images</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>DOF Preview</td>
<td>49</td>
</tr>
<tr>
<td>Chapter 7</td>
<td>Composition</td>
<td>50</td>
</tr>
<tr>
<td>Chapter 8</td>
<td>White Balance</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Filters</td>
<td>53</td>
</tr>
<tr>
<td>Chapter 9</td>
<td>Digital Post-processing</td>
<td>55</td>
</tr>
<tr>
<td>Chapter 10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Thought process of Photography

Conveying Stories

Special Traits of a Photographer

Ethics of Photography

Good Practices in Photography
CHAPTER 1

1. Introduction to Digital Photography

The popularity of digital photography is barely surprising because it has revolutionized the way we perceive and practise photography. The digitization of the camera and the accompanying post-production workflow have made photography a financially viable, accessible and practicable art form.

One of Toehold’s Photography Tour participants busy photographing the Nubra Valley in Ladakh during a Ladakh Expedition.

With a digital camera, it is possible to get instant feedback from the LCD about a picture just taken and take immediate corrective action if necessary. Digital cameras are flexible and agile and encourage you to take more photographs since the cost of image capture is lower than on film. In post-production, pictures can be edited more easily than in a darkroom and the connected web-world makes sharing and transmission of pictures a breeze.

All this combines to make digital photography a powerful medium of both artistic self-expression and documentation.

There are two major components in the process of digital image-making – the hardware and the software. The hardware comprises the camera and related accessories, including lenses, external flashes and support equipment such as a tripod or a monopod.

The software, which may or may not be necessary, comprises the proprietary image-reading and processing software bundled with the camera by the manufacturer, or a
third-party image-management or advanced image-editing application such as Adobe Photoshop or all of them.

1.1. The Digital Camera

A film camera uses a strip of photo-sensitive film to record light reflected off subjects into a photograph. In a digital camera, that strip of film is replaced by an electronic sensor chip, which has a number of 'photosites'. When the shutter button is depressed and the sensor is exposed, the photosites gather and store photons from the light falling on them. Once the exposure is over, the photosites are closed and the camera then assesses the quantity and intensity of the collected photons.

Each photosite has a ‘microlens’ above it, which functions as a funnel and directs photons from a wider area than the photosite into the photosite cavity. The amount of noise (visible grain) present in an image depends to a degree on the quality of the microlenses used, and over the years, camera manufacturers have been successful in achieving unprecedented low-noise levels by leveraging improvements in microlens design.

However, the sensor is unable to distinguish colours in the incident light, so, in order to compute the amount of primary colours, viz. red, green and blue, in a scene, a filter is required on each photosite to allow only one colour of light to pass through. This filter comprises alternating red, green and blue filters in a 4x4 matrix.

This array of primary colours is then translated into a final image that contains full colour information in each pixel, by a process called Bayer Demosaicing. The analogue information is then converted to digital data by an Analog-to-Digital Converter before being ‘written’ on to the memory card as an image file, which shows on the camera’s LCD immediately after the picture is taken.
1.2. Sensor Formats

Different types and different brands of cameras use different sensor sizes in relation to the size of a frame of 35mm film, which measured 36mm wide x 24mm long. The relative size is expressed as ‘nx’ where n is the factor by which the sensor is smaller or larger than 35mm film. E.g. A 1.5x sensor is one that is 1.5 times, that is 50%, smaller than 35mm.

Cameras with sensors the same size as 35mm film are often referred to as ‘full-frame’ cameras, those with sensors smaller than 35mm film are called ‘cropped-sensor’ cameras and cameras with sensors larger than 35mm film are known as medium-format and large-format cameras.

The image dimension ratio of most 35mm and cropped-sensor cameras is 6:4. Medium format and large format cameras often have image ratios of 5:4, 4:3 and even 10:8.

Below is an illustration showing the various sensor sizes in existence.
The size of the sensor used in a camera determines multiple factors, as follows:

**Angle of View:** The smaller is the sensor, the narrower is the angle of view and vice versa. This is why a 27mm lens on a ‘full-frame’ camera gives the same angle of view as an 18mm lens on a 1.5x cropped-sensor camera (18 x 1.5 = 27). While this is a disadvantage for wide-angle work, as wider lenses are needed on cropped-sensor bodies than on full-frame bodies to achieve the same angle of view, for telephoto work, especially in wildlife photography, this often proves to be a boon since shorter focal length lenses can be used to achieve the same ‘reach’ (through a narrower field of view) as a longer focal length lens on a full-frame body. E.g. A 400mm lens will yield the same field of view as a 600mm lens, thereby allowing the photographer to take a tighter photograph of the subject without needing a longer lens or having to get closer.

Note that in any case, the focal length of a lens does not change upon being mounted on a cropped-sensor body. A 400mm lens remains a 400mm lens; only, it yields the effective field of view of a 600mm lens due to light from only its centre part being used by the sensor.

![Image of angle of view and consequent composition on two popular DSLR sensor formats.](image)

Some camera bodies active in the market in the year 2012:

**Full Frame DSLRs**
Nikon D4, D3s, D800/D800E, D700
Canon EOS 1DX, 1Ds Mark III, 5D Mark III, 5D Mark II

**Crop Sensor DSLRs**
Nikon D300S, D7000, D5100, D3100
Canon EOS 7D, 60D, 50D, 600D, 550D, 1100D, 1000D
**Image Quality:** For the same image size (number of megapixels), a larger sensor generally yields better image quality than a smaller one. This entails better dynamic range and lower noise at high-sensitivities. Since larger sensors have larger pixels, their light-gathering capabilities are better, resulting in smoother images.

**Price:** Because sensor chips are expensive, sensor size is directly proportional to cost. This is why large-format cameras are more expensive than full-frame bodies, which in turn are more expensive than cropped-sensor bodies.

### 1.3. Types of Digital Cameras

#### 1.3.1. Compact ‘Point and Shoot’ Cameras

Compact point-and-shoot cameras are the smallest and least expensive dedicated non-disposable cameras available. These cameras, made by several companies including Nikon, Canon, Sony, Panasonic, Olympus, Samsung and Leica, employ very small sensors to keep the physical dimensions of the camera to a bare minimum to enable effortless carrying and use. Most cameras feature a modest amount of optical zoom, have very basic autofocus systems although modern feature additions such as face-detection provide assistance in casual situations. These cameras are typically weak in low and very low light, so that they are typically not suited for high-quality applications.

Most or all compact point-and-shoot cameras have zoom lenses, that is, lenses that offer a range of focal lengths. This zoom range is called the optical zoom and is expressed as a ratio of the longest focal length to the shortest focal length, with an ‘x’ as a suffix. E.g. if the lens has a focal length range of 10mm to 30mm, the optical zoom is 30/10 = 3x. Therefore it follows that the larger this ‘x’ number, the wider the zoom range. However, too large a zoom range (such as 20x), although sounds attractive, is not desirable because in optics, quality and versatility are usually mutually exclusive, and the wide zoom range often comes at the cost of sharpness and other optical quality parameters.
1.3.2. Bridge Prosumer Cameras

Bridge cameras are compact point-and-shoot cameras that attempt to offer some features of a DSLR while not losing the inherent advantages of a compact camera, such as economy and lightness. These typically include manual control over shutter speed, aperture, ISO, white balance, metering and even focus. Many bridge cameras sport DSLR-like hand-grips and a substantial zoom range to enhance ergonomic comfort and versatility in a small, fixed but versatile package. The two biggest differences of bridge cameras from DSLRs are that they employ a smaller sensor and do not offer lens interchange ability.

Such cameras are ideal for a somewhat demanding casual photographer, who wants more from their camera than a basic point-and-shoot camera offers, without assuming the financial and weight burden of owning a DSLR. Examples of such cameras are the Panasonic Lumix series, Fujifilm Finepix series and those made by Sony and Konica Minolta.

1.3.3. Digital SLR Cameras

Single Lens Reflex (SLR) cameras are those in which the photographer views a scene directly through the lens, before taking a picture. This is achieved with the help of a mirror, which reflects light from the lens on to a pentaprism viewfinder above, which in turn reflects light to the eyepiece, ensuring utmost accuracy and simplicity in visualising and composing a picture. The optical viewfinder in SLR cameras allows a bright, clear view with minimal battery usage, and provides a range of shooting information to the photographer without having to look away to find it on the LCD. An SLR camera allows lens interchange ability, thereby allowing the photographer the critical ability to use a lens specialized for a particular application.
Cross Section of an SLR Camera

1. **Lens** – The optical device attached to the front of a camera body, necessary to direct light to the sensor and take a picture

2. **Mirror** – The sensor-sized piece of reflective glass that reflects light coming through the lens up onto the pentaprism to enable through-the-lens viewing in the viewfinder, and flips up and down when a picture is taken

3. **Shutter** – The screen over the sensor that opens to expose the sensor to light coming in through the lens for the duration specified, and then shuts to complete the exposure

4. **Sensor** – The device that converts light rays into an electronic signal, using a chip and other electronic components

5. **Focusing screen** – The piece of ground glass or Fresnel lens that enables the viewing and focusing through the viewfinder

6. **Condensing Lens** – The component that concentrates light from the illumination source that is in turn focused through the object and magnified by the objective lens

7. **Pentaprism** – The five-faced prism that reflects light coming up from the Mirror to the Eye-piece of the viewfinder, enabling the photographer to see the same view as being obtained by the lens

8. **Eye-piece** – The opening through which the photographer looks into the viewfinder to compose and focus
1.3.4. **Mirror-less Interchangeable Cameras**

The mirror in SLR cameras, which performs the function described earlier, contributes greatly to the size of the camera apart from causing vibrations at the time of the picture being taken, sometimes leading to blurry images at slow shutter speeds. Mirror-less cameras eliminate these demerits while retaining the other benefits of an interchangeable lens camera, by replacing the mirror-based optical viewfinder with an electronic one that does not require a mirror. Mirror-less interchangeable lens cameras use sensors smaller than SLR cameras but larger than compact point-and-shoot cameras, so they slot in between the two as regards functionality, responsiveness, capability and image quality.

