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The art, application and practice of creating durable images by recording light or other electromagnetic radiation, either electronically by means of an image sensor, or chemically by means of a light-sensitive material such as photographic film is known as photography. Photography is used in various fields of science, manufacturing, and business, as well as its more direct uses for art, film and video production, recreational purposes, hobby, and mass communication.

In this book, Photography, we will examine various aspects of photography. The book will discuss the general concepts of photography, the natural sources of photography, different types of images and camera, as well as the impact of technology on photography.

This book is divided into fourteen units that follow the self-instruction mode with each unit beginning with an Introduction to the unit, followed by an outline of the Objectives. The detailed content is then presented in a simple but structured manner interspersed with Check Your Progress Questions to test the student’s understanding of the topic. A Summary along with a list of Key Words and a set of Self-Assessment Questions and Exercises is also provided at the end of each unit for recapitulation.
UNIT 1 PHOTOGRAPHY: AN INTRODUCTION

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1.0 INTRODUCTION

The recent years have seen a major boom in photography industry and how photography is used as a professional means. Photography taken from the Greek term meaning ‘painting with light’. It can be considered both a form of art as well as a form of science. It can be counted as a science because there are basic principles of physics that govern success. Photography is an art because its beauty is subjective and can mean different things for different people. As we are aware, photography did not exist in the form as it does now few years ago. Earlier the only form of pictures that existed were the ones painted by painters, and even then, the final did not resemble us completely. Do you realise that this was not possible for a long time and it was left to the artists to draw our images and even then the pictures were never exactly the same. The process of painting was also very complex and time consuming and not everyone could afford it. During those times, only kings and other important people were wealthy enough to get their pictures made by artists. When photography was invented, it brought a wave of excitement. This new wave of technology lured people’s interests. People could now see an exact copy of a scene or of a person in front of them.

From such times to now photography has come a long way. It is both a recreation as well as a profession. In this unit, you will study the meaning and tools of photography in detail.
1.1 OBJECTIVES

After going through this unit, you will be able to:

- Define and discuss the meaning of photography
- Describe the history of photography
- Analyse the tools of photography
- Explain the various parts and types of camera

1.2 PHOTOGRAPHY: MEANING AND DEFINITION

Photography is the art, application and practice of creating durable images by recording light or other electromagnetic radiation, either electronically by means of an image sensor, or chemically by means of a light-sensitive material such as photographic film. It is employed in many fields of science, manufacturing (e.g., photolithography), and business, as well as its more direct uses for art, film and video production, recreational purposes, hobby, and mass communication.

Typically, a lens is used to focus the light reflected or emitted from objects into a real image on the light-sensitive surface inside a camera during a timed exposure. With an electronic image sensor, this produces an electrical charge at each pixel, which is electronically processed and stored in a digital image file for subsequent display or processing. The result with photographic emulsion is an invisible latent image, which is later chemically “developed” into a visible image, either negative or positive depending on the purpose of the photographic material and the method of processing. A negative image on film is traditionally used to photographically create a positive image on a paper base, known as a print, either by using an enlarger or by contact printing.

The coining of the word “photography” is usually attributed to Sir John Herschel in 1839. The word “photography” was created from the Greek roots ὀψ (phōs), genitive of ὀψ (phōs), “light” and γραφή (graphē) “representation by means of lines” or “drawing”, together meaning “drawing with light”.

Several people may have coined the same new term from these roots independently. Hercules Florence, a French painter and inventor living in Campinas, Brazil, used the French form of the word, photographie, in private notes which a Brazilian historian believes were written in 1834. This claim is widely reported but apparently has never been independently confirmed as beyond reasonable doubt.

Credit has traditionally been given to Sir John Herschel both for coining the word and for introducing it to the public. His uses of it in private correspondence prior to 25 February 1839 and at his Royal Society lecture on the subject in London on 14 March 1839 have long been amply documented and accepted as settled facts.
The inventors Nicéphore Niépce, Henry Fox Talbot and Louis Daguerre seem not to have known or used the word ‘photography’ but referred to their processes as ‘Heliography’ (Niépce), ‘Photogenic Drawing’/’Talbotype’/‘Calotype’ (Talbot) and ‘Daguerreotype’ (Daguerre).

1.3 HISTORY OF PHOTOGRAPHY

Earlier, there used to be fairly clear demarcations between cameras aimed at entry-level consumers, enthusiasts, and professionals. Consumers were sold cameras with entry-level functionalities, the prices of which decreased year by year. Enthusiasts had their pick from a varied menu of expensive cameras that delivered a wide range of features in combination with the top specifications available in moderately high prices. Professionals had to take a loan to get a durable camera that accommodated high-quality interchangeable lenses they needed to use as well as resolution suitable for the demands of colour separation and offset printing.

Little, if any of that is true anymore. Today the digital camera market is instead progressing in four distinct directions. Multifunction devices that are not primarily cameras, such as cell phones, PDAs, and even camcorders offer still image capture capabilities that are adequate for casual photography. These products have almost taken over entry level cameras.

Consumer cameras are now available in smaller sizes and they include many high-end features which enable them to give high performance. d-sized cameras which were once limited to low resolution, no LCD, and fixed-focal length optics, now have 5MP or more, 3× optical zooms or better, and 2-inch or larger LCDs. Professionals can also now get digital SLRs that have double the resolution of the most expensive models of the past, at a fraction of the cost. These cameras now outperform 35mm film SLRs across the board with high quality film resolution coupled with enhanced speed and features. For the enthusiasts, this market is the most mixed up, with choices ranging from super-sleek compact cameras to mid-size hybrids that combine super-long-range zoom lenses with camcorder-like video capabilities. The enthusiast market now also includes digital SLRs that match many of the performance and feature sets of the professional models at quite affordable prices.

All of these markets are growing rapidly. While the rate of growth in the digital camera business overall is slowing, the number of cameras sold continues to grow each year.

The history of photography began in remote antiquity with the discovery of two critical principles; camera obscura image projection and the observation that some substances are visibly altered by exposure to light. Apart from a possibly photographic but unrecognised process used on the Turin Shroud there are no artefacts or descriptions that indicate any attempt to capture images with light sensitive materials prior to the 18th century. Around 1717 Johann Heinrich Schulze...
captured cut-out letters on a bottle of a light-sensitive slurry, but he apparently never thought of making the results durable. Around 1800 Thomas Wedgwood made the first reliably documented, although unsuccessful attempt at capturing camera images in permanent form. His experiments did produce detailed photograms, but Wedgwood and his associate Humphry Davy found no way to fix these images.

In the mid-1820s, Nicéphore Niépce first managed to fix an image that was captured with a camera, but at least eight hours or even several days of exposure in the camera were required and the earliest results were very crude. Niépce’s associate Louis Daguerre went on to develop the daguerreotype process, the first publicly announced and commercially viable photographic process. The daguerreotype required only minutes of exposure in the camera, and produced clear, finely detailed results. The details were introduced as a gift to the world in 1839, a date generally accepted as the birth year of practical photography. The metal-based daguerreotype process soon had some competition from the paper-based calotype negative and salt print processes invented by William Henry Fox Talbot. Subsequent innovations made photography easier and more versatile. New materials reduced the required camera exposure time from minutes to seconds, and eventually to a small fraction of a second; new photographic media were more economical, sensitive or convenient, including roll films for casual use by amateurs. In the mid-20th century, developments made it possible for amateurs to take pictures in natural color as well as in black-and-white.

The commercial introduction of computer-based electronic digital cameras in the 1990s soon revolutionized photography. During the first decade of the 21st century, traditional film-based photochemical methods were increasingly marginalized as the practical advantages of the new technology became widely appreciated and the image quality of moderately priced digital cameras was continually improved. Especially since cameras became a standard feature on smartphones, taking pictures (and instantly publishing them online) has become an ubiquitous everyday practice around the world.

Check Your Progress
1. Define photography.
2. Who coined the term “photography?”

1.4 TYPES OF CAMERA

You can classify cameras into the following four groups by the way they are focused.

1. **Rangefinder and view finder cameras**: Rangefinder and viewfinder cameras have a “viewfinder” through which the picture is framed. The rangefinder differs from the viewfinder in that it has a double image created
through the use of mirrors. We refer to this as a split-image. When the two images line up (are superimposed), the camera is in focus.

2. **Miniature cameras:** Miniature cameras are twin lens cameras that have two look-alike lenses, hence the name ‘twin lens’. The scene before the camera, while being viewed through the top lens, is actually photographed through the bottom lens. As the picture is focused through the top lens, the bottom lens is adjusted at the same time.

3. **Medium format camera:** A folding, or medium format camera is a camera that can be folded to a compact and rugged package when not in use. The camera objective is sometimes attached to a pantograph-like mechanism, in which the lid usually is a component. The objective extends to give correct focus when unfolded. A cloth or leather bellows keeps the light out. When folded, the camera has an excellent physical size to film size ratio. This feature was very appealing when the only film formats available were large or medium format films. These cameras are also known as bellows cameras.

4. **Large format cameras:** The Single Lens Reflex (SLR) uses a series of mirrors so that one can view the scene to be photographed through the same lens that takes the picture. When the shutter release is depressed, the lower mirror snaps up, the picture is taken, and the mirror returns to its original position, hence, a ‘reflex’ action. When the picture is taken, the viewfinder is blackened for a split second.

### 1.5 PARTS OF A CAMERA: SHUTTER, LENS, APERTURE AND FILMS

Talking about are digital cameras, DSLRs or any other type of camera, the mechanism of capturing images is almost the same. A camera is a simple gadget that captures light and records it on the storage medium (film, memory card). The common components of a camera are the lens, shutter, image sensor, viewfinder and a mirror. Let’s discuss these components in detail:

1. **Lens:** It is an optical component of a camera whose function is to focus the light coming from objects on the image making component of the camera. The angle of view of the camera is also defined by the type of lenses being used. Lens also defines what kind of optical distortions will be present in the image. A good lens should not suffer from any kind of defects such as chromatic aberration, scratches, fogging etc. Lenses are the primary elements that help you define your compositions; how much area you want to cover, what kind of feeling you want to associate, how much depth of field you want to create, etc.

2. **Shutter:** This is that component of the camera which restricts the light from falling onto the image making component, when it is not required. When the shutter opens, the light enters the camera and falls on the image making
component and when the shutter closes it stops the inflow of light completely. The life of a camera body is also measured in shutter cycles. Every camera manufacturer defines for how long a camera body would work properly, and for this the unit of measurement is the number of times the shutter can be used.

3. Viewfinder: It allows the photographer to look through the lens, compose and frame the picture. In case of a SLR camera, the viewfinder shows exactly what will be visible to the image making component and thus will finally come out as the image. This gives a very clear idea about the framing of the photographs. Depending on the manufacturer, what you see in viewfinder can be different in terms of markings, grid or other elements. Normally a viewfinder will show you markings off the places which your camera uses for auto-focus. Sometimes gridlines are also visible in some cameras. A viewfinder can be optical as well as electronic. In new cameras, especially in point-and-shoot cameras, electronic viewfinder is found. Electronic viewfinder is actually a small screen inside the camera that draws the image. Generally, electronic viewfinder provides you with much more information and compositional guide elements like gridlines etc.

4. Mirror: This component allows the light which is entering the camera to divert and go to the viewfinder so that the photographer can have a look when the exposure is not happening. Once the mirror is lifted the same light which was coming through the lens will fall on the image making component and start the exposure. During the exposure viewfinder will not show anything.

5. Image making component/image sensor: This is the main component of the camera which records the visible light and creates images. The resolution of the final picture depends on the image sensor. The number of pixels is defined by the number of image sensing components and pixels present on the sensor itself.

   To control all the processes and to do all the complex calculations, cameras have built in processors. So, in many ways, cameras are much like small computers which do all calculations, decide all settings, take pictures, preview them and store them. Nowadays, the digital cameras and DSLRs have advanced so much that they are able to take a photograph in almost any kind of situation, which was not the case with early cameras.

6. Aperture and Lens Aperture: The aperture stop of a photographic lens can be adjusted to control the amount of light reaching the film or image sensor. In combination with variation of shutter speed, the aperture size will regulate the film’s or image sensor’s degree of exposure to light. Typically, a fast shutter will require a larger aperture to ensure sufficient light exposure, and a slow shutter will require a smaller aperture to avoid excessive exposure.
A device called a diaphragm usually serves as the aperture stop and controls the aperture. The diaphragm functions much like the iris of the eye—it controls the effective diameter of the lens opening. Reducing the aperture size increases the depth of field, which describes the extent to which subject matter lying closer than or farther from the actual plane of focus appears to be in focus. In general, the smaller the aperture (the larger the number), the greater the distance from the plane of focus the subject matter may be while still appearing in focus.

The lens aperture is usually specified as a f-number, the ratio of focal length to effective aperture diameter. A lens typically has a set of marked “f-stops” that the f-number can be set to. A lower f-number denotes a greater aperture opening which allows more light to reach the film or image sensor. The photography term “one f-stop” refers to a factor of \(2\) (approx. 1.41) change in f-number, which in turn corresponds to a factor of 2 change in light intensity.

Aperture priority is a semi-automatic shooting mode used in cameras. It permits the photographer to select an aperture setting and let the camera decide the shutter speed and sometimes also ISO sensitivity for the correct exposure. This is also referred to as Aperture Priority Auto Exposure, A mode, AV mode (aperture-value mode), or semi-auto mode.

Typical ranges of apertures used in photography are about f/2.8–f/22 or f/2–f/16, covering 6 stops, which may be divided into wide, middle, and narrow of 2 stops each, roughly (using round numbers) f/2–f/4, f/4–f/8, and f/8–f/16 or (for a slower lens) f/2.8–f/5.6, f/5.6–f/11, and f/11–f/22. These are not sharp divisions, and ranges for specific lenses vary.

Lens
The lens of a camera captures the light from the subject and brings it to a focus on the sensor. The design and manufacture of the lens is critical to the quality of the photograph being taken. The technological revolution in camera design in the 19th century revolutionized optical glass manufacture and lens design with great benefits for modern lens manufacture in a wide range of optical instruments from reading glasses to microscopes. Pioneers included Zeiss and Leitz.

Camera lenses are made in a wide range of focal lengths. They range from extreme wide angle, and standard, medium telephoto. Each lens is best suited to a certain type of photography. The extreme wide angle may be preferred for architecture because it has the capacity to capture a wide view of a building. The normal lens, because it often has a wide aperture, is often used for street and documentary photography. The telephoto lens is useful for sports and wildlife, but it is more susceptible to camera shake.

1.5.1 Tools of Photography
A large variety of photographic techniques and media are used in the process of capturing images for photography. These include the camera; stereoscopy; dual
Camera

A camera is the image-forming device, and a photographic plate, photographic film or a silicon electronic image sensor is the capture medium. The respective recording medium can be the plate or film itself, or a digital magnetic or electronic memory.

Photographers control the camera and lens to "expose" the light recording material to the required amount of light to form a "latent image" (on plate or film) or RAW file (in digital cameras) which, after appropriate processing, is converted to a usable image. Digital cameras use an electronic image sensor based on light-sensitive electronics such as charge-coupled device (CCD) or complementary metal-oxide-semiconductor (CMOS) technology. The resulting digital image is stored electronically but can be reproduced on a paper.

The camera (or ‘camera obscura’) is a dark room or chamber from which, as far as possible, all light is excluded except the light that forms the image. It was discovered and used in the 16th century by painters. The subject being photographed, however, must be illuminated. Cameras can range from small to very large, a whole room that is kept dark while the object to be photographed is in another room where it is properly illuminated. This was common for reproduction photography of flat copy when large film negatives were used.

As soon as photographic materials became “fast” (sensitive) enough for taking candid or surreptitious pictures, small “detective” cameras were made, some actually disguised as a book or handbag or pocket watch (the Ticka camera) or even worn hidden behind an Ascot necktie with a tie pin that was really the lens.

The movie camera is a type of photographic camera which takes a rapid sequence of photographs on recording medium. In contrast to a still camera, which captures a single snapshot at a time, the movie camera takes a series of images, each called a “frame”. This is accomplished through an intermittent mechanism. The frames are later played back in a movie projector at a specific speed, called the “frame rate” (number of frames per second). While viewing, a person’s eyes and brain merge the separate pictures to create the illusion of motion.

A camera works with the light of the visible spectrum or with other portions of the electromagnetic spectrum. A still camera is an optical device which creates a single image of an object or scene and records it on an electronic sensor or photographic film. All cameras use the same basic design: light enters an enclosed box through a converging/convex lens and an image is recorded on a light-sensitive medium (mainly a transition metal-halide). A shutter mechanism controls the length of time that light can enter the camera. Most photographic cameras have functions that allow a person to view the scene to be recorded, allow for a desired part of the scene to be in focus, and to control the exposure so that it is not too bright or
too dim. A display, often a liquid crystal display (LCD), permits the user to view the scene to be recorded and settings such as ISO speed, exposure, and shutter speed.

A movie camera or a video camera operates similarly to a still camera, except it records a series of static images in rapid succession, commonly at a rate of 24 frames per second. When the images are combined and displayed in order, the illusion of motion is achieved.

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1.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Photography is the art, application and practice of creating durable images by recording light or other electromagnetic radiation, either electronically by means of an image sensor, or chemically by means of a light-sensitive material such as photographic film.

2. The coining of the word “photography” is usually attributed to Sir John Herschel in 1839.

3. The rangefinder differs from the viewfinder in that it has a double image created through the use of mirrors.

4. Shutter is that component of the camera which restricts the light from falling onto the image making component, when it is not required.

1.7 SUMMARY

- Photography is the art, application and practice of creating durable images by recording light or other electromagnetic radiation, either electronically by means of an image sensor, or chemically by means of a light-sensitive material such as photographic film.

- Typically, a lens is used to focus the light reflected or emitted from objects into a real image on the light-sensitive surface inside a camera during a timed exposure.

- With an electronic image sensor, this produces an electrical charge at each pixel, which is electronically processed and stored in a digital image file for subsequent display or processing.

- The result with photographic emulsion is an invisible latent image, which is later chemically “developed” into a visible image, either negative or positive.
A negative image on film is traditionally used to photographically create a positive image on a paper base, known as a print, either by using an enlarger or by contact printing.

The coining of the word “photography” is usually attributed to Sir John Herschel in 1839.

Earlier, there used to be fairly clear demarcations between cameras aimed at entry-level consumers, enthusiasts, and professionals.

Consumer cameras are now available in smaller sizes and they include many high-end features which enable them to give high performance.

Around 1717 Johann Heinrich Schulze captured cut-out letters on a bottle of a light-sensitive slurry, but he apparently never thought of making the results durable.

In the mid-1820s, Nicéphore Niépce first managed to fix an image that was captured with a camera, but at least eight hours or even several days of exposure in the camera were required and the earliest results were very crude.

Rangefinder and viewfinder cameras have a ‘viewfinder’ through which the picture is framed.

The rangefinder differs from the viewfinder in that it has a double image created through the use of mirrors.

Miniature cameras are twin lens cameras that have two look-alike lenses, hence the name ‘twin lens’.

Talking about are digital cameras, DSLRs or any other type of camera, the mechanism of capturing images is almost the same.

A camera is a simple gadget that captures light and records it on the storage medium (film, memory card).

The common components of a camera are the lens, shutter, image sensor, viewfinder and a mirror.

The aperture stop of a photographic lens can be adjusted to control the amount of light reaching the film or image sensor.

A device called a diaphragm usually serves as the aperture stop and controls the aperture. The diaphragm functions much like the iris of the eye – it controls the effective diameter of the lens opening.

A large variety of photographic techniques and media are used in the process of capturing images for photography.

A camera works with the light of the visible spectrum or with other portions of the electromagnetic spectrum.
A still camera is an optical device which creates a single image of an object or scene and records it on an electronic sensor or photographic film. All cameras use the same basic design: light enters an enclosed box through a converging/convex lens and an image is recorded on a light-sensitive medium (mainly a transition metal-halide).

1.8 KEY WORDS

- **Photolithography**: It refers to lithography using plates made photographically.
- **Photochemical**: It refers to something relating to or caused by the chemical action of light.
- **Projector**: It is a device that is used to project rays of light, especially an apparatus with a system of lenses for projecting slides or film on to a screen.
- **Illusion**: It is an instance of a wrong or misinterpreted perception of a sensory experience.

1.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

**Short-Answer Questions**

1. Briefly discuss the history of photography.
2. Write a short note on the various types of cameras.
3. Describe the tools of photography and explain their function.

**Long-Answer Questions**

1. Describe photography in detail. What is the process involved in photography?
2. Give a detailed description of the parts of a camera. Explain each part individually.

1.10 FURTHER READINGS


UNIT 2 COMPOSITION

Structure
2.0 Introduction
2.1 Objectives
2.2 Composition and the Need for Composing a Picture
2.3 Elements, Rules and Conventions of Composition
2.4 Relevance in a Communication Message
2.5 Answers to Check Your Progress Questions
2.6 Summary
2.7 Key Words
2.8 Self Assessment Questions and Exercises
2.9 Further Readings

2.0 INTRODUCTION

To define in simple terms, ‘composition’ describes the placement of relative objects and elements in a work of art. Composition functions as a key aspect of a good work of art and therefore it is required to emphasize the importance of its role in creating good art. Artists are required to pay a lot of attention to composition while working on a piece of art. A good composition is one that has just enough detail. Lack of enough details make the work difficult to interpret and gives an impression of “something amiss”. Similarly, too many elements can be very distracting and can ruin the balance of the image. It is best to make sure all the elements present are necessary for the idea or story you are trying to pass on.

Composing an image means arranging elements within it in a way that suits the core idea or goal of that image. The elements can be arranged by manually moving the objects or subjects. For example, a portrait or still life photography. Street photography involves anticipation, since the photographer doesn’t usually have the choice of moving his subjects himself but has to wait for them to take the most suitable position within the frame. If moving the objects or subjects is not feasible then another way of arranging elements is by changing your own position. Such a way is appropriate in circumstances that do not allow the photographer to physically move anything, like landscape photography.

2.1 OBJECTIVES

After going through this unit, you will be able to:
- Explain the need for composing a picture
- Discuss the rules and conventions of composition
- Analyse the elements of composition
- Describe the role and relevance in communicating a message
2.2 COMPOSITION AND THE NEED FOR COMPOSING A PICTURE

Composition is the nature of something’s ingredients or constituents; the way in which a whole or mixture is made up. The dictionary definition of composition pretty much sums it up with regards to photography composition as well. The composition of an image is simply the way all the individual subjects within our frame combine to form the final image. We can alter our composition by moving around, zooming in or out, changing lenses, or even just crouching down.

The possibilities are almost endless with regards to composition, and even the slightest tweak can make a big difference to the finished photograph. Once you get the hang of it you’ll start seeing every scene as a potential compositional goldmine.

There are no unbreakable rules when it comes to how you should compose your photographs. There are however, several guidelines that can help in improving the composition of the photos.

2.3 ELEMENTS, RULES AND CONVENTIONS OF COMPOSITION

A few things must come together to make a great photograph. One of them is, being in the right place at the right time. Another, is the ability to tell a story. Yet another is excellent composition.

However, there are several easy tips on how to take photographs that are interesting and well-composed. Some of these tips overlap and contain common concepts. However, they are all free. They do not require any extra money or equipment. They require only an open mind and an eye that is willing to be trained over time.

Find a Focal Point

One of the most important tools for properly composing a photo is establishing a focal point — a main point of interest. If too many elements are competing for attention, a photo probably does not have a clearly defined focal point. Your eye, therefore, does not know where to look. Too many images without a focal point cause the viewer to tire quickly or lose interest. The eye prefers to be drawn to a specific subject.

Excessive background elements, such as furniture, walls, tables, fences, buildings, and even random bystanders, do not add much to the compositional or emotional value of your shot. What you really want to capture might be, for instance, the smiles and expressions of your family and friends.
Keep the following tips in mind to help you find your focal point:

(i) Pick your subject and then get close to it.

(ii) Include a point of interest in scenic shots. Sunrises and sunsets are pretty, but after you have seen a few, you have seen them all. Try to capture an early morning fisherman casting his line off the pier or a child checking out a rogue hermit crab at dusk. This potentially ho-hum scenic shot now has some visual punch.

(iii) When it is appropriate, try to include an element in the foreground, middle ground, or background. This adds depth and a sense of scale to the image. Just ensure that it is a meaningful element and not a random clutter, as shown in Figure 2.1.

![Fig. 2.1 Image Shot Showing the Inclusion of Elements in the Foreground](image)

**Understanding the rule of thirds**

One of the most common principles of digital photography is the rule of thirds. This rule has been used successfully from ancient artists to the modern greeting card designers. According to the rule of thirds, dividing a photo or a page into thirds vertically and horizontally and positioning the objects on those lines makes the image seem more pleasing to the eye.

While using the rule of thirds to a photo, remember the following points:

- The main subject is generally not in the centre of your page or image.
- Too much symmetry makes for a bad overall composition.
- Avoid centring the horizon line, that is, equal amounts of sky and land, which would divide the visual in the middle horizontally.

As you design a page or try to improve a photo, be open to experiments. Move the elements around. Play with the original ideas about the photo or the page and see what happens. When you feel that the page or photo looks good, try
to take a dispassionate look at it with the rule of thirds in mind. It is sure that you will find that making adjustments to your design in accordance with the rule of thirds improves the look of your Web page.

**Tweaking your page design with the rule of thirds**

A page or a photo can be made better by following the rule of thirds. Consider modifying a Web page keeping in view the rule of thirds. First of all, you have to find the focal point—an object that is the main topic or the most prominent visual element in the page—anything the viewer is supposed to notice first.

Figure 2.2 depicts a page with the following primary zones:

- Some text (gray blocks)
- Some bold text (the dark block)
- Headlines (black bars)

Overall, Figure 2.2 is not a bad design because it has variety and is also balanced. Note, that it is not symmetrical. It is balanced. That is an important difference.

![This Nicely Balanced Page Lacks a Focus](image)

However, Figure 2.2 does not have a focal point. There is nothing very punchy or extraordinary on the page to hold the attention of the viewer. You should remember that a focal point stands out from the rest of the page. The focal point can even be as simple as an unusual shape-something that does not match the other shapes on the page, as shown in Figure 2.3.
Figure 2.3 seem to be an improvement over Figure 2.7 but keeping the rule of thirds can make the composition even more strong. To apply the rule:

- Draw imaginary, horizontal and vertical lines to divide the page into thirds, as shown in Figure 2.4.
- Place straight lines (walls and horizons, for example) along any of these lines.
The points in which these horizontal and vertical lines intersect are the best points where you can place the focus or the key subject of the page. The four spots where the lines intersect are referred to as hotspots. Figure 2.5 is a further improvement to the design with the dancer now moved to a hotspot.

![Fig. 2.5 The Focal Point Moves onto a Hotspot](image)

Now, try moving the focal point to any of the other hotspots. You will find that the picture looks good in the other positions as well. Remember that there are four hotspots to experiment with. In Figure 2.6, the picture is inserted in the upper left hotspot. Also, notice the change in the dancer's position: it is just the opposite of her position in Figure 3.40; in Figure 3.41, she dances into the page.

![Fig. 2.6 The Dancer Looks Good in the Other Hotspot](image)
TIP: When you have to place a moving object in your composition (an arrow, a dancer or anything that points or “moves”), remember that in a good design the object moves into—not out of—the page. The focal point is the first thing that the viewer will notice, and it should be positioned such that it leads the eye into the page.

Balancing the rule of thirds with the background

While changing the position of the focal point in accordance with the rule of thirds, you have to pay attention to the background also. For instance, the design shown in Figure 2.7 is not as good as that in Figure 2.6 even though the moving object is placed on a hotspot. In Figure 2.7, the focal point mingles with the dark background and is not even noticeable; it has lost its prominent effect.

![Fig. 2.7 The Focal Point is Swallowed by the Dark Background](image)

Therefore, you should move a focal point such that it becomes more prominent; you should violate white space, that is, the focal point should poke into the surrounding white space.

Background image positioning

You should remember to employ the rule of thirds hotspots with the background images as well. For example the image in Figure 2.8 has been centred to provide balance. Although that is right, remember that balance combined with interest and unity combined with diversity will make the design better.
Now, try moving around the background image from Figure 2.8. Figure 2.9 is an improvement over that in Figure 2.7. The background in Figure 2.9 is radiating from the hotspot, not from the centre.

Use the Rule of Thirds

After you find a focal point for your shot, the next step is to try to put that focal point, or subject, in a prime location within your view-finder or LCD display. These prime locations are based on the photographic principle called the rule of thirds. If you divide an image into a grid of nine equal segments, as shown in
Composition

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Figure 2.10, then the elements most appealing to the eye and, the most likely to be noticed first are those that fall close to one of the four intersections of the dividing lines.

When you are composing your shot, try to mentally divide your frame into vertical and horizontal thirds and position your most important visual element at any intersecting point. When you are shooting landscapes, remember that a low horizon creates a dreamy and spacious feeling and that a high horizon gives an earthy and intimate feeling. For close-up portraits, try putting the face or eyes of a person at one of these points.

If the rule of thirds is too hard for you to remember or employ, when you look through the viewfinder, just repeat the mantra “Move from centre.” Everybody has a natural tendency to be at the centre of everything. Get it nice and orderly. However, generally, centered subjects are often static and boring. Asymmetry often gives more dynamic and interesting images.

Note: If you have an autofocus camera, then you need to lock the focus when you are moving from the centre. This is because the autofocus sensor locks onto whatever is in the centre of the viewfinder — not on your point of interest. Autofocus can also be problematic when you are trying to do something as simple as photographing two people (in this case, you may want the two people in the centre) and your camera keeps focusing on the space in the distance between them. Centre your subject in the viewfinder and apply a slight pressure to your shutter release button to lock the focus. Then, reposition your subject at an intersecting point on the rule-of-thirds grid and press down all the way to snap the photo.

Cut the Clutter

Contrary to what you see on supermarket tabloid covers, those telephone poles, branches, car antennas and other everyday objects do not naturally grow out of people’s heads. Although these mergers, as photographers call them, are good for a laugh, they are not good enough to make it into picture frames and scrapbooks. Here are some ways you can cut the clutter from your background:

(i) **Get up close and personal:** Most people worry about getting their heads cut off when they get their photos taken. But more often than not, people tend to capture too much boring or distracting background. Fill your
viewfinder frame with your subject. Although you can always crop your image later, you should try to get your subject to fill the frame when you take the photo.