There are different formats and sensor sizes that different camera companies use, with the ‘Micro Four Thirds’ system used by Olympus and Panasonic (2x of full-frame); the CX system used by Nikon (2.7x of full-frame); the APS-C format (1.5x of full-frame) used by Fujifilm, Pentax, Ricoh, Samsung and Sony; and the APS-H (1.3x) format used by Leica, apart from full-frame, chiefly in existence.

The main advantages of a mirror-less interchangeable lens camera system are compactness as compared to DSLRs, lens interchanging ability, better autofocus performance and image quality as compared to compact point-and-shoot cameras, and quietness and stability of operation.

The main disadvantages include inferior autofocus performance and responsiveness compared to DSLRs, somewhat lower image quality and lack of an optical viewfinder in most cameras.
1.4. Choosing a Camera

Contrary to common belief, a universally best camera does not exist. A digital SLR camera, although arguably more capable than a compact point-and-shoot camera, may not be ideal in some situations such as when you wish to remain discreet, cannot carry a lot of weight or want a very wide zoom range in a highly compact package. Conversely, if making huge high-quality prints or freezing very fast action is the priority, a point-and-shoot camera may not be the answer.

Therefore, choosing the ideal camera is a matter of matching individual need and constraints with what is available. Think carefully about your target genre, your potential subjects, your end application, future aspirations and related issues before honing in on the range of equipment that would serve your need the best. Then, procure the best equipment you can afford and make sure you utilize it to the optimum.

If you are not clear about your needs, always start with basic equipment and then work your way upwards gradually as you become clearer. This will also allow you to master your tools and use them to their limits before migrating to something more capable.

www.toehold.in
Great images can be produced with the most basic of equipment, even a phone camera. The more advanced cameras only provide additional capabilities in specific situations, besides offering many conveniences.

When using an SLR and required to choose between a camera body upgrade and a lens upgrade, always prioritize a lens upgrade since your image can be only as good as the lens is. Besides, the high resolution of contemporary camera bodies glaringly exposes any flaws in the lens, making it wiser to spend on high-quality lenses, which also retain their value much better than digital camera bodies.

When choosing a brand, take a hard look at the variety, suitability and affordability of the lenses available in the system and pick the one that offers you the most complete solution. If possible, hire the camera body and the lens you are considering buying to experience them firsthand before making a final decision.

Do not be swayed my marketing jargon or the allure of higher resolution. Pay more value to features and performance areas that matter to your style of photography.

At any time during your photography endeavour, if you find it difficult to choose a camera or any other piece of equipment, please feel free to contact your mentor or any of Toehold’s photographers for advice.

1.5. Camera Resolution

A pixel (short for picture element) is the smallest unit of a picture that can be represented or controlled. A cluster of pixels in the horizontal and vertical axes forms an image. The greater the number of pixels is, the higher the resolution of a camera is.

For example, if a camera produces images that are 4000 pixels wide x 3000 pixels long, the resolution is 4000 x 3000 = 12000000, i.e. 12 million pixels or 12 Megapixels. A 1920 x 1080 image has 2.073 Megapixels.

Resolution is also specified in Pixels per Inch (PPI) or Dots per Inch (DPI), which, as the names suggest, defines the number of pixels per unit dimension. The maximum DPI supported by web display is 72, but printers can process 300 DPI or more. The greater the resolution, the higher the quality of a print, and it is therefore desirable to print at least 250 DPI to ensure maximum quality. The quality and size of a print are functions of image size and resolution.

E.g. to print a 12 x 18 image at 300 DPI, the image needs to be (12 x 300 = 3600) by (18 x 5400) pixels. If the image is smaller but the same size of print is required, either the image has to be upsized through interpolation in photo editing software like Photoshop, or printed at a lower DPI.

<table>
<thead>
<tr>
<th>Final Print</th>
<th>Megapixels</th>
<th>Image Size on Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>10” X 6.5”</td>
<td>5.3 Megapixels</td>
<td>3008 X 1960 pixels</td>
</tr>
<tr>
<td>13.5” X 9”</td>
<td>11.1 Megapixels</td>
<td>4064 X 2704 pixels</td>
</tr>
</tbody>
</table>

The table above shows the print size that can be obtained at a particular image size.

www.toehold.in
1.6. Essential Features of a DSLR

35mm-, APS-H- and APS-C-DSLRs offer many advanced features and highly efficient performance that make them the most popular choice of serious amateur photographers and professional sports, wildlife and journalistic photographers who need an agile combination of performance and quality. The chief features that make a DSLR a potent tool are:

**Lens Interchanging Ability**

DSLR cameras allow easy interchanging ability of lenses so that the photographer can choose the most appropriate lens for a specific application, e.g. a wide-angle lens for a landscape image or a telephoto lens for wildlife. This allows the photographer to obtain maximum image quality with a set of right lenses for various purposes.

**Full Manual Control**

Doesn’t it always feel good to be in charge of the reins and have the power to engineer your own future? A DSLR camera allows just that, by enabling complete control over all the programmable functions of a camera, including exposure metering, autofocus mode, ISO sensitivity, white balance, flash style and picture style apart from the obvious aperture and shutter speed values.

This supports the photographer, not the camera, to decide exactly how they want a picture to look and ensures that the annoying flash doesn’t popup when you’re photographing a grumpy elephant from close range in low light!

**Low Response Times**

Suppose that you wanted to take a photograph of your best friend exchanging rings at his wedding ceremony. You framed and clicked the shutter just when he was about to put the ring onto her finger but the camera didn’t respond immediately; it clicked only two seconds later, by when the couple was already sharing a kiss! That would be a pity, wouldn’t it? The worst part would be, the wedding being a once-in-a-lifetime event, you’d probably never have another opportunity to freeze the seminal moment.

Most DSLRs typically have very low response times, so that when you depress the shutter release button, the moment you want to capture is mostly what is captured, especially in low-light conditions and when using flash. The high processing power in DSLRs also helps them display clicked images faster, makes zooming in and zooming out while playing back images smoother and generally enables the camera to get out of your way as much as possible. This lively responsiveness alone makes a DSLR worth the money for a lot of photographers.
Flexible Capability

Want to photograph that local derby in the morning as well as a star-studded sky at night, with some early-morning and late-evening wildlife thrown in between? No problem.

DSLRs typically have a wide range of capabilities, including very low to very high shutter speeds and very low to very high ISO sensitivities, to help you tackle most situations in most photography-genres. The extendibility of SLRs ensures that you are equipped to tackle a variety of shooting situations.

Big Sensors

There is a popular myth, propagated by camera manufacturers to further their new products and embraced readily by consumers, that image quality increases in direct proportion to number of pixels. While this is not necessarily true at all, and can in fact even be contrary to the truth if too many pixels are packed into a given sensor area, it is generally true that image quality increases with sensor size itself provided the number of pixels is reasonable. The minimum size of sensor in use in DSLRs today is 2x, which is much larger than sensors employed in compact point-and-shoot and even mirror-less interchangeable lens cameras, thus yielding higher dynamic range, greater sharpness (although this is variable by the lens used), better high-ISO-sensitivity noise performance, more accurate and vivid colours and fine detail and surface textures.

Phase-detect Autofocus

Most or all DSLRs use an autofocus system superior to the contrast-detect autofocus employed by compact point-and-shoot cameras, called phase-detect autofocus, which is faster and more accurate in a wider range of situations, especially for moving subjects, low-contrast scenes and low-light conditions.

Image Size and Raw Capture

There are DSLRs that offer up to 36MP images (the just-announced D800 and D800E), and those offering 24-25MP are not uncommon (Canon 5D Mark II, Nikon D3X etc), with even entry-level modern DSLRs offering 14-18MP. This allows large print sizes, capture of a great deal of detail and flexibility in composition through fair amounts of cropping. All DSLRs also allow full raw data capture for maximum control in post-production processing and a variety of sizes and compression level settings to balance size with quality.

Optical TTL Viewfinder

Nearly all DSLRs are equipped with bright optical viewfinders that enable through-the-lens viewing for observation and composition before image capture, and advanced, semi-professional and professional DSLRs offer 100% coverage viewfinders. This ensures accurate visualisation and framing before a picture is taken at the expense of minimal battery power.
Fast Continuous Shutter Burst Rate

Continuous shutter burst is that feature of a camera that allows the photographer to take a sequence of pictures in one continuous flow by holding the shutter-release button depressed. DSLRs, thanks to their more powerful processors and more robust mechanics, typically tend to provide faster continuous shutter burst rates than lower cameras, with the maximum speed in existence today being 14 frames per second (FPS). Such a fast continuous burst rate is not necessary for normal shooting but is useful in capturing many stages of a bird’s flight off a perch or the swing of a footballer's kick.

Large Buffer

When shooting in continuous burst mode, the camera saves the pictures being taken in a temporary in-camera memory, called the buffer, before writing them onto the memory card when you pause or when the buffer fills up – whichever occurs first. Therefore, the larger this buffer is, the longer you can continue shooting before the camera compulsorily pauses to write images onto the card. DSLRs typically have larger buffers than lower cameras, allowing you to keep shooting longer and ensure you capture all the moments you want, even though files are typically larger. This is especially critical when shooting action.

Body Ergonomics and Robustness

To ensure that you don’t let critical moments pass by while you’re busy changing settings on your camera, DSLRs have buttons to many frequently-changed, key settings on the body itself, which allows quick changes.

Powerful Flash

DSLRs are equipped with a powerful in-camera flash that has a fairly good coverage, which proves very handy in low light conditions. Flash recycle times are also typically much lower, and one can always connect not just one external flash but a network of multiple external flashes for maximum creative possibility.

Functionality

Increasingly, camera manufacturers are bundling in many handy features in DSLRs that make them all the more attractive. Most recent DSLRs sport full-HD video recording with sound with various frame rate and size options, and the subject-isolation capability of DSLR lenses allows the photographer to make striking HD videos at the click of a button, although the autofocus in video mode in most DSLRs is still primitive, limiting the use to stationary or slowly-moving subjects.

All DSLRs have exposure and white-balance bracketing, which is very handy when you are not sure of the correct exposure or white-balance to use or are making High Dynamic Range (HDR) images. Many cameras are equipped with in-built HDR processing as well, while some cameras are loaded with many more innovative tools such as Interval timer shooting, which is critical to time-lapse photography, multiple exposure, selective de-saturation and monochrome shooting modes, which open up many creative opportunities.

Besides, most DSLR cameras allow some basic amount of in-camera image adjustment or editing, including cropping, colour-balance adjustment and conversion.
to monochrome, saving precious processing time for photographers who need to get their images across to somewhere else quickly or take them to print right away.

**Battery Power**

DSLRs typically offer much more shooting power on one charge, especially when using flash and even when shooting in raw mode, than compact point-and-shoot and mirrorless cameras. This is further enhanced when an optional battery grip, which houses a second battery, is used. Many high-end DSLRs have this battery grip built in and offer twice the battery performance by default; hence the photographer is much less likely to run out of power during an intensive shoot when using a DSLR than smaller format cameras.

### 1.7. Advantages and Disadvantages of Digital Photography

As discussed earlier, the advantages of digital photography are many, including instant feedback, flexibility, versatility and adaptability, lower per-image cost, accessibility and creative freedom.

But, just like anything else, digital photography is not perfect and there are disadvantages:

**Need for software**

A raw image is the as-captured, unprocessed non-image-format file that retains all the data captured at the time the picture was taken, and thus allows maximum latitude during post-shoot processing. Most serious photographers shoot in the raw mode not only to allow themselves this room for adjustment in processing but also because many competitions require submission of the original raw images for verification of authenticity.

But since the raw image needs to be first read and converted to an image format (like JPEG or TIFF), the proprietary software supplied by the camera manufacturer or third-party software (like Adobe Photoshop) that has the latest updates is required, and because virtually every new camera, even if from the same manufacturer, produces a different type of file even if in the same format, the software needs to be updated each time you change your camera. This requires the modern photographer not only to be computer-literate but also learn using image-editing software.

**Room for Excessive Manipulation**

Image manipulation per se is not an objectionable thing. Basic enhancements to an image are not a luxury but almost a necessity, since images straight out of the camera are seldom optimal in visual appeal and technical precision.

Even manipulation beyond merely basic enhancement, involving removal or addition of elements from or into a picture or alteration in unnatural or unrealistic ways, is completely acceptable provided the image maker is honest in disclosing the fact.
However, there is a chance of manipulated images being passed off dishonestly as natural, as-shot images, which creates an environment of distrust, thus causing the work of even an honest photographer to be regarded with scepticism. This can undermine the entire vocation of both documentary and artistic photography and make it harder for photographers to earn credibility.

Image Management

Since digital cameras encourage prolific photography, handling and organizing all the gigabytes of data collected is a serious issue for frequent photographers, which requires them not only to spend a significant amount of time and energy managing files but also to procure the necessary computing infrastructure for processing and storage of the abundance of data. Besides, since the images are in perishable soft format and hard disks have an almost inexorable tendency to eventually fail, photographers need to invest considerable time and money in making several copies of their work to safeguard it.

Intellectual Property Security

The ease of sharing and transmission also entails the danger of misuse. Images posted online even with watermarks can be plagiarised by anybody and exploited for commercial purposes or even be labelled by someone else as their own original piece of work.
2. Understanding your Camera

2.1. Focal Length

Focal length is the distance between the focal point (in the lens) and the focal plane (the camera sensor), and is usually expressed in millimetres. That is, in a 50mm lens, the distance between the focal point of the lens and the camera sensor is 50mm (5cm). Focal length is one of the key specifications of a lens.

2.2. Focal Length and Magnification

The longer the focal length, the narrower the field of view and the greater the magnification of a scene (that is, the larger the subjects will appear in the frame). Consequently, the longer the focal length of a lens, the longer the lens will be physically. An illustration that shows the same scene shot at various increasing focal lengths shows its effect:
2.3. Different Types of Lenses

One of the biggest benefits of an SLR is the flexibility it offers by allowing the photographer to use specialised, high-quality, lenses for specific purposes. Here, we discuss the various types of lenses in existence and their ideal applications.

**Manual Focus versus Auto Focus:** Before taking a picture, it is necessary first to bring the intended subject(s) into sharp focus. To achieve this, the focus elements inside the lens need to be aligned in accordance to the distance of the subject(s) from the camera to bring them into focus. Up until the 1980s, this process had to be done manually by the photographer by twisting a focus ring on the lens while looking through the viewfinder until the subject(s) came into focus. Lenses that need to be thus operated to focus are manual focus lenses. Although available even today, manual focus lenses are not in popular use because they are usually too time-consuming to use for anything that is not stationary.

Auto focus lenses, on the other hand, employ a motor in the camera or in the lens itself to achieve alignment of the focus elements of the lens to bring the subject(s) into sharp focus. The photographer indicates a part of the scene visible through the viewfinder or the camera’s LCD as the subject that needs to be in focus by using any of a number of focus points available on the focusing screen visible in the viewfinder.

**Fixed Focal Length versus Zoom:** Fixed focal length lenses are those that offer one fixed focal length and no other. E.g. a 105mm fixed lens will always give a focal length of 105mm. Because these lenses are simpler to construct and use fewer glass elements than zoom lenses, until recent times they offered better image quality than the latter, and therefore came to be known traditionally as ‘prime’ lenses. However, the advancements in technology and years of research and development by leading optical companies have made some professional zoom-lenses as good as or even better than certain fixed focal length lenses.
Zoom lenses are those that offer multiple focal lengths by allowing the photographer to twist or pull and push a ring on the lens barrel to ‘zoom in’ to and ‘zoom out’ of a scene to vary the composition and the size of the subject in a frame. E.g. an 18-55mm lens allows the user to use the lens at all the calibrated focal lengths between 18mm and 55mm.

**Wide-angle:** These lenses provide a wide angle of view and are most popularly used for landscapes, journalistic photography and for any type of photography that requires you to include a big subject with its surroundings from close quarters. Typically, lenses having a focal length between 18mm and 28mm on a full-frame camera are classified as wide-angle lenses, while those having a focal length between 14mm and 17mm on full-frame are referred to as ultra-wide-angle lenses. Lenses that offer multiple ultra-wide-angle or wide-angle focal lengths, such as 14-24mm or 16-35mm, are called wide-angle zoom lenses.

**Normal:** Lenses with a focal length of around 50mm on a full-frame body and 35mm on a 1.5x crop body are classified as normal lenses because they afford a field of view that is most similar to that of human vision. Lenses like the 28-70mm, which...
cover the normal focal length along with a wider range, are often referred to as 'normal zooms'. The most popular normal lenses in SLR photography are the 50mm f/1.4 and f/1.8 lenses, which are small and light, inexpensive, offer prodigious light-gathering ability and due to their relatively simple construction, yield excellent image quality. These fast normal lenses are most commonly used for street and journalistic photography, landscapes, portraiture, weddings and general creative work.

Above: Nikon and Canon 50mm f/1.8 prime lenses

Lenses with a range of focal lengths are referred to as zoom lenses while lenses with just one focal length like the 50mm f/1.8 are referred to as fixed focal length or “prime” lenses.

Macro: When you need to photograph a small object from very close so that the subject is rendered at or greater than life size (referred to as 1:1 or greater than 1:1 magnification), a macro lens (or ‘micro’, in Nikon parlance) is what you need. Macro lenses come in different focal lengths, from 40mm to 200mm, and the choice depends on the sensor format, the nature of the intended subjects and other considerations. Macro lenses are usually prime lenses.

Above: Nikon 105mm f/2.8 VR and Canon 100mm f/2.8 macro lenses

Telephoto: Lenses with focal lengths longer than the ‘normal’ range are referred to as telephoto lenses. These lenses offer high magnification and are highly useful in ‘compressing’ a scene, that is, making distant objects appear closer. Lenses in the
range of 60 to 90mm are called short telephoto lenses, those in the range of 105 to 120mm are referred to as medium telephoto lenses, lenses in the range of 135mm to 300mm are called simply telephoto lenses and the highly specialised lenses offering a focal length of more than 300mm (400mm, 500mm, 600mm and 800mm) are often referred to as 'super-telephoto' lenses.

Special Purpose Lenses

**Fisheye:** A special type of wide-angle lens, a fisheye lens is used to create either a circular image in the centre of a frame or a highly distorted, curved perspective of a scene rendered as a rectangular image filling the frame. Fisheye lenses are available for both full-frame and cropped-sensor SLR cameras and are employed by creative photographers to create an unusual and spectacular view of a scene.