(ii) **Shoot at a different angle:** Most photos are horizontal merely because it is easier to hold the camera that way. That is okay for a lot of shots (such as the requisite group photo and some landscape shots), but other subjects (buildings, trees, waterfalls, mountain peaks, giraffes, Shaquille O’Neal) are best shot in a vertical format.

(iii) **Move around your subject:** Moving around may help eliminate unwanted clutter. Shoot from below or above your subject, if necessary.

(iv) **Move your subject, if possible, to get the optimum background:** Although there are exceptions, an ideal background is usually free from distracting elements, such as tree branches, poles, wires, chain-link fences, signs, bright lights, a lot of loud colours, busy wallpaper and so on. Include only what complements your subject.

(v) **Use background elements to enhance, not distract:** However, if your background is interesting and can make your photo stronger, include it. You can use famous landmarks, props, and even decorations in the background to give context to images, as shown in Figure 2.11.

![Image Shot with Background Elements to Define and Add Ambience to the Subject](image)

**Fig. 2.11 Image Shot with Background Elements to Define and Add Ambience to the Subject**

(vi) **Use space around a subject to evoke a certain mood:** A lot of space around a person can give a sense of loneliness, just as a closely cropped portrait can create a feeling of intimacy. Just make sure that the space is intentionally used in the shot.
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Tip: If you’re stuck with a distracting background, you can try blurring it by using a wider aperture (such as f/4, rather than f/11 or f/16) on your camera. This makes the depth of field (areas of sharpness in relation to your focal point) shallower so that your subject is in focus, but the background isn’t.

Because consumer digital cameras use image sensors that are typically one-third the size of a 35mm frame, the lens is very close to the sensor, which really increases the depth of field. This deep depth of field can make blurring the background difficult. However, you can also blur the background by making a selection and using the Blur filter in Elements.

Frame Your Shot

When it is appropriate, use foreground elements to frame your subject. Frames lead you into a photograph. You can use elements, such as tree branches, windows, archways and doorways, to frame a wide or long shot, add a feeling of depth, and create a point of reference, as shown in Figure 2.12. You need not reserve the use of framing for wide and long shots, however. Close-ups can also be framed. Your framing elements need not always have to be sharply focused. Sometimes, if they are too sharp, they can distract you from the focal point.

Employ Contrast

Just remember 'Light on dark, dark on light.' A light subject has more impact and emphasis if it is shot against a dark background, and vice versa, as shown in Figure 2.13.
When people view an image, their eyes go first to the area of the most contrast. Obviously, finding contrast in the environment is sometimes beyond your control. Nevertheless, when you are setting up a shot, you can certainly try to incorporate this technique. Keep in mind, however, that contrast needs to be used carefully. Sometimes, it can be distracting, especially if the high-contrast elements are not your main point of interest.

Use Leading Lines

Leading lines are lines that, by either the actual elements in the image or the composition of those elements, lead the eye into the picture and, hopefully, to a point of interest. These following lines add dimension, depth and perspective by carrying the eye through the photo:

- **Diagonal lines** are dynamic and evoke movement.
- **Curves** are graceful and harmonious.
- **Horizontal lines** are peaceful and give a feeling of balance.
- **Vertical lines** are direct and active.

The best leading lines are those that enter the image from the lower-left corner. Many elements provide natural leading lines, especially in scenic or landscape photos, such as roads, walls, fences, rivers, shadows, skyscrapers and bridges. The photo shown in Figure 2.14 of the Great Wall of China is an example of curved leading lines.

*Fig. 2.13 Image Shot Using Light on Dark, Dark-on-light Concept*
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Fig. 2.14 Image Showing the Long Unbroken Curve of the Great Wall of China

Experiment with Viewpoints

Not much in the world looks fascinating photographed from a height of 5 to 6 feet off the ground. Unfortunately, this is the viewpoint of ‘Snapshotville.’ Attempt to break out of this mode by taking photos from another vantage point. Experiment with taking a photo from above the subject (bird’s-eye view) or below it (worm’s-eye view). Different angles may provide a more interesting image, such as:

(i) **Unexpected angles can exaggerate the size of the subject:** The subject may appear either larger or smaller than normal, as shown in Figure 2.15. Try extreme angles with scenic shots, which otherwise can tend to be rather static or boring.

Fig. 2.15 Subjects Shot from Extreme Angles Make an Interesting Shot
(ii) Changing your viewpoint can change the mood of the image: If Figure 2.15 had been taken from a front angle, then it would have been pretty dull. Taken from below, looking up, exaggerates the height and makes for a stronger and more exciting composition, making the cactus seem like nature’s skyscraper.

(iii) Use direct eye contact when you are photographing people: It provides a sense of realism and makes the image more intimate and warm, pulling you into the photo. But remember, that children are not at the same eye level as adults. You often shoot down at them, making them appear smaller than they really are. Try kneeling or sitting on the floor and getting down to their level. You will also find that you get a less distracting background in the frame and the lighting from your flash more evenly covers the face. Do the same for pets and other short-stature subjects, such as flowers.

Use Light

When you think of light in regard to photography, the first thing that comes to mind are all those photos that you took in the past that are either overexposed (too much light) or underexposed (too dark). With lighting, you have to consider not only whether you have the right amount of lighting but also the following factors:

- The direction of the light
- The intensity of the light
- The colour of the light
- The source of light — Natural light (outdoors) or artificial light (indoors)

Creative use of lighting to lead the eye and create a certain mood. If the light is not right for your shot, then you have quite a few choices: Hurry up and wait, move yourself, move the subject, add more light with a flash or diffuse the light. Of course, which one you select depends on the circumstances of the shot, the convenience or most productive angle. The following are a few tips to remember about light:

- The best light for photographs is in the early morning and later afternoon: The light is warmer and softer, and the shadows are longer and less harsh.
- Avoid taking portraits at midday: The overhead sun causes ugly shadows and makes people squint. If you must shoot, then use a reflector to block some of the sunlight or fill in the shadow areas. You can use a scrim (white translucent fabric stretched across a frame) to diffuse the light.
- Cloudy or overcast days can be great for photographing, especially portraits: The light is soft and diffused and flatters the face.
- Shooting subjects with backlighting (where the lighting comes from behind the subject) can produce dramatic results: Figure 2.16 shows...
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an example. If you want to see the details of the subject, and not just a silhouette, use a fill flash to lighten the shadow areas (see also Figure C-8).

Fig. 2.16 Backlighting Yields Dramatic Images

• Ensure that the brightest light source is not directed right into the lens: This causes lens flare refers to those strange light circles that appear in the photo.

• Take into account the colour of the light: The light at noon is white, the light at sunset is orange and at twilight, is blue. The colour of the light can make an image feel warm or cool.

• Use a flash when necessary: Use a flash in low-light conditions. If your built-in flash is not cutting the mustard, you may want to invest in an accessory flash.

• Get creative with light: Look for those unique compositions created by the interplay between light and shadow areas or how light illuminates a particular subject. Lighting by itself can make or break a certain mood or emotion. Think of a simple beam of light coming through the roof of an old barn. Even in the lousiest weather, the most beautifully lit images can emerge. When wet objects are lit, they seem to shimmer, as shown in Figure 2.17 (see also Figure C-9).

Fig. 2.17 Lighting Creating Drama from Simple Objects
Give Direction

When you look at magazines that feature the year’s best photos, they all appear as instances of pure serendipity. Sometimes that is the case, but more often than not, the photographer arranged the shot or waited for the right light or a special moment.

As a photographer, you also should not be afraid to play photo stylist:

- **Give directions on where you want people to stand, how to stand, and so on:** For example, tell people to touch each other, bring their heads toward each other or put their arms around each other.
- **Designate the location.**
- **Arrange people around props, such as trees or cars.**
- **Use a variety of poses:** Have some people sit and others stand.
- **If you are dealing with a large group of people, rambunctious kids or excited pets, get someone to help direct:** Just make sure that the parties being photographed pay attention and look at the camera.
- **Try to get people to relax:** Although spontaneity can yield great images, you can still get good photos from posed subjects if they are not hating the experience.

Consider Direction of Movement

When the subject is capable of movement, such as a car, person or animal, make sure that you leave more space in front of the subject than behind it, as shown in Figure 2.18. Otherwise, the viewer may subconsciously experience a feeling of departure or discomfort. You want to try to give the person or object room to move into the frame. Likewise, if a person is looking out onto a vista, make sure that you include that vista so that the person is given a point of view and the scene is the given context.

![Fig. 2.18 Image Shot Considering Direction of Movement](image-url)
2.4 RELEVANCE IN A COMMUNICATION MESSAGE

Once you learn to see like the camera, the next step that you will take will be for composing your photographs. Composition is important because your image cannot speak and guide the viewer’s eyes in the photograph. Compositionally, elements like leading lines guide the viewer’s eye in the photograph. In addition, there will be a lot of different points of interests that you would want the viewer to see. Once the viewer sees what you want to show him, your message is delivered, and your photograph is a success.

Composition plays several important roles like creating the mood of an image, expressing the emotions, telling the viewer the story. To understand the fundamentals of composition, study the paintings and photographs of great masters and observe how they have composed their images and why. This is a very easy way to learn, by observing and analysing good photographs and paintings.

Now, when you talk about the practical aspect of composing a portrait, there are a few things that you should consider so that you’re not only taking pictures but are creating images. Portrait photography is not the same as any other type of photography. Here, your subject is very direct and physical. While photographing a person, the most important part of the image has to be the person. Posing and lighting play very important roles in portrait photography but the importance of composition is still great.

Check Your Progress

1. What is composition of an image?
2. What is the rule of thirds?
3. What does ‘light on dark, dark on light’ mean?
4. What are leading lines?

2.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The composition of an image is simply the way all the individual subjects within our frame combine to form the final image.
2. According to the rule of thirds, dividing a photo or a page into thirds vertically and horizontally and positioning the objects on those lines makes the image seem more pleasing to the eye.
3. Light on dark, dark on light’ means that a light subject has more impact and emphasis if it is shot against a dark background, and vice versa.
4. Leading lines are lines that, by either the actual elements in the image or the composition of those elements, lead the eye into the picture and, hopefully, to a point of interest.

2.6 SUMMARY

- Composition is the nature of something’s ingredients or constituents; the way in which a whole or mixture is made up.
- The composition of an image is simply the way all the individual subjects within our frame combine to form the final image.
- We can alter our composition by moving around, zooming in or out, changing lenses, or even just crouching down.
- A few things must come together to make a great photograph. One of them is, being in the right place at the right time.
- One of the most important tools for properly composing a photo is establishing a focal point — a main point of interest. If too many elements are competing for attention, a photo probably does not have a clearly defined focal point.
- Excessive background elements, such as furniture, walls, tables, fences, buildings, and even random bystanders, do not add much to the compositional or emotional value of your shot.
- One of the most common principles of digital photography is the rule of thirds. This rule has been used successfully from ancient artists to the modern greeting card designers.
- According to the rule of thirds, dividing a photo or a page into thirds vertically and horizontally and positioning the objects on those lines makes the image seem more pleasing to the eye.
- A page or a photo can be made better by following the rule of thirds. Consider modifying a Web page keeping in view the rule of thirds.
- After you find a focal point for your shot, the next step is to try to put that focal point, or subject, in a prime location within your view-finder or LCD display. These prime locations are based on the photographic principle called the rule of thirds.
- When you are composing your shot, try to mentally divide your frame into vertical and horizontal thirds and position your most important visual element at any intersecting point.
- If the rule of thirds is too hard for you to remember or employ, when you look through the viewfinder, just repeat the mantra ‘Move from centre’.
- When it is appropriate, use foreground elements to frame your subject. Frames lead you into a photograph.
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- Leading lines are lines that, by either the actual elements in the image or the composition of those elements, lead the eye into the picture and, hopefully, to a point of interest.
- The best leading lines are those that enter the image from the lower-left corner.
- When the subject is capable of movement, such as a car, person or animal, make sure that you leave more space in front of the subject than behind it.
- Once you learn to see like the camera, the next step that you will take will be for composing your photographs.
- Composition is important because your image cannot speak and guide the viewer’s eyes in the photograph.
- Composition plays several important roles like creating the mood of an image, expressing the emotions, telling the viewer the story.
- To understand the fundamentals of composition, study the paintings and photographs of great masters and observe how they have composed their images and why.

2.7 KEY WORDS

- **Portrait**: It is a painting, drawing, photograph, or engraving of a person, especially one depicting only the face or head and shoulders.
- **Image**: It is a representation of the external form of a person or thing in art.
- **Background**: It is the part of a picture, scene, or design that forms a setting for the main figures or objects or appears furthest from the viewer.

2.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

**Short-Answer Questions**

1. Write a short note on the rule of thirds.
2. How can you declutter the background in a photo?
3. How are leading lines and framing helpful in photography? What impact do they have?

**Long-Answer Questions**

1. What do you understand by composition? Why is there a need for composing a picture?
2. Give a detailed description of elements, rules and conventions of composition.

3. How is light used in taking a good photograph?

2.9 FURTHER READINGS


UNIT 3 TYPES OF CAMERAS

3.0 INTRODUCTION

Modern technology has transformed capturing photos as a regular everyday activity as compared to during the earlier generations when only film cameras were available. With rapid technological advances, more and more types of cameras are being developed to suit every aspiring photographer. Cameras are being developed to suit a photography enthusiast’s artistic style and needs. There are cameras in the market which have such defined specs that even an amateur can click scintillating pictures. The technological improvements too come in very handy for both professionals and learners alike.

Nowadays, cameras come in many different forms. These camera types include film cameras, compact digital cameras, DSLRs, action cameras and many more. It becomes easy to differentiate between the cameras once you find out more about each of them, what they’re best for, and what their pros and cons are.

Some of the types of cameras are as follows:

- Compact Digital Cameras
- Digital SLR Cameras
- Mirrorless Cameras
- Action Cameras
- 360 Cameras
- Film Cameras

In this unit, you will study about different kinds of cameras in detail.
3.1 OBJECTIVES

After going through this unit, you will be able to:

- Explain the single lens reflex (SLR)
- Discuss large and medium format cameras
- Describe pin-hole, box, folding, DSLR and twin lens reflex (TLR)

3.2 SINGLE LENS REFLEX(SLR)

The first major difference between SLRs and digital compact cameras is in terms of price. Even though digital SLR prices have come down over the years, they are still significantly more expensive than their compact cousins.

Size and weight is the second most obvious difference between SLR and compact digital cameras. Even a small-sized digital SLR camera is twice the size and bulk of a compact camera. Though many new digital SLR models are more portable and easier to travel with, they are still not able to fit in your shirt pocket or purse.

Digital SLR cameras that could capture both video and still images made their first appearance in 2008. Prior to 2008, digital SLR cameras were exclusively used for capturing stills. Even now when videos have become a more common feature in SLRs, they suffer from one major limitation; **autofocus does not work while you are capturing video**. This means that you will have to focus manually, which is pretty tricky when you are taking video of fast-moving subjects. However, the video captured by digital SLRs does have one advantage over compacts; you can set the camera to capture High Definition (HD) videos that are suitable for playback on modern HDTVs. Digital SLRs with video capture also come equipped with HDMI ports, so you can connect the camera directly to your TV to playback both photos and video.

While compact digital cameras have **electronic zooms**, the zoom mechanisms in digital SLR lenses are entirely manual. To change the view in a SLR, you have to twist a ring on the lens. This manual zoom actually results in a faster zoom, you do not have to wait for the motors to move the lens in and out, you can just twist the zoom ring as fast or slow as you like.

SLRs and compact digital cameras also differ with respect to the zoom range. There are many compact cameras available in the market today with ‘mega-zooms’. These cameras have 10x or 12x zooms and are capable of taking both wide angle and telephoto shots. In order to cover a similar range with a digital SLR you may either buy a mega-zoom lens or buy two zoom lenses.
3.3 PINHOLE, BOX, FOLDING AND DSLR, LARGE AND MEDIUM FORMAT, TWIN LENS REFLEX (TLR)

A pinhole camera, also known as camera obscura, or “dark chamber”, is a simple optical imaging device in the shape of a closed box or chamber. In one of its sides is a small hole which, via the rectilinear propagation of light, creates an image of the outside space on the opposite side of the box.

History

Images created via a small opening will be found in the natural environment and in everyday life, and people in various parts of the world have been observing them since ancient times. Probably the earliest surviving description of this kind of observation dates from the 5th century BC, written by Chinese philosopher Mo Ti. In the Western hemisphere, Aristotle in 4 BC was asking, without receiving any satisfactory answer, why sunlight passing through quadrilaterals, for example, one of the holes in wickerwork, does not create an angled image, but a round one instead, and why the image of the solar eclipse passing through a sieve, the leaves of a tree or the gaps between crossed fingers creates a crescent on the ground. In 10 AD the Arabian physicist and mathematician Ibn al-Haitham, known as Alhazen, studied the reverse image formed by a tiny hole and indicated the rectilinear propagation of light. There was another scholar during the Middle Ages who was familiar with the principle of the camera obscura, namely the English monk, philosopher and scientist Roger Bacon. It was not until the manuscript Codex atlanticus (c. 1485) that the first detailed description of the pinhole camera was set down by Italian artist and inventor Leonardo da Vinci, who used it to study perspective.

Initially, the camera obscura was, in fact, a room where the image was projected onto one of the walls through an opening in the opposite wall. It was used to observe the solar eclipse and to examine the laws of projection. It later became a portable instrument which was perfected with a converging lens. Instruments of this kind were often used as drawing aids and, at the dawn of photographic history, they formed the basis for the construction of the camera. The pinhole camera was finally also applied in modern science – during the mid-20th century scientists discovered that it could be used to photograph X-ray
radiation and gamma rays, which the ordinary lens absorbs. As a result, the pinhole camera then found its way onto spacecraft and into space itself.

While the first photograph taken with a pinhole camera was the work of Scottish scientist Sir David Brewster back in 1850, the technique became more established in photography during the late 19th century when it was noted for the soft outlines it produced, as opposed to lenses generating perfect, sharp images. The pinhole camera was later abandoned, and it wasn’t until the end of the 1960s that several artists began using it in their experiments, thus awakening renewed interest in this simple photographic apparatus which endures to this day.

**Principle and characteristics**

As mentioned above, the image in the pinhole camera is created on the basis of the rectilinear propagation of light. Each point on the surface of an illuminated object reflects rays of light in all directions. The hole lets through a certain number of these rays which continue on their course until they meet the projection plane where they produce a reverse image of the object. Thus, the point is not reproduced as a point, but as a small disc, resulting in an image which is slightly out of focus. This description would suggest that the smaller the hole, the sharper the image. However, light is essentially a wave phenomenon and so, as soon as the dimensions of the opening are commensurable with the dimensions of the light wavelength, diffraction occurs. In other words, if the hole is too small, the image will also be out of focus. The calculations for the optimal diameter of the hole in order to achieve the sharpest possible image were first proposed by Josef Petzval and later perfected by British Nobel prizewinner Lord Rayleigh (see Making the pinhole). He published the formula in his book Nature in 1891, and it is still valid today.

The image created by a pinhole camera has certain characteristics which we won’t find in classical lens photography. Since the process entails a central projection, the images in the pinhole camera are rendered in ideal perspective.

Another special characteristic is the infinite depth of field which, in a single photograph, allows objects to be captured with equal sharpness whether they are very close up or far away.

The pinhole camera takes in an extremely wide angle. The rays of light, however, take much longer to reach the edges of the negative than the centre, thus the picture is less exposed along the edges and therefore darkens.

A certain disadvantage of the pinhole camera is the amount of light allowed through (small aperture), which complicates and sometimes prevents entirely the photographing of moving subjects. Exposure time is normally counted in seconds or minutes but, in bad lighting conditions, this could be hours or even days (see Determining exposure times for pinhole cameras).
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Pinhole Cameras

Constructing a simple pinhole camera is easy. Make a hole in one side of a closable box made of material which doesn’t let light in. Place a thin piece of metal or tin can with a tiny hole over the opening. On the outside of the box stick a strip of black tape over the opening which acts as the release. Then, in a dark room, attach a piece of film or photographic paper onto the opposite side and the camera is ready.

The pinhole camera’s simple construction offers a number of ways in which it can be constructed, using various materials. The cameras can be all kinds of shapes and sizes, with various formats and types of light-sensitive material, several holes, curved film planes, for panoramic images etc. There are all sorts of imaginative ways to make these cameras; the most ordinary of objects can unexpectedly become pinhole cameras, for example a matchbox, book, a pepper, travel bag, a delivery van, an old fridge or even a hotel room. You can, of course, turn your ordinary camera into a pinhole camera by simply replacing the lens with a small hole. And to complete the list, there are also a number of commercially produced pinhole cameras in existence, on the whole, highly elaborate models.

What you experience once you design, construct and try out your own pinhole camera is difficult to describe. You’ll find yourself on a whole new plane of imagination, experimentation and creativity. Moreover, the photos themselves have an unusual atmosphere and capture the world in a different way than you are used to. Make your own pinhole camera and take some photographs with it. You’ll find out for yourselves.
Folding and DSLR

A digital single-lens reflex camera (also called digital SLR or DSLR) is a digital camera that combines the optics and the mechanisms of a single-lens reflex camera with a digital imaging sensor, as opposed to photographic film. The reflex design scheme is the primary difference between a DSLR and other digital cameras. In the reflex design, light travels through the lens, then to a mirror that alternates to send the image to either the viewfinder or the image sensor. The traditional alternative would be to have a viewfinder with its own lens, hence the term "single lens" for this design. By using only one lens, the viewfinder of a DSLR presents an image that will not differ substantially from what is captured by the camera's sensor. A DSLR differs from non-reflex single-lens digital cameras in that the viewfinder presents a direct optical view through the lens, rather than being captured by the camera's image sensor and displayed by a digital screen.

DSLRs largely replaced film-based SLRs during the 2000s, and despite the rising popularity of mirrorless system cameras in the early 2010s, DSLRs remain the most common type of interchangeable lens camera in use as of 2018.
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accurate optical preview with separate autofocus and exposure metering sensors.
Essential parts of all digital cameras are some electronics like amplifier, analog to
digital converter, image processor and other (micro-)processors for processing
the digital image, performing data storage and/or driving an electronic display.

Large and Medium format cameras

Large format refers to any imaging format of 4×5 inches (102×127 mm) or
larger. Large format is larger than “medium format”, the 6×6 cm (2¼×2¼ inch) or
6×9 cm (2½×3½ inch) size of Hasselblad, Rollei, Kowa, and Pentax cameras
(using 120- and 220-roll film), and much larger than the 24×36 mm (0.95×1.42
inch) frame of 35 mm format. The main advantage of large format, film or digital,
is a higher resolution at the same pixel pitch, or the same resolution with larger
pixels or grains. A 4×5 inch image has about 15 times the area, and thus 15× the
total resolution, of a 35 mm frame.

Large format cameras were some of the earliest photographic devices, and
before enlargers were common, it was normal to just make 1:1 contact prints
from a 4×5, 5×7, or 8×10-inch negative.

Format

The most common large format is 4×5 inches, which was the size common cameras
used in the 1930s-1950s, like the Graflex Speed Graphic and Crown Graphic,
among others. Less common formats include quarter-plate, 5×7 inches, and 8×10
inches (20×25 cm); the size of many old 1920s Kodak cameras (various versions
of Kodak 1, 2, and 3 and Master View cameras, to much later Sinar monorail
studio cameras) are 11×14 inches, 16×20 inches, 20×24 inches, various panoramic
or “banquet” formats (such as 4×10 and 8×20 inches), and metric formats, including
9×12 cm, 10×13 cm, and 13×18 cm and assorted old and current aerial image
formats of 9×9 inches, 9×18 inches (K17, K18, K19, K22 etc.), using roll film of
4, 5, 6, 7, 9, or 10 inches width or, view cameras (including pinhole cameras),
reproduction/process cameras, and x-ray film.

Above 8×10 inches, the formats are often referred to as Ultra Large Format
(ULF) and may be 11×14, 16×20, or 20×24 inches or as large as film, plates, or
cameras are available. Many large formats (e.g., 24×24, 36x36, and 48x48 inches)
are horizontal cameras designed to make big negatives for contact printing onto
press-printing plates.

The Polaroid 20×24 camera is one of the largest format instant cameras in
common usage and can be hired from Polaroid agents in various countries. Many
well-known photographers have used the 235 pounds (107 kg), wheeled-chassis
Polaroid.

Control

Most, but not all, large format cameras are view cameras, with fronts and backs
called “standards” that allow the photographer to better control rendering of
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perspective and increase apparent depth of field. Architectural and close-up photographers in particular benefit greatly from this ability. These allow the front and back of the camera to be shifted up/down and left/right (useful for architectural images where the scene is higher than the camera, and product images where the scene is lower than the camera) and tilted out of parallel with each other left/right, up/down, or both; based on the Scheimpflug principle. The shift and tilt movements make it possible to solve otherwise impossible depth-of-field problems, and to change perspective rendering, and create special effects that would be impossible with a conventional fixed-plane fixed-lens camera.

Ansel Adams’ photographs, and those of the other Group f/64 photographers, demonstrate how the use of front (lens plane) and back (film plane) adjustments can secure great apparent depth of field when using the movements available on large format view cameras.

Operation

A number of actions need to be taken to use a typical large format camera, resulting in a slower, often more contemplative, photographic style. For example, film loading using sheet film holders requires a dark space to load and unload the film, typically a changing bag or darkroom, although pre-packaged film magazines and large format roll films have also been used in the past.

A tripod is typically used for view camera work, but some models are designed for hand-held use. These “technical cameras” have separate viewfinders and rangefinders for faster handling.

In general, large format camera use, the scene is composed on the camera’s ground glass, and then a film holder is fitted to the camera back prior to exposure. A separate Polaroid back using instant film is used by some photographers, allowing previewing of the composition, correctness of exposure and depth of field before committing the image to film to be developed later. Failure to “Polaroid” an exposure risks discovery later, at the time of film development, that there was an error in camera setup.

Uses

The 4×5 inch sheet film format was very convenient for press photography since it allowed for direct contact printing on the printing plate, hence it was widely used in press cameras. This was done well into the 1940s and 1950s, even with the advent of more convenient and compact medium format or 35 mm roll-film cameras which started to appear in the 1930s. The 35 mm and medium format SLR which appeared in the mid-1950s were soon adopted by press photographers.

Large format photography is not limited to film; large digital camera backs are available to fit large format cameras. These are either medium-format digital backs adapted to fit large format cameras (sometimes resulting in cropped images), step and repeat Multishot systems, or scanning backs (which scan the image area
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in the manner of a flat-bed scanner). Scanning backs can take seconds or even several minutes to capture an image. When using a Sinar Macroscan unit and 54H data files, over 1 gigabyte of data is produced.

Large format, both film-based and digital, is still used for many applications, such as landscape photography, advertising photos, fine-art photography, scientific applications and generally for images that will be enlarged to a high magnification while requiring a high level of detail. High quality fine art prints can be made at sizes in the range of 40x50" from a 4x5" original, and well beyond that for larger negatives.

The Library of Congress uses various large format digital scans for “American Memories” (its website of old images and maps) in the current JPEG 2000 format (which allows quick small images, remote tiling, remote enlargement), and the older MsSID, JPEG, and TIFF formats.

In the printing industry, very large fixed cameras were also used to make large films for the preparation of lithographic plates before computer-to-film and computer-to-plate techniques were introduced. These are generally referred to as a "process camera" and consist of vertically mounted models for smaller work and horizontal units mounted on rails for very large works such as maps and plans.

Medium format has traditionally referred to a film format in still photography and the related cameras and equipment that use film. Nowadays, the term applies to film and digital cameras that record images on media larger than 24 mm × 36 mm (0.94 in × 1.42 in) (full-frame) (used in 35 mm (1.4 in) photography), but smaller than 4 in × 5 in (100 mm × 130 mm) (which is considered to be large-format photography).

In digital photography, medium format refers either to cameras adapted from medium-format film photography uses or to cameras making use of sensors larger than that of a 35 mm film frame. Often, medium-format film cameras can be retrofitted with digital camera backs, converting them to digital cameras, but some of these digital backs, especially early models, use sensors smaller than a 35 mm film frame. As of 2013, medium-format digital photography sensors were available in sizes of up to 40.3 by 53.7 mm, with 60 million pixels for use with commonly available professional medium-format cameras. Sensors used in special applications such as spy satellites can be even larger but are not necessarily described as medium-format equipment.

In the film world, medium format has moved from being the most widely used film size (the 1900s through 1950s) to a niche used by professionals and some amateur enthusiasts, but one which is still substantially more popular than large format. In digital photography, medium format has been a very expensive option, with lower-cost options such as the Fujifilm GFX 50R still retailing for $4,500.

While at one time a variety of medium-format film sizes were produced, today the vast majority of the medium-format film is produced in the 6 cm 120
and 220 sizes. Other sizes are mainly produced for use in antique cameras, and many people assume 120/220 film is being referred to when the term medium format is used.

The general rule with consumer cameras—as opposed to specialized industrial, scientific, and military equipment—is the more cameras sold, the more sophisticated the automation features available. Medium-format cameras made since the 1950s are generally less automated than smaller cameras made at the same time, having high image quality as their primary advantage. For example, autofocus became available in consumer 35 mm cameras in 1977, but did not reach medium format until the late 1990s, and has never been available in a consumer large format camera.

Characteristics

The main benefit of medium-format photography is that, because of the larger size of the film or digital sensor (two to six times larger than 35 mm), images of much higher resolution can be produced. This allows for bigger enlargements and smooth gradation without the grain or blur that would characterize similarly enlarged images produced from smaller film formats. The larger size of the film also allows for better control of the depth of field and therefore more photographic creativity.

Cameras with a bellows typically support ‘tilt and shift’ of the lens. Together with 1:1 focusing (via a ground glass screen mounted at the rear in the film plane position), this permits landscape photography with an extremely large depth of field — from closest foreground to the far horizon — to be achieved.

Compared with 35 mm, the main drawbacks are accessibility and price. While 35-mm cameras, film, and photo finishing services are generally widely available and cheap, medium format is usually limited to professional photography shops and can be prohibitively expensive. Also, medium-format cameras tend to be bulkier than their 35mm counterpart.