Tilt-shift: Also known as Perspective Control (PC) lenses, these are used typically in architectural and landscape photography to control the perspective and depth of field through selective focus achieved by moving the camera as required, that is, tilting of the camera in relation to the image plane, and movement of the camera in
parallel to the image plane, called ‘shifting’. Among other things, this helps avoid convergence of parallel lines such as when photographing tall buildings at close range.

Teleconverters

Teleconverters are an inexpensive way of extending the focal length of a telephoto lens. A teleconverter is mounted between the body and the lens, and it works by multiplying the focal length by its specified amount. The most commonly available multiplication factors are 1.4 and 2, with Nikon offering 1.7 as well. The caveat with using a teleconverter is that it causes the usable maximum aperture or f-stop to drop by the corresponding multiplication factor.

E.g. when a 1.4x teleconverter is used with a 300mm f/2.8 lens, the focal length becomes 300 x 1.4 = 420mm, while the maximum aperture will drop to 2.8 x 1.4 = f/4.

Teleconverters are almost exclusively used with telephoto lenses, almost invariably slow down the autofocus and in many cases, reduce image quality. They generally work better on fixed focal length lenses than on zoom lenses.
CHAPTER 3

3. Exposure

An image is formed when the camera’s sensor is exposed to the light reflected off the subject that is being photographed. Hence, exposure simply means the process of letting a finite amount of reflected light hit the sensor for a finite amount of time.

The sensor then captures photons from the incident light as explained earlier and the electronic components in the camera convert the information into a digital image.

Thus it follows that exposure is a function of two variables – aperture and shutter speed, apart from the ISO sensitivity, which we shall ignore for the moment.

3.1. Aperture

The aperture is simply the hole at the back of a lens, visible through the rear glass-element. This hole is formed by a number of blades that are controlled by a diaphragm. The diaphragm contracts or expands to define a smaller or larger hole when a picture is taken, to control the aperture size.

The larger the aperture, the greater is the amount of light that can pass through it in one exposure.

Aperture is expressed in ‘f-stops’ and as a function of focal length as:

\[ \text{Aperture} = \frac{\text{focal length}}{f\text{-stop}} \]

That is, the aperture size in millimetres of a 300mm lens at the f-stop f/4 is: \( \frac{300}{4} = 75 \text{mm} \).

This is why the larger the aperture of a lens, the larger the lens has to be physically.

**Effect of aperture on an image:** The larger the aperture is, the higher the shutter speed that can be used in any given situation, which is why large aperture lenses like f/1.4, f/1.8, f/2 and f/2.8 lenses are so popular for night, sports, indoor and wildlife photography, where light-gathering ability or fast shutter speeds are critical. A large aperture also helps isolate the subject from its surroundings, because of the shallow depth of field obtained at maximum aperture. See Depth of Field for more details. Most lenses are at their sharpest when shot at about two stops below their maximum aperture but many modern or professional lenses are impressively sharp wide-open as well.
3.2. Shutter Speed

Shutter speed is the duration for which the shutter of the camera is opened so that the sensor is exposed to incident light. It is usually expressed in fraction of second, e.g. 1/500sec but in the context of night and astronomical photography, the shutter speeds used are usually in seconds. All DSLRs allow a shutter speed range of 30sec to 1/4000sec in up to one third stops. The larger the denominator of the shutter speed is, the faster the shutter speed is said to be. Advanced DSLRs allow shutter speeds of up to 1/8000sec, although such a fast shutter speed is very rarely required, usually only when using very large aperture lenses and/or shooting in very bright light.

Effect of shutter speed on an image: Shutter speed has a direct relation with the sharpness of an image. A slow shutter speed captures the motion of subjects in the scene or the motion of the camera due to shake while shooting with the setup hand-held. Depending on the exact slowness of the shutter speed, moving subjects in a scene can be rendered as anywhere between a slight blur and a long streak.

If such blur or rendering as streaks is not desired, then a fast enough shutter speed that freezes the motion of the subject should be used. The minimum shutter speed required for such situations depends on how fast the subject is moving.
For typical fast-flying birds and moving vehicles, a shutter speed in excess of 1/1600sec is considered safe. For a subject moving more slowly, a slower shutter speed may be sufficient.

When shooting a waterfall or any sort of dynamic water body, using a fast shutter speed like even 1/250sec will render the water stream as sharp droplets while employing a slow shutter speed such as 1sec to 1/10sec (depending on the speed/force of the water) will render the water as a smooth, foamy streak that nicely portrays the flow of the water. This is the simplest and most powerful example of how shutter speed influences the nature of an image.
3.3. Exposure Programs

All DSLRs offer multiple shooting modes, also called exposure programs, to allow the photographer maximum flexibility in shooting according to individual style and specific situations. In addition to the five modes explained below, most basic and many mid-level DSLRs are also equipped with ‘dummy modes’ for portraits, landscapes, sports, night photography etc. The important and most-frequently used modes are explained below.

**Automatic (denoted as AUTO):** In this mode, the camera performs just like a point-and-shoot, that is, all settings for a photograph are determined entirely by the camera, without needing any manual input from the photographer and making camera operation very easy for a beginner. However, this is not the appropriate mode for an advanced photographer because no settings can be overridden at any time, including automatic flash popup.

**Programmable Automatic (denoted as P):** In this mode, the camera chooses most of the settings automatically but allows the photographer to override some decisions. Use of flash is a manual choice and exposure compensation can be applied. The aperture and shutter speed are chosen by the camera for any scene based on in-built algorithms, but the photographer can override these too if necessary.
Aperture Priority (or Aperture Value, denoted as A or Av): In this mode, the photographer inputs the aperture at which they want the camera to shoot, and the camera calculates and sets the appropriate shutter speed for that aperture. This is probably the most popular shooting mode among advanced amateurs and professionals since aperture is probably the most variable parameter for most types of shooting.

Once a desired depth of field is decided all that the photographer needs to do is set an appropriate aperture and ISO. The Camera sets the best possible shutter speed according to the situation and saves a lot of time.

Please read the Exposure Compensation section to learn to over-ride camera decisions on the shutter speed to gain additional control in this mode.

Using smaller apertures, a high depth of field can be obtained like in this landscape image by Giri Cavale, made on one of Toehold’s Ladakh Photography Expeditions.
Shutter Priority (or Time Value, denoted as S or Tv): In this mode, the photographer inputs the shutter speed they want and the camera calculates the appropriate aperture for that shutter speed. This mode is ideal when taking a panned shot, or when photographing waterfalls or other dynamic subjects with a slow shutter speed, so that the exact shutter speed to obtain the desired effect can be input into the camera.
Using Shutter Priority modes one can set the camera to slower shutter speeds like 1/20, 1/10th of a second to deliberately obtain motion blurs like in this photograph.

Manual (denoted as M): In this mode, the photographer inputs both the aperture and the shutter speed for a photograph manually, with the camera not deciding on any parameter on its own. This gives the photographer ultimate control in deciding how the image turns out.

However, it is a myth that to do justice to a DSLR, one should use the Manual mode all the time. In order to choose the appropriate aperture-shutter speed combination, an external incidental light meter is needed, and without this, the accurate exposure can only be guessed or estimated by trial and error, which leads to exposure inaccuracies and loss of time and possibly precious photo opportunities.

Therefore, the Manual mode should be used only when the camera’s inbuilt meter is likely to yield an inaccurate reading due to challenging conditions or when you have plenty of time at hand, such as when photographing landscapes or working in a studio. An external light meter tends to be more accurate than the camera’s inbuilt light meter, since the former measures light directly incidental on it, whereas the latter meters light reflected off the subject through the lens. This becomes particularly important when photographing back-lit subjects or scenes that have contrasting or confusing light.
This famous photograph of macaws in flight was shot on Manual mode after setting the exposure required for a well-lit area, which wasn't available in this frame.

**Bulb Mode**

This famous photograph of macaws in flight was shot on Manual mode after setting the exposure required for a well-lit area, which wasn’t available in this frame.

The slowest (longest) shutter speed setting offered by most or all DSLRs is 30 seconds. The Bulb mode is used when an even longer exposure (using an even slower shutter speed) is required. The Bulb mode allows the photographer to expose for a virtually infinite time, that is, as long as the battery has power, or, if plugged into an electricity point, as long as there is uninterrupted power supply. To enter the Bulb mode, switch the camera to the Manual exposure program and then turn the dial controlling shutter speed beyond 30 seconds. The Bulb mode is best used in conjunction with a remote trigger (either a cable release or a wireless infrared or radio remote) because otherwise, you will need to physically keep the shutter release button pressed for the duration of the exposure, which is impractical for very long exposures. Also, a tripod or some form of secure support is critical.

Two ways in which the Bulb mode can be used are explained below.

**Star trails** – A star-trail image is one that shows the stars in the night sky as circular streaks, rendered so because of the rotation of the earth in orientation to them over the duration of the exposure. One of the ways of making a star-trail image is to expose for several minutes or even hours, to obtain an image that shows stars rendered as several circles with some prominent anchor in the foreground, such as a tree, a building, a rock or any other object. To do this, once in the Bulb mode, press the button on the remote trigger to open the shutter and start the exposure and then, once you think you have exposed for long enough, press the button on the remote again to close the shutter.
This beautiful picture was shot around Ladakh’s Tso Moriri lake using a Nikon D700 body with a Nikon 24-70mm f/2.8 lens set to f/8 on Manual (Bulb) mode. The shutter was open for nearly 16 minutes creating the radial trail of the stars and also capturing colours due to the long exposure on a moon-lit night.

Capturing lightning – The challenge with capturing lightning is the inherent difficulty in predicting its location and timing but the Bulb mode makes it relatively easy. Using a wide-angle lens, compose the scene such that you have a high probability of catching a lightning strike somewhere in the frame. Set an appropriate aperture, switch to the Bulb mode and begin the exposure by pressing the remote trigger button. Then, when a stroke of lightning strikes within the view of your composition, stop the exposure by pressing the shutter button again and you will have hopefully caught a lightning streak. Try again if you haven’t!
3.4. ISO Sensitivity

The light-gathering ability of a sensor is dependent on the sensitivity it is set at. The higher the sensitivity, the more light it can gather on an exposure, thereby yielding faster shutter speeds (since the amount of light being gathered is high, the duration of light gathering can be low.)

Therefore, when the light gets low and despite using the maximum aperture of the lens the shutter speed is insufficient to freeze the motion of a moving subject or the shake of the photographer’s hand when not using a tripod, increasing the sensitivity of the sensor is the only way to increase the shutter speed and obtain sharp images. However, there is a caveat.

Just as when the output volume of an audio speaker is increased considerably, disturbances in the form of noise are also amplified along with the music, so when the ISO in a camera is increased, the visual noise (colour and monochromatic grain) also increases. Therefore, ISO sensitivity should be increased judiciously, and it is preferable to use the lowest possible ISO for any given situation.

Before digital cameras came into existence, films would be available at specific ISO sensitivities, such as 50, 64, 100, 200 and 400. Once a roll of film was loaded, the photographer could not change the sensitivity unless they changed the roll of film. But in digital cameras, the sensitivity can be changed at any time at the press of a button.

The advent of full-frame 35mm sensor digital cameras and several years of advancement in technology have allowed unprecedented improvements in high-ISO image quality. During the film days, the ceiling for high-sensitivity was 800 ISO, which itself would yield very high noise. Today, there are cameras that offer ISO sensitivities of over 100,000 and fairly clean, usable images at 6400 ISO, representing an eight-time improvement over film! Thus it is now possible to take photographs without using flash in a wider variety of lighting conditions than was earlier possible, which opens up a wealth of new shooting opportunities.

**AUTO ISO**

Most or all DSLRs offer an Auto ISO feature, which is useful when you do not have the time or the inclination to change ISO manually. With the Auto ISO mode turned on, you can define the minimum shutter speed you require, and as the light drops, the camera will automatically go on increasing the ISO as required to maintain that minimum shutter speed. Some cameras even allow you to define the maximum ISO setting you want to allow. Naturally, Auto ISO should be turned off when you deliberately want to use slow shutter speeds to achieve panning or other motion blur effects.

**Quick Quiz:** Two people are shooting the same scene in Aperture Priority mode with the same aperture set on both cameras. Only, one camera is set to 400 ISO and the other to 800. Whose photograph will look brighter?

*Answer: Since they are shooting on Aperture priority mode, the difference lies only in the shutter speed. Brightness of both photos will be similar as the camera sets a shutter speed according to the ISO sensitivity.*

www.toehold.in
3.5. Metering

We have just learned that an image is formed when incident light is allowed to fall on the camera sensor through the aperture of the lens for a finite duration of time, which is the shutter speed. But if too much light is let through for too long or too little light is let through for too short, the resultant image will turn out either too bright or too dark. Therefore in any shooting situation, it is necessary to determine the correct amount and duration of light of exposure, that is the aperture and the shutter speed, for the image to be exposed optimally, without being too dark (underexposed) or too bright (overexposed). This process of determining the correct aperture-shutter speed combination is called metering.

In the early days of photography, photographers would use an external light meter to ‘measure’ the light and determine the optimal exposure settings. Modern cameras have a light meter built-in, so that the process of exposure metering and image capture is seamless. When taking a picture, the camera’s light meter evaluates the scene and using the inbuilt algorithm based on thousands of sample situations, decides what the exposure should be.

Most or all DSLRs offer multiple modes of metering in order to allow the photographer to dictate how a scene is metered. These are –

**Matrix (Nikon) or Evaluative (Canon) Metering:** In this mode, the camera’s meter evaluates the light in various zones in the frame and takes an average of the readings to arrive at the optimal exposure. This mode is ideal when a scene is uniformly lit with no harsh contrasts between well-lit and shadow areas and the subject is in the same or similar light as its surroundings. Nikon’s acclaimed Colour Matrix Metering even takes the colours in a scene into account to arrive at the optimal exposure and some of its lenses, termed ‘D’, even feed distance information from the lens to the subject as a metering input, yielding accurate exposure metering.
**Spot Metering:** In this mode, the camera determines the optimal exposure based on the reading from a particular zone or part of the frame. In Nikon cameras, the ‘spot’ can be defined by the using a focus point in the viewfinder or the back LCD. In Canon cameras, the spot is always 3% of the centre of the frame, regardless of which AF point is active. Some Nikon cameras allow the user to define how large the spot-metered area should be. This metering mode is highly useful when the subject is in a significantly different light than the surroundings, so that the subject can be exposed accurately even if the rest of the frame ends up too dark or bright.

**Centre-weighted Metering:** In this mode, the camera confines its reading to the centre of the frame when determining the exposure, with advanced cameras allowing the user to define the size of the centre zone to be metered. This mode is absent in Canon cameras.

**Partial Metering:** A feature present in Canon cameras, in this mode, the centre 9% of the frame is metered on priority. This mode can be used over Spot metering when a larger area in the centre needs to be metered (9% as against 3%).
3.6. Exposure Compensation

Although contemporary camera meters are fairly accurate, like all automated systems, they have some inherent limitations, especially in complex or extreme situations, such as when photographing a black subject or in snow, when camera meters are often fooled into yielding an exposure that leads to black subjects and white subjects being rendered as grey instead of true black and white. Also, most camera meters tend to overexpose by default, leading to blowing out of highlights in bright light.

It is therefore necessary to allow the photographer to dial in corrective inputs to fine-tune the exposure reading the camera's meter has suggested, without having to expose manually. The exposure compensation feature of DSLRs allows precisely this.

If the image needs to be made darker, the exposure should be compensated negatively (-0.3 stop, -0.5 stop, -0.7 stop, -1 stop etc); or if the image needs to be made brighter, the exposure should be compensated positively (by dialling in +0.3 stop or +0.5 stop or +0.7 stop or 1 stop and so on.)

Using the exposure compensation button that most DSLRs provide on the body itself, the photographer can quickly apply the appropriate amount of correction in either direction (underexposure or overexposure) in one third stops, half stops or full stops, and the camera will compensate the aperture or the shutter speed (depending on the exposure program mode the camera is in) before taking the picture.

E.g. if, while shooting a scene, the exposure the camera’s meter has determined is f/5.6 at 1/400sec, and you wish to compensate negatively (underexpose) the scene by one full stop, you dial in a stop of underexposure using the exposure compensation
button, and the camera will modify the shutter speed to 1/800sec if in Aperture Priority (or Aperture Value) mode, or f/4 (assuming you’re using a lens featuring a maximum aperture of f/4) if shooting in Shutter Priority (or Time Value) mode, to make the image a stop darker.

Most Nikon DSLRs and many Canon DSLRs allow underexposure and overexposure, through exposure compensation, of up to five stops, that is, you can apply up to +5 or -5 stops of compensation. Other cameras allow up to two stops of compensation on either side.

Tip: If you have sufficient shutter speed, overexpose the image slightly so as to avoid deep shadows in the image. This will minimize the noise in those areas when you process the image.

If you do not have sufficient shutter speed to get a sharp image even after increasing the ISO sensitivity, underexpose the image until you get enough or near-enough shutter speed so you capture a sharp image (unless you deliberately want a blurred image to capture the panning effect for example) that can be brightened later. Even though this will result in the image turning out noisy, noise-reduction software can be employed to minimize the noise whereas there is no solution for capturing a blurred image at the time of capture.
3.7. Bracketing

When you wish to take multiple photographs of the same scene at different exposures, either because you are not sure of the ideal exposure at that moment or want to compose a high dynamic range (HDR) image by taking images at multiple exposures and then combining them to obtain a composite image, instead of manually changing the exposure thrice, you can simply use your camera’s bracketing feature, which, when activated, takes a series of images instead of one image, over the exposure range that you have specified.

*Picture: Bracketing setting in Nikon D3, with 7 frames activated at steps of 0.7 stop.*

E.g. if you have set the camera to take three images spread over three stops, when you click the shutter button and keep it held, the camera will take one image at normal exposure, another image with one stop of underexposure, and a third image with one stop of overexposure, thereby making the process easy.

Most or all DSLRs allow bracketing of white balance as well. Here you shoot multiple pictures at different white balance settings.
3.8. **AE Lock**

Normally, when a camera is on and not in sleep mode, the light meter of the camera goes on metering the scene as the scene keeps changing. However, if for some reason you wish to lock the exposure reading from changing while taking a picture, you simply need to press and hold the Auto Exposure (AE) Lock button until the picture is taken.

The AE Lock button is useful when spot-metering a subject. Suppose you do not have a focus point in your viewfinder that corresponds to the position of your subject in the frame, but you wish to spot-meter it. One of the solutions would be, after putting the camera into spot metering mode, to use any of the focus points available, even the centre focus point, press AE Lock to lock that spot metering reading, recompose to put the subject back where you want in the frame, and then click. Thus here the AE Lock button ensures that the exposure reading does not change because of recomposing.