Film Handling

The medium-format film is usually roll film, typically allowing 8 to 32 exposures on one roll of film before reloading is needed. This is fewer than 35 mm cartridges, which typically take 12 to 36 pictures on one roll. This is somewhat offset by the fact that most medium-format systems used interchangeable film magazines, thereby allowing photographers to switch rolls quickly, allowing them larger numbers of exposures before needing to load new film or to change the file type. Some companies had bulk film backs that used 70mm double-perforated film that allowed up to 75 feet of film to be loaded at one time. While rolls of large format film were produced at one time, their use was specialized, typically for aerial cameras installed in military aircraft or printing industry equipment.

Most large format film is sheet film, that is, film where each picture is on a separate piece of film, requiring that the camera be frequently reloaded, usually...
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after every picture, sometimes using magazines of up to five pictures or reduction that allow multiple pictures on a single sheet of film. Medium-format sheet film was produced for some cameras, but these cameras tend to be smaller, lighter, and easier to use than large format gear. Sheet film was never commonly used in cameras smaller than medium format.

Film cost per exposure is directly related to the amount of film used, thus, the larger the file size, the more expensive each picture will be. An 8" by 10" large format negative is far more expensive than a 6 by 6 cm medium-format picture, which is substantially more expensive than a frame of 35 mm film.

35 mm cartridges are generally easier to load and unload from a camera than medium-format rolls. A 35 mm cartridge is placed inside a camera, and in most motorized cameras this is all that is needed; the camera loads the film and rewinds it into the cartridge for removal. Far fewer medium-format cameras are motorized, and medium-format roll film does not have sprocket holes, so loading often requires that marking on the backing paper of the film be lined up with markings on the camera, and on unloading, the backing paper must be carefully secured to protect the film from light.

120, 220 and 620 film

All medium-format cameras mass-produced today (as of 2012) use the 120 film format. Additionally, many are capable of using the 220 film format, effectively doubling the number of frames available with 120 film. Medium-format roll film is still available from specialty shops and photographic laboratories, yet it is not as ubiquitous as 135 (35mm) film.

The 620 format was introduced by Kodak in 1931 as an alternative to 120. It was discontinued in 1995. The 620 format is essentially the same film on a thinner and narrower all-metal spool. While 620 film is required on a number of old Kodak Brownie cameras, many of these cameras can accommodate the slightly larger 120 rolls/spools. In other situations where the camera cannot accommodate a 120 spool, the 120 film can be rolled onto a 620 spool in a darkroom or changing bag.

This film is shot in a variety of aspect ratios, which differ depending on the camera or frame insert used. The most common aspect ratios are 6×6 cm (square/1:1) and 6×4.5 cm (rectangular/4:3). Other frequently used aspect ratios are 6×7 cm, 6×9 cm, and 6×17 cm panoramic. The 6×4.5 cm format is usually referred to as “645”, with many cameras that use this ratio bearing “645” in their product name. Cameras that can switch to different aspect ratios do so by either switching camera backs, by using a frame insert, or by use of special multi-format backs. All of these dimensions are nominal; actual dimensions are a bit different. For example, 6×7 cm might give an image on film that is actually 56×70 mm; this enlarges exactly to fill an 8×10 sheet of paper. Another feature of many medium-format models is the ability to use Polaroid instant film in an interchangeable back. Studio,
commercial and architectural photographers value this system for its ability to verify the focus and exposure.

**70 mm film — still versus cine**

For some professional medium-format cameras, those used in school portraiture for example, long-roll film magazines were available. Most of these accommodated rolls of film that were 100 ft (30.5 m) long and 70 mm wide, sometimes with perforations, sometimes without. Some cameras, such as the Hasselblad, could be equipped with film magazines holding 15-foot rolls of double perforated 70mm film passed between two cassettes. 70 mm was a standard roll film width for many decades, last used as late as the 1960s for 116 and 616 size roll films. It was also used for aerial photo-mapping, and it is still used by large format cinema systems such as IMAX. 70mm film used in still cameras, like Mamiya and Hasselblad, and 70mm print film used in IMAX projectors have the same gauge or height as 120 film. With 70mm cine projector film, the perforations are inset by 2.5mm to make room for the old-style optical sound tracks; a standard established by Todd-AO in the 1950s. IMAX cameras use 65mm film, which have perforations and pitch that match-up to the 70mm film used in IMAX projectors.

**System Cameras**

Many professional medium-format cameras are system cameras, which means that they have various interchangeable parts. Like most 35 mm SLRs, these cameras usually support different lenses, but in addition it is also standard for medium-format system cameras to support different winding mechanisms, viewfinders, and camera backs. This flexibility is one of the primary advantages of medium-format photography.

**Digital medium format**

Digital photography came to the medium-format world with the development of digital camera backs, which can be fitted to many system cameras. Digital backs are a type of camera back that have electronic sensors in them, effectively converting a camera into a digital camera. These backs are used predominantly by professional photographers. As with film, due to the increased size of the imaging chip (up to twice that of a 35 mm film frame, and thus as much as 40 times the size of the chip in a typical pocket point-and-shoot camera) they deliver more pixels than consumer-grade cameras and have lower noise. Features like fan cooling also improve the image quality of studio models.

**Single lens reflex (SLR)**

The single-lens reflex (SLR) camera is one of the simplest cameras to use and offers an extreme flexibility for advanced users or beginners to photography. Single-lens reflex derives from a camera that uses a mirror system built in the camera that
permits the user to see exactly what will be captured by the film or digital system. This is of great significance because most other camera systems (without digital backs) do not permit you to view exactly what will be captured. As such, these other systems may reveal a different image other than the one you attempted to capture if you don’t compensate correctly.

**Advantages and Use of an SLR Camera**

In the SLR camera system, a mirror sits behind the camera lens at a 45-degree angle with the film or digital input resting behind the mirror, blocked from light. The mirror bounces the image through the camera lens and out the viewfinder for the photographer to see the image. Once the shutter is released, that mirror flips up for the duration of time the shutter speed was set and flips down when completed. While the mirror is flipped up, the film behind it is exposed for the duration of time.

SLR cameras also have the unique feature of truly interchangeable lenses. Because the mirror inside the camera hides film from light, you can change lenses even when a roll of film is in the back of the camera. Most SLR cameras also have built-in light meters to measure light for a good exposure, eliminating the need for additional handheld light meters.

The SLR camera system is commonly seen in 35mm cameras using 35mm film but is also available in medium format cameras. The medium format SLR is generally much more expensive and heavier than the 35mm counterpart but is preferred by many professionals because of the larger film size.

**Cons to the SLR Camera**

The major con to an SLR camera is that once the mirror flips up to expose the film, the photographer’s view is blocked. While this only occurs for a split second, the photographer is never able to see the precise moment the photo is taken. This could come into play for portrait photography or motion photography, among other techniques. A model or subject may move slightly or blink while the image is taken, resulting in a blurry image that you won’t see until the film is developed. For motion photography, this makes it a little more difficult when using the panning-panning technique to follow the moving subject.

Whether someone is a professional or beginner to photography, the single-lens reflex camera should be the first camera type. After mastering various photography techniques, one can move onto other systems.

**Twin lens reflex (TLR)**

TLR stands for Twin Lens Reflex. The camera uses two lenses of equal focal length, one for viewing and focusing and the other for taking the photograph; reflex refers to the mirror used behind the viewing lens that makes focusing possible. The great commercial successes among TLR designs have been the 6×6 cm designs that flourished from the 1930s to the 1950s, but TLR designs long predated these.
Twin Lens Reflex (TLR) cameras are “two-eyed” cameras such as the Rolleiflex or Rolleicord. They normally consist of two lenses of equal focal length and equal “speed”. They are mounted one above the other in the front of the camera, and their focusing is synchronized so that they are always focused at the same distance. The difference is that the upper lens projects the incoming image via mirror up to the reflex finder’s ground glass focusing screen while the lower one (the “taking” lens) projects the image into the camera’s dark chamber and onto the film plane. The taking lens can be stopped down while the finder lens is always at maximum aperture.

The scene viewed by the top lens is reflected by a mirror onto the ground glass screen. This is usually viewed from above, in a waist-level viewing hood. When viewed like this, the image on the screen is laterally inverted (i.e. left-right), which can take some time to get used to. This phenomenon is neither unique to nor an inevitable characteristic of TLR cameras; a waist-level finder on an SLR camera will give the same left-right reversal. Prism finders, which both correct this reversal and allow eye-level focusing, were available for some Rolleiflex and Mamiya TLR cameras.

The taking lens exposes the film, usually by an in-lens leaf shutter. The small distance between the centre of the viewing lens and that of the taking lens leads to a difference in the scene each captures; this phenomenon is known as parallax error; if the subject of the photographs permit, this can be corrected by lifting the camera until the taking lens is as high as the viewing lens was when the image was composed.

The earliest known TLR is one made in 1880 by R & J Beck of London for the Kew Observatory in west London. During the next twenty years, numerous camera makers included a TLR design, of course for glass plates.

Film Format

6 × 6 format

The typical TLR is medium format, using 120 roll film with square 6×6 cm images. Presently, the Chinese Seagull Camera is still in production along with Lomography’s Lubitel, but in the past, many manufacturers made them. DHW-Fototechnik GmbH continues to make the Rolleiflex TLR, as well. The Ciro-flex produced by Ciro Cameras Inc. rose dramatically in popularity due in large part to the inability to obtain the German Rollei TLRs during World War II. The Ciro-flex was widely accessible, inexpensive, and produced high quality images. Models with the Mamiya, Minolta and Yashica brands are common on the used-camera market, and many other companies made TLRs that are now classics. The Mamiya C series TLRs had interchangeable lenses, allowing focal lengths from 55mm (wide angle) to 250mm (telephoto) to be used. The bellows focusing of these models also allowed extreme closeups to be taken, something difficult or impossible with most TLRs. The simple, sturdy construction of many TLRs means they have tended
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127 format

There were smaller TLR models, using 127 roll film with square 4×4 cm images, most famous the “Baby” Rolleiflex and the Yashica 44. The TLR design was also popular in the 1950s for inexpensive fixed focus cameras such as the Kodak Duaflex and Argus 75.

35mm format

Though most used medium format film, a few 35mm TLRs were made, the very expensive Contaflex TLR being the most elaborate, with interchangeable lenses and removable backs. The LOMO Lubitel 166, a natively medium format camera, comes with an adapter for 35mm film.

Instant film format

Instantflex TL70

The only twin lens reflex camera that uses instant film is Instantflex TL70 manufactured by MiNT Camera which is compatible with Fuji instax mini film (film size 54 × 86 mm, picture size 46 × 62 mm). It is the world’s first instant twin lens reflex camera.

Subminiature format

Gemflex is a subminiature twin lens reflex camera made by Showa Optica Works, in occupied Japan in the 50s. Gemflex resembles the well-known Rolleiflex 6x6cm twin lens reflex, but much smaller in size. The body of Gemflex is die casted from shatter proof metal.

The smallest photography TLR camera using 35mm film is the Swiss-made Tessina, using perforated 35mm film reloaded into special Tessina cassette, forming images of 14×21 mm.

Goerz Minicord twin lens reflex made 10x10mm format on double perforated 16mm film in metal cassette. 6 Element Goerz Helgor F2 lens, metal focal plane shutter B, 1/10, 1/25, 1/50, 1/100 and 400. Viewing lens uses pentaprism reflex optics for the viewing lens. Picture format 10x10mm on double perforated 16mm film.

Minox rebadged Sharan Rolleflex 2.8F classic retro TLR film camera, 1/3 scale 6x6 Rolleiflex TLR, using Minox cassette image size 8x11 mm, 15mm F5.6 glass triplet lens, mechanical shutter 1/250 sec.

Japan made Gemflex, a twin lens reflex using 17.5mm paper back roll film.

It has been argued that the medical gastroscopy camera, the Olympus Gastro Camera is technically the smallest TLR device.
3.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. One major difference between SLRs and digital compact cameras is in terms of price.
2. While compact digital cameras have electronic zooms, the zoom mechanisms in digital SLR lenses are entirely manual.
3. A pinhole camera, also known as camera obscura, or “dark chamber”, is a simple optical imaging device in the shape of a closed box or chamber.
4. A digital single-lens reflex camera (also called digital SLR or DSLR) is a digital camera that combines the optics and the mechanisms of a single-lens reflex camera with a digital imaging sensor, as opposed to photographic film.

3.5 SUMMARY

- Digital SLR cameras that could capture both video and still images made their first appearance in 2008. Prior to 2008, digital SLR cameras were exclusively used for capturing stills.
- While compact digital cameras have electronic zooms, the zoom mechanisms in digital SLR lenses are entirely manual. To change the view in a SLR, you have to twist a ring on the lens.
- A pinhole camera, also known as camera obscura, or “dark chamber”, is a simple optical imaging device in the shape of a closed box or chamber.
- Probably the earliest surviving description of this kind of observation dates from the 5th century BC, written by Chinese philosopher Mo Ti.
- The image in the pinhole camera is created on the basis of the rectilinear propagation of light. Each point on the surface of an illuminated object reflects rays of light in all directions.
- A certain disadvantage of the pinhole camera is the amount of light allowed through (small aperture), which complicates and sometimes prevents entirely the photographing of moving subjects.
- A digital single-lens reflex camera (also called digital SLR or DSLR) is a digital camera that combines the optics and the mechanisms of a single-lens reflex camera with a digital imaging sensor, as opposed to photographic film.
reflex camera with a digital imaging sensor, as opposed to photographic film.

- The reflex design scheme is the primary difference between a DSLR and other digital cameras.

- DSLRs largely replaced film-based SLRs during the 2000s, and despite the rising popularity of mirrorless system cameras in the early 2010s, DSLRs remain the most common type of interchangeable lens camera in use as of 2018.

- The main benefit of medium-format photography is that, because of the larger size of the film or digital sensor (two to six times larger than 35 mm), images of much higher resolution can be produced.

- The medium-format film is usually roll film, typically allowing 8 to 32 exposures on one roll of film before reloading is needed.

- All medium-format cameras mass-produced today (as of 2012) use the 120 film format.

- The single-lens reflex (SLR) camera is one of the simplest cameras to use and offers an extreme flexibility for advanced users or beginners to photography.

- The major con to an SLR camera is that once the mirror flips up to expose the film, the photographer’s view is blocked.

- TLR stands for Twin Lens Reflex. The camera uses two lenses of equal focal length, one for viewing and focusing and the other for taking the photograph; reflex refers to the mirror used behind the viewing lens that makes focusing possible.

- Twin Lens Reflex (TLR) cameras are “two-eyed” cameras such as the Rolleiflex or Rolleicord. They normally consist of two lenses of equal focal length and equal “speed”.

- The typical TLR is medium format, using 120 roll film with square 6×6 cm images.

- Gemflex is a subminiature twin lens reflex camera made by Showa Optica Works, in occupied Japan in the 50s.

### 3.6 KEY WORDS

- **Lens**: It is an optical lens or assembly of lenses used in conjunction with a camera body and mechanism to make images of objects either on photographic film or on other media capable of storing an image chemically or electronically.
Types of Cameras

NOTES

Self-Instructional Material

• **Film**: Photographic film is a strip or sheet of transparent plastic film base coated on one side with a gelatin emulsion containing microscopically small light-sensitive silver halide crystals.

• **Exposure**: It is the unit of measurement for the total amount of light permitted to reach the electronic sensor during the process of taking a photograph.

3.7 **SELF ASSESSMENT QUESTIONS AND EXERCISES**

**Short-Answer Questions**

1. What is a single lens reflex (SLR) camera? Discuss in brief.
2. What are DSLRs?
3. Write a short note on advantages and use of an SLR camera.

**Long-Answer Questions**

1. What is a pinhole camera? Describe its principles and characteristics.
2. Explain large and medium format cameras in detail as described in this unit.
3. Describe twin lens reflex (TLR) in detail.

3.8 **FURTHER READINGS**


UNIT 4  SIZE, SPEED AND DEPTH

Structure

4.0 Introduction
4.1 Objectives
4.2 Size of the Image
4.3 Speed and Power of the Lens
4.4 Depth of Field
    4.4.1 Concept of Depth of Field
    4.4.2 Keeping Everything Sharp
    4.4.3 Adjusting the Hyperfocal Distance
    4.4.4 Using Manual Focus Lenses
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4.6 Answers to Check Your Progress Questions
4.7 Summary
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4.0  INTRODUCTION

By definition, an image is an artifact that depicts visual perception. For instance, a photo or a two-dimensional picture, that has a similar appearance to some subject (often a physical object or a person), thus providing a depiction of it. In a more complex language and in context of image signal processing, an image is a distributed amplitude of colors.

Images may be two-dimensional or three-dimensional. Things such as a photograph or screen display are an example of a 2-D image whereas, a statue or hologram are an example of a 3-D image. These may be captured by optical devices for example with cameras, mirrors, lenses, telescopes, etc. and with natural objects and phenomena, such as the human eye or water.

In this unit, various aspects of photography will be discussed. Size of an image, power of lens, depth of field are some of the topics which are covered in this unit in detail.

4.1  OBJECTIVES

After going through this unit, you will be able to:

- Explain the size of the image
- Discuss the speed and power of the lens
- Describe the depth of field
- Discuss principal focus, focal length and angle of view
4.2 SIZE OF THE IMAGE

Let us begin by discussing different image formats.

Image formats

Most cameras store your images in a graphic format that makes the best use of the camera’s limited storage space. The format of choice is invariably JPEG, a ‘lossy’ format commonly used by graphics professionals. It is called lossy because in the process of compressing an image in the JPEG format, some data is squeezed out and lost. JPEG is a very flexible and versatile format, however—you can choose how tightly you want to compress the image, and in the process choose whether to lose only a little information or a lot.

The most commonly used JPEG compression ratios result in very little image degradation—usually too little to see with the human eye. Of course, highly compressed JPEG images can contain artifacts that result from the compression process, but most people stop short of that level of compression.

Some cameras store images in lossless data files, such as 24-bit TIFF files. Only professional-grade cameras with access to a large internal hard disk are likely to use such a scheme, however, since each individual image can consume megabytes of storage space. The advantage of lossless images is that you get 100% of the picture you took—but at the cost of transfer speed and storage space.

Image resolutions

The quick-and-dirty answer is to always shoot images at a slightly higher resolution than you expect to need in the final application. That ways you can crop the image on your PC and still have enough pixels left over to achieve the resolution you wanted to begin with. If your images are destined for the printed page, though, you will probably want to use a higher resolution than if the images will be e-mailed or inserted in a Web page. Even so, the fact of the matter is that there is no simple gauge to determine what resolution you need, because the printed resolution often depends on the specific printer.

You should use a lower resolution if:
- You are displaying the images on a computer screen or video screen
- Your camera has limited memory
- You have little hard-drive space to dedicate to image storage

You should use a higher resolution if:
- You will be printing the image at a high resolution
- You will be cropping the image, resulting in a final image with fewer pixels
- You have storage space on your camera and hard disk to spare
The resolution is the total number of pixels in an image. This is the ‘size’ of the image, both in file size and actual dimensions. Image quality, on the other hand, is a setting that applies to whichever resolution you choose. Digital camera images are compressed to increase the number of images you can store in memory, and the camera’s image-quality setting determines how much each image is compressed.

**File compression**

Most cameras allow you not only to choose from among two or more resolutions, but also to decide how much the graphics images will be compressed as they are stored in the camera’s memory. The lower the compression, the better the image quality (see Figure 4.1). But, the downside is that the lower the compression, the fewer images you can fit into your camera’s memory. Figure 4.2 shows the image quality selector button.

![Fig. 4.1 Two Dog Faces Shot and Magnified from the Original Images](image1)

**Fig. 4.1 Two Dog Faces Shot and Magnified from the Original Images**

![Fig. 4.2 Image Quality Selector Button](image2)

**Fig. 4.2 Image Quality Selector Button**

In general, you should stick to the lowest level of compression available, usually called ‘fine.’ This produces images with the greatest detail and the fewest compression artifacts. Of course, some cameras have so little memory that you can only get a few images in memory in this mode before needing more ‘film.’ Either upgrade by buying an additional memory card or drop the image quality down one notch.
While ‘economy’ or ‘low-quality’ compression is fine for e-mail and even Web pages, do not use this for print applications, including things like newsletters and T-shirts. In those situations, quality counts.

4.3 SPEED AND POWER OF THE LENS

When figuring out the best shutter speed to use, your first consideration should usually be subject motion. You need to think about whether and how the subject is moving, and how you want to represent that motion.

If the subject and camera are both stationary, you can base your exposure decisions on the aperture and ISO you want to use. However, when the subject is moving, you have to consider how much movement may occur while the shutter is open and what effect that will have on your finished image.

A slow shutter speed allows the image of a moving object to move across the sensor during exposure, resulting in a blurred image, even if the image was sharply focussed. Figure 4.3, shows how a fast shutter speed can freeze motion and capture a blurred image of a fast moving soccer player because the subject does not have time to move significantly during the brief instant that the shutter is open. Conversely, in Figure 4.4, you can see the path of the soccer ball during the 1/4 second that the shutter was open.

Fig. 4.3 Blurred Image of Subject while the Shutter Is Open

Fig. 4.4 Sharp Image while the Shutter Is Open
Proper shutter speed selection depends first, on whether your goal is to freeze the action or allow the moving object to blur. Next, you need to analyze the speed and direction of the moving object to determine just how fast or slow the shutter speed needs to be to achieve the desired effect.

Check Your Progress
1. What is a JPEG?
2. What does a slow shutter speed do?

4.4 DEPTH OF FIELD

When you are thinking only about exposure, you can think of the aperture as a simple regulator that controls the flow of light through the lens. If your goal is to allow a certain amount of light to reach the imaging sensor in the camera, whether you set the regulator for maximum flow for a very short time or a much smaller flow for a longer time—as long as the total is the same, it does not affect the image.

However, the aperture has other effects on your image besides regulating the amount of light that passes through the lens during an exposure. Aperture also controls depth of field, and changes in depth of field can cause dramatic changes in your images.

The depth of field is the area in a lens’ field of view where objects appear acceptably sharp.

Tips: Photographic joke: The circle of confusion is a bunch of photographers sitting around discussing the exact definition of the depth of field.

Note: Theoretically, all aperture/shutter speed/ISO combinations that produce equivalent exposures should produce images of the same quality. In practice, slow shutter speeds and high ISO settings both introduce digital noise that degrade the image. So, selecting a small aperture that requires a very slow shutter speed can affect the image in the real world.

Objects within the depth of field zone appear sharp, while objects outside the depth of field appear visibly blurred. Depth of field extends some distance in front of and behind the vertical plane that represents the actual focus point of the lens—and aperture controls just how shallow or deep this zone of acceptable sharpness is. Smaller apertures produce greater depth of field and larger apertures produce shallower depth of field.

Aperture is not just an exposure regulator. To control the depth of field in your photograph, you must control the aperture. Therefore, aperture selection has now become a balancing act between exposure and depth of field considerations.
4.4.1 Concept of Depth of Field

Depth of field does not describe what part of the scene is precisely in focus. Instead, the term describes an area of acceptable sharpness.

A lens that is focused on a point of light produces an image of a single point on the film or sensor in the camera. Points of light that are closer or farther away than the focus point are blurred into disk shapes instead of single points. The edge of such a disk is known as the circle of confusion. Depth of field is the zone where the diameter of the disk (the circle of confusion) is small enough that the average human eye cannot perceive the difference between the disk and a single point.

The size of the film or image sensor, the focal length of the lens, and the magnification of the final print, in addition to the aperture, all affect depth of field. However, aperture is the only variable that the photographer normally controls at the time of exposure.

4.4.2 Keeping Everything Sharp

Perhaps the most common concern that most photographers have about depth of field is how to maximize it to utilize as much of the scene as possible for the image to appear acceptably sharp. You may want to maximize depth of field in a product shot where the entire product must be sharp or a scenic shot. Perhaps you are shooting people or pets whose positions are changing rapidly and you need plenty of depth of field to make up for not having time to focus carefully and accurately.

Because smaller apertures produce greater depth of field, maximizing the depth of field means using the smallest aperture you can possibly manage. Obviously, selecting the aperture means using an exposure mode (manual mode or aperture-priority auto) that allows you to control that setting.

To get an equivalent exposure with a smaller aperture, you need to use a slower shutter speed. Therefore, unless you are shooting in very bright light conditions, the shutter speeds that combine with these small apertures to produce the correct exposure are sometimes too slow to allow hand-holding the camera. Thus, a tripod or other camera support is quite essential.

4.4.3 Adjusting the Hyperfocal Distance

One of the best ways to maximize the depth of field is to focus your camera to the hyperfocal distance of your lens. The hyperfocal distance is the focus point at which the farthest reaches of depth of field extends to infinity. Focusing at the hyperfocal distance allows the objects to appear sharp from a relatively near point to infinity, as shown in Figure 4.5.
Because changing the aperture changes the depth of field, it also changes the hyperfocal distance. Smaller apertures increase depth of field and move the hyperfocal distance closer to the camera. Larger apertures decrease depth of field and move the hyperfocal distance farther away. There are tables and charts available that show the hyperfocal distance for various combinations of lens, focal length and aperture.

4.4.4 Using Manual Focus Lenses

Finding the hyperfocal distance for a given lens and aperture can be a little tricky, but the results can be impressive.

Manual-focus lenses (or lenses that have manual focus capability) usually have a distance scale and depth of field indicators (pairs of hash marks for each f-stop arrayed on either side of the central focus mark) engraved on the lens barrel, as shown in Figure 4.6.

To find the hyperfocal distance, you rotate the focus ring to align the infinity mark of the distance scale with the distant depth of field indicator for your chosen
shooting aperture (in Figure 4.6, f-8). The central focus mark indicates the hyperfocal distance (10 feet), and the other depth of field indicator shows the near limit of acceptable sharpness (5 feet). The lens barrel markings are often small, which makes precise adjustments challenging. However, this technique can help you understand the intricacies hyperfocal distance.

If the lens has a focus distance scale and depth of field indicators marked on the lens barrel, then you can perform the following steps:

1. Focus on the closest portion of the subject that needs to be sharp — for example, the foreground bush in figure 4.6. Note the distance on the focus distance scale.

2. Rotate the focus ring so that the infinity mark is aligned with the depth of field indicator for a given aperture and the close focus distance (determined in step 1) is aligned with the corresponding depth of field indicator on the opposite side of the central focus point. Leave the lens focused at that point and note the aperture that allows the depth of field indicators to encompass the desired range from close to infinity.

3. Set the aperture to the f-stop recorded in step 2, or smaller.

4. Frame your shot and shoot. Do not change the focus distance or aperture.

Selective focus

Controlling the depth of field does not always entail using small apertures to maximize the sharpness of the subject. Sometimes, your goal is just the opposite, that is, to create a shallow depth of field that isolates a sharp-focused subject against an out-of-focus background or blurs a distracting foreground object.

For example, the background behind the foreground flower in Figure 3.18 would be busy and distracting if it was in crisp focus. However, as it is out of focus, a blur caused by the photographer’s use of shallow depth of field creates a pleasing, soft backdrop.

Fig. 4.7 A Selective Focus Image
Just as smaller apertures increase the depth of the field, wider apertures decrease the depth of field. So, creating selective focus effects with shallow depth of field usually entail large aperture settings (f-4.0 or wider).

Distance from the lens to the subject also affects depth of field. The closer the subject is to the lens, the shallower the depth of field becomes. Therefore, a close-up subject (such as the flower in Figure 4.7) combined with a large aperture often creates a depth of field that measures only fractions of an inch.

Apertures and Image Quality

Most lenses offer a range of aperture settings. You can use in these range of aperture settings to get the correct exposure. However, just because it is possible to get an equivalent exposure at every available aperture by combining it with the appropriate shutter speed and ISO settings, does not mean that you will get the equivalent image quality at all apertures.

Most lens designs produce optimum results when set at a specific aperture or within a limited range of apertures. To make the lens usable for a wider variety of situations, lens designers frequently must compromise on the image quality to expand the aperture range. This is especially true for zoom lenses.

The lens produces the best results when you shoot at or near the optimum aperture. Although some lenses are at their best when stopped down, but for most lenses, the optimum aperture is somewhere in the middle of the available range. Apertures toward the extremes of the range, often tend to exhibit less sharpness and more distortion. For example, the building on the left side of the frame in Figure 4.8 displays noticeable barrel distortion (bowing out from the centre of the frame). This type of distortion is typical of wide angle lenses, and is often exaggerated at the largest aperture. Telephoto lenses often exhibit the opposite distortion effect (pinching in toward the centre of the frame), called pincushion distortion.
**Tips:** Most pros try to avoid shooting with their lens aperture “wide open” because most lenses exhibit the most distortion and lack of sharpness at maximum aperture.

**Using Aperture-Priority Exposure**

Most auto-exposure cameras default to shutter-priority or programmed exposure modes. However, an aperture-priority mode is usually available only as an option. You can use aperture-priority mode for those times when controlling depth of field by specifying the shooting aperture is more important than specifying the shutter speed.

Figure 4.9 shows how a carefully selected depth of field (shooting at f-5.6) keeps all the facial features and clothing sharp while allowing the background to blur. The result is a clear separation between the foreground and the background. This is despite some bright spots in the background that would be very distracting in case they were sharper.

![Fig. 4.9 Image Shot in Aperture-Priority Mode](image)

In aperture-priority mode, you select the aperture and let the camera adjust the shutter speed automatically, to achieve the correct exposure. The procedure sounds simple; but for using aperture-priority mode effectively, you need to pay careful attention to the shutter speed that the camera selects.

When shooting at small apertures, it is easy to end up with blurred pictures caused by camera shake, because the shutter speed was a little too slow. Attempts to improve picture sharpness by increasing the depth of field often have the opposite effect. You can avoid that particular pitfall by monitoring the automatically set shutter speed and by using a tripod when the speed dips too low.

Shooting at large apertures to create shallow depth of field can cause problems with shutter speeds. It is surprisingly easy to select an aperture that needs a faster shutter speed than most cameras have available. For example,
suppose you are shooting a close-up of a flower on a sunny day and want to use shallow depth of field to blur the background, you set the ISO to 100, choose aperture-priority mode and select f-2.8 as the shooting aperture.

According to the sunny-16 rule, the correct exposure at ISO 100 is f-16 at 1/100, and the equivalent exposure at f-2.8 is 1/3200. However, only a few cameras have that shutter speed available—the outer limit for several cameras is about 1/1000. You could reduce the ISO setting if your camera has a lower setting available, but many do not. So, either you have to select a smaller aperture and accept the increased depth of field or you need to add a neutral density filter to the lens or wait for a cloud to pass over the sun and decrease the light level.