These images are excellent illustrations of the use of the AE Lock feature using the Spot Meter. The exposure needed to be spot-metered on the sun to prevent the image from turning out too bright, but the subject needed to be in focus (and not the sun). Therefore, the metering was set to Spot and the sun metered by setting the focus point to the sun. Then, locking the reading thus obtained by pressing AE Lock, the focus point was moved to the subject (Vehicle in the above image and Wild Ass in the image across) to bring it in focus and the picture taken. If AE Lock hadn’t been used, when the focus point was moved to the vehicle, the camera would have spot-metered the subject instead, making the image too bright (since the subject is against the light, the camera would have exposed so as to make detail on it visible).
Like discussed earlier, it is necessary to first achieve focus before taking a picture so that the subject is rendered sharp. DSLRs are equipped with sophisticated auto-focus technology, which enables fast, quiet and accurate focus. This makes it possible to take pictures of both stationary and moving subjects in a wide variety of situations.

Primarily, cameras employ two types of autofocus – passive autofocus and active autofocus.

In passive AF, which is the most commonly used method, the camera’s autofocus sensors measure the difference in contrast between the chosen subject and its surroundings, and align the elements of the lens until the contrast is maximum.

In active AF, the camera sends out a light beam to the subject to estimate the distance to it and adjust the lens elements accordingly.

**AF assist lamp**: Most DSLRs are equipped with a small lamp in the front. This lights up in low light conditions to help the camera detect the subject so it can attempt to focus on it.
4.1. AF Sensors

The component of the camera that performs the contrast-detection of phase-detection to achieve focus is the autofocus sensor. A camera has a number of AF sensors spread across the frame. Advanced DSLRs can have up to 63 sensors filling the frame. The position of each sensor is represented by an AF point, as explained under the next header.

There are two types of AF sensors – cross-type and vertical line. Cross-type sensors track contrast in two dimensions and are therefore more accurate, especially whilst photographing action, while vertical line sensors track contrast on only one dimension. Advanced DSLRs have multiple cross-type sensors, which are especially sensitive when used with f/2.8 lenses.

4.2. AF Points

In the completely automatic autofocus mode, a DSLR will assess a scene and automatically pick the subject to focus on. In a scene that has few or no distracting elements and a very obvious subject, this works well enough but in a complex scene that is comprised of several competing elements or an inconspicuous subject, the camera may not be able to pick your intended subject and may focus on something else. Therefore, to allow the photographer to define the part of the frame which needs to be focussed, DSLRs have a number of AF points spread across the frame, corresponding to the position of the AF sensors, and visible in the viewfinder (as well as the rear LCD for DSLRs equipped with the ‘live view’ feature).

Basic DSLRs have five to nine AF points while advanced DSLRs have up to 63 AF points spread across the frame. It is advantageous to have as many AF points as possible so that you can almost always find one for your subject regardless of where it is in the frame, and free yourself from having to recompose after focussing.

4.3. AF Lock

When using the continuous autofocus mode (called AI Servo in Canon parlance), the focussing system continues to try to fine-tune focus until the subject is perfectly in focus. In good light and when shooting a scene with high contrast, that is when there is a clear and significant difference in colour tone between the subject and its background and foreground, there is rarely a problem. But when there is little contrast between the subject and its surroundings or in low light, the autofocus
system may fail to find focus and keep searching for focus in an infinite loop – a phenomenon called ‘hunting’.

In such situations, the AF Lock feature is extremely useful. Pressing it locks the focus so that the lens stops ‘hunting’, thus allowing the photographer to quickly define the focus and take the photograph. The AF Lock button is also useful in compose-recompose situations as explained under AE Lock.

4.4. Autofocus Modes

Most DSLR cameras offer three main autofocus modes, viz. single time, continuous and an automatic mode that chooses between single and continuous depending on the situation. This is called the AF-A mode in Nikon and the AI Focus mode in Canon.

In the single time autofocus mode, when the camera’s shutter-release button is half-pressed or the AF-On button is fully pressed, the camera will achieve focus and then stop focussing once focus has been achieved even if the subject moves, unless the photographer releases the button and presses again. Therefore, it is easy to lose focus if the subject moves even slightly before the shutter is released. Due to this, this mode is good only for stationary subjects.

In the continuous focus mode, the camera ‘tracks’ the subject and keeps adjusting focus if the subject moves either towards or away from the camera, so long as the photographer has the shutter-release button half-pressed or the AF-On button pressed continuously. This ensures that the subject is always in focus when a picture is taken and accidental loss of focus due to the subject moving just before the picture is taken is minimized. For this reason, this mode is necessary for moving subjects.
4.5. AF Point Modes

The autofocus points of a camera can be used in multiple ways depending on each situation and subject.

In the completely automatic mode, no autofocus points are displayed and the camera determines by itself what to focus on. This is called 'Auto Area' by Canon.

In the single-point mode, the photographer chooses the autofocus point manually and the camera focuses on the subject at which the focus point is pointed. This is called 'Single Shot' by Canon.

In the tracking mode, called Dynamic Area by Nikon and AF Point Tracking by Canon, the camera offers a cluster of points that light up semi-automatically and continues to track the subject if and as it moves, so long as the shutter-release button is half-pressed or the AF-On button is fully pressed. This is particularly useful when photographing randomly-moving subjects like butterflies or hunting birds.
CHAPTER 5

5. Image Stabilization

We have learned that one of the reasons for blur in an image when using a slow shutter speed is movement of the hand when shooting with the camera-lens setup in hand. The shutter speed below which hand-shake affects the sharpness of the image depends on each individual, the magnification of the lens (the longer the focal length, the more susceptible the photographer is to hand-shake because of the weight and length of the lens and the high magnification). Generally, the guideline to avoid image blur due to hand-shake is to maintain a shutter speed of at least the reciprocal of the focal length being used (e.g. 1/300sec when using a 300mm lens). However, this is not always possible, and the risk of obtaining a blurred image due to hand-shake becomes very high when shooting at shutter speeds below 1/100sec.

To counter this, camera manufacturers have developed image-stabilization technology, with some companies incorporating it in the camera body and the market leaders (Canon and Nikon) providing it in lenses. Canon calls it simply Image Stabilization (IS) and Nikon’s term for it is Vibration Reduction (VR). Sony refers to it as Super Steady Shot and Sigma’s name for it is Optical Stabilization (OS).
The optical image stabilisation system works by employing a moving element inside the lens, which measure the amount of the vertical and horizontal movement of the lens and applies a counter, corrective action to stabilise the light before it passes through to the camera sensor.

Most image stabilisation programs allow the photographer a choice between cutting all motion and cutting only vertical motion, leaving the horizontal motion free for panning.

Modern image stabilisation systems claim up to four stops of advantage over non-image-stabilised lenses, that is, if you can get a sharp image hand-held at 1/200sec with a non-image-stabilised lens, a modern image-stabilised lens promises to deliver sharp images at 1/15sec.

Note that image stabilisation is not a substitute for high shutter speed because it only freezes hand motion and does nothing to freeze subject motion. That is, if you are photographing a moving car or a walking tiger, the car or the tiger will be blurred at 1/15sec even if you have image stabilisation turned on. Therefore, image stabilisation is a tool useful mostly for stationary subjects at very slow shutter speeds.
A camera lens is theoretically capable of focussing at only one point, which will be rendered as sharp as the quality of the lens will allow it to be. The rest of the image will gradually appear softer as you move away from the point in focus. However, depending on a number of factors discussed below, the area immediately surrounding the subject, although theoretically out of focus, can appear to be in focus and therefore sufficiently sharp for no softness to be apparent. This area is called the depth of field.

Depth of field (DOF) defines how much of the frame is sharp or sharp enough to be thought of as being in focus. The more of the frame appears to be in focus, the deeper the field is said to be (or higher the DOF), and the less of the frame in focus, the shallower the field is (or lower the DOF.)

This is a function of several variables including:

**Aperture used:** The larger the aperture, the lesser the DOF. The shallowness of the field at large apertures gets further accentuated at longer focal lengths, especially in the telephoto range.

**Focal length:** As mentioned above, the thinning of the field appears amplified with increase in focal length, due to magnification of the subject. In other words, the difference in the depth of field between f/2.8 and f/5.6 at 12mm is far less perceptible than that at 85mm, which in turn is less perceptible than that at 300mm and so on.
Working distance: The distance between the camera and the subject is also a determinant of DOF. The closer the subject is to the camera, the lesser the DOF.

Sensor format: Cropped-sensor cameras, by virtue of their narrower angle-of-view compared to full-frame cameras, allow the photographer to obtain the same angle-of-view with a lens of a shorter focal length as with a lens of a longer focal length on a full-frame camera, thereby yielding more DOF due to the effect of focal length on DOF as explained in point 2. This is why, to achieve the same subject isolation as on a full-frame camera with a lens of the same focal length, a larger aperture is needed on a cropped-sensor camera than on a full-frame camera. Conversely, to achieve the same DOF with a full-frame camera as on a cropped-sensor camera for the same angle of view, a smaller aperture is needed.

DOF is higher behind (or beyond) the subject in focus than in front of the subject.

6.1. Circle of confusion

As discussed earlier, theoretically, a lens can focus on only one point. The area in the immediate vicinity that is not in focus will be rendered as a blurred spot shaped like the aperture, which can be assumed to be circular. When this circular spot is sufficiently small, it is indistinguishable from a point, and appears to be in focus. This leads to it being rendered as sufficiently sharp. But as the distance from the point in focus increases, that is, as you go away from it, the diameter of the circle increases. The largest circle that is indistinguishable from a point is known as the circle of confusion, and it is influenced by the viewing conditions and the amount by which the image is enlarged.