4.5 PRINCIPAL FOCUS AND FOCAL LENGTH, ANGLE OF VIEW

In geometrical optics, a focus, also called an image point, is the point where light rays originating from a point on the object converge. Although the focus is conceptually a point, physically the focus has a spatial extent, called the blur circle. This non-ideal focusing may be caused by aberrations of the imaging optics. In the absence of significant aberrations, the smallest possible blur circle is the Airy disc, which is caused by diffraction from the optical system’s aperture. Aberrations tend to get worse as the aperture diameter increases, while the Airy circle is smallest for large apertures.

An image, or image point or region, is in focus if light from object points is converged almost as much as possible in the image, and out of focus if light is not well converged. The border between these is sometimes defined using a “circle of confusion” criterion.

A principal focus or focal point is a special focus: For a lens, or a spherical or parabolic mirror, it is a point onto which collimated light parallel to the axis is focused. Since light can pass through a lens in either direction, a lens has two focal points—one on each side. The distance in air from the lens or mirror’s principal plane to the focus is called the focal length.

Elliptical mirrors have two focal points: light that passes through one of these before striking the mirror is reflected such that it passes through the other.

The focus of a hyperbolic mirror is either of two points which have the property that light from one is reflected as if it came from the other.

Diverging (negative) lenses and convex mirrors do not focus a collimated beam to a point. Instead, the focus is the point from which the light appears to be emanating, after it travels through the lens or reflects from the mirror. A convex parabolic mirror will reflect a beam of collimated light to make it appear as if it were radiating from the focal point, or conversely, reflect rays directed toward the
focus as a collimated beam. A convex elliptical mirror will reflect light directed towards one focus as if it were radiating from the other focus, both of which are behind the mirror. A convex hyperbolic mirror will reflect rays emanating from the focal point in front of the mirror as if they were emanating from the focal point behind the mirror. Conversely, it can focus rays directed at the focal point that is behind the mirror towards the focal point that is in front of the mirror as in a Cassegrain telescope.

**Camera Focal Length**

The focal length of an optical system is a measure of how strongly the system converges or diverges light. For an optical system in air, it is the distance over which initially collimated (parallel) rays are brought to a focus. A system with a shorter focal length has greater optical power than one with a long focal length; that is, it bends the rays more sharply, bringing them to a focus in a shorter distance.

In most photography and all telescopy, where the subject is essentially infinitely far away, longer focal length (lower optical power) leads to higher magnification and a narrower angle of view; conversely, shorter focal length or higher optical power is associated with lower magnification and a wider angle of view. On the other hand, in applications such as microscopy in which magnification is achieved by bringing the object close to the lens, a shorter focal length (higher optical power) leads to higher magnification because the subject can be brought closer to the center of projection.

Camera lens focal lengths are usually specified in millimetres (mm), but some older lenses are marked in centimetres (cm) or inches.

**What does the focal length number mean?**

The focal length number tells us how much of the scene is captured in the picture. The lower the number the wider the view, and the more we can see. The higher the number, the narrower the view, and the less we can see. This is illustrated below – where the camera is stationary and the focal length (in white numerals) changes:
A camera typically has focal length in a range of 10mm to 500mm. Different types of camera can have different ranges and speciality lenses can extend outside this range as well. A 10mm focal length would be a very wide lens (capturing a lot of the scene), and 500mm would be a very narrow lens (capturing only a small part of the scene – giving a large magnification like binoculars or a telescope).

Cameras can have fixed lenses (sometimes called ‘prime’ lenses) which have just one focal length, or zoom lenses which allow the focal length to be varied (for example between 18mm-55mm, or 55mm-200mm).

For high accuracy photogrammetric work in PhotoModeler, a fixed (or prime) wide lens (such as a 20mm lens on an APS-C frame camera) is recommended as the primary option, but different applications may require different focal lengths, and cameras with adjustable zoom lenses can still be used to achieve very good results with some extra procedural care over the focal length.

Note: A technical photogrammetry term that you may come across is the “Principal Distance”. Strictly, the Principal Distance is the distance mentioned above (i.e. distance from imaging plane to the lens optical sensor), and the focal length is the principal distance when the lens is focused at infinity. See below for more information on focus vs focal length. When PhotoModeler lists focal length for a camera, it is actually the Principal Distance that is shown.

Format Size

When you buy a digital camera, you will often see the specification “equivalent 35mm focal length”. What does this mean? Most digital cameras have imaging chips that cover much less area than a standard 35mm film frame. Since 35mm film cameras were the standard for so long in photography, much of the techniques and methods were developed around them. A 35mm film camera has a negative that is about 36mm wide by 24mm high (the “35” comes from the physical width of the film stock that is exactly 35mm wide). A ‘normal lens’ (has a field of view that appears ‘natural’ to humans) on a 35mm film camera has a focal length of 50mm.

Modern digital cameras can have imaging chips that are as small as 6mm by 4mm; some Smartphone cameras are even smaller, and then up to full 24mm by 35mm size. A very common size is the APS-C format at 16mm by 24mm. This smaller size affects what is considered to be a ‘normal’ focal length.

Let’s say you take a picture of an automobile with two cameras, a 35mm film camera and a smartphone camera. You stand in the same spot and take two photos, one with each camera. In both cases you want to take a photo of the automobile that fills the frame. If the 35mm film camera lens has a 50mm focal length, the digital camera’s focal length might be 4mm. So even though they are very different numbers they produce the same result because of the size of the imaging surface. So the “equivalent 35mm focal length” for this smartphone camera at 4mm is 50mm.
Camera manufacturers sometimes list these equivalents because some photographers are more familiar with 35mm cameras and they want to make it easier to understand. It also gives us a standard of reference for all the different format sizes. They may also list the multiplier factor. For example, the APS-C multiplier is around 1.6x. So a 32mm lens on an APS-C camera (like the Nikon D3200) would act like a 50mm lens on a 35mm film camera.

**Does focusing affect the focal length?**

Above we mention that focal length is related to focus distance. Focal length is the principal distance of a camera when it is focused at infinity. In photogrammetry we are interested in the camera’s internal geometry at the time photos were taken – so it is the principal distance that we want to know precisely in photogrammetry.

The answer is ‘yes focusing a lens changes its principal distance’.

All lenses have a stated or specified focal length value (or range of values for a zoom lens). This printed number is actually its nominal length or the principal distance when the lens is focused at infinity. As you focus on objects that are closer to the camera, the principal distance changes. So for example, a 50mm lens focused on an object a few feet away might have a principal distance of 55mm lens at that time. The most extreme example of this is with a macro setting (a lens setting that allows you to focus on very close, very small objects, under 53 in size for example). A lens that has a 50mm nominal focal length (so a 50mm principal distance when focused at infinity) might in fact have a 100mm principal distance when focused at a few inches! This is why it is good with photogrammetry (where precise geometry is needed) to calibrate a camera at the distance you will be working with.

There is some ability to calibrate a camera (which solves the principal distance) at one focus and execute your photogrammetric project at another focus. The actual discrepancy that is acceptable depends on your accuracy requirements and how much the focus changes. Generally a calibration done at 2m/6ft focus distance is acceptable for projects up to infinite focus (again depending on accuracy requirements), but may not be acceptable for a project where the focus distance was 50cm/20in.

In many cases though, the advantages of using focus (i.e. crisp targets and distinct features) with subtle effects on principal distance/focal length, outweigh the advantages of keeping focus and principal distance constant (i.e. potentially causing blur in some photos taken at a different distance).

**Focal Length and Photogrammetry**

There are three main items to remember in relation to focal length and photogrammetry/PhotoModeler:

1. PhotoModeler needs to know the principal distance of the camera/lens at the time the photos were taken so that it can solve geometry and calculate
the camera positions and create 3D coordinate points. This means a) calibrate the camera to establish the exact focal length/principle distance for more accuracy (or at least use a reasonably close focal length estimate), and b) if using a zoom lens, take photos with the camera set at the same focal length (zoom setting) at which the camera was calibrated (for repeatability, use the widest angle or fully zoomed).

2. The format size and the focal length are both important. Knowing just the focal length is not enough.

3. PhotoModeler has four methods for calculating the focal length/principle distance and the format size. These are a) Camera Calibration, b) the quick Approximate Camera method using the images’ EXIF header, c) the Inverse Camera method (for projects using photos from an unknown source), and d) Field and Auto Calibration (which is camera calibration executed at the same time as the modelling project). For the most consistent and accurate project results, calibrate your camera and then always use it at the same focal length that you calibrated it at.

**Angle of view and perspective**

In photography, angle of view (AOV) describes the angular extent of a given scene that is imaged by a camera. It is used interchangeably with the more general term field of view.

It is important to distinguish the angle of view from the angle of coverage, which describes the angle range that a lens can image. Typically, the image circle produced by a lens is large enough to cover the film or sensor completely, possibly including some vignetting toward the edge. If the angle of coverage of the lens does not fill the sensor, the image circle will be visible, typically with strong vignetting toward the edge, and the effective angle of view will be limited to the angle of coverage.

In 1916, Northey showed how to calculate the angle of view using ordinary carpenter’s tools. The angle that he labels as the angle of view is the half-angle or “the angle that a straight line would take from the extreme outside of the field of view to the center of the lens;” he notes that manufacturers of lenses use twice this angle.

In this simulation, adjusting the angle of view and distance of the camera while keeping the object in frame results in vastly differing images. At distances approaching infinity, the light rays are nearly parallel to each other, resulting in a “flattened” image. At low distances and high angles of view objects appear “foreshortened”.

Size, Speed and Depth

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Self-Instructional Material
A camera’s angle of view depends not only on the lens, but also on the sensor. Digital sensors are usually smaller than 35mm film, and this causes the lens to have a narrower angle of view than with 35mm film, by a constant factor for each sensor (called the crop factor). In everyday digital cameras, the crop factor can range from around 1 (professional digital SLRs), to 1.6 (consumer SLR), to 2 (Micro Four Thirds ILC) to 4 (enthusiast compact cameras) to 6 (most compact cameras). So, a standard 50mm lens for 35mm photography acts like a 50mm standard “film” lens even on a professional digital SLR, but would act closer to an 80mm lens (1.6 x 50mm) on many mid-market DSLRs, and the 40 degree angle of view of a standard 50mm lens on a film camera is equivalent to a 28 - 35mm lens on many digital SLRs.

Check Your Progress
3. How does the depth of field impact objects?
4. What is focal length?

4.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. JPEG is a ‘lossy’ format commonly used by graphics professionals.
2. A slow shutter speed allows the image of a moving object to move across the sensor during exposure, resulting in a blurred image, even if the image was sharply focussed.
3. Objects within the depth of field zone appear sharp, while objects outside the depth of field appear visibly blurred.

4. The focal length of an optical system is a measure of how strongly the system converges or diverges light.

4.7 SUMMARY

- Most cameras store your images in a graphic format that makes the best use of the camera’s limited storage space.
- The format of choice is invariably JPEG, a ‘lossy’ format commonly used by graphics professionals.
- It is called lossy because in the process of compressing an image in the JPEG format, some data is squeezed out and lost.
- The most commonly used JPEG compression ratios result in very little image degradation—usually too little to see with the human eye.
- Most cameras allow you not only to choose from among two or more resolutions, but also to decide how much the graphics images will be compressed as they are stored in the camera’s memory.
- A slow shutter speed allows the image of a moving object to move across the sensor during exposure, resulting in a blurred image, even if the image was sharply focussed.
- Proper shutter speed selection depends first, on whether your goal is to freeze the action or allow the moving object to blur.
- Next, you need to analyze the speed and direction of the moving object to determine just how fast or slow the shutter speed needs to be to achieve the desired effect.
- The depth of field is the area in a lens’ field of view where objects appear acceptably sharp.
- Objects within the depth of field zone appear sharp, while objects outside the depth of field appear visibly blurred.
- Aperture is not just an exposure regulator. To control the depth of field in your photograph, you must control the aperture.
- One of the best ways to maximize the depth of field is to focus your camera to the hyperfocal distance of your lens. The hyperfocal distance is the focus point at which the farthest reaches of depth of field extends to infinity.
- In geometrical optics, a focus, also called an image point, is the point where light rays originating from a point on the object converge. Although the
focus is conceptually a point, physically the focus has a spatial extent, called
the blur circle.

- The focal length of an optical system is a measure of how strongly the system
  converges or diverges light.
- A camera typically has focal length in a range of 10mm to 500mm. Different
  types of camera can have different ranges and speciality lenses can extend
  outside this range as well.
- In photography, angle of view (AOV) describes the angular extent of a
  given scene that is imaged by a camera. It is used interchangeably with the
  more general term field of view.
- A camera’s angle of view depends not only on the lens, but also on the
  sensor.

4.8 KEY WORDS

- Sensor: It is a device which detects or measures a physical property and
  records, indicates, or otherwise responds to it.
- Photogrammetry: It is the use of photography in surveying and mapping
  to ascertain measurements between objects.
- Calibration: It means to determine, check, or rectify the graduation of
  (any instrument giving quantitative measurements).
- Zoom: It is a camera shot that changes smoothly from a long shot to a
  close-up or vice versa.

4.9 SELF ASSESSMENT QUESTIONS AND
EXERCISES

Short-Answer Questions

1. Write a short note on image formats and resolutions.
2. Describe angle of view and perspective as discussed in this unit.
3. Briefly discuss the speed and power of the lens.

Long-Answer Questions

1. Describe the concept of depth of field in detail.
2. What is principle focus? Discuss its meaning and features as given in this
   unit.
3. Give a detailed explanation of camera focal length.
4.10 FURTHER READINGS


UNIT 5 PHOTOGRAPHIC OPTICS

5.0 INTRODUCTION

Newton proposed that light is a stream of particles traveling in a straight line. Each particle is called a quantum and each quantum of light is a photon. Thus, the intensity of light is measured in number of photons. The visible spectrum is from 380 nm (violet) to 760 nm (red); refraction occurs when light enters a different medium causing the velocity of the light to change, this change bends the direction of the light; short wavelengths (violet) of light are refracted more than longer wavelengths (red). This is why a spectrum is formed from white light passing through a prism and it also causes the problem of chromatic aberration. Light plays an important role in photography and therefore it is imperative that the concepts related to light are discussed at length.

This unit sheds light on various phenomenon of light such as reflection, refraction and dispersion of light. The topic image formation is also discussed in detail in this unit.
5.1 OBJECTIVES

After going through this unit, you will be able to:

- Explain reflection and refraction of light
- Discuss dispersion of light through a glass prism
- Lenses, Different kinds of image formation

5.2 PHOTOGRAPHIC OPTICS

Let us begin by discussing reflection of light.

5.2.1 Reflection of Light

Reflection of light is either specular (mirror-like) or diffuse (retaining the energy but losing the image) depending on the nature of the interface. In specular reflection the phase of the reflected waves depends on the choice of the origin of coordinates, but the relative phase between s and p (TE and TM) polarizations is fixed by the properties of the media and of the interface between them.

A mirror provides the most common model for specular light reflection, and typically consists of a glass sheet with a metallic coating where the significant reflection occurs. Reflection is enhanced in metals by suppression of wave propagation beyond their skin depths. Reflection also occurs at the surface of transparent media, such as water or glass.

In the diagram, a light ray PO strikes a vertical mirror at point O, and the reflected ray is OQ. By projecting an imaginary line through point O perpendicular to the mirror, known as the normal, we can measure the angle of incidence, $\theta_i$ and the angle of reflection, $\theta_r$. The law of reflection states that $\theta_i = \theta_r$, or in other words, the angle of incidence equals the angle of reflection.

In fact, reflection of light may occur whenever light travels from a medium of a given refractive index into a medium with a different refractive index. In the
most general case, a certain fraction of the light is reflected from the interface, and the remainder is refracted. Solving Maxwell’s equations for a light ray striking a boundary allows the derivation of the Fresnel equations, which can be used to predict how much of the light is reflected, and how much is refracted in a given situation. This is analogous to the way impedance mismatch in an electric circuit causes reflection of signals. Total internal reflection of light from a denser medium occurs if the angle of incidence is greater than the critical angle.

Total internal reflection is used as a means of focusing waves that cannot effectively be reflected by common means. X-ray telescopes are constructed by creating a converging “tunnel” for the waves. As the waves interact at low angle with the surface of this tunnel they are reflected toward the focus point (or toward another interaction with the tunnel surface, eventually being directed to the detector at the focus). A conventional reflector would be useless as the X-rays would simply pass through the intended reflector.

When light reflects off a material denser (with higher refractive index) than the external medium, it undergoes a phase inversion. In contrast, a less dense, lower refractive index material will reflect light in phase. This is an important principle in the field of thin-film optics.

Specular reflection forms images. Reflection from a flat surface forms a mirror image, which appears to be reversed from left to right because we compare the image we see to what we would see if we were rotated into the position of the image. Specular reflection at a curved surface forms an image which may be magnified or demagnified; curved mirrors have optical power. Such mirrors may have surfaces that are spherical or parabolic.

Laws of reflection

If the reflecting surface is very smooth, the reflection of light that occurs is called specular or regular reflection. The laws of reflection are as follows:

1. The incident ray, the reflected ray and the normal to the reflection surface at the point of the incidence lie in the same plane.
2. The angle which the incident ray makes with the normal is equal to the angle which the reflected ray makes to the same normal.
3. The reflected ray and the incident ray are on the opposite sides of the normal.

These three laws can all be derived from the Fresnel equations.

Mechanism

In classical electrodynamics, light is considered as an electromagnetic wave, which is described by Maxwell’s equations. Light waves incident on a material induce small oscillations of polarisation in the individual atoms (or oscillation of electrons, in metals), causing each particle to radiate a small secondary wave in all directions, like a dipole antenna. All these waves add up to give specular reflection and refraction, according to the Huygens–Fresnel principle.
In the case of dielectrics such as glass, the electric field of the light acts on the electrons in the material, and the moving electrons generate fields and become new radiators. The refracted light in the glass is the combination of the forward radiation of the electrons and the incident light. The reflected light is the combination of the backward radiation of all of the electrons.

In metals, electrons with no binding energy are called free electrons. When these electrons oscillate with the incident light, the phase difference between their radiation field and the incident field is $\pi$ (180°), so the forward radiation cancels the incident light, and backward radiation is just the reflected light.

Light–matter interaction in terms of photons is a topic of quantum electrodynamics and is described in detail by Richard Feynman in his popular book QED: The Strange Theory of Light and Matter.

5.2.2 Refraction of Light

In physics, refraction is the change in direction of a wave passing from one medium to another or from a gradual change in the medium. Refraction of light is the most commonly observed phenomenon, but other waves such as sound waves and water waves also experience refraction. How much a wave is refracted is determined by the change in wave speed and the initial direction of wave propagation relative to the direction of change in speed.

For light, refraction follows Snell’s law, which states that, for a given pair of media, the ratio of the sines of the angle of incidence $\theta_1$ and angle of refraction $\theta_2$ is equal to the ratio of phase velocities ($v_1 / v_2$) in the two media, or equivalently, to the indices of refraction ($n_2 / n_1$) of the two media.

Refraction of light at the interface between two media of different refractive indices, with $n_2 > n_1$. Since the phase velocity is lower in the second medium ($v_2 < v_1$), the angle of refraction $\theta_2$ is less than the angle of incidence $\theta_1$; that is, the ray in the higher-index medium is closer to the normal.

Optical prisms and lenses utilize refraction to redirect light, as does the human eye. The refractive index of materials varies with the wavelength of light, and thus the angle of the refraction also varies correspondingly. This is called dispersion and causes prisms and rainbows to divide white light into its constituent spectral colors.

Refraction of light can be seen in many places in our everyday life. It makes objects under a water surface appear closer than they really are. It is what optical lenses are based on, allowing for instruments such as glasses, cameras, binoculars, microscopes, and the human eye. Refraction is also responsible for some natural optical phenomena including rainbows and mirages.

Photographic Optics

The focal length of an optical system is a measure of how strongly the system converges or diverges light. For an optical system in air, it is the distance over
which initially collimated (parallel) rays are brought to a focus. A system with a shorter focal length has greater optical power than one with a long focal length; that is, it bends the rays more sharply, bringing them to a focus in a shorter distance. In most photography and all telescopes, where the subject is essentially infinitely far away, longer focal length (lower optical power) leads to higher magnification and a narrower angle of view; conversely, shorter focal length or higher optical power is associated with lower magnification and a wider angle of view. On the other hand, in applications such as microscopy in which magnification is achieved by bringing the object close to the lens, a shorter focal length (higher optical power) leads to higher magnification because the subject can be brought closer to the center of projection.

Camera lens focal lengths are usually specified in millimetres (mm), but some older lenses are marked in centimetres (cm) or inches.

Focal length \( f \) and field of view (FOV) of a lens are inversely proportional. For a standard rectilinear lens, \( \text{FOV} = 2 \arctan \frac{x}{2f} \), where \( x \) is the diagonal of the film.

When a photographic lens is set to "infinity", its rear nodal point is separated from the sensor or film, at the focal plane, by the lens’s focal length. Objects far away from the camera then produce sharp images on the sensor or film, which is also at the image plane.

To render closer objects in sharp focus, the lens must be adjusted to increase the distance between the rear nodal point and the film, to put the film at the image plane. The focal length \( f \), the distance from the front nodal point to the object to photograph \( s_1 \), and the distance from the rear nodal point to the image plane \( s_2 \).

As \( s_1 \) is decreased, \( s_2 \) must be increased. For example, consider a normal lens for a 35 mm camera with a focal length of \( f = 50 \text{ mm} \). To focus a distant object \( s_1 = \infty \), the rear nodal point of the lens must be located a distance \( s_2 = 50 \text{ mm} \) from the image plane. To focus an object 1 m away \( s_1 = 1,000 \text{ mm} \), the lens must be moved 2.6 mm farther away from the image plane, to \( s_2 = 52.6 \text{ mm} \).

The focal length of a lens determines the magnification at which it images distant objects. It is equal to the distance between the image plane and a pinhole that images distant objects the same size as the lens in question. For rectilinear lenses (that is, with no image distortion), the imaging of distant objects is well modelled as a pinhole camera model. This model leads to the simple geometric model that photographers use for computing the angle of view of a camera; in this case, the angle of view depends only on the ratio of focal length to film size. In general, the angle of view depends also on the distortion.

A lens with a focal length about equal to the diagonal size of the film or sensor format is known as a normal lens; its angle of view is similar to the angle
subtended by a large-enough print viewed at a typical viewing distance of the print diagonal, which therefore yields a normal perspective when viewing the print; this angle of view is about 53 degrees diagonally. For full-frame 35 mm-format cameras, the diagonal is 43 mm and a typical “normal” lens has a 50 mm focal length. A lens with a focal length shorter than normal is often referred to as a wide-angle lens (typically 35 mm and less, for 35 mm-format cameras), while a lens significantly longer than normal may be referred to as a telephoto lens (typically 85 mm and more, for 35 mm-format cameras). Technically, long focal length lenses are only “telephoto” if the focal length is longer than the physical length of the lens, but the term is often used to describe any long focal length lens.

Due to the popularity of the 35 mm standard, camera–lens combinations are often described in terms of their 35 mm-equivalent focal length, that is, the focal length of a lens that would have the same angle of view, or field of view, if used on a full-frame 35 mm camera. Use of a 35 mm-equivalent focal length is particularly common with digital cameras, which often use sensors smaller than 35 mm film, and so require correspondingly shorter focal lengths to achieve a given angle of view, by a factor known as the crop factor.

### 5.3 Dispersion of Light Through a Glass Prism

When white light is passed through a glass prism it splits into its spectrum of colors (in order violet, indigo, blue, green, yellow, orange and red) and this process of white light splitting into its constituent colors is termed as dispersion.

**How is light refracted through a glass prism?**

When light travels from one medium to another, the speed of its propagation changes, which is why it ‘bends’ or is ‘refracted’. Now when light passes through a prism, it is refracted towards the base of the triangle.

The different colors in the spectrum of light have different wavelengths. Therefore, the speed with which they all bend varies depending on this wavelength, where violet bends the most, having the shortest wavelength and red bends the least, having the longest wavelength. Because of this, dispersion white light into its spectrum of colors takes place when refracted through a prism.

**Why does light split into its spectrum of colors in a prism but not in a glass slab?**

The light does disperse into its spectrum of colors in a glass slab as well. We can see this if we observe it in a particular way. Before we proceed you should know something about refractive indices. They aren’t constant. They vary with the frequency of light and hence the wavelength.

Now, for white light to pass through a glass slab or a glass prism, it is
refracted not once, but twice. It first travels from air to glass and then from glass to air. At the first instance of refraction, it slows down and at the second it speeds up right?

So what happens in a glass slab? All the light rays slow down and speed up at the same rate because both the surfaces are parallel. And hence, to an observer it would seem as if white light has entered and left the slab. But the case is different in a prism. The surfaces aren’t parallel to each other and so the light rays emerging out of the prism finally follow path that are different from each other, giving a dispersed effect.

**Significance of the dispersion of light into spectrum of colours**

Newton was the first to conduct this experiment on passing light through a prism. He let sunlight pass through the prism expecting to see white light on the screen places at the other side but instead he saw the spectrum of light after dispersion. He had a small hunch regarding the significance here, but decided to do something else here to confirm it.

By controlling the size of the inlet, he allowed only one color (therefore only one wavelength of light) of light to pass through the prism. Obviously, the ray of light was refracted and didn’t undergo and further dispersion.

Therefore, he realized that different colors of the spectrum of light bend differently as they have different wavelengths. He made the observation that violet bent the most and red the least because of their shorter and longer wavelengths respectively.

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**Check Your Progress**

1. How does reflection of light take place?
2. State Snell’s law.

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**5.4 LENSES**

A lens is a transmissive optical device that focuses or disperses a light beam by means of refraction. A simple lens consists of a single piece of transparent material, while a compound lens consists of several simple lenses (elements), usually arranged along a common axis. Lenses are made from materials such as glass or plastic and are ground and polished or moulded to a desired shape. A lens can focus light to form an image, unlike a prism, which refracts light without focusing. Devices that similarly focus or disperse waves and radiation other than visible light are also called lenses, such as microwave lenses, electron lenses, acoustic lenses, or explosive lenses.
Simple lenses
Lenses are classified by the curvature of the two optical surfaces. A lens is biconvex (or double convex, or just convex) if both surfaces are convex. If both surfaces have the same radius of curvature, the lens is equiconvex. A lens with two concave surfaces is biconcave (or just concave). If one of the surfaces is flat, the lens is plano-convex or plano-concave depending on the curvature of the other surface. A lens with one convex and one concave side is convex-concave or meniscus. It is this type of lens that is most commonly used in corrective lenses.

If the lens is biconvex or plano-convex, a collimated beam of light passing through the lens converges to a spot (a focus) behind the lens. In this case, the lens is called a positive or converging lens. The distance from the lens to the spot is the focal length of the lens, which is commonly abbreviated f in diagrams and equations. An extended hemispherical lens is a special type of plano-convex lens, in which the lens’s curved surface is a full hemisphere and the lens is much thicker than the radius of curvature.

Compound lenses
Simple lenses are subject to the optical aberrations discussed above. In many cases these aberrations can be compensated for to a great extent by using a combination of simple lenses with complementary aberrations. A compound lens is a collection of simple lenses of different shapes and made of materials of different refractive indices, arranged one after the other with a common axis.

Other type of lenses
Cylindrical lenses have curvature in only one direction. They are used to focus light into a line, or to convert the elliptical light from a laser diode into a round beam. They are also used in motion picture anamorphic lenses.

A Fresnel lens has its optical surface broken up into narrow rings, allowing the lens to be much thinner and lighter than conventional lenses. Durable Fresnel lenses can be moulded from plastic and are inexpensive.

Lenticular lenses are arrays of microlenses that are used in lenticular printing to make images that have an illusion of depth or that change when viewed from different angles.

A gradient index lens has flat optical surfaces but has a radial or axial variation in index of refraction that causes light passing through the lens to be focused.

An axicon has a conical optical surface. It images a point source into a line along the optic axis or transforms a laser beam into a ring.

Diffractive optical elements can function as lenses.

Superlenses are made from negative index metamaterials and claim to produce images at spatial resolutions exceeding the diffraction limit. The first superlenses were made in 2004 using such a metamaterial for microwaves.
Improved versions have been made by other researchers. As of 2014 the superlens has not yet been demonstrated at visible or near-infrared wavelengths.

**Camera lenses**

A camera lens (also known as photographic lens or photographic objective) is an optical lens or assembly of lenses used in conjunction with a camera body and mechanism to make images of objects either on photographic film or on other media capable of storing an image chemically or electronically.

There is no major difference in principle between a lens used for a still camera, a video camera, a telescope, a microscope, or other apparatus, but the detailed design and construction are different. A lens might be permanently fixed to a camera, or it might be interchangeable with lenses of different focal lengths, apertures, and other properties.

While in principle a simple convex lens will suffice, in practice a compound lens made up of a number of optical lens elements is required to correct (as much as possible) the many optical aberrations that arise. Some aberrations will be present in any lens system. It is the job of the lens designer to balance these and produce a design that is suitable for photographic use and possibly mass production.

**Type of lens**

Let us discuss some of the other types of lens.

**“Close-up” or macro**

A macro lens used in macro or “close-up” photography (not to be confused with the compositional term close up) is any lens that produces an image on the focal plane (i.e., film or a digital sensor) that is one quarter of life size (1:4) to the same size (1:1) as the subject being imaged. Magnification from life size to larger is called “Micro” photography (2:1, 3:1 etc.). This configuration is generally used to image close-up very small subjects. A macro lens may be of any focal length, the actual focus length being determined by its practical use, considering magnification, the required ratio, access to the subject, and illumination considerations. It can be a special lens corrected optically for close up work or it can be any lens modified (with adapters or spacers, which are also known as “extension tubes”) to bring the focal plane “forward” for very close photography. Depending on the camera to subject distance and aperture, the depth-of-field can be very narrow, limiting the linear depth of the area that will be in focus. Lenses are usually stopped down to give a greater depth-of-field.

**Zoom**

Some lenses, called zoom lenses, have a focal length that varies as internal elements are moved, typically by rotating the barrel or pressing a button which activates an electric motor. Commonly, the lens may zoom from moderate wide-angle, through normal, to moderate telephoto; or from normal to extreme telephoto. The zoom range is limited by manufacturing constraints; the ideal of a lens of large maximum
aperture which will zoom from extreme wideangle to extreme telephoto is not attainable. Zoom lenses are widely used for small-format cameras of all types: still and cine cameras with fixed or interchangeable lenses. Bulk and price limit their use for larger film sizes. Motorized zoom lenses may also have the focus, iris, and other functions motorized.

Special purpose

- Apochromat (apo) lenses have added correction for chromatic aberration. An apochromat, or apochromatic lens (apo), is a photographic or other lens that has better correction of chromatic and spherical aberration than the much more common achromat lenses.

- Process lenses have extreme correction for aberrations of geometry (pincushion distortion, barrel distortion) and are generally intended for use at a specific distance.

- Process and apochromat lenses are normally of small aperture and are used for extremely accurate photographs of static objects. Generally, their performance is optimized for subjects a few inches from the front of the lens, and suffers outside this narrow range.

- Enlarger lenses are made to be used with photographic enlargers (specialised projectors), rather than cameras.

- Lenses for aerial photography. For general aerial landscape photography, a zoom lens that roughly covers the 24-105mm focal range is the ideal lens. I say “roughly”, because a 24-70mm will also be a very good option. On this particular flight that I took, my Canon 24-70 f/2.8 L II was used for 90% of the images.

- Fisheye lenses: extreme wide-angle lenses with an angle of view of up to 180 degrees or more, with very noticeable (and intended) distortion.

- Stereoscopic lenses, to produce pairs of photographs which give a 3-dimensional effect when viewed with an appropriate viewer.

- Soft-focus lenses which give a soft, but not out-of-focus, image and have an imperfection-removing effect popular among portrait and fashion photographers.

- Infrared lenses: IR Lenses are optical lenses that use specific substrates or anti-reflection coatings to maximize performance for applications operating above 700nm including thermal imaging, FLIR, or spectroscopy. The infrared spectrum refers to 700 – 16000nm wavelengths.

- Ultraviolet lenses: UV Lenses are optical lenses consisting of a single or multiple element that have been designed for optimal performance when used with ultraviolet light. Ultraviolet lenses utilize specific substrates, anti-reflection coatings, or a combination of the two to maintain performance when operating below 400nm.
Photographic Optics

5.5 DIFFERENT KINDS OF IMAGE FORMATION

The study of image formation encompasses the radiometric and geometric processes by which 2D images of 3D objects are formed. In the case of digital images, the image formation process also includes analog to digital conversion and sampling.

Imaging

The imaging process is a mapping of an object to an image plane. Each point on the image corresponds to a point on the object. An illuminated object will scatter light toward a lens and the lens will collect and focus the light to create the image. The ratio of the height of the image to the height of the object is the magnification. The spatial extent of the image surface and the focal length of the lens determine the field of view of the lens.

Illumination

An object may be illuminated by the light from an emitting source such as the sun, a light bulb or a Light Emitting Diode. The light incident on the object is reflected in a manner dependent on the surface properties of the object. For rough surfaces, the reflected light is scattered in a manner described by the Bi-directional Reflectance Distribution Function (BRDF) of the surface. The BRDF of a surface is the ratio of the exiting power per square meter per steradian (radiance) to the incident power per square meter (irradiance). The BRDF typically varies with angle and may vary with wavelength, but a specific important case is a surface that has constant BRDF. This surface type is referred to as Lambertian and the magnitude of the BRDF is \( \frac{R}{\pi} \), where \( R \) is the reflectivity of the surface. The portion of scattered light that propagates toward the lens is collected by the entrance pupil of the imaging lens over the field of view.

Field of View and Imagery

The field of view of a lens is limited by the size of the image plane and the focal length of the lens. The relationship between a location on the image and a location on the object is \( y = \frac{f}{\tan(\theta)} \), where \( y \) is the max extent of the image plane, \( f \) is the focal length of the lens and \( \theta \) is the field of view. If \( y \) is the max radial size of the image, then \( \theta \) is the field of view of the lens. While the image created by a lens is continuous, it can be modeled as a set of discrete field points, each representing a point on the object. The quality of the image is limited by the aberrations in the lens and the diffraction created by the finite aperture stop.
Pupils and Stops

The aperture stop of a lens is a mechanical aperture which limits the light collection for each field point. The entrance pupil is the image of the aperture stop created by the optical elements on the object side of the lens. The light scattered by an object is collected by the entrance pupil and focused onto the image plane via a series of refractive elements. The cone of the focused light at the image plane is set by the size of the entrance pupil and the focal length of the lens. This is often referred to as the f-stop or f-number of the lens. \( f/# = f/D \) where \( D \) is the diameter of the entrance pupil.

Pixelation and Color vs Monochrome

In typical digital imaging systems, a sensor is placed at the image plane. The light is focused on to the sensor and the continuous image is pixelated. The light incident on each pixel in the sensor will be integrated within the pixel and a proportional electronic signal will be generated. The angular geometric resolution of a pixel is given by \( \text{atan}(p/f) \), where \( p \) is the pitch of the pixel. This is also called the pixel field of view. The sensor may be monochrome or color. In the case of a monochrome sensor, the light incident on each pixel is integrated and the resulting image is a grayscale image. For color images, a mosaic color filter is typically placed over the pixels to create a color image. An example is a Bayer filter. The signal incident on each pixel is then digitized to a bit stream.

Image Quality

The quality of an image is dependent upon both geometric and physical items. Geometrically, higher density of pixels across an image will give less blocky pixelation and thus a better geometric image quality. Lens aberrations also contribute to the quality of the image. Physically, diffraction due to the aperture stop will limit the resolvable spatial frequencies as a function of f-number.

In the frequency domain, Modulation Transfer Function (MTF) is a measure of the quality of the imaging system. The MTF is a measure of the visibility of a sinusoidal variation in irradiance on the image plane as a function of the frequency of the sinusoid. It includes the effects of diffraction, aberrations and pixelation. For the lens, the MTF is the autocorrelation of the pupil function, so it accounts for the finite pupil extent and the lens aberrations. The sensor MTF is the Fourier Transform of the pixel geometry. For a square pixel, \( \text{MTF}(\xi) = \frac{\sin(\pi \xi p)}{\pi \xi p} \) where \( p \) is the pixel width and \( \xi \) is the spatial frequency. The MTF of the combination of the lens and detector is the product of the two component MTFs.

Perception

Color images can be perceived via two means. In the case of computer vision the light incident on the sensor comprises the image. In the case of visual perception, the human eye has a color dependent response to light, so this must be accounted for. This is important consideration when converting to grayscale.
Image Formation in Eye

The principal difference between the lens of the eye and an ordinary optical lens is that the former is flexible. The radius of the curvature of the anterior surface of the lens is greater than the radius of its posterior surface. The shape of the lens is controlled by tension in the fibers of the ciliary body. To focus on distant objects, the controlling muscles cause the lens to be relatively flattened. Similarly, these muscles allow the lens to become thicker in order to focus on objects near the eye.

The distance between the center of the lens and the retina (focal length) varies from approximately 17 mm to about 14 mm, as the refractive power of the lens increases from its minimum to its maximum. When the eye focuses on an object farther away than about 3 m, the lens exhibits its lowest refractive power. When the eye focuses on a close object, the lens is most strongly refractive.

Check Your Progress

3. What does a simple and a compound lens consist of?
4. What is imaging?

5.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Reflection of light is either specular (mirror-like) or diffuse (retaining the energy but losing the image) depending on the nature of the interface.
2. Snell's law states that for a given pair of media, the ratio of the sines of the angle of incidence $\theta_1$ and angle of refraction $\theta_2$ is equal to the ratio of phase velocities ($v_1 / v_2$) in the two media, or equivalently, to the indices of refraction ($n_2 / n_1$) of the two media.
3. A simple lens consists of a single piece of transparent material, while a compound lens consists of several simple lenses (elements), usually arranged along a common axis.
4. The imaging process is a mapping of an object to an image plane.

5.7 SUMMARY

- Reflection of light is either specular (mirror-like) or diffuse (retaining the energy but losing the image) depending on the nature of the interface.
- In specular reflection the phase of the reflected waves depends on the choice of the origin of coordinates, but the relative phase between $s$ and $p$ (TE and TM) polarizations is fixed by the properties of the media and of the interface between them.
A mirror provides the most common model for specular light reflection, and typically consists of a glass sheet with a metallic coating where the significant reflection occurs.

Total internal reflection is used as a means of focusing waves that cannot effectively be reflected by common means.

When light reflects off a material denser (with higher refractive index) than the external medium, it undergoes a phase inversion.

In contrast, a less dense, lower refractive index material will reflect light in phase. This is an important principle in the field of thin-film optics.

If the reflecting surface is very smooth, the reflection of light that occurs is called specular or regular reflection.

In classical electrodynamics, light is considered as an electromagnetic wave, which is described by Maxwell’s equations.

In physics, refraction is the change in direction of a wave passing from one medium to another or from a gradual change in the medium.

For light, refraction follows Snell’s law, which states that, for a given pair of media, the ratio of the sines of the angle of incidence $\theta_1$ and angle of refraction $\theta_2$ is equal to the ratio of phase velocities ($v_1 / v_2$) in the two media, or equivalently, to the indices of refraction ($n_2 / n_1$) of the two media.

Refraction of light at the interface between two media of different refractive indices, with $n_2 > n_1$.

The focal length of an optical system is a measure of how strongly the system converges or diverges light. For an optical system in air, it is the distance over which initially collimated (parallel) rays are brought to a focus.

When white light is passed through a glass prism it splits into its spectrum of colors (in order violet, indigo, blue, green, yellow, orange and red) and this process of white light splitting into its constituent colors is termed as dispersion.

A lens is a transmissive optical device that focuses or disperses a light beam by means of refraction.

Lenses are classified by the curvature of the two optical surfaces. A lens is biconvex (or double convex, or just convex) if both surfaces are convex.

A Fresnel lens has its optical surface broken up into narrow rings, allowing the lens to be much thinner and lighter than conventional lenses.

Lenticular lenses are arrays of micro lenses that are used in lenticular printing to make images that have an illusion of depth or that change when viewed from different angles.

There is no major difference in principle between a lens used for a still camera, a video camera, a telescope, a microscope, or other apparatus, but the detailed design and construction are different.
• Some lenses, called zoom lenses, have a focal length that varies as internal elements are moved, typically by rotating the barrel or pressing a button which activates an electric motor.
• The imaging process is a mapping of an object to an image plane.
• An object may be illuminated by the light from an emitting source such as the sun, a light bulb or a Light Emitting Diode.
• The Field of view of a lens is limited by the size of the image plane and the focal length of the lens.
• The relationship between a location on the image and a location on the object is \( y = \frac{f}{\tan(\theta)} \), where \( y \) is the max extent of the image plane, \( f \) is the focal length of the lens and \( \theta \) is the field of view.
• The principal difference between the lens of the eye and an ordinary optical lens is that the former is flexible.

5.8 KEY WORDS

• **Refraction**: It is the phenomenon of light, radio waves, etc. being deflected in passing obliquely through the interface between one medium and another or through a medium of varying density.
• **Monochrome**: It refers to a photograph or picture developed or executed in black and white or in varying tones of only one colour.
• **Pixel**: It is a minute area of illumination on a display screen, one of many from which an image is composed.

5.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

**Short-Answer Questions**
1. State the laws of reflection.
2. Write a short note on photographic optics.
3. Describe the various types of lenses in brief.
4. Write a note on image quality.

**Long-Answer Questions**
1. What is reflection of light? What is the mechanism behind it?
2. What is refraction of light? How is it different from reflection of light?
3. Discuss in detail the phenomena of dispersion of light through a glass prism.
4. Explain the different kinds of image formation.
5.10 FURTHER READINGS


UNIT 6 CHOICE OF CAMERA

Structure
6.0 Introduction
6.1 Objectives
6.2 Choice of Cameras and Sizes
6.3 Miniature, Sub-Miniature and Instant Camera
6.4 Rising, Falling, Cross Movements and Swing Back
6.5 Answers to Check Your Progress Questions
6.6 Summary
6.7 Key Words
6.8 Self Assessment Questions and Exercises
6.9 Further Readings

6.0 INTRODUCTION

The most important tool in photography is a camera. While deciding on factors conducive to capturing a perfect image, utmost care is taken on deciding the type of camera used. By definition, a camera is an optical instrument for capturing still images or for recording moving images. These images are then stored in a physical medium such as in a digital system or on photographic film. A camera consists of various parts such as lens, which focuses light from the scene, and a camera body which facilitates the image capture mechanism. Still images stored in digital form are called “image files”. Similarly, moving images stored are called “video files.” In simple terms, still images are known as “photographs,” and moving images are called “films.”

The still image camera is the main instrument in photography and captured images may be reproduced later as a part of the process of photography, digital imaging or photographic printing.

A camera lens (also known as photographic lens or photographic objective) is also used in conjunction with a camera body and mechanism to make images of objects either on photographic film or on other media capable of storing an image chemically or electronically.

Elaborating further on types of cameras and lens, this unit gives an in-depth account of the same.

6.1 OBJECTIVES

After going through this unit, you will be able to:

- Describe choice of cameras and sizes
- Explain the types and techniques of miniature, sub-miniature and instant camera
- Discuss the features of rising, falling, cross movements and swing back
6.2 CHOICE OF CAMERAS AND SIZES

There are many considerations that go into choosing a digital camera, from budget and picture quality to the purpose of the digital camera. Someone who wants a portable easy-to-use camera for travel photos will not benefit from a camera perfectly suited to an advanced photographer seeking manual controls.

Digital-Single Lens Reflex (DSLR) cameras are the better choice for those who have higher demands from their advanced photography. These modern cameras generally have wider functionality and versatile shooting conditions and controls. The DSLR is the best camera to be chosen in case of action shots, nature and wildlife photography. It is also the most appropriate type of camera while carrying out portrait and people photography.

Digital compact cameras are the direct opposite of DSLRs. The main advantage of these cameras is that they are extremely light and compact. This makes them the better choice for those who prefer convenience and ease of handling. They are normally available with basic features required for day-to-day photography. The major limitations of these types of cameras are that their lenses cannot be changed, and the built-in flashes are limited in their capabilities.

While some of the most popular compact digital cameras are Panasonic Lumix DMC-TS1, Canon PowerShot S90, Samsung DualView TL225, FujiFilm FinePix F200EXR, Sony Cyber-Shot DSC-WX1 and Panasonic Lumix DMC-ZR1, the most favourite DSLRs include Nikon D90, Canon EOS 50D, Sony Alpha A900, Nikon D300, and Canon EOS Rebel XSi.

6.3 MINIATURE, SUB-MINIATURE AND INSTANT CAMERA

Let us begin by discussing miniature cameras

Miniature

Miniature photography is amongst the newest trends in photography arena. What makes it stand out of the crowd is ability to capture big things in the smallest possible form.

A miniature effect is a special effect created for motion pictures and television programs using scale models. Scale models are often combined with high speed photography or matte shots to make gravitational and other effects appear convincing to the viewer. The use of miniatures has largely been superseded by computer-generated imagery in the contemporary cinema.

Where a miniature appears in the foreground of a shot, this is often very close to the camera lens — for example when matte painted backgrounds are used. Since the exposure is set to the object being filmed so the actors appear well lit, the miniature must be over-lit in order to balance the exposure and eliminate
any depth of field differences that would otherwise be visible. This foreground miniature usage is referred to as forced perspective. Another form of miniature effect uses stop motion animation.

Use of scale models in the creation of visual effects by the entertainment industry dates back to the earliest days of cinema. Models and miniatures are copies of people, animals, buildings, settings and objects. Miniatures or models are used to represent things that do not really exist, or that are too expensive or difficult to film in reality, such as explosions, floods or fires.

Miniature effect companies operational are

- Cinema Production Services
- CINWIZ
- Fantasy II Film Effects
- Grant McCune Design
- New Deal Studios
- Vision Crew Unlimited
- Weta Workshop
- WonderWorkshop
- Magicon GmbH
- Mattes & Miniatures Visual Effects (UK)

Miniature faking

Miniature faking, also known as diorama effect or diorama illusion, is a process in which a photograph of a life-size location or object is made to look like a photograph of a miniature scale model. Blurring parts of the photo simulates the shallow depth of field normally encountered in close-up photography, making the scene seem much smaller than it actually is; the blurring can be done either optically when the photograph is taken, or by digital postprocessing. Many diorama effect photographs are taken from a high angle to simulate the effect of looking down on a miniature. Tilt–shift photography is also associated with miniature faking.

For video sequences, a way of strengthening the miniature impression is to run the video at higher speed than it was recorded. This appears to reduce the inertia which would normally limit the motion of large objects.

In a typical scene, objects close to the camera are at the bottom of the image, and objects far from the camera are at the top. This is less true if the image includes significant height as well as depth; a tall object near the camera can extend the height of the entire image.

Only one plane can be in precise focus. Objects not in the plane of focus are blurred; the blurring increases with distance from the plane of focus. But blurring less than a certain amount is imperceptible under normal viewing conditions; objects for which blurring is imperceptible are within the depth of field (DoF).
DoF decreases as magnification increases; in a close-up photograph of a miniature scene, the DoF is limited, and it often is impossible to have everything appear sharp even at the lens’s smallest aperture. Consequently, the foreground and background are often blurred, with the blur increasing with distance above or below the center of the image. In a photograph of a full-size scene, the DoF is considerably greater; in some cases, it is difficult to have much of the scene outside the DoF, even at the lens’s maximum aperture. Thus, a difference in DoF is one characteristic by which a photograph of a full-size scene is readily distinguished from one of a miniature model.

In typical photographs, there are no optical cues that specify the distance to objects (how far they are from the observation point) and so distance has to be inferred from the size of familiar objects in the scene. DoF blurring is a visual cue to distance. In a diorama illusion, the introduction of the blur cue appears to override this familiar information causing objects to appear miniature and toy-like.

Techniques
A common technique for making an image of a full-size scene resemble an image of a miniature model is to have the image progressively blurred from the center to the top or bottom, simulating the blurring due to the limited DoF of a typical image of a miniature. The blurring can be accomplished either optically or with digital post-processing.

Optical
Miniatures can be simulated optically by using lens tilt, although the effect is somewhat different from the shallow depth of field (DoF) that normally results from macro photography.

In a normal photograph (i.e. one not using tilt):

- The DoF extends between two parallel planes on either side of the plane of focus; the DoF is finite in depth but infinite in height and width.
- The sharpness gradients on each side of the DoF are along the line of sight.
- Objects at the same distance from the camera are rendered equally sharp.
- Objects at significantly different distances from the camera are rendered with unequal sharpness.

In a photograph using tilt:

- The DoF extends between two planes on either side of the plane of focus that intersect at a point beneath the lens (see Depth of field in the Scheimpflug principle article for an illustration).
- The DoF is wedge shaped, with the apex of the wedge near the camera, and the height of the wedge increasing with distance from the camera.
- When the plane of focus is at a substantial angle to the image plane, the DoF can be small in height but infinite in width and depth.
• The sharpness gradients are at an angle to the line of sight. When the plane of focus is almost perpendicular to the image plane, the sharpness gradients are almost perpendicular to the line of sight.

• When the plane of focus is at a substantial angle to the image plane, objects at the same distance from the camera are rendered with unequal sharpness, depending on their positions in the scene.

• Objects at greatly different distances from the camera are rendered sharp if they are within the DoF wedge.

Despite the differences, for a scene that includes relatively little height, lens tilt can produce a result similar to that of a miniature scene, especially if the image is taken from above at a moderate angle to the ground. For a completely flat surface, the effect using tilt would be almost the same as that with a regular lens: the region of focus would be sharp, with progressive blurring toward the top or bottom of the image. The image of Jodhpur was made from such a scene; although the blurring was accomplished with digital post-processing, a similar result could have been obtained using tilt.

Diorama effect using tilt is less effective if a scene includes objects of significant height, such as tall buildings or trees, especially when photographed at a small angle to the ground, because there is a sharpness gradient along surfaces that are obviously the same distance from the camera.

Though probably less common, similar difficulties arise if an object has significant extent along the line of sight, such as a long train receding from view, again photographed at a small angle to the ground, because parts of the train that are obviously at considerably different distances from the camera are rendered equally sharp.

With a view camera, tilt can usually be set with movements built into the camera; with a small- or medium-format camera, a tilt/shift lens or adapter is usually required.

**Digital postprocessing**

A miniature can also be simulated digitally, using an image editor to blur the top and bottom of the photograph, so that only the subject is sharp. With basic techniques, e.g., a tool such as Adobe Photoshop’s Lens Blur filter, using sharpness gradients extending from the middle of the image to the top and bottom, the effect is quite similar to that obtained using lens tilt.

The simple techniques have limitations similar to those of lens tilt. In the image of Jodhpur, the diorama simulation is quite effective, because the scene includes relatively little height and was photographed at a fairly high angle to the ground. The simulation is less convincing in the image of the train and in the image of the large, low building, because these scenes include several tall objects and were photographed at fairly low angles to the ground. In the image of the train, there is significant sharpness variation from the bottom of the train to the top, and
the same is true for many of the trees, even though the tops and bottoms of these objects are at nearly the same distances from the camera. Similar effects occur in the image of the large, low building; although the diorama simulation of the main subject is reasonable, there are noticeable sharpness differences from top to bottom on the nearest light poles and on the taller building in the background, even though the tops and bottoms of these objects are at nearly the same distances from the camera.

Even simple digital techniques afford greater flexibility than optical techniques, including the ability to choose the region of sharpness and the amount of blur for the unsharp areas after the photograph has been taken. In addition, digital miniature faking does not require a camera with movements or a special (and usually very expensive) lens.

Other techniques to enhance the impression of a diorama scene are increasing the contrast of the picture, simulating the darker, harder shadows of a miniature under a light, and increasing the saturation of the picture to simulate the brighter colors of a painted miniature.

Sub-miniature and instant camera

Sub-miniature photography is photographic technologies and techniques working with film material smaller in size than 35mm film, such as 16mm, 9.5mm, 17mm, or 17.5mm films. It is distinct from photomicrography, photographing microscopic subjects with a camera which is not particularly small.

A sub-miniature camera is a class of camera that is very much smaller than a "miniature camera". The term "miniature camera" was originally used to describe cameras using the 35 mm cine film as negative material for still photography; so cameras that used film smaller than 35mm were referred to as "sub-miniature". The smallest of these are often referred to as “ultra-miniature”. Lipstick cameras and other small digital cameras are not included, because they don’t use film. The smaller sub-miniature cameras, called ultra-miniature cameras, particularly Minox, are associated with spying.

Types

There are many sub-miniature cameras. Minox, followed by Tessina, GaMi, Rollei, Yashica, Mamiya, Gemflex and Minolta are the best-known manufacturers. All made small, precision cameras and a few were still in production in 2006 but by 2011, only the Minox TLX model was still in production. Getting film and processing for smaller cameras is a challenge as they are no longer manufactured or supported. Most require cutting your own film and home-processing.

The best known sub-miniature formats are—in increasing size—Minox (8×11 mm), Kodak disc (8×11 mm), 16 mm (10×14 mm), Super 16 mm (12×17 mm), 110 film (13×17 mm), 17.5mm for HIT camera( for example TONE camera),
and the Advanced Photo System (APS) with different aspect ratios on 24 mm film. While many sub-miniature cameras were inexpensive and poorly manufactured (thus giving the format a bad name), Minox, Gami, Edixa, Rollei, Pentax and Minolta made quality cameras capable of producing fine results—even when enlarged. Some of these formats, or non-standard cartridges loaded with an otherwise standard ciné format, are best described as specialised (e.g., Minox); half-frame 35 mm uses standard 35 mm film; cameras such as 110 and disc were aimed at the mass market.

The first sub-miniature single lens reflex is the Russian Narciss camera produced in 1961-65.

First making an appearance in the late 19th century, often as concealed cameras, sub-miniature cameras became popular soon after WWII when many consumer markets required small, inexpensive cameras. Friedrich Kaftansky’s Mini-flex was designed in 1931, on the market in 1933. Walter Zapp’s Riga Minox appeared in 1938. Kodak’s introduction of the 110 camera in the 1970s and the Kodak disc camera in the 1980s brought the subminiature camera to the forefront of the photographic market. The many cheap, poorly made cameras that soon appeared drove Kodak out of the market.

Various formats of sub-miniature camera have come and gone over the years as newer formats have replaced older one. In addition, many larger format cameras, especially 35 mm, become smaller in size and weight—partly due to the consumer demand for sub-miniature cameras—and were able to replace some sub-miniature formats. For example, full-frame 35 mm cameras, such as the Minox 35 and the Olympus XA, were made as small as earlier half-frame sub-miniature cameras such as the Olympus Pen, using moderate wide-angle fixed lenses to minimise lens barrel depth. Some sub-miniature formats, such as the Minox and 110 formats, continue in production. Most other sub-miniature cameras are still usable if film can be obtained, particularly if the photographer is prepared to do the processing.

**Technique**

The process of focusing a subminiature camera is the same as any other camera:

- **Unit focusing:** the entire lens is moved back and forth relative to the film plane. Examples: Minox B, C, LX, TLX; Edixa 16, Tessina. Minox 110, Monolta 16
- Front element focusing: Rollei 16, Rollei 110.
- Fixed focus, feasible with the great depth of field of short focal length lenses: Minox EC, Minox ECX.
- Internal focusing is not used.

The small size of the camera and film require the use of a lens with short focal length, and hence great depth of field. This simplifies focusing to some extent.
Choice of Camera

The simplest system is to use a lens with fixed focus set at the hyper-focal distance. This will produce images that are acceptably sharp from infinity to some near plane (usually five to eight feet away). This system is used in most cheaper cameras. More complex systems allow variable focus, through a dial or slider. Many cameras with this system have distance markings on the control; it is up to the user to set the focus according to the distance to the subject. Most Minox cameras use this system.

Some sub-miniature cameras include a rangefinder, for example the Minox 110. These increase the size. Autofocus or through-the-lens focusing systems are not used on sub-miniature cameras to reduce the size requirements.

Macro Photography

Sub-miniature cameras are less suited to macro photography than larger cameras, although the relatively large depth of field at close distances is an advantage. Where concealment is required, sub-miniature cameras are required; they (particularly the various Minox models) are well known as spy cameras, where they were used to photograph documents close up. Minox cameras for these purposes come with a 24-inch measuring chain attached, with markings corresponding to certain distances, to assist in focusing at these short ranges.

Telephoto

Few sub-miniature cameras have interchangeable lenses, which reduce the advantages of a small size system. Telephoto lenses for such small formats essentially do not exist, except for Steky and Gami. There have been attachments to allow cameras (generally Minox) to attach to telescopes or binoculars, but these give results of lower quality than the camera’s optics can achieve.

Developing and enlarging

- Nikor or Jobo 16mm development reel
- Nikor 9.2mm or Jobo 8x11 development reel
- Minox daylight development tank
- 10x14mm, 12x17mm, 14x21mm and 8x11mm negative carrier used with 35mm enlarger.
- Minox enlarger with 15mm Micro-Minox enlarging lens

Instant camera

The instant camera is a type of camera which uses self-developing film to create a chemically developed print shortly after taking the picture. Polaroid Corporation pioneered (and patented) consumer friendly instant cameras and film and were followed by various other manufacturers.

The invention of commercially viable instant cameras, which were easy to use, is generally credited to American scientist Edwin Land, who unveiled the first
commercial instant camera, the model 95 Land Camera, in 1948, a year after unveiling instant film in New York City. The earliest instant camera, which consisted of a camera and portable wet darkroom in a single compartment, was invented in 1923 by Samuel Shlafrock.

During 1977, was the height of the Instant Camera popularity but around 1979, Started the decline of Polaroid cameras. There were newer, smaller, and less expensive cameras and recording devices being introduced which was the start of the digital photography age being born.

In February 2008, Polaroid filed for bankruptcy protection for the second time and announced it would discontinue production of its instant films and cameras, shut down three manufacturing facilities, and lay off 450 workers. Sales of analog film by all makers dropped by at least 25% per year in the first decade of the 21st century. In 2009, Polaroid was acquired by PLR IP Holdings, LLC which uses the Polaroid brand to market various products often relating to instant cameras. Among the products it markets are a Polaroid branded Fuji Instax instant camera, and various digital cameras and portable printers.

As of 2017, film continues to be made by the Polaroid Originals (previously the Impossible Project) for several models of Polaroid camera, and for the 8×10 inch format. Other brands such as Lomography, Leica, Fuji-Film, and etc. have innovated new models and features to their own takes on instant cameras.

Polaroid cameras

Polaroid cameras can be classified by the type of film they use. The earliest Polaroids (pre-1963) used instant roll film. Roll film came in two rolls (positive/developing agent and negative) which were loaded into the camera and was eventually offered in three sizes (40, 30, and 20 series). The next generation of Polaroid cameras used 100 series “pack film,” where the photographer pulled the film out of the camera, then peeled apart the positive from the negative at the end of the developing process. Pack film initially was offered in a rectangular format (100 series), then in square format (80 series). Third generation Polaroids, like the once popular SX-70, used a square format integral film, in which all components of the film (negative, developer, fixer, etc.) were contained. Each exposure developed automatically once the shot was taken. SX-70 (or Time Zero) film had a strong following with artists who used it for image manipulation.

600 series cameras such as the Pronto, Sun 600, and One600 used 600 (or the more difficult to find professional 779) film which was four times faster than SX-70 film. Polaroid Spectra cameras used Polaroid Spectra film which went back to a rectangular format. Captiva, Joycam, and Popshots (single use) cameras used a smaller 500 series film in rectangular format. I-zone cameras use a very small film format which was offered in a sticker format. Finally, Mio cameras used Polaroid Mio film which was Fuji Instax mini, branded as Polaroid and which is still available in 2015 as Fuji Instax Mini. This size produces a billfold sized photo.
Choice of Camera

Polaroid still markets a mini format camera built by Fuji branded as Polaroid 300 and the film is available with both the Polaroid name and as Fuji Instax mini which are interchangeable.

NOTES

Models

Many different models of Polaroid and non-Polaroid instant cameras were introduced in the mid to late 20th century. They can be categorized by the film type. The first roll film model was the model 95, followed by subsequent models containing various new features. The first 100 series pack film model was the model 100, followed by various models in the 100 - 400 series and a few ad hoc cameras such as the countdown series. Models which used SX-70 film were introduced in a folding version, with later versions being unfolding and plastic bodied. 600 series cameras were all plastic bodied, but most came with an electronic flash. This was followed by other various plastic cameras based on spectra, captiva, and izone film.