6.2. Bokeh

Bokeh, which is often wrongly used as a substitute for DOF, is a Japanese term that defines the quality (pleasantness) of the out-of-focus areas in an image, and is NOT a measurement of the depth of field. Bokeh is termed pleasant when the out-of-focus areas, which may include circles of light, are soft, gradual and as smoothly rounded and circular as possible, so that they do not distract the viewer from the subject and enhance the aesthetics of the image.

Bokeh is particularly important in portrait and wildlife photography. The most popular lenses for portraiture, like the Nikon and Canon 50mm f/1.4 and f/1.8, 85mm f/1.4 and f/1.8, the Nikon 135mm f/2 DC and the Nikon 200mm f/2 lenses are designed to yield excellent bokeh while for wildlife, the 300mm and 400mm f/2.8 and the 600mm f/4 lenses are the most popular.

For a lens to be said to have good bokeh, it should exhibit pleasant out-of-focus area characteristics not only when used wide-open, but also when stopped down to smaller apertures, when, even though the DOF will be higher, the shape of the out-of-focus circles should remain as round and indistinct as possible, without flaws such as chromatic aberration and fringing. ‘Good-bokeh’ lenses achieve this by having a sophisticated diaphragm with many curved blades and use coatings on the glass to minimize or eliminate chromatic imperfections.
6.3. Effect of depth of field on images

The DOF of an image is an important determinant of the appearance of an image. Thought has to be given to the DOF to ensure that it corresponds to the context, content and composition of a photograph and the aesthetic objectives, style and other considerations of the photographer.

The photograph of the left was shot at f10 while the one on the right at f2.8 providing a shallow DOF than the former.

6.4. DOF Preview

All advanced DSLRs allow preview of DOF prior to taking a picture, through the DOF Preview button, usually located beside the lens mount.

By default, all DSLRs use the maximum aperture of the lens mounted, to show the view in the viewfinder, to afford the brightest possible view and also because keeping the lens at its largest aperture while shooting ensures the best possible autofocus performance.

When the DOF Preview button is pressed, the camera temporarily closes down the aperture to the value to which it has been set (e.g. f/8, on a lens with a maximum aperture of f/4) and shows the view in the viewfinder, so the photographer can visualise how much of the scene will be in focus and make adjustments to the aperture value if necessary before taking the picture. There are also formulae and even ready charts to know the DOF at various settings.

In film photography, knowing the DOF prior to taking a picture was critical since the photographer couldn’t see the image taken until the film was developed. But with a DSLR, it is less important since a picture can be reviewed on the LCD screen in a fraction of a second after taking it and corrective action, if necessary, undertaken immediately.
CHAPTER 7

7. Composition

Composition is the inclusion, exclusion and arrangement of the contents in an image to achieve an aesthetically pleasing, striking or story-telling result. Composition is closely related to other elements of visual design, such as perspective, space, colour and contrast. The composition of an image is one of the biggest determinants of the impact of an image. There are some rules of good composition but these should be treated more as guidelines and as with any other rules, sometimes they can be and should be broken.

Rule of thirds: Probably the most well-known of all compositional rules, this rule, which is believed to be a simplification of the famous golden mean, suggests placement of the main subject of interest on or close to the intersection of two lines that divide the frame into three equal rows and columns respectively. In other words, the rule states that instead of placing the subject in the centre of the frame or in random position in the image, it should be placed in a one-third corner for a balanced composition.

Rule of space: This rule suggests that more space should be allowed in the direction in which the subject is looking (or appearing to be looking, if it is an inanimate object) rather than in the other direction. This space is called ‘positive space’, whilst the space in which the subject is not looking is called the negative space. Generally the image is more pleasing to the eye and appears more logical to the brain if there is more positive space than negative space in an image.
**Rule of horizon placement:** When shooting landscapes that include the horizon, the horizon should not bisect the image into equal parts for visual impact. Therefore, you should allow more space either to the sky or to the land (or water) below, depending on what you intend to emphasize.

![Image of a landscape with the horizon framed to the left side]

**Rule of simplification:** Any element in an image that is not adding value or is serving to distract the viewer from the main subject being portrayed should be excluded. This includes dominating backgrounds, clutter and competing subjects. A large-aperture lens in conjunction with a long focal length can be employed to achieve a shallow depth of field and limit focus and minimize distraction. Also, when excluding a part of a subject, the point of exclusion to be carefully considered to ensure that it does not appear awkward or accidental.

![Image of Mona Lisa with Golden Ratio markings]

**Golden Ratio:** Two parts of a frame are said to be in the Golden Ratio if they are divided in such a way that the ratio of the sum of the quantities to the larger quantity is equal to the ratio of the larger quantity to the smaller one. The Golden Ratio has fascinated mathematicians and artists alike for many centuries and is believed especially by painters to lend a great deal of aesthetic value to the work that employs it. A series of quarter circles (arcs) drawn across the diagonal edges of two rectangles in the Golden Ratio lead to the formation of an approximated Golden Spiral.

*Picture of the legendary Mona Lisa showing employment of the golden ratio*
CHAPTER 8
8. White Balance

White balance is a setting tool which helps ensure that the colours in an image stay realistic, whites remain neutral and there are no casts.

White balance is measured in colour temperature, which approximately defines the temperature (in Kelvin) of the light in the image. Naturally, the higher the temperature, the warmer is the resultant image.

![Photographs](image)

*The photograph on the left was shot in a warmer colour temperature than the one on the right. Shooting RAW, White Balance can be easily changed and corrected.*

DSLRs offer several preset white balance settings including direct sunlight, cloudy, shade, tungsten and incandescent, but advanced DSLRs also allow fine-tuning of each of these presets as well as fully manual input of the exact temperature the photographer wishes to shoot at.

Advanced DSLRs also offer a custom white balance setting which allows the photographer to take a white balance reading using a reference neutral grey card and then use that white balance setting for the rest of the images.

All DSLRs by default have an auto white-balance setting which determines the ideal colour temperature for an image by itself, but its intelligence is limited, hence its use is not recommended in tricky situations.

Since it is somewhat challenging to arrive at the ideal white balance in the field, it is prudent to take photographs in the raw mode, so as to be able to change the white-balance setting even in post-production processing if necessary, whereas it’s not possible to do the same with JPEGs.
8.1. Filters

Filters are thin glass elements screwed on to the front of a lens (or the middle, in case of long telephoto lenses), to block or modify the light in a particular way. Generally, filters find a smaller use in digital photography since a broad range of colour temperatures, tints and even high dynamic range can be obtained through digital means either in the camera itself or on the computer in post-production processing. However, there are some filters that are still very useful and are used regularly especially in landscape photography. These are:

**Polarizing Filters:** These filters are useful in darkening the sky, removing reflections off surfaces such as when photographing a glass window or a water-body, and in improving colours especially when photographing plants and trees. They work by allowing light of certain polarization and blocking waves of other polarizations. There are two types of polarizing filters – linear and circular, but it is the latter type that is more common in contemporary use. A polarizer generally costs two stops of light while shooting, that is, if the exposure metering is 1/400sec at f/8, when the polarizer is put on, the shutter speed will drop to 1/100sec.

For the above image, a polarizing filter was used to remove reflections off the water surface and cut down some harsh light. While centre-weighted metering was used to underexpose the background, the polarizing filter proved to be a good decision to capture detail on the white subject.
Neutral Density (ND) Filters: These filters are used to cut the intensity of light passing through the lens into the camera sensor, in order to enable shooting with a slower shutter speed. They come in various specifications of light-cutting ability, such as one stop, two stop and four stops. Two common situations when you may be required to do this are explained below.

You wish to photograph a waterfall with a slow shutter speed to get the motion-blurred flowing effect explained earlier under Shutter Speed. It would be ideal to visit it in the early morning or in the late evening, so that you get a slow shutter speed by default, due to the low light. However, suppose that you are unable to visit at the ideal hour and instead are confronted with the harsh light of the late morning or early afternoon, so that despite stopping down the aperture and shooting at the lowest ISO, the shutter speed is still too high to get a blurred effect. In such a situation, you can use a four-stop ND filter to cut down the amount of light by four stops, so that you can employ a slow shutter speed despite the harsh light and get the image you are after.

The other situation is when you want a slow shutter speed without having to stop down excessively, so that you remain within the diffraction limit, also a scenario confronted in bright light conditions. You can simply use an ND filter of the appropriate rating, so that you can obtain a slow shutter speed without stopping down beyond the diffraction limit.

A special type of ND filter is called the graduated neutral density filter, which works just as a normal ND filter, except that the amount by which light is cut varies across the surface of the filter. This is useful when photographing high dynamic range situations such as sunrises and sunsets, where, using a graduated ND filter, you can have the sun exposed correctly while retaining details in the foreground. This often yields a more natural-looking result than creating an HDR image on a computer.

Clear UV Filters: These filters are used to shield a lens from the harmful UV radiation from the sun or simply to protect the front lens element from dust or physical damage through contact against another object. UV filters do not yield any effect unlike the other filters discussed above. Care, however, must be taken to choose a quality UV filter to ensure it does not rob the lens of its optical quality and sharpness.
CHAPTER 9

9. Digital Post-processing

Digital post-production processing is a vast topic in itself and extends to complex manipulation and digital art. Here we restrict our discussion to basic digital enhancements rather than manipulation.

Digital adjustments are an integral part of the photography workflow, and when done moderately, can greatly enhance the aesthetic quality of an image. The exact workflow and adjustments required depend on each image and the photographer’s taste and vision, but a common workflow is depicted below.