Check Your Progress

1. Name any three popular compact digital cameras.
2. What is miniature faking?

6.4 RISING, FALLING, CROSS MOVEMENTS AND SWING BACK

A view camera is a large format camera in which the lens forms an inverted image on a ground glass screen directly at the plane of the film. The image viewed is exactly the same as the image on the film, which replaces the viewing screen during exposure.

This type of camera was first developed in the era of the daguerreotype (1840s-1850s) and still in use today, though with many refinements. It comprises a flexible bellows that forms a light-tight seal between two adjustable standards, one of which holds a lens, and the other a viewfinder or a photographic film holder. There are three general types, the monorail camera, the field camera, and press or technical cameras.

The bellows is a flexible, accordion-pleated box. It encloses the space between the lens and film, and flexes to accommodate the movements of the standards. The front standard is a board at the front of the camera that holds the lens and, usually, a shutter.

At the other end of the bellows, the rear standard is a frame that holds a ground glass plate, used for focusing and composing the image before exposure—and is replaced by a holder containing the light-sensitive film, plate, or image sensor for exposure. The front and rear standards can move in various ways relative to
each other, unlike most other camera types. This provides control over focus, depth of field, and perspective. The camera is usually used on a tripod or other support.

** Movements **

Photographers use view cameras to control focus and convergence of parallel lines. Image control is done by moving the front and/or rear standards. Movements are the ways the front and rear standards can move to alter perspective and focus. The term can also refer to the mechanisms on the standards that control their position.

Not all cameras have all movements available to both front and rear standards, and some cameras have more movements available than others. Some cameras have mechanisms that facilitate intricate movement combinations.

Some limited view camera-type movements are possible with SLR cameras using various tilt/shift lenses. Also, as use of view cameras declines in favor of digital photography, these movements are simulated using computer software.

** Rise and fall **

Rise and fall are the movements of either the front or rear standard vertically along a line in a plane parallel to the film (or sensor) plane. Rise is a very important movement especially in architectural photography. Generally, the lens is moved vertically—either up or down—along the lens plane to change the portion of the image captured on the film. In the 35 mm format, special shift lenses (sometimes called perspective control lenses) emulate the rise or fall of view cameras.

The main effect of rise is to eliminate converging parallels when photographing tall buildings. If a camera without movements is pointed at a tall building, the top is off. If the camera is tilted upwards to get it all in, the film plane is not parallel to the building, and the building seems narrower at the top than the bottom: lines that are parallel in the object converge in the image.

To avoid this apparent distortion, a wide-angle lens gets more of the building in, but includes more of the foreground and alters the perspective. A camera with rising front lets a normal lens be raised to include the top of the building without tilting the camera.

This requires that the image circle of the lens be larger than required to cover the film without use of movements. If the lens can produce a circular image just large enough to cover the film, it can’t cover the bottom of the film as it rises. Consequently, lens coverage must be larger to accommodate rises (and falls, and shifts).

** Shift **

Moving the front standard left or right from its normal position is called lens shift, or simply shift. This movement is similar to rise and fall but moves the image
horizontal rather than vertically. One use for shift is to remove the image of the camera from the final image when photographing a reflective surface.

Tilt

The axis of the lens is normally perpendicular to the film (or sensor). Changing the angle between axis and film by tilting the lens standard backwards or forwards is called lens tilt, or just tilt. Tilt is especially useful in landscape photography. By using the Scheimpflug principle, the “plane of sharp focus” can be changed so that any plane can be brought into sharp focus. When the film plane and lens plane are parallel as is the case for most 35 mm cameras, the plane of sharp focus is also parallel to these two planes. If, however, the lens plane is tilted with respect to the film plane, the plane of sharp focus is also tilted according to geometrical and optical properties. The three planes intersect in a line below the camera for downward lens tilt. The tilted plane of sharp focus is useful, in that this plane can be made to coincide with a near and far object. Thus, both near and far objects on the plane are in focus.

This effect is often incorrectly thought of as increasing the depth of field. Depth of field depends on the focal length, aperture, and subject distance. As long as the photographer wants sharpness in a plane that is parallel to the film, tilt is of no use. However, tilt has a strong effect on the depth of field by drastically altering its shape, making it asymmetrical. Without tilt, the limits of near and far acceptable focus are parallel to the plane of sharp focus as well as parallel to the film. With forward tilt, the plane of sharp focus tilts even more and the near and far limits of acceptable focus form a wedge shape (viewed from the side). Thus, the lens still sees a cone shaped portion of whatever is in front of it while the wedge of acceptable focus is now more closely aligned with this cone. Therefore, depending on the shape of the subject, a wider aperture can be used, lessening concerns about camera stability due to slow shutter speed and diffraction due to too-small aperture.

Tilting achieves the desired depth of field using the aperture at which the lens performs best. Too small an aperture, risks losses to diffraction and camera/subject motion what is gained from depth of field. Only testing a given scene, or experience, shows whether tilting is better than leaving the standards neutral and relying on the aperture alone to achieve the desired depth of field. If the scene is sharp enough at f/32 with 2 degrees of tilt but would need f/64 with zero tilt, then tilt is the solution. If another scene would need f/45 with or without tilt, then nothing is gained.

With a forward tilt, the shape of the portion of a scene in acceptable focus is a wedge. Thus, the scene most likely to benefit from tilting is short in the front and expands to a greater height or thickness toward the horizon. A scene consisting of tall trees in the near, middle and far distance may not lend itself to tilting unless the photographer is willing to sacrifice either the top of the near trees and/or the bottom of the far trees.
Assuming lens axis front tilt, here are the trade-offs in choosing between a small degree of tilt (say less than 3) and a larger tilt: A small tilt causes a wider or fatter wedge but one that is far off axis from the cone of light seen by the lens. Conversely, a large tilt (say 10 degrees) makes the wedge more aligned with the lens view, but with a narrower wedge. Thus, a modest tilt is often, or even usually, the best starting point. Small and medium format cameras have fixed bodies that do not allow for misalignment of the film and lens planes, intentionally or not. Tilt/shift ("TS") or perspective control ("PC") lenses that provide limited movements for these cameras can be purchased from a number of lens makers. High-quality TS or PC lenses are expensive. The price of a new Canon TS-E or Nikon PC-E lens is comparable to that of a good used large-format camera, which offers a much greater range of adjustment.

**Swing**

*Front standard swing*

Altering the angle of the lens standard in relation to the film plane by swiveling it from side to side is called swing. Swing is like tilt, but it changes the angle of the focal plane in the horizontal axis instead of the vertical axis. For example, swing can help achieve sharp focus along the entire length of a picket fence that is not parallel to the film plane.

*Back tilt/swing*

Angular movements of the rear standard change the angle between the lens plane and the film plane just as front standard angular movements do. Though rear standard tilt changes the plane of sharp focus in the same manner as front standard tilt, this is not usually the reason to use rear tilt/swing. When a lens is a certain distance (its focal length) away from the film, distant objects, such as faraway mountains, are in focus. Moving the lens farther from the film brings closer objects into focus. Tilting or swinging the film plane puts one side of the film farther from the lens than the center is and the opposite point of the film is therefore closer to the lens.

One reason to swing or tilt the rear standard is to keep the film plane parallel to the face of the subject. Another reason to swing or tilt the rear standard is to control apparent convergence of lines when shooting subjects at an angle.

It is often incorrectly stated that rear movements can be used to change perspective. The only thing that truly controls perspective is the location of the camera in relation to the objects in the frame. Rear movements can let a photographer shoot a subject from a perspective that puts the camera at an angle to the subject, yet still achieves parallel lines. Thus, rear movements allow a change of perspective by allowing a different camera location, yet no view camera movement actually alters perspective.
Choice of Camera

Check Your Progress

3. What is a view camera?
4. What are rise and fall movements?

6.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The three most popular compact digital cameras are Panasonic Lumix DMC-TS1, Canon PowerShot S90 and Samsung DualView TL225.
2. Miniature faking, also known as diorama effect or diorama illusion, is a process in which a photograph of a life-size location or object is made to look like a photograph of a miniature scale model.
3. A view camera is a large format camera in which the lens forms an inverted image on a ground glass screen directly at the plane of the film.
4. Rise and fall are the movements of either the front or rear standard vertically along a line in a plane parallel to the film (or sensor) plane.

6.6 SUMMARY

- Digital-Single Lens Reflex (DSLR) cameras are the better choice for those who have higher demands from their advanced photography.
- Digital compact cameras are the direct opposite of DSLRs. The main advantage of these cameras is that they are extremely light and compact.
- A miniature effect is a special effect created for motion pictures and television programs using scale models.
- Scale models are often combined with high speed photography or matte shots to make gravitational and other effects appear convincing to the viewer.
- Models and miniatures are copies of people, animals, buildings, settings and objects. Miniatures or models are used to represent things that do not really exist, or that are too expensive or difficult to film in reality, such as explosions, floods or fires.
- Many diorama effect photographs are taken from a high angle to simulate the effect of looking down on a miniature.
- Tilt–shift photography is also associated with miniature faking.
- A common technique for making an image of a full-size scene resemble an image of a miniature model is to have the image progressively blurred from the center to the top or bottom, simulating the blurring due to the limited DoF of a typical image of a miniature.
Choice of Camera

NOTES

Self-Instructional Material

- Miniatures can be simulated optically by using lens tilt, although the effect is somewhat different from the shallow depth of field (DoF) that normally results from macro photography.
- A miniature can also be simulated digitally, using an image editor to blur the top and bottom of the photograph, so that only the subject is sharp.
- Sub-miniature photography is photographic technologies and techniques working with film material smaller in size than 35mm film, such as 16mm, 9.5mm, 17mm, or 17.5mm films.
- A sub-miniature camera is a class of camera that is very much smaller than a “miniature camera”.
- The term “miniature camera” was originally used to describe cameras using the 35 mm cine film as negative material for still photography; so, cameras that used film smaller than 35mm were referred to as “sub-miniature”.
- Sub-miniature cameras are less suited to macro photography than larger cameras, although the relatively large depth of field at close distances is an advantage.
- The instant camera is a type of camera which uses self-developing film to create a chemically developed print shortly after taking the picture.
- Polaroid Corporation pioneered (and patented) consumer friendly instant cameras and film and were followed by various other manufacturers.
- Polaroid cameras can be classified by the type of film they use. The earliest Polaroids (pre-1963) used instant roll film.
- A view camera is a large format camera in which the lens forms an inverted image on a ground glass screen directly at the plane of the film.
- Photographers use view cameras to control focus and convergence of parallel lines. Image control is done by moving the front and/or rear standards.
- Movements are the ways the front and rear standards can move to alter perspective and focus. The term can also refer to the mechanisms on the standards that control their position.
- The axis of the lens is normally perpendicular to the film (or sensor). Changing the angle between axis and film by tilting the lens standard backwards or forwards is called lens tilt, or just tilt.

6.7 KEY WORDS

- **Aperture**: It is a space through which light passes in an optical or photographic instrument, especially the variable opening by which light enters a camera.
- **Shutter**: It is a device that opens and closes to expose the film in a camera.
Choice of Camera

• **Polaroid**: It means relating to or denoting a type of camera with internal processing that produces a finished print rapidly after each exposure.

6.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

**Short-Answer Questions**

1. Which is the best camera for photographers?
2. Write a detailed note on sub-miniature and instant camera.
3. Write a brief note on rise and fall movements in a camera.
4. Discuss digital postprocessing.

**Long-Answer Questions**

1. Discuss movements in photography in detail.
2. What is miniature photography? Discuss its types and techniques in detail.

6.9 FURTHER READINGS


UNIT 7 LENS, APERTURE AND SHUTTERS

Structure
7.0 Introduction
7.1 Objectives
7.2 Lens, Aperture, Shutters: Types and Functions
7.2.1 View Finders and Focusing System
7.3 Answers to Check Your Progress Questions
7.4 Summary
7.5 Key Words
7.6 Self Assessment Questions and Exercises
7.7 Further Readings

7.0 INTRODUCTION

The quality of photography is determined by a number of factors. One of the most important factor is the lenses that are used to capture an image. A good camera lens results in sharp photos with special care to detail and contrast, while a bad camera will result in dull, blurry and poor-quality pictures.

Changing lenses and other camera functions depending on the subject of the photograph intended to be shot are of utmost importance as it will provide the much needed clarity and balance to the image. Considering favourable lighting conditions should also be kept in mind. There is no single lens that is perfect for every situation and every photograph therefore, an in-depth knowledge of the types of lenses is imperative.

The two fundamental parameters of an optical lens are the focal length and the maximum aperture. The lens’ focal length determines the magnification of the image projected onto the image plane, and the aperture the light intensity of that image. For a given photographic system the focal length determines the angle of view, short focal lengths giving a wider field of view than longer focal length lenses. A wider aperture, identified by a smaller f-number, allows using a faster shutter speed for the same exposure.

In this unit, you will study in detail about types of lenses, aperture and shutters.
7.1 OBJECTIVES

After going through this unit, you will be able to:

- Describe the types of lens, aperture and shutters
- Explain the functions of lens, aperture and shutters
- Discuss view-finders and focusing system

7.2 LENS, APERTURE, SHUTTERS: TYPES AND FUNCTIONS

Cameras contain lenses comprising several lens elements. Each of these elements aims at directing the path of light rays such that they create the image as accurately as possible on the digital sensor. The basic objective is to minimize aberrations.

Types of Lenses

There are many types of lenses, such as normal lenses, wide-angled lenses, telephoto lenses, PC lenses, TS lenses, etc.

In photography and cinematography, a normal lens is a lens that reproduces perspective that generally looks ‘natural’ to a human observer under normal viewing conditions, as compared with lenses with longer or shorter focal lengths which produce an expanded or contracted field-of-view. Lenses of shorter focal length are called wide-angle lenses, while longer focal length lenses are often referred to as telephoto lenses.

Wide-angled lenses

Wide-angle lenses are great for capturing large, expansive scenes or moving in close and getting a unique perspective on smaller environments (see Figure 7.1).

![Fig. 7.1 A Wide-Angle Lens that Includes more Information as Compared to Normal Lens](image.png)
The key thing to remember about wide-angle lenses is that since they can see more than a human eye can, they distort perspective:

- Objects in the scene tend to appear farther apart than they would in real life or with a longer lens.
- Objects in the periphery of the scene can appear distorted—the shorter the lens, the more distorted they appear.
- These lenses favour objects near the center of the scene, making them handy for emphasizing the subject in a crowded setting.
- Wide-angle lenses typically offer a lot of depth of field, meaning that you can often get everything from the subject to infinity in sharp focus. Many digital and point-and-shoot cameras come with wide-angle lenses for exactly this reason.

**Telephoto lens and digital camera**

A telephoto lens is typically considered to be any lens with a focal length beyond that of the normal focal length lens. Telephoto lenses act like binoculars for your camera, pulling distant objects in and magnifying the scene (see Figure 7.2).

Many photographers love telephoto lenses—particularly zoom telephotos—because they expand your range of options significantly. Following telephoto factors should be kept in mind:

- Objects in a telephoto lens get compressed, making everything seem somewhat closer together.
- In contrast to the distorted perspective offered by wide-angle lenses, a telephoto image looks very flat.
- Telephoto lenses reduce the depth of field of an image. Typically, only the subject of a telephoto shot is in perfectly sharp focus (and this effect is more pronounced with greater focal lengths).

**Pros and cons of using a telephoto lens:** Virtually every photographer should own a telephoto lens. Since, there are many subjects you simply cannot approach safely—like lions at the zoo—a telephoto allows you to stand off some distance...
and still fill the frame with the subject that you are trying to capture. Because of the flat, compressed perspective of a telephoto shot, these lenses also bring a level of intimacy to a scene that a wide-angle lens cannot match; the stretched feel of wide-angle images makes you feel like you are looking in from a distance, instead of being right there in the scene.

Telephotos have a downside, though. You may need a tripod or some other kind of support to ensure there is no camera shake, particularly with very long telephoto lenses. Telephoto lenses also have smaller apertures, meaning that the shutter speed must be slower—and that only aggravates the jitter problem. For the same reason, telephotos cannot easily be used in low-light situations.

Zoomed images are a popular ‘effect’ shot, taken with a zoom lens and a somewhat long exposure. These pictures suggest action where there may otherwise just be a static scene, and they can get ‘wows’ from the people you show it to (see Figure 7.3).

Unfortunately, most of the digital cameras cannot manage the traditional zoomed shot, either because you cannot directly control the shutter speed or because the zoom lens is motorized and does not go quickly enough. If your camera is up to the task, however, you can try to capture the effect ‘in the lens’ instead of on the computer:

- Choose a scene to zoom through. You will get the best results with a brightly coloured subject and a simple scene that will not be too ‘busy.’
- Mount the camera on a tripod to minimize camera shake. Or you can try to hand-hold it if you have a steady grip.
- Set the shutter for 1/4 or 1/8 of a second. You will need that much time to slide the zoom lens. Obviously, you may need to take this picture early or late in the day to be able to properly expose the image. If you cannot set the
exposure because your camera is an automatic, it is always an option to apply a neutral-density filter over the lens to effectively slow the camera down—or shoot in the shade or late in the day.

- Just as you press the shutter release, start zooming with a firm, steady and consistent motion. Just as in baseball or golf, ensure that you follow through the zoom motion even after the shutter releases—that way, you will not stop moving the zoom in the middle of the exposure. You may need to practice this a few times to get the shot right, but electronic film is free.

**Perspective control (PC) and Tilt shift (TS) lenses**

In photography, a perspective control lens allows the photographer to control the appearance of perspective by reorienting the lens in relationship to the film or sensor, mimicking certain view camera movements. Lenses which can shift may be called shift lenses, while those which can also tilt may be called tilt-shift lenses. The terms PC and TS are also used by some manufacturers to refer to this type of lens.

This type of lens is used mostly in architectural and other technical photography. Perspective control lenses are generally designed for single-lens reflex (SLR) cameras, as rangefinder cameras do not allow the photographer to directly view the effect of the lens and view cameras allow for perspective correction using movements.

A perspective control lens has a larger image circle than is required to cover the image area (film or sensor size). Typically, the image circle is large enough, and the mechanics of the lens sufficiently limited. However, all PC lenses require a small aperture setting to prevent vignetting when significant shifts are employed. PC lenses for 35 mm cameras typically offer a maximum shift of 11 mm.

**Working and Angle View of a Lens**

The focal length of a lens is the distance from the lens to the point at which the rays of light that pass through it focus. The higher the focal length, the greater will be the distance (see Figure 7.4).
The conventional definition of focal length in photography is simply related to magnification. Larger focal lengths produce greater magnification; hence, long-focal-length lenses are great for capturing far-away action or enlarging objects that are moderately far away (see Figure 7.5).

Focal length is not the same as f/stop, which is a measure of how large the opening in the lens is. In a nutshell, f/stop measures the amount of light the lens can admit, while focal length is the magnification of the lens.

The focal length of a given lens also affects the camera’s angle of view (see Figure 7.6). Because a telephoto lens magnified distant objects, it has a very narrow angle of view. As you move toward the smaller focal lengths, the magnification goes down and hence the angle of view increases. At the extreme end of the scale—wide-angle lenses—the image is actually shrunk (with respect to what a human eye could see) and the angle of view become extreme, sometimes greater than 180 degrees. This kind of wide-angle lens is known as a ‘fish-eye lens’ due to the peculiar effect of the angle of view.
Lens aperture

The aperture of your lens is the size of the opening that determines how much light reaches your camera’s CCD or CMOS chip. In a traditional camera, the aperture settings are indicated by a series of numbers, called f/stops. F/stops generally vary from about f/1.2 to f/22, and each increment is exactly half as large as the preceding number—so f/16 admits twice as much light as f/22. The smaller the number, the larger the opening. Incidentally, the numbers are not consecutive (like 2, 3 and 4) because they are derived from the relationship between the lens diameter and the focal length (see Figure 7.7).

A small aperture (like f/22) admits relatively little light. As a consequence, you will need a longer exposure to capture the image. In addition, a smaller opening also produces more depth of field, so a deeper range of foreground and background will be in focus.

Only professional-grade digital cameras actually allow you to dial in a specific aperture setting. Other cameras choose this automatically, or sometimes provide a two- or three-position switch for bright and dark lighting situations. Most digital cameras offer a fairly large-aperture lens, typically between f/2 and f/4.
Shutter speed and aperture

There is a direct relationship between the aperture and shutter speed of a camera. Together, these two factors determine the proper exposure of a picture, and if they are not synchronized correctly, your images will likely be under- or overexposed.

Aperture determines how much light is allowed. Shutter speed is a measure of how long the camera’s imaging circuits are exposed to the light. Both settings can change in doubles and halves, such as 1/1,000, 1/500 and 1/250 of a second. In any given lighting condition, your digital camera typically finds the fastest shutter speed that will capture the scene and then assigns the proper aperture setting to take the picture (see Figure 7.8).

If the aperture is very large, the shutter will be open only for a short time. But, if the aperture is closed to a smaller diameter, less light can get through and thus, the shutter must be left open longer. It is this tradeoff between shutter speed and the aperture size that determines how well action can be frozen and how much depth of field is available around the focal point.

Equivalency of digital camera lenses to 35 mm lenses

Most people understand that a 50 mm lens is ‘normal’ magnification and a 200 mm lens is a moderate telephoto, but what is a 6 mm focal length lens on a digital camera?

With this equation you can figure out the 35 mm equivalent of a lens that you know the actual focal length of:

\[
\text{36 mm equivalent focal length} = \frac{(\text{NLE} \times \text{RL})}{\text{NL}}
\]

where:

- NLE is the 35 mm-equivalent rating of the lens that comes with your digital camera.
• RL is the actual focal length of the new lens you are thinking of buying for your digital camera.
• NL is the actual focal length of the lens that comes with your digital camera.

You can almost always find the NLE value right on the lens itself, on the box, or in the user’s guide. Let us assume that you have a digital camera with a focal length of 4.4 mm, which according to the box equates to a 29 mm lens. You are trying to decide whether to buy a 6 mm, 9 mm or 12 mm replacement lens. Here is what each one would work out to in 35 mm equivalents:

\[
\begin{align*}
\frac{29 \times 6}{4.4} &= 40\text{mm} \\
\frac{29 \times 9}{4.4} &= 59\text{mm} \\
\frac{29 \times 12}{4.4} &= 79\text{mm}
\end{align*}
\]

### 7.2.1 View Finders and Focusing System

In photography, a viewfinder is what the photographer looks through to compose, and, in many cases, to focus the picture. Most viewfinders are separate, and suffer parallax, while the single-lens reflex camera lets the viewfinder use the main optical system. Viewfinders are used in many cameras of different types: still and movie, film, analog and digital. A zoom camera usually zooms its finder in sync with its lens, one exception being rangefinder cameras.

**Modern view-finders**

Viewfinders can be optical or electronic. An optical viewfinder is simply a reversed telescope mounted to see what the camera will see. Its drawbacks are many, but it also has advantages; it consumes no power, it does not wash out in sunlight, and it has “full resolution” (i.e. the resolution of the photographer’s eye). An electronic viewfinder (EVF) is a CRT, LCD or OLED based display device, though only the LCD is commonplace today due to size and weight. In addition to its primary purpose, an electronic viewfinder can be used to replay previously captured material, and as an on-screen display to browse through menus.

A still camera’s optical viewfinder typically has one or more small supplementary LED displays surrounding the view of the scene. On a film camera, these displays show shooting information such as the shutter speed and aperture and, for autofocus cameras, provide an indication that the image is correctly focussed. Digital still cameras will typically also display information such as the current ISO setting and the number of remaining shots which can be taken in a burst. Another display which overlays the view of the scene is often provided. It typically shows the location and state of the camera’s provided auto-focus points. This overlay can also provide lines or a grid which assist in picture composition.
It is not uncommon for a camera to have two viewfinders. For example, a digital still camera may have an optical viewfinder and an electronic one. The latter can be used to replay previously captured material, has an on-screen display, and can be switched off to save power. A camcorder may have two viewfinders, both electronic. The first is viewed through a magnifying eyepiece, and due to a rubber eyepiece, it can be viewed perfectly even in bright light. The second viewfinder would be larger, of a higher resolution, and may be mounted on the side of the camera. Because it consumes more power, a method is often provided to turn it off to save energy.

In late 2010, Fujifilm announced hybrid viewfinder of optical viewfinder and electronic viewfinder in one viewfinder for its high end compact cameras. There is a half mirror prism that reflect data from LCD to the optical viewfinder, so we can see both the shooting frame and the shooting data. A button can change the hybrid function to electronic viewfinder by blocking the image through the optical viewfinder with moving a half mirror prism to be a straight up mirror.

Some special purpose cameras do not have viewfinders at all. These are, for example, web cameras and video surveillance cameras. They use external monitors as their viewfinders.

**Autofocus optical system**

An autofocus (or AF) optical system uses a sensor, a control system and a motor to focus on an automatically or manually selected point or area. An electronic rangefinder has a display instead of the motor; the adjustment of the optical system has to be done manually until indication. Autofocus methods are distinguished by their type as being either active, passive or hybrid variants.

Autofocus systems rely on one or more sensors to determine correct focus. Some AF systems rely on a single sensor, while others use an array of sensors. Most modern SLR cameras use through-the-lens optical sensors, with a separate sensor array providing light metering, although the latter can be programmed to prioritize its metering to the same area as one or more of the AF sensors.

Through-the-lens optical autofocusing is now often speedier and more precise than can be achieved manually with an ordinary viewfinder, although more precise manual focus can be achieved with special accessories such as focusing magnifiers. Autofocus accuracy within 1/3 of the depth of field (DOF) at the widest aperture is common in professional AF SLR cameras.

Most multi-sensor AF cameras allow manual selection of the active sensor, and many offer automatic selection of the sensor using algorithms which attempt to discern the location of the subject. Some AF cameras are able to detect whether the subject is moving towards or away from the camera, including speed and acceleration data, and keep focus on the subject — a function used mainly in sports and other action photography; on Canon cameras this is known as AI servo, while on Nikon cameras it is known as “continuous focus”.
The data collected from AF sensors is used to control an electromechanical system that adjusts the focus of the optical system. A variation of autofocus is an electronic rangefinder, a system in which focus data are provided to the operator, but adjustment of the optical system is still performed manually.

The speed of the AF system is highly dependent on the widest aperture offered by the lens. F-stops of around f/2 to f/2.8 are generally considered optimal in terms of focusing speed and accuracy. Faster lenses than this (e.g.: f/1.4 or f/1.8) typically have very low depth of field, meaning that it takes longer to achieve correct focus, despite the increased amount of light.

Most consumer camera systems will only autofocus reliably with lenses that have a widest aperture of at least f/5.6, while professional models can often cope with lenses that have a widest aperture of f/8, which is particularly useful for lenses used in conjunction with teleconverters.

**Active vs passive focus system**

Active systems will typically not focus through windows, since sound waves and infrared light are reflected by the glass. With passive systems this will generally not be a problem, unless the window is stained. Accuracy of active autofocus systems is often considerably less than that of passive systems.

Active systems may also fail to focus a subject that is very close to the camera (e.g., macro photography).

Passive systems may not find focus when the contrast is low, notably on large single-colored surfaces (walls, blue sky, etc.) or in low-light conditions. Passive systems are dependent on a certain degree of illumination to the subject (whether natural or otherwise), while active systems may focus correctly even in total darkness when necessary. Some cameras and external flash units have a special low-level illumination mode (usually orange/red light) which can be activated during autofocus operation to allow the camera to focus.

**Trap focus**

A method variously referred to as trap focus, focus trap, or catch-in-focus uses autofocus to take a shot when a subject moves into the focal plane (at the relevant focal point); this can be used to get a focused shot of a rapidly moving object, particularly in sports or wildlife photography, or alternatively to set a “trap” so that a shot can automatically be taken without a person present. This is done by using AF to detect but not set focus – using manual focus to set focus (or switching to manual after focus has been set) but then using focus priority to detect focus and only release the shutter when an object is in focus. The technique works by choosing the focus adjustment (turning AF off), then setting the shooting mode to “Single” (AF-S), or more specifically focus priority, then depressing the shutter – when the subject moves into focus, the AF detects this (though it does not change the focus), and a shot is taken.
The first SLR to implement trap focusing was the Yashica 230 AF. Trap focus is also possible on some Pentax (e.g. K-x and K-5), Nikon, and Canon EOS cameras. The EOS 1D can do it using software on an attached computer, whereas cameras like the EOS 40D and 7D have a custom function (III-1 and III-4 respectively) which can stop the camera trying to focus after it fails. On EOS cameras without genuine trap focus, a hack called “almost trap focus” can be used, which achieves some of the effects of trap focus. By using the custom firmware Magic Lantern, some Canon DSLRs can perform trap focus.

**AI Servo**

AI Servo is an autofocus mode found on Canon SLR cameras. The same principle is used by other brands such as Nikon, Sony, and Pentax, called “continuous focus” (AF-C). Also referred to as focus tracking, it is used to track a subject as it moves around the frame, or toward and away from the camera. When in use, the lens will constantly maintain its focus on the subject, hence it is commonly used for sports and action photography. AI refers to artificial intelligence: algorithms that constantly predict where a subject is about to be based on its speed and acceleration data from the autofocus sensor.

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**Check Your Progress**

1. What are lenses with different focal lengths called?
2. What is the role of a perspective control lens?
3. Define focal length of a lens.
4. What is an optical viewfinder?

---

### 7.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Lenses of shorter focal length are called wide-angle lenses, while longer focal length lenses are often referred to as telephoto lenses.
2. A perspective control lens allows the photographer to control the appearance of perspective by reorienting the lens in relationship to the film or sensor, mimicking certain view camera movements.
3. The focal length of a lens is the distance from the lens to the point at which the rays of light that pass through it focus.
4. An optical viewfinder is simply a reversed telescope mounted to see what the camera will see.
Cameras contain lenses comprising several lens elements. Each of these elements aims at directing the path of light rays such that they create the image as accurately as possible on the digital sensor.

- There are many types of lenses, such as normal lenses, wide-angled lenses, telephoto lenses, PC lenses, TS lenses, etc.
- Wide-angle lenses are great for capturing large, expansive scenes or moving in close and getting a unique perspective on smaller environments.
- A telephoto lens is typically considered to be any lens with a focal length beyond that of the normal focal length lens. Telephoto lenses act like binoculars for your camera, pulling distant objects in and magnifying the scene.
- Telephotos have a downside, though. You may need a tripod or some other kind of support to ensure there is no camera shake, particularly with very long telephoto lenses.
- Zoomed images are a popular ‘effect’ shot, taken with a zoom lens and a somewhat long exposure.
- Unfortunately, most of the digital cameras cannot manage the traditional zoomed shot, either because you cannot directly control the shutter speed or because the zoom lens is motorized and does not go quickly enough.
- In photography, a perspective control lens allows the photographer to control the appearance of perspective by reorienting the lens in relationship to the film or sensor, mimicking certain view camera movements.
- Lenses which can shift may be called shift lenses, while those which can also tilt may be called tilt-shift lenses. The terms PC and TS are also used by some manufacturers to refer to this type of lens.
- The focal length of a lens is the distance from the lens to the point at which the rays of light that pass through it focus.
- In photography, a viewfinder is what the photographer looks through to compose, and, in many cases, to focus the picture.
- Viewfinders can be optical or electronic.
- A still camera’s optical viewfinder typically has one or more small supplementary LED displays surrounding the view of the scene.
- It is not uncommon for a camera to have two viewfinders. For example, a digital still camera may have an optical viewfinder and an electronic one.
- An autofocus (or AF) optical system uses a sensor, a control system and a motor to focus on an automatically or manually selected point or area.
• An electronic rangefinder has a display instead of the motor; the adjustment of the optical system has to be done manually until indication.

• The data collected from AF sensors is used to control an electromechanical system that adjusts the focus of the optical system.

• Active systems will typically not focus through windows, since sound waves and infrared light are reflected by the glass. With passive systems this will generally not be a problem, unless the window is stained.

• Passive systems may not find focus when the contrast is low, notably on large single-colored surfaces (walls, blue sky, etc.) or in low-light conditions.

• The first SLR to implement trap focusing was the Yashica 230 AF.

• AI Servo is an autofocus mode found on Canon SLR cameras. The same principle is used by other brands such as Nikon, Sony, and Pentax, called “continuous focus” (AF-C).

7.5 KEY WORDS

• Artificial Intelligence: It is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings.

• Electromechanical: It means relating to or denoting a mechanical device which is electrically operated.

• Analog: It means relating to or using signals or information represented by a continuously variable physical quantity such as spatial position, voltage, etc.

7.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. What are the pros and cons of using a telephoto lens.

2. Write a short note on the working and angle view of a lens.

3. Write a detailed note on autofocus optical system.

4. Write brief notes on:
   (a) Trap focus
   (b) AI Servo
   (c) Active vs passive focus system
Long-Answer Questions

1. Discuss the various types of lenses and their functions.
2. What is the relationship between a lens and aperture and shutter speed and aperture?
3. Discuss modern viewfinders in detail.

7.7 FURTHER READINGS


UNIT 8  FILM CHAMBER

8.0 INTRODUCTION

The word *camera* comes from *camera obscura*, which means “dark chamber” and is the Latin name of the original device for projecting an image of external reality onto a flat surface. The modern photographic camera evolved from the camera obscura. The functioning of the camera is very similar to the functioning of the human eye. The first permanent photograph was made in 1826 by Joseph Nicéphore Niépce. This unit discusses the film chamber in a camera.

8.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss about exposure counter
- Describe the use of self-timer, tripod stand, panning tilt head in photography
- Understand the meaning of lens hood, cable release, extension tubes and bellows
- Learn about tele-converter and changing bag

8.2 Exposure Counter

- 8.2.1 Self-Timer
- 8.2.2 Tripod Stand
- 8.2.3 Lens Hood
- 8.2.4 Cable Release
- 8.2.5 Extension Tubes and Bellows
- 8.2.6 Bellows

8.3 Tele-Converter and Changing Bag

- 8.3.1 Tele-Converter
- 8.3.2 Changing Bag

8.4 Answers to Check Your Progress Questions

8.5 Summary

8.6 Key Words

8.7 Self Assessment Questions and Exercises

8.8 Further Readings
8.2 EXPOSURE COUNTER

Macro photography (or photomacrography or macrography, and sometimes macrophotography), is extreme close-up photography, usually of very small subjects and living organisms like insects, in which the size of the subject in the photograph is greater than life size (though macrophotography technically refers to the art of making very large photographs). By the original definition, a macro photograph is one in which the size of the subject on the negative or image sensor is life size or greater. However, in some uses it refers to a finished photograph of a subject at greater than life size.

The ratio of the subject size on the film plane (or sensor plane) to the actual subject size is known as the reproduction ratio. Likewise, a macro lens is classically a lens capable of reproduction ratios of at least 1:1, although it often refers to any lens with a large reproduction ratio, despite rarely exceeding 1:1.

8.2.1 Self-Timer

A self-timer is a device on a camera that gives a delay between pressing the shutter release and the shutter’s firing. It is most commonly used to let photographers to take a photo of themselves (often with family), hence the name.

The self-timer is also used to reduce camera shake when taking photographs in low light or with long (telephoto) lenses. The timer’s delay gives the photographer time to steady the camera before the shutter fires, and allows vibrations from the mirror flipping up (on SLRs) to die out. It also eliminates any photographer-induced camera motion when the shutter button is pressed.

Most modern cameras with a self-timer flash a light during the countdown, emit a beeping sound, or both. These warnings generally increase in speed or intensity during the last few seconds, to warn that the shutter is about to fire. The most common delay is ten seconds. Some cameras also have a two-second setting. A few cameras provide continuously variable delay.

Single-lens reflex cameras have to flip up the viewing mirror before the picture is taken, which can also shake the camera. It is not uncommon for a camera to combine mirror lockup with the two-second self-timer mode, which reduces camera shake still further.

Alternatives to the self-timer include a cable release, and infrared or radio remote control. On some leaf-shutter cameras, the self-timer mode is selected with the flash-sync lever, and is marked V, for the German word Vorlaufwerk.

8.2.2 Tripod Stand

In photography, a tripod is used to stabilize and elevate a camera, a flash unit, or other photographic equipment. All photographic tripods have three legs and a mounting head to couple with a camera. The mounting head usually includes a
thumbscrew that mates to a female threaded receptacle on the camera, as well as a mechanism to be able to rotate and tilt the camera when it is mounted on the tripod. Tripod legs are usually made to telescope, in order to save space when not in use. Tripods are usually made from aluminum, carbon fiber, steel, wood or plastic.

Use

Tripods are used for both still and motion photography to prevent camera movement. They are necessary when slow-speed exposures are being made, or when lenses of extreme focal length are used, as any camera movement while the shutter is open will produce a blurred image. In the same vein, they reduce camera shake, and thus are instrumental in achieving maximum sharpness. A tripod is also helpful in achieving precise framing of the image, or when more than one image is being made of the same scene, for example when bracketing the exposure. Use of a tripod may also allow for a more thoughtful approach to photography. For all of these reasons, a tripod of some sort is often necessary for professional photography as well as certain video uses. Tripods are also used as an alternative to C-Stands to photographic accessories.

Construction

For maximum strength and stability, most photographic tripods are braced around a center post, with collapsible telescoping legs and a telescoping section at the top that can be raised or lowered. At the top of the tripod is the head, which includes the camera mount (usually a detachable plate with a thumbscrew to hold on to the camera), several joints to allow the camera to pan, rotate and tilt, and usually a handle to allow the operator to do so without jostling the camera. Some tripods also feature integrated remote controls to control a camcorder or camera, though these are usually proprietary to the company that built the camera. Materials used in the construction of tripod or monopod legs include metal (typically bare or painted aluminum), wood and carbon fibre-reinforced plastics, among others.

Screw thread

Per ISO 1222:2010, the current tripod screw thread standard for attaching the camera calls for a 1/4-20 UNC or 3/8-16 UNC thread. Most consumer cameras are fitted with 1/4-20 UNC threads. Larger, professional cameras and lenses may be fitted with 3/8-16 UNC threads, plus a removable 1/4-20 UNC adapter, allowing them to be mounted on a tripod using either standard.

Historically, The Royal Photographic Society recommended the thread standard for attaching older cameras to tripods was 3/16-24 BSW (3/16 inch nominal diameter, 24 threads per inch), or 1/4-20 BSW for smaller cameras and 3/8-16 BSW for larger cameras and pan/tilt heads. In this application, the BSW and UNC thread profiles are similar enough that one can mount a modern camera
on a legacy tripod and vice versa. The UNC threads are a 60-degree angle and flattened, whereas the BSW are a 55-degree angle and rounded crest. However, at least one English manufacturer uses No.1 B.A. (British Association) for its tripod mount thread.

**Variations**

There are several types of tripods. The least expensive, generally made of aluminum tubing and costing less than US$50, is used primarily for consumer still and video cameras; these generally come with an attached head and rubber feet. The head is very basic, and often not entirely suitable for smooth panning of a camcorder. A common feature, mostly designed for still cameras, allows the head to flip sideways 90 degrees to allow the camera to take pictures in portrait format rather than landscape. Often included is a small pin on the front of the mounting screw that is used to stabilize camcorders. This is not found on the more expensive photographic tripods.

More expensive professional tripods are sturdier, stronger, and usually come with no integrated head. The separate heads allow a tripod-head combination to be customized to the photographer’s needs. There are expensive carbon fiber tripods, used for applications where the tripod needs to be lightweight. Many tripods, even some relatively inexpensive ones, also include leveling indicators for the legs of the tripod and the head.

Many of the more expensive tripods have additional features, such as a reversible center post so that the camera may be mounted between the legs, allowing for shots from low positions, and legs that can open to several different angles.

Small tabletop tripods (sometimes called tablepods) are also available, ranging from relatively flimsy models costing less than US$20, to professional models that can cost up to US$800 and can support up to 68 kg (150 lb). They are used in situations where a full sized tripod would be too bulky to carry. An alternative is a clamp-pod, which is a ball head attached to a C-clamp.

Another technique involves forming a string triangle held taut around the two feet of the photographer and linked to the camera. This negative string “tripod” can stabilize the camera sufficiently to use a shutter speed three stops slower.

**Heads**

The head is the part of the tripod that attaches to the camera and allows it to be aimed. It may be integrated into the tripod, or a separate part. There are generally two different types of heads available.

A ball head utilizes a ball joint to allow movement of all axes of rotation from a single point. Some ball heads also have a separate panoramic rotation axis on the base of the head. The head has two main parts, the ball, which attaches to the camera and the socket, which attaches to the tripod. The camera is attached to the ball via quick release plate, or a simple UNC 1/4”-20 screw.
The socket is where the ball rotates in, and also contains the controls for locking the ball. The socket has a slot on the side, to allow the camera to be rotated to the portrait orientation. Ball heads come in varying styles of complexity. Some have only one control for both ball and pan lock, while others have individual controls for the ball, pan, and also ball friction. Ball heads are used when a free-flow movement of the camera is needed. They are also more stable and can hold heavier loads, than pan-tilt heads. However, ball heads have the disadvantage that only one control is available to allow or prevent movement of all axes of rotation, so if the camera is tilted on one axis, there may be a risk of tilting on the other axes as well. When a movement of one, or two axes or rotation is needed, a pan-tilt head is used.

**Panning tilt head**

The pan-tilt head has separate axes and controls for tilting and panning, so that a certain axis can be controlled without risk of affecting the other axes. These heads come in two types, 2-way and 3-way. 2-way heads have 2 axes and controls, one for panoramic rotation, and one for front tilt. 3-way heads have 3 axes and controls, one for panoramic rotation, front tilt, and lateral tilt. The controls on these heads are usually handles that can be turned, to loosen or tighten the certain axis. This allows movement in one, a few, or none of the axes. When the movement of all axes of rotation is needed, a ball head is used. There are some pan-tilt heads that use gears, for precision control of each axis. This is helpful for some types of photography, such as macro photography.

**Other head types**

Other head types include the gimbal head, fluid head, gear head, alt-azimuth, and equatorial heads. Fluid heads and gear heads move very smoothly, avoiding the jerkiness caused by the stick-slip effect found in other types of tripod heads. Gimbal heads are single-axis heads used in order to allow a balanced movement for camera and lenses. This proves useful in wildlife photography as well as in any other case where very long and heavy telephoto lenses are adopted: a gimbal head rotates a lens around its center of gravity, thus allowing for easy and smooth manipulation while tracking moving subjects.

**8.2.3 Lens Hood**

In photography, a lens hood or lens shade is a device used on the front end of a lens to block the Sun or other light source(s) to prevent glare and lens flare. Lens hoods may also be used to protect the lens from scratches and the elements without having to put on a lens cover.

The geometry of a lens hood is dependent on three things: the focal length of the lens, the size of the front lens element and the dimensions of the image sensor or film in the camera.
Cause of lens flare

Flare occurs when stray light strikes the front element of a lens and then bounces around within the lens. This stray light often comes from very bright light sources, such as the Sun, bright studio lights, or a bright white background. If a light source is in the lens’ angle of view, a lens hood will hardly have any effect, but the light does not have to cause lens flare. It is sufficient that stray light from a bright light source enters the lens. Multi-layer coatings in newer lenses also help to reduce lens flare.

Types

The shape of a lens hood can vary from a plain cylindrical or conical section (much like a lamp shade) to a more complex shape, sometimes called a petal, tulip, or flower hood. These more complex shapes take into account the final image’s shape and aspect ratio. This allows the lens hood to block stray light with the longer portions of the lens hood, while allowing more light into the corners of the image through the shorter portions of the hood, thereby reducing the amount of mechanical vignetting (reduction of light around the periphery) in the final image.

The geometry of a lens hood is dependent on three things:

- focal length of the lens,
- size of the front lens element,
- dimensions of the image sensor or film in the camera.

Ideally, lens hoods should increase in length, and therefore in efficiency, as the focal length of the lens increases and the angle of view reduces. Lens hoods are more prominent in long focus lenses because they have a smaller viewing angle than that of wide-angle lenses. For wide angle lenses, the length of the hood (away from the end of the lens) cannot be as long as those for telephoto lenses, as a longer hood would enter the wider field of view of the lens.

Maximum aperture also affects the shape of a lens hood. As the aperture gets larger the amount of light and consequentially the amount of the frame the sensor “sees” increases. This can be seen when comparing two lens hoods of the same focal length but with differing apertures—compare the lens hood of a telephoto f/4 lens with that of the same lens but with a maximum aperture of f/2.8.

Correctly made rectangular or square lens hoods are generally more efficient than cylindrical or conical ones because those shapes closely resemble the shape of the photograph. However, rectangular or square lens hoods should not be used with zoom lenses whose front elements rotate as the focal length is changed, as the hood will rotate as well, blocking parts of the angle of view. The same also applies to petal lens hoods. For these types of lenses, only cylindrical or conical lens hoods will work effectively.

In addition, lens hoods can offer some degree of physical protection for the lens due to the hood extending farther than the lens itself. Lens hoods with an
extending bellows design (much like the bellows of a medium or large format camera) can be adjusted for depth. This means that the depth can be increased when used on longer focal length lenses, and reduced as necessary for shorter focal length lenses.

Storage
Lens hoods that are supplied by the manufacturer of the lens are often designed to fit onto the matching lens facing either forward, for normal use, or backwards, so that the hood may be stored with the lens without occupying much additional space. Rubber lens hoods are flexible and generally collapse for storage. However other lens hoods must be removed if these features are not available and length extension of the lens is not preferred during storage.

8.2.4 Cable Release
A cable release is a shutter button on a hand unit that can be attached to a camera by a short cable. Some manufacturers have a dedicated cable release port on the side of the camera, and some use the USB port to offer the shutter control. Make sure you refer to your camera manual to find out what kind of cable release works with your camera as each manufacturers often has several models that vary depending on the size of the camera.

Use
There are several situations where a cable release can be an invaluable tool. When the camera is set to bulb mode, you can use the cable release to hold the shutter open for as long as you want by locking the cable release switch in the down position. This allows you to create photos with an extremely long exposure time which is great for astrophotography and star trails. The second most common usage for a cable release is in landscape photography when you are seeking absolute critical sharpness. When the camera is on a tripod and exposure times are quite long, pressing the shutter button on the camera can induce vibrations into the camera that have a small effect on image sharpness. Using a cable release means that you do not have to touch the camera to take the photos.

The third reason to have a cable release is for time-lapse photography. Most manufacturers offer two types of cable release; one that simply has a shutter button, and one that has a screen and several other controls. These other controls allow you to set an interval time between repeating shots, and you can also set how many photos you want to take. For example, you might set it to take 300 photos, each with a 5 second exposure. These can then be combined into a time-lapse video on a computer.

8.2.5 Extension Tubes and Bellows
An extension tube - also called extension ring - is used with interchangeable lenses to focus closer, useful in macro photography.
**Construction**

The tube contains no optical elements; its sole purpose is to move the lens farther from the image plane. The farther away the lens is, the closer the focus, the greater the magnification, and also the greater the loss of light (requiring a longer exposure time). Lenses classically focus closer than infinity by moving all optical elements farther from the film or sensor; an extension tube simply enables this movement.

Extension tubes without electrical contacts will not allow an electronic automatic camera to control the lens, thus disabling autofocus and in some cases forcing a user to shoot wide open unless the lens offers manual aperture control. More expensive extension tubes contain electrical contacts allowing the user to use autofocus and electronically control the aperture of the attached lens. An advantage to the non-electrical tubes is their lower price.

Other items like lens adapters may unintentionally have an effect similar to an extension tube. A lens designed for a small flange focal distance may not be able to focus to infinity when a lens adapter places the sensor too far away.

Extension tubes are sometimes confused with teleconverters, an optical component (i.e., containing lenses) designed to increase effective focal length.

A close-up lens also enables focusing closer for macro photography but, unlike an extension tube, a close-up lens actually is an optical element.

### 8.2.6 Bellows

In photography, a bellows is the accordion-like, pleated expandable part of a camera, usually a large or medium format camera, to allow the lens to be moved with respect to the focal plane for focusing. Bellows are also used on enlargers. The bellows provides a flexible, dark extension between the film plane and the lens. In some cameras, the photographer can change the angle of the film plate with respect to the optical axis of the lens, providing alterations of perspective distortion and of the object plane of focus. Bellows may be part of a camera or come as an optional accessory.

Two kinds of bellows are commonly used on cameras; bag bellows are normally used with a lens of short focal length, and accordion bellows with a much longer range of extension. For large format cameras, “double extension” refers to bellows that extend to a length equal to about twice the focal length of a standard lens, e.g. 300 mm for the 4×5 inch format. “Triple extension” for the same format indicates bellows extension of 450 to 500 mm.

Bellows allow movements that can be used to correct distortion in a photograph and to avoid converging or diverging verticals. Use of a bellows-based camera can ensure that parallel elements in a scene remain parallel in the final photograph.
Check Your Progress

1. What is a self-timer?
2. What is the use of tripod in photography?
3. What is a lens shade?

8.3 TELE-CONVERTER AND CHANGING BAG

8.3.1 Tele-Converter

Let us begin by studying tele-converter.

A teleconverter (sometimes called tele extender) is a secondary lens mounted between a camera and a photographic lens which enlarges the central part of an image obtained by the objective lens. A 2× teleconverter for a 35 mm camera would enlarge the central 12×18 mm part of an image to the size of 24×36 mm in the standard 35 mm film format.

Teleconverters are typically made in 1.4×, 1.7×, 2× and 3× variants, with 1.4× and 2× being the most common. A 2× teleconverter effectively doubles the focal length of a given lens. Teleconverters also decrease the intensity of the light that reaches the film plane (or sensor) by a factor of 4—equivalent to doubling the focal ratio—and decrease the resolution of an image by a factor of 2.

Function

A teleconverter works similarly to a telephoto group of a proper telephoto lens. It consists of a group of lenses which together act as a single diverging lens. The location of a teleconverter is such that the image produced by the objective is located behind the teleconverter in a distance smaller than its focal length. This image is a virtual object of the teleconverter, which is then focused further away and thus enlarged. For example, when a single negative lens is placed so that the image formed by the objective is located in the midpoint between the lens and its focal point, then the lens produces the image in its focal point and enlarging it two-fold, thereby acting as a 2× teleconverter.

When used with somewhat slow lenses they may reduce the effective aperture enough that the camera’s autofocus system will no longer work; depending on the camera system, this may range from f/5.6 to f/8.

Dedicated teleconverters only work with a limited number of lenses, usually telephoto lenses made by the same manufacturer, or by a third-party manufacturer to a matching standard.
Using a teleconverter with an existing lens is usually less expensive than acquiring a separate, longer telephoto lens, but as the teleconverter is magnifying the existing image circle, it also magnifies any aberrations. The use of a teleconverter also results in a darker image.

Teleside converter
A different type of teleconverter called a teleside converter can be mounted on the front of the camera’s lens rather than between the primary lens and the camera body. These are popular with users of video cameras and bridge cameras with fixed lenses, as they represent the only way to add more reach to such a camera. They are usually afocal lenses that do not reduce the brightness of the image, but are more likely to add aberrations to the image, independent of the quality of the main lens.

Teleconverters may be confused with extension tubes, a non-optical component designed to increase magnification (at the expense of reduced focal distance).

8.3.2 Changing Bag
A changing bag is a photographic bag specifically designed to be light-proof while in use. It is required for certain applications involving photosensitive materials when a darkroom is not available, like in the field. Common usages include removing film from its canister to put it into a developing tank, or loading and unloading sheet film holders. They are also commonly found on the set of a film, where the clapper loader may need one if shooting on location or far away from a darkroom.

Use
It is handy to use when a darkroom is not available as is often the case in field shooting. It is also used in commercial photo processing labs, often to change paper.

Description
A changing bag has two sleeves at one end for both the user’s arms, and a zipper (often more than one, for double layered changing bags) to insert the tools and film needed. There are several sizes available, from smaller ones for many still photography applications to larger bags used in large-format still photography or film making, which may need to hold both a magazine and a can of film stock which each have a 1000-foot capacity. Larger changing bag sizes are also available as “changing tents”, where the top of the bag can be held in a dome-like configuration through the use of two curved rods.
4. What is a teleconverter?
5. What is a changing bag?

8.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. A self-timer is a device on a camera that gives a delay between pressing the shutter release and the shutter’s firing.
2. In photography, a tripod is used to stabilize and elevate a camera, a flash unit, or other photographic equipment.
3. In photography, a lens hood or lens shade is a device used on the front end of a lens to block the Sun or other light source(s) to prevent glare and lens flare.
4. A teleconverter (sometimes called tele extender) is a secondary lens mounted between a camera and a photographic lens which enlarges the central part of an image obtained by the objective lens.
5. A changing bag is a photographic bag specifically designed to be light-proof while in use. It is required for certain applications involving photosensitive materials when a darkroom is not available, like in the field.

8.5 SUMMARY

- Macro photography (or photomacrography or macrography, and sometimes macrophotography), is extreme close-up photography, usually of very small subjects and living organisms like insects, in which the size of the subject in the photograph is greater than life size (though macrophotography technically refers to the art of making very large photographs).
- The ratio of the subject size on the film plane (or sensor plane) to the actual subject size is known as the reproduction ratio.
- A self-timer is a device on a camera that gives a delay between pressing the shutter release and the shutter’s firing. It is most commonly used to let photographers to take a photo of themselves (often with family), hence the name.
- Most modern cameras with a self-timer flash a light during the countdown, emit a beeping sound, or both. These warnings generally increase in speed or intensity during the last few seconds, to warn that the shutter is about to fire.
In photography, a tripod is used to stabilize and elevate a camera, a flash unit, or other photographic equipment. All photographic tripods have three legs and a mounting head to couple with a camera.

Tripods are used for both still and motion photography to prevent camera movement. They are necessary when slow-speed exposures are being made, or when lenses of extreme focal length are used, as any camera movement while the shutter is open will produce a blurred image.

The head is the part of the tripod that attaches to the camera and allows it to be aimed. It may be integrated into the tripod, or a separate part. There are generally two different types of heads available.

In photography, a lens hood or lens shade is a device used on the front end of a lens to block the Sun or other light source(s) to prevent glare and lens flare. Lens hoods may also be used to protect the lens from scratches and the elements without having to put on a lens cover.

The shape of a lens hood can vary from a plain cylindrical or conical section (much like a lamp shade) to a more complex shape, sometimes called a petal, tulip, or flower hood.

A cable release is a shutter button on a hand unit that can be attached to a camera by a short cable. Some manufacturers have a dedicated cable release port on the side of the camera, and some use the USB port to offer the shutter control.

In photography, a bellows is the accordion-like, pleated expandable part of a camera, usually a large or medium format camera, to allow the lens to be moved with respect to the focal plane for focusing. Bellows are also used on enlargers.

A changing bag is a photographic bag specifically designed to be light-proof while in use. It is required for certain applications involving photosensitive materials when a darkroom is not available, like in the field.

8.6 KEY WORDS

- **Macro Photography:** Macro photography is extreme close-up photography, usually of very small subjects and living organisms like insects, in which the size of the subject in the photograph is greater than life size.

- **Lens:** A camera lens is an optical lens or assembly of lenses used in conjunction with a camera body and mechanism to make images of objects either on photographic film or on other media capable of storing an image chemically or electronically.

- **Bellows:** A bellows or pair of bellows is a device constructed to furnish a strong blast of air.
8.7 SELF-ASSESSMENT QUESTIONS

Short-Answer Questions

1. Write a short note on exposure counter.
2. What are the main uses of self-timer?
3. How is a tripod stand constructed?
4. What is the use of a cable release?

Long-Answer Questions

1. What are the different types of tripod? Discuss.
2. What are the three things on which the geometry of a lens hood depends?
3. How are extension tubes and bellows constructed?
4. What are the functions of a tele-converter?

8.8 FURTHER READINGS


UNIT 9 NATURAL SOURCES AND PHOTOGRAPHY

Structure
9.0 Introduction
9.1 Objectives
9.2 Natural Source: The Sun
  9.2.1 Characteristics of Natural Light
  9.2.2 Different Types of Natural Light
  9.2.3 How to Capture a Visual Story with Natural Light?
  9.2.4 How is Natural Light Used in Different Photography Genres?
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9.0 INTRODUCTION
Shade and overcast light typically have a cool, soft appearance, since the source of such light is spread across the entire sky, and doesn’t include any direct sunlight. Bright overcast light may also enhance close-up photography, such as with flowers, since the appearance and saturation of colours usually improve. When working with diffused less intense light, contrast is lower and the light is more flattering. When the sun is shining brightly overhead there are a few things you can do to diffuse the light. Overcast days are good for natural light portrait photography because the cloud cover acts as a natural diffuser.

9.1 OBJECTIVES
After going through this unit, you will be able to:

- Discuss the impact of nature and sunlight on photography
- Describe the impact of different weather conditions on photography
- Understand various types of light sources used in photography
9.2 NATURAL SOURCE: THE SUN

Light is a photograph’s key ingredient—it’s literally the only reason an image can exist. Upon clicking the shutter, light enters the camera, transferring the image it hits onto the film or transforming into electric signals that then turn into the pixels in a digital photograph. Without light, there is no photograph.

Before moving on to the fundamentals of photography, first develop a deeper understanding of light—how it works and how to capture it, control it, enhance it, and use it creatively.

What Exactly is Natural Light?
The most basic and important form of light is natural light, generally referring to any light created by sunlight. In other instances, ambient light (meaning the available light in an environment) can be considered as natural because it isn’t directly influenced by the photographer’s lighting equipment. This usually indicates natural lighting from outside that lights up a room through a window.

Natural light is abundant (so you get to practice consistently, free of charge) and, by paying attention to certain factors such as how the sun behaves throughout the day and in different weather conditions, you will learn to see light better, maximize its potential, and apply the basic techniques in any genre of photography.

9.2.1 Characteristics of Natural Light

Before learning the different types of natural light, let’s look at the four main characteristics that are used to categorize them—colour, intensity, direction, and quality.

**Colour temperature**

Colour temperature refers to the various shades of colour that are produced by different light sources. It is measured on the Kelvin scale, from the cooler, blue-tinged end of the spectrum to the warmer, reddish-coloured end. Colour temperature changes throughout the day, depending on the time and the amount of clouds in the sky. At dawn, the sky appears light blue. At sunset, the sky appears orange (this is what photographers refer to as the golden hour or magic light); and at dusk, the sky appears violet-blue.

**Intensity of Sunlight**

The intensity of light is a measure of its harshness or brightness and determines how much light is present in a scene. Intensity is sometimes referred to as “quantity of light.” You can estimate how intense light is based on the balance between shadows (the darker areas of your image) and highlights (the lighter areas of your
image). This distinction between highlights and shadows is known as contrast. Light is usually most intense at noon when the sun is directly overhead. Contrast at noon, therefore, is high and tends to make shadows more pronounced. On the other hand, light and contrast are less intense early in the morning or evening.

**Direction**

Depending on the time of day, the direction of light changes as per the movement of the sun. Given that the sun is below the horizon at dawn and twilight, almost horizontal at sunrise, and is highest and nearly vertical midday, photographing at these different times of day produces largely different images. The cycle reverses towards the night with the sun medium to low in the afternoon, almost horizontal at sunset, and below the horizon at twilight and dusk.

**Quality**

Quality encompasses the other characteristics and can either be classified as hard/direct or soft/diffused. The smaller the light source is compared to a subject, the harder the quality, and as the light spreads and becomes bigger, the quality also becomes softer.

In reality, bad light does not exist—the light is either suitable or not suitable for you. Therefore, if you’re searching for good quality of light, you just need to determine the kind of images you want to create and then decide if you want to work with soft or hard light.

**9.2.2 Different Types of Natural Light**

Based on these characteristics, we can now identify the different types of natural light. Below are some you might find useful in your photography:

**Hard/direct light**

Hard/direct light may come from the sun on a cloudless day at noon or a couple of hours before sunset.

- **Colour:** neutral white midday, cooler early in the day, and warmer later in the afternoon
- **Intensity:** high contrast, producing very sharp, defined shadows and edges
- **Direction:** vertical to low
- **Quality:** hard

Hard light offers many possibilities to create striking images. For instance, you can create interesting images by photographing shadows that fall away from your subject like what photographer Graham Hunt does in the photo above. On the other hand, you can also incorporate the shadows that fall directly on your subject.
Soft/diffused light

On the other hand, soft/diffused light may come from the sun on an overcast or cloudy day or as the sun starts to set. Snow, fog, air pollution, or a shaded area can also soften the light in a scene.

- **Colour**: cooler in the day, warmer later in the afternoon, and cool pastel at twilight, dawn, and dusk
- **Intensity**: low contrast, softening light and dark areas and producing mild shadows and soft edges
- **Direction**: low to below horizontal
- **Quality**: soft/diffused

You can create magnificent photographs by finding some open shade, such as under a tree or a tent, to photograph your subject in. You can also try shooting from different angles, especially with your subject facing the light or try using contrasts in colour or a tighter composition to amplify the appeal of your image.

Reflected light

Reflected light is the result of the light source bouncing off of an object, creating a softer colour cast or glow.

- **Colour**: inherits the colour of the surface
- **Intensity**: low contrast, filling in shadows
- **Direction**: equivalent to angle of reflected light
- **Quality**: soft/diffused

One thing to note is that the rougher your surface is, the softer the reflected light will be.

Window light

If you intend to shoot indoors, window light will serve as a major source of lighting.

- **Colour**: depends on the time of day and colours in the scene from which light might bounce off
- **Intensity**: depends on distance and angle of subject from the source
- **Direction**: depends on where the window is, but usually produces side lighting
- **Quality**: can be hard or soft

Window light can be modified directly by adjusting the amount of light you let in. For example, you have the option of placing a translucent material across the window to serve as a diffuser, which reduces the light intensity and helps to create softer silhouettes.

You can also block off a section with an opaque material to enhance a darker setting, creating a moodier effect.
Dappled light

Dappled light is the result of sunlight that has been filtered through tree leaves and projected on a nearby surface. It casts interesting shadows on your subject and could make your image more compelling.

- **Colour**: depends on the time of day
- **Intensity**: depends on distance of filter from the subject—the closer the filter, the higher the contrast
- **Direction**: best shot in the morning and late in the afternoon, mid to near the horizon
- **Quality**: can be hard or soft

This kind of light tends to be a bit scattered, so some photographers prefer to avoid or “fix” it. But like with every other kind of natural light, it can still be utilized in many creative ways.

Take the portrait above for example, the photographer, Marco A. Gallico, uses shadows cast by the leaves to accentuate his subject’s eye makeup while creating an image that’s both mysterious and ethereal.

Twilight

Twilight is the transition between day and night (before the sun rises and after it sets) and always has a cool colour, has low contrast, and is soft/diffused. Twilight is sub-divided into three main categories:

![Fig. 9.1 Types of Twilight](image-url)
1. **Civil twilight**: Occurring right before sunrise or right after sunset, light at civil twilight is closest to the horizon. It is the brightest form and most intense form of twilight. At this time, the colour temperature of the sky is cooler and will serve as a great backdrop for your images.

2. **Nautical twilight**: Nautical twilight draws reference from the time when sailors used stars to navigate the seas. At this point, the sky starts to darken significantly and gives off a deep blue tone. It is also known as the best time to capture moon silhouettes.

3. **Astronomical twilight**: During astronomical twilight, light is farther below the horizon, so the sky will get even darker. A tripod will help you in capturing sharp images at astronomical twilight, but at this point, you should know that you’ll most likely have to rely on artificial lights.

### 9.2.3 How to Capture a Visual Story with Natural Light?

Armed with the knowledge of the different types of light, you should have a fair idea of when and where to find suitable lighting. So, how do you utilize this information to tell a compelling visual story?

When working with natural light, you have to use (not fight) what nature gives you. Worry less about being technically correct, focus more on the story tied to your images, and use the available light in interesting ways.

After all, what makes a great photograph isn’t just acing its technical aspects, but also being able to evoke an emotional response from the viewer.

#### Search for your ideal light

When thinking about your ideal light, consider the type of light you want to work with. Remember, light from the sun changes rapidly throughout the day based on the time, weather, and location, so you’ll have to be very specific about the mood and theme you’re going for and plan your shoot accordingly.

Forget “good versus bad” light because, again, light is either suitable or not suitable depending on the kind of photographs you want to create.

Train your eyes to notice how light behaves (like how it falls through your windows in the morning or how it interacts with the environment or spaces you visit often) and see how each type of light can transform your picture and mould it in your favour.

#### Using light to compose thoughtfully

Figuring out how to create a balance between the direction of light and the position of your subject can be a bit tough, but it will certainly help in setting the mood of your photographs.

Be creative by finding the best angle for the light to hit your subject, which can typically be from the front, from the side, or from the back.
Front lit
A subject is front lit if the light is behind you and is directly hitting your subject. Light coming from this direction will partially or fully eliminate shadows.

Side lit
A subject is side lit if the light hits the subject from the left or right side, adding drama and emphasizing texture.

Backlit
Conversely, a subject is considered backlit if the light is coming from behind the subject, which can produce a glow, silhouette, shadow, or light flare.

Note, however, that while light flares can be used in creative ways, it can also damage your camera’s sensor if not used carefully.

Choose the best setting for your camera
The relationship between the light present in your scene and your camera settings are very important. If you want to the best quality of light present, it’s advisable to either shoot in manual or aperture priority (Av) mode.

Manual mode will give you full control over your camera settings, which allows you to make adjustments based on the light you are given. For example, adjusting your white balance allows you to alter the colour temperature of your shot from warmer to cooler and vice-versa.

Meanwhile, Av mode will allow you set a specific aperture value while the camera selects a shutter speed to match it. This will result in proper exposure based on lighting conditions.

Bonus tip: Always shoot in RAW file format—capturing all image data recorded by the camera sensor. Because no information is compressed, this will allow you to produce higher quality images. If your memory card is not large enough, get another one that’s at least 32GB.

Know when to work with reflectors, diffusers, and flags
The point of using reflectors, diffusers and flags is to help enhance or modify natural light.
Reflectors allow you to fill in backlight by directing more light towards your subject. They are affordable and come in a five-in-one kit that provides gold, silver, and white reflective surfaces, as well as black and translucent surfaces. You can also make your own reflector by using a plain white cardboard to bounce light in any direction you want.

A diffuser, on the other hand, is a translucent surface that can be placed between the light source and your subject to soften transitions between shadows and highlights.

Finally, a flag is anything that blocks some of your light. You can use a black surface or even your subject as a flag.

Don’t let the weather put you off

One thing you can be sure of is that when it comes to natural light, it is rarely consistent due to the unpredictable changes in weather. A sunny day can suddenly turn cloudy and dull, and while you might find this frustrating, simply understanding how the weather affects light will leave you better prepared to work around it.

For example, a passing storm can scatter cloud formations across otherwise clear skies, producing more dramatic, darker landscapes that evoke serenity or even bleakness.
A rolling fog can also transform the sky into a giant, natural soft box (a photographic lighting device used to reduce harsh shadows and spread light evenly).

9.2.4 How is Natural Light Used in Different Photography Genres?

Natural light can be used in any genre of photography but applies slightly different techniques.

**Portait**

Portrait photography is typically about capturing people and could either be candid (as in travel/street photography and photojournalism) or staged (as in fashion photography).

Soft/diffused light is the most flattering for portrait photography, but just because hard/direct light creates dramatic shadows, it doesn’t mean you cannot use it to create stunning photos. Cast by reflected light by placing your subject close to any coloured surface. Window light is also a great type to of light to use in portraiture because you can easily adjust the quality, quantity, and even the colour of the light.

**Bonus tip:** For a smoother background, consider using wide aperture values.

**Documentary**

Documentary photography refers to the chronicling of events, environments, and everyday life. This is one of the easiest and cheapest genres of photography to explore.

When you’re documenting, you don’t have the luxury of moving your subject around or using reflectors and diffusers. Instead, you have to work around the characteristics, such as colour and intensity, of the light that is available to help create photos that evoke emotions and convey your ideas.

*Photo by Mohammed Elshamy*
For instance, the warm colours placed on a cool coloured background in this photo by Mohammed Elshamy put the focus on the women working in brick depots in South Sudan. Warm colours are suggested to evoke happiness, energy, warmth, change, intensity, anger, frustration, romance, intensity, and life.

On the other hand, cool colours are suggested to evoke feelings of health, tranquility, calmness, serenity, truth, wealth, spirituality, and wisdom but also loneliness and misery.

Many photojournalists also depend on contrast—light and shadows—to set mood and add dimension to photos. The shadows help emphasize the emotion by putting a viewer’s focus on the important parts of the subject.

**Landscape**

Landscape photography is about capturing scenery. In this genre, your composition is often the only thing within your control. This means that you’ll spend a lot of time chasing the light—be patient. Be very observant about the changes in quality or direction of light over time, so you can decide how to best shoot the scene.

For instance, at midday, the light is usually harder and could emphasize details especially when you find the right angle. Side lit landscapes under hard/direct light create interesting shadows and can emphasize details. Meanwhile, backlighting landscapes particularly at sunrise or sunset create beautiful silhouettes. Front lit landscapes are one thing to avoid because the minimized shadows result in flat photographs. You might also observe that soft/diffused light created by an overcast day, fog, mist, or even air pollution and haze makes for some of the most awe-striking landscape photographs because of how it preserves colour and texture.

**Food photography**

Great food photography often uses window light because it creates soft/diffused light that tends to make everything on a plate look more appetizing, again by highlighting details and textures.

When photographing food indoors with natural light, you can soften light by placing a white material opposite the window, placing food between it and the window. Outdoors, shoot under a shaded area such as a patio or a tree. This is also a great time to utilize reflectors and diffusers to either fill in shadows or soften light.

**Wedding photography**

Technically, weddings can be classified under documentary photography, but, as we all know, it’s in a league of its own. Shooting a wedding with just natural light can be tricky especially if it is held indoors with inadequate light.
What you can do indoors is look for reflected light. Consider where the light is coming from and look for light-coloured surfaces such as dresses, walls, and curtains.

You can also use window light, which most churches have lots of. Window light will also provide endless opportunities to take wonderful portraits not only of the bride and the groom but also their family and guests. In this situation, remember that you’ll most likely be working with direct or diffused sunlight, so prepare accordingly.

**Some best practices**

When working with natural light, you need to know that the odds won’t always be in your favour. The weather can turn on you at anytime, and the quality of light can go from soft to practically non-existent in a blink of an eye.

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<th>Check Your Progress</th>
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<td>1. Define colour temperature.</td>
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### 9.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Colour temperature refers to the various shades of colour that are produced by different light sources.
2. Dappled light is the result of sunlight that has been filtered through tree leaves and projected on a nearby surface.
3. A subject is side lit if the light hits the subject from the left or right side, adding drama and emphasizing texture.
4. Documentary photography refers to the chronicling of events, environments, and everyday life. This is one of the easiest and cheapest genres of photography to explore.

### 9.4 SUMMARY

- Light is a photograph’s key ingredient—it’s literally the only reason an image can exist.
- Upon clicking the shutter, light enters the camera, transferring the image it hits onto the film or transforming into electric signals that then turn into the pixels in a digital photograph. Without light, there is no photograph.
The most basic and important form of light is natural light, generally referring to any light created by sunlight.

Colour temperature refers to the various shades of colour that are produced by different light sources.

The intensity of light is a measure of its harshness or brightness and determines how much light is present in a scene. Intensity is sometimes referred to as “quantity of light.”

Quality encompasses the other characteristics and can either be classified as hard/direct or soft/diffused. The smaller the light source is compared to a subject, the harder the quality, and as the light spreads and becomes bigger, the quality also becomes softer.

Hard light offers many possibilities to create striking images.

Reflected light is the result of the light source bouncing off of an object, creating a softer colour cast or glow.

Dappled light is the result of sunlight that has been filtered through tree leaves and projected on a nearby surface.

Twilight is the transition between day and night (before the sun rises and after it sets) and always has a cool colour, has low contrast, and is soft/diffused.

Portrait photography is typically about capturing people and could either be candid (as in travel/street photography and photojournalism) or staged (as in fashion photography).

Documentary photography refers to the chronicling of events, environments, and everyday life. This is one of the easiest and cheapest genres of photography to explore.

9.5 KEY WORDS

Twilight: The soft glowing light from the sky when the sun is below the horizon, caused by the reflection of the sun’s rays from the atmosphere is called twilight.

Portrait: A portrait is a painting, photograph, sculpture, or other artistic representation of a person, in which the face and its expression is predominant.

Photography: Photography is the art, application and practice of creating durable images by recording light or other electromagnetic radiation, either electronically by means of an image sensor, or chemically by means of a light-sensitive material such as photographic film.
9.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions
1. What are the characteristics of soft light?
2. What are the characteristics of natural light?
3. What are the different types of natural light?
4. Write a short note on portrait photography.

Long-Answer Questions
1. What is natural light? How does it impact photography?
2. What is twilight? Mention the three categories of twilight.
3. What are the steps involved in capturing a visual story in natural light?
4. How is natural light used in different photography genres?

9.7 FURTHER READINGS


UNIT 10 ARTIFICIAL LIGHT SOURCES

10.0 INTRODUCTION

The artificial light sources typically used in photography are constant lights (lamps, daytime permanent photographic lights, hand lamps, etc.) and flashes (studio flash generators and flash guns). When it comes down to controlling and manipulating light, there are many options within photography, whether you are dealing with artificial, natural, soft, or hard light. It comes down to understanding how images are affected by different lighting conditions, setting up the desired lighting environment, adjusting your camera settings (e.g., the white balance), and post-processing your picture in programs such as Gimp or Photoshop.

10.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the use of artificial light sources
- Understand the effect of nature and intensity of different types of light sources
- Know about photo flood lamp, halogen lamp, barn doors and shoot
- Describe flash unit, bulb flash and electronic flash

10.2 Artificial Light

10.2.1 Producing Images with a Consistent Look
10.2.2 Controlling Depth of Field and Length of Exposure
10.2.3 Technique
10.2.4 Intensity of Different Types of Light Sources Used: Photo Flood Lamp

10.3 Halogen Lamp

10.3.1 History
10.3.2 Barn Doors and Shoot
10.3.3 Flash Unit: Bulb Flash and Electronic Flash

10.4 Answers to Check Your Progress Questions

10.5 Summary

10.6 Key Words

10.7 Self Assessment Questions and Exercises

10.8 Further Readings
10.2 ARTIFICIAL LIGHT

The challenges of using natural light are quite similar to those faced when shooting in artificial light. You must still understand how various light sources act upon a subject and how to produce the desired effect. Different sources of light can produce soft or hard light when shooting in a studio, but in this case, the photographer has direct control over elements such as hardness, distance, intensity, and angle. Furthermore, artificial light from different sources yields different colour heat signatures. For instance, halogen bulbs are colder and produce a light that is blue in colour, while tungsten bulbs, being hotter, produce light with a reddish hue.

10.2.1 Producing Images with a Consistent Look

Using multiple artificial light sources offers total control of your lighting and is ideal for producing consistent imagery. Unlike natural light, which produces shifts in colour and intensity every time the sun goes behind a cloud, or as it moves throughout the sky, artificial lights produce the same colour and intensity of light over and over again.

For example, you wish to photograph numerous items for a catalogue and prefer the images to maintain uniformity, using artificial light sources helps to produce perfectly consistent colour and contrast qualities in your images.

Keeping the same lighting setup throughout the duration of your shoot means that you don’t have to worry about coming across inconsistencies between images after the shoot is completed. Professional studio photographers for products and jewellery often practice this method.

10.2.2 Controlling Depth of Field and Length of Exposure

When photographing with strobes or battery-operated flash units, you have total control over which exposure settings you use for your shots. Simply set the camera to your preferred exposure settings and adjust the power and distance of your lights accordingly.

Smaller apertures (which are represented by a higher f/stop number and produce a greater depth of field) and faster shutter speeds require higher intensities of light. Larger apertures (which are represented by a lower f/stop number and produce a more shallow depth of field) and slower shutter speeds may require lower intensities of light.

Because you can control the intensity of light produced by your strobes and flashes, they’re ideal for enabling you to control exactly how much depth of field you have in an image and for maximizing the speed of your shutter to avoid motion blur from a shaky camera or a moving subject.

If you use the modelling light (a continuous light that operates between shots to give a sense of how the strobe affects your scene and to aid with focusing) on
Some photographers use a slow shutter speed with the combination of the strobe and modelling light to achieve creative effects. For instance, you can capture a still image of your subject when the strobe pops and leave the shutter open while the modelling light reveals the motion of the subject.

10.2.3 Technique

Several techniques are used to soften light from the flash or provide other effects.

1. Softboxes, diffusers that cover the flash lamp, scatter direct light and reduce its harshness. Reflectors, including umbrellas, flat-white backgrounds, drapes and reflector cards are commonly used for this purpose (even with small hand-held flash units). Bounce flash is a related technique in which flash is directed onto a reflective surface, for example a white ceiling or a flash umbrella, which then reflects light onto the subject. It can be used as fill-flash or, if used indoors, as ambient lighting for the whole scene. Bouncing creates softer, less artificial-looking illumination than direct flash, often reducing overall contrast and expanding shadow and highlight detail, and typically requires more flash power than direct lighting. Part of the bounced light can be also aimed directly on the subject by "bounce cards" attached to the flash unit which increase the efficiency of the flash and illuminate shadows cast by light coming from the ceiling. It's also possible to use one's own palm for that purpose, resulting in warmer tones on the picture, as well as eliminating the need to carry additional accessories.

2. Fill flash or "fill-in flash" describes flash used to supplement ambient light in order to illuminate a subject close to the camera that would otherwise be in shade relative to the rest of the scene. The flash unit is set to expose the subject correctly at a given aperture, while shutter speed is calculated to correctly expose for the background or ambient light at that aperture setting. Secondary or slave flash units may be synchronized to the master unit to provide light from additional directions. The slave units are electrically triggered by the light from the master flash. Many small flashes and studio monolights have optical slaves built in. Wireless radio transmitters, such as Pocket Wizards, allow the receiver unit to be around a corner, or at a distance too far to trigger using an optical sync.

To strobe, some high end units can be set to flash a specified number of times at a specified frequency. This allows action to be frozen multiple times in a single exposure.

Coloured gels can also be used to change the colour of the flash. Correction gels are commonly used, so that the light of the flash is the same as tungsten lights (using a CTO gel) or fluorescent lights.
3. Open flash, free flash or manually-triggered flash refers to modes in which the photographer manually triggers the flash unit to fire independently of the shutter.

10.2.4 Intensity of Different Types of Light Sources Used: Photo Flood Lamp

Designed specifically for photography, a photoflood bulb is capable of producing an intense white light for accurate colour and shadow control when used in conjunction with other photoflood bulbs. A softbox diffuses the light into a pleasing soft, even light. When used properly, it reduces harsh shadows. The closer the softbox is to the model or subject, the softer the light appears, emulating window light. The shape of a softbox can vary from rectangular to octagonal to square to a long strip of light.

A softbox is also known as a small light, used primarily in studios, but which can be adapted for use outside. The mini variety tends to be best in this regard since it is easy to transport around. When you can control the lighting of the outdoors with a mini softbox, you can drastically change how your photos look.

Umbrella is used to soften the effect of flash. To provide proper lighting to the subject and the surroundings, flash lights are used. An external flash is very bright and causes harsh shadows. Using an umbrella or a soft box softens the light, makes the light look more natural and no harsh shadow. White translucent umbrellas are used as an inexpensive and effective way to spread out a light that will cover approximately a 1.5 yard (1.4 meter) area. Shoot through umbrellas are, in our opinion, the best type of lighting modifier for beginning flash photographers.

Best softbox for newborn photography
- The ESDDI 20X28 Softbox Photography Lighting Kit.
- Flash Diffuser Light Softbox 6x5 by Altura Photo.
- The StudioFX H9004SB2 2400 Watt Large Photography Softbox.
- EMART Softbox Photography Video Studio Equipment Lighting Kit.
- CRAPHY Upgraded 20x28 Photography Lighting Kit Auto Pop-Up Softbox.

Top 5 best led lights for photography
- Neewer 2 Packs Dimmable Bi-colour 480 LED Lighting Kit (Best Tested)
- SAMTIAN 160 LED Video Light Kit.
- EachShot ES240 183 Ring Light Kit.
- GVM LED Light Kit For Photography & Video.
- Neewer 143 LED Ring Light.
10.3 HALOGEN LAMP

A halogen lamp, also known as a tungsten halogen, quartz-halogen or quartz iodine lamp, is an incandescent lamp consisting of a tungsten filament sealed into a compact transparent envelope that is filled with a mixture of an inert gas and a small amount of a halogen such as iodine or bromine. The combination of the halogen gas and the tungsten filament produces a halogen cycle chemical reaction which redeposits evaporated tungsten to the filament, increasing its life and maintaining the clarity of the envelope. For this to happen, a halogen lamp must be operated at a higher temperature (250°C; 482°F) than a standard gas-filled lamp of similar power and operating life, with the side benefit of producing light of a higher luminous efficacy and colour temperature. The small size of halogen lamps permits their use in compact optical systems for projectors and illumination. Due to their relative inefficiency compared to LED and compact fluorescent lamps, halogen bulbs have been banned in many jurisdictions.

10.3.1 History

A carbon filament lamp using chlorine to prevent darkening of the envelope was patented in 1882, and chlorine-filled “NoVak” lamps were marketed in 1892. The use of iodine was proposed in a 1933 patent, which also described the cyclic redeposition of tungsten back onto the filament. In 1959, General Electric patented a practical lamp using iodine.

In 2009, the EU began its phase-out of inefficient bulbs. The production and importation of directional mains-voltage halogen bulbs was banned on 1 September 2016 and non-directional halogen bulbs followed on 1 September 2018. Australia will ban halogen light bulbs from September 2020.

Halogen lamps are manufactured with enough halogen to match the rate of tungsten evaporation at their design voltage. Increasing the applied voltage increases the rate of evaporation, so at some point there may be insufficient halogen and the lamp goes black. Over-voltage operation is not generally recommended. With a reduced voltage the evaporation is lower and there may be too much halogen, which can lead to abnormal failure. At much lower voltages, the bulb temperature may be too low to support the halogen cycle, but by this time the evaporation rate is too low for the bulb to blacken significantly. If the bulbs do blacken, it is recommended to run the lamps at the rated voltage to restart the cycle. There are many situations where halogen lamps are dimmed successfully. However, lamp
life may not be extended as much as predicted. The life span on dimming depends on lamp construction, the halogen additive used and whether dimming is normally expected for this type.

**Applications**

Halogen headlamps are used in many automobiles. Halogen floodlights for outdoor lighting systems as well as for watercraft are also manufactured for commercial and recreational use. They are now also used in desktop lamps. Tungsten-halogen lamps are frequently used as a near-infrared light source in Infrared spectroscopy.

Halogen lamps were used on the Times Square Ball from 1999 to 2006. However, from 2007 onward, the halogen lamps were replaced with LEDs, due to the much longer potential lifespan (about ten times longer for LED over incandescence). The ‘New Year’ numerals that light up when the Times Square Ball reaches the base used halogen lighting for the last time for the 2009 ball drop. It was announced on the Times Square website that the year numerals for the 2010 ball drop would use LEDs.

**Heating**

Halogen lamps are the heating-elements in halogen ovens and ceramic cooktops. Banks of powerful tubular halogen lamps were used to simulate the heat of re-entry of space vehicles.

**General lighting**

Fixed-mount lamps are used in indoor and outdoor flood lighting, although improvements in LED systems are displacing halogen lamps. Round lamps with built-in multifaceted reflectors are widely used in residential and commercial lighting. Tubular halogen lamps provide a large quantity of light from a small source and so can be used to produce powerful flood lamps for architectural lighting effects, or for lighting large areas outdoors.

Low voltage lamps use the GU5.3 and similar bi-pin bases, whereas mains voltage lamps use the same caps as normal mains tungsten filament lamps, or a special GU10/GZ10 base. The GU10/GZ10 bases are shaped to prevent dichroic reflector lamps being used in luminaires intended for aluminised reflector lamps, which could cause overheating of the fitting. Higher efficiency LED versions of all of these lamps are now available, but these have widely varying light output and quality.

Tubular lamps with electrical contacts at each end are now being used in standalone lamps and household fixtures. These come in various lengths and wattages (50–300 W). More powerful lamps are used as portable work lights, with bulbs rated 250 or 500 watts.
Stage lighting

Tungsten halogen lamps are used in the majority of theatrical and studio (film and television) fixtures, including Ellipsoidal reflector spotlights, Source Four, and Fresnels. PAR Cans are also predominately tungsten halogen.

Specialized

Projection lamps are used in motion-picture and slide projectors for homes and small office or school use. The compact size of the halogen lamp permits a reasonable size for portable projectors, although heat-absorbing filters must be placed between the lamp and the film to prevent melting. Halogen lamps are sometimes used for inspection lights and microscope stage illuminators. Halogen lamps were used for early flat-screen LCD backlighting, but other types of lamps are now used.

10.3.2 Barn Doors and Shoot

There are some who believe barn doors are only on a lighting fixture to protect the bulb from breakage. While a legitimate use, they were originally conceived for a more artistic purpose; to shape or control the beam of a light by keeping it off the places you don’t want it.

Barn doors (light modifier) Barn doors are light modifiers that shape and direct light. They are flexible to use and can create focused light. They also make a variety of shapes. Barn doors are fixed onto the front of studio or theatre lights.

Harsh light with little to no diffusion is a personal favorite. While some photographers view its unforgiving nature as a travesty and avoid it like the plague, others embrace it and capitalize on the moodiness provided by the added contrast. When manipulated properly, harsh light sings.

Hands down one of the most underrated and overlooked modifiers has to be barn doors. They are more commonly seen on film sets as opposed to photo studios and come in two variations; 2-door and 4-door configurations. Unlike a snoot that creates a very small and circular beam of harsh light, the doors control the spill of light similar to the way a flag would by shaping the light without affecting the overall quality.

Barn doors are a great way to enhance creativity and the overall lighting setup. They are relatively inexpensive in comparison to some of the other lighting modifiers and are available for all budgets and brands of light. While this piece is geared toward portraiture, barn doors are also essential to product and still life photography.

10.3.3 Flash Unit: Bulb Flash and Electronic Flash

A flash is a device used in photography producing a flash of artificial light (typically 1/1000 to 1/200 of a second) at a colour temperature of about 5500 K to help
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illuminating a scene. A major purpose of a flash is to illuminate a dark scene. Other uses are capturing quickly moving objects or changing the quality of light. Flash refers either to the flash of light itself or to the electronic flash unit discharging the light. Most current flash units are electronic, having evolved from single-use flashbulbs and flammable powders. Modern cameras often activate flash units automatically.

Flash units are commonly built directly into a camera. Some cameras allow separate flash units to be mounted via a standardized “accessory mount” bracket (a hot shoe). In professional studio equipment, flashes may be large, standalone units, or studio strobes, powered by special battery packs or connected to mains power. They are either synchronized with the camera using a flash synchronization cable or radio signal, or are light-triggered, meaning that only one flash unit needs to be synchronized with the camera, and in turn triggers the other units, called slaves.

Flash lamp

Studies of magnesium by Bunsen and Roscoe in 1859 showed that burning this metal produced a light with similar qualities to daylight. The potential application to photography inspired Edward Sonstadt to investigate methods of manufacturing magnesium so that it would burn reliably for this use. He applied for patents in 1862 and by 1864 had started the Manchester Magnesium Company with Edward Mellor. With the help of engineer William Mather, who was also a director of the company, they produced flat magnesium ribbon, which was said to burn more consistently and completely so giving better illumination than round wire. It also had the benefit of being a simpler and cheaper process than making round wire. Mather was also credited with the invention of a holder for the ribbon, which formed a lamp to burn it in. A variety of magnesium ribbon holders were produced by other manufacturers, such as the Pistol Flashmeter, which incorporated an inscribed ruler that allowed the photographer to use the correct length of ribbon for the exposure they needed. The packaging also implies that the magnesium ribbon was not necessarily broken off before being ignited.

An alternative to ribbon was flash powder, a mixture of magnesium powder and potassium chlorate, introduced by its German inventors Adolf Miethe and Johannes Gaedicke in 1887. A measured amount was put into a pan or trough and ignited by hand, producing a brief brilliant flash of light, along with the smoke and noise that might be expected from such an explosive event. This could be a life-threatening activity, especially if the flash powder was damp. An electrically triggered flash lamp was invented by Joshua Lionel Cowen in 1899. His patent describes a device for igniting photographers’ flash powder by using dry cell batteries to heat a wire fuse. Variations and alternatives were touted from time to time and a few found a measure of success, especially for amateur use. In 1905, one French photographer was using intense non-explosive flashes produced by a special mechanized carbon arc lamp to photograph subjects in his studio, but more portable
and less expensive devices prevailed. On through the 1920s, flash photography normally meant a professional photographer sprinkling powder into the trough of a T-shaped flash lamp, holding it aloft, then triggering a brief and (usually) harmless bit of pyrotechnics.

**Flash bulbs**

The use of flash powder in an open lamp was replaced by flashbulbs; magnesium filaments were contained in bulbs filled with oxygen gas, and electrically ignited by a contact in the camera shutter. Manufactured flashbulbs were first produced commercially in Germany in 1929. Such a bulb could only be used once, and was too hot to handle immediately after use, but the confinement of what would otherwise have amounted to a small explosion was an important advance. A later innovation was the coating of flashbulbs with a plastic film to maintain bulb integrity in the event of the glass shattering during the flash. A blue plastic film was introduced as an option to match the spectral quality of the flash to daylight-balanced colour film. Subsequently, the magnesium was replaced by zirconium, which produced a brighter flash.

Flashbulbs took longer to reach full brightness and burned for longer than electronic flashes. Slower shutter speeds (typically from 1/10 to 1/50 of a second) were used on cameras to ensure proper synchronization. Cameras with flash sync triggered the flashbulb a fraction of a second before opening the shutter, allowing faster shutter speeds. A flashbulb widely used during the 1960s was the Press 25, the 25-millimetre (1 in) flashbulb often used by newspapermen in period movies, usually attached to a press camera or a twin-lens reflex camera. Its peak light output was around a million lumens. Other flashbulbs in common use were the M-series, M-2, M-3 etc., which had a small (“miniature”) metal bayonet base fused to the glass bulb. The largest flashbulb ever produced was the GE Mazda No. 75, being over eight inches long with a girth of 14 inches, initially developed for nighttime aerial photography during World War II.

The all-glass PF1 bulb was introduced in 1954. Eliminating both the metal base, and the multiple manufacturing steps needed to attach it to the glass bulb, cut the cost substantially compared to the larger M series bulbs. The design required a fibre ring