Step 1: Raw conversion

Raw images retain all the data captured at the time of shooting, so retaining the raw file allows you to make many adjustments, reverts and corrections that are virtually impossible to achieve with JPEGs. But a raw image is just that – raw data – that first needs to be converted to a viewable image with the help of software. The ideal software application to use is the proprietary one supplied by the camera manufacturer, e.g. DPP for Canon and Capture NX by Nikon, since the algorithms built in will be equipped to extract maximum quality from the images. However, third-party software like Adobe Photoshop or Lightroom and Apple Aperture can be used if found more convenient. Each camera manufacturer has their own proprietary file type (e.g. Canon’s CR2 and Nikon’s NEF), so when a new camera is procured, it is necessary to keep the software updated to ensure that it can ‘read’ the new camera’s files. When a raw image is opened in compatible software, important image settings like exposure, white balance, tint and other camera-specific settings such as picture styles and high dynamic range filters can be added, modified or undone.

Therefore, the first step involves opening the raw image and performing any adjustments as necessary chiefly to the exposure and white balance.

Step 2: Cropping

If necessary, the image should be cropped to exclude any distracting elements to strengthen the composition. While cropping, be conscious of the format and if processing for print, ensure that you fix the aspect ratio of the crop to ensure that no part of the image gets excluded when the image is printed. The temptation to crop excessively to magnify the subject in the image should be resisted, especially for high-quality applications, since doing so compromises the output quality of the image.

Step 3: Scaling

Before processing an image, the target dimensions should be clear. This depends on the exact application. A small image is sufficient for web display while a high-resolution image is needed for a print. Therefore the image should be scaled to the requisite dimensions using the Image Size feature (for example) to down-scale the
image. Images can also be up-scaled (a process called interpolation) but this should be avoided unless absolutely necessary since to achieve this, the software copies each pixel to create the neighbouring pixel through approximation, which leads to loss in quality. Most competitions and image agencies do not accept interpolated images.

**Step 4: Sharpening**

Images from most or all digital cameras require some minimum degree of sharpening at the very least because of the naturally softening effect of the electronic components of digital cameras. But the sharpening should be applied judiciously to make sure that halos, artefacts and other blemishes are not introduced into the image because of excessive sharpening. Nearly all photo-editing software applications allow control over amount of sharpening through multiple parameters.

**Step 5: Levels**

Using the levels sliders, the highlights, shadows and mid-tone luminance can be adjusted if the image needs to be brightened or darkened. If the Levels feature is not available in the software being used, even the Brightness controller can be used to increase or decrease brightness.

**Step 6: Contrast**

Most images need a slight contrast boost from the out-of-camera state provided they have been shot in the camera’s ‘neutral’ mode. Contrast increase can block shadow detail so it should be enhanced judiciously. Also, care should be exercised to ensure that contrast is not increased to an extent where the highlights are blown out. In rare instances, contrast may need to be reduced to enhance mood or when there are harsh highlights in the image.

**Step 7: Saturation**

The colour saturation of an image can be increased to taste if more vividness is desired. In most cases, only a nominal increase is warranted and care should be exercised to ensure that any saturation increase is not overdone. In rare cases, saturation may need to be decreased to enhance aesthetics.

**Step 8: Noise Reduction**

If required, a round of noise reduction may be applied to the image either as a whole or only on the background if using Adobe Photoshop (using Layers). While doing so, care should be taken to avoid excessive application so that fine detail is not lost and the image does not look ‘plastic’. If selectively applying noise reduction to the background, it should be done subtly enough to prevent the separation of the subject and the background from looking unnatural.

**Step 9: Borders**

If you wish to add borders to your image, in Photoshop, click on ‘Image’ on the top bar and then on ‘Canvas Size’. In the window that pops up, you can choose the width of the vertical and horizontal borders in any of the available units (centimetres, inches or pixels).
Step 10: Watermark

If you wish to post the image onto the Web and want to prevent misuse of your image, you can add a watermark specifying your copyright information. To do this in Photoshop, simply choose the Text tool from the vertical panel on the left, click on the point on the image where you wish to have it, choose the font and the colour, and type your copyright notice. To get the copyright symbol (©) on a Windows PC, hold down the Alt key and type 0169 on your number pad (note that it won’t work on the main keypad). On a Mac, hold down Alt and simply type the letter G. Once done, go to ‘Layer’ on the top bar and click on ‘Flatten Image’.

Do not add ugly and large watermarks which spoil the beauty of an image.

Saving

Once you’re done with the above steps, you can save the image as either a JPEG, if you wish to share or post on the Web, or TIFF, if you wish to save it on your hard disk for future use. The benefit of saving the file as a TIFF is that it is a ‘lossless’ file, that is, it doesn’t lose data every time you access or edit it, unlike a JPEG.
A good photograph is one that captures the spirit of a place, a person, a situation or a creature, makes a statement either about the featured subject or the photographer, and touches a chord with the viewer. So, how does one make a good photograph? There is no set formula, but there are some guiding principles which can help create good photographs:

- It's easier to make good photos if you care about the subject. Passion for photography and a love for your subjects are critical determinants of the quality and depth of your work.
- Knowledge is power. Research as much as possible about your subject before you set out to photograph it.
- Spend some time visualising and planning the kind of images you wish to make before a shoot. Then, when in the field, be conscious of your objectives and try to achieve them.
- Always be alert to the action and the situation around you and be prepared to adapt as required.
- Before squeezing the shutter-release button, spend a few moments thinking about the composition and other aesthetic aspects of the image.
• Put thought into your images and time them well rather than adopting the ‘spray-and-pray’ technique of taking a number of pictures and then hoping that one will turn out well.

### 10.1. Conveying Stories

![Image of a person sitting against a row of large wheels]

Pictures are an excellent medium of communication. Everybody is familiar with the old adage that a picture is worth a thousand words. Therefore, when practised the right way, photography can be a truly powerful tool for reportage as well as self-expression. Some of the most memorable images in history are those that are not merely pictures but a narration of a larger story through the freezing of just a moment in time. They hold the most potential of connecting with the viewer and remaining in their memory for a long time.

So, whenever there is an opportunity to convey a story through a picture, use it by including or excluding elements, as discussed under Composition, capturing the right moments and using your imagination to portray what is ahead of you in a striking, creative way. If possible, pick a topic one at a time, spend a few weeks photographing all the various aspects of it and make a photo story. This is a great way of developing the eye and the skills required to tell a complete story with just one or a series of pictures.
10.2. Special Traits of a Photographer

Contrary to the perception prevalent in some quarters, photography is not a terribly glamorous pastime, practice or profession. It involves investing time to study your subjects, rising early and sleeping late (and sometimes not sleeping at all) to be at the right place at the right time, getting your clothes and hands dirty, and, in professional journalistic photography, even risking your life at times. The following are some traits required of a photographer:

- A photographer is only as good as their eye. The ability to ‘see’ a picture from a not-obvious scene is one of the most important traits of a good photographer.

- Once the photographer has ‘seen’ a picture or the potential for it, technical skill is required to bring it to reality.

- For the above reason, the photographer must be equipped with thorough knowledge of their equipment, so as to use it optimally and to achieve the desired results. The biggest mistake a photographer can commit is to take equipment they are unfamiliar with on an important shoot.

- A photographer should also be able to connect to the subjects they are attempting to photograph. Only then can they portray some part of the subject’s sphere in a way that is aesthetically appealing and emotionally impactful.

- For some types of photography, a photographer should have the ability to build local contacts wherever they go, so that they get updates and useful information from time to time about developments in that place. This allows the photographer to stay abreast of the subject’s life and time their next visit strategically for maximum effectiveness.
• A photographer should have the ability to improvise and use their tools creatively to do something new every so often, or show the mundane in a way nobody has hitherto seen. This requires them to be experimental and never hesitant to innovate to produce unconventional results.

• Finally, a photographer who is especially into photography that involves travel, should be adaptable and open to new cultures and environments.

10.3. Ethics of Photography

A framework of ethics is necessary in order to uphold the sanctity of the art form. This, ultimately, has to be defined by each photographer for themselves, but below is a general set of guidelines that are good to be followed.

• No image is worth compromising the subject’s welfare for. If in doubt about causing distress or putting the subject in danger, always back out.

• When out in a forest, follow park rules and guidelines, be quiet and never leave anything or take back anything that belongs to the forest.

• When photographing wildlife, never interfere with the natural behaviour of the subject or feed animals.

• Because photography is a medium of expression, communication and reportage, anything not obvious should be declared explicitly, e.g. if a trained animal was used to make an image that is made to look as though taken in natural conditions, it should be stated expressly. Never lie about how or where an image was taken, e.g. an image of an animal taken in captivity should never be passed off as shot in the wild.

• If shooting nesting animals, care must be exercised not to approach the nest too closely or for too long, since the mother may abandon the nest due to intrusion or the young ones may come under threat from predators who may be guided to the nest through your presence.
10.4. Good Practices in Photography

- Know your tools well and always make the most of what you have before ‘upgrading’.
- Know as much as possible about your subject or place to maximise your photo opportunities.
- Never go on an important photography expedition with equipment you are not familiar with.
- Master your technique quickly so you can concentrate on creating images.
- Watch and learn from inspirational, good quality photography regularly.
- Take inspiration but do not copy. Use photography to express your individuality.
- Take care of your equipment; protect it from dust and moisture.
- Pursue subjects and genres you are passionate about and excellence will follow.
- Back your images up regularly to prevent loss of files due to hardware failure.
- Stay abreast of the latest technological advancements so you can find new and better ways of achieving objectives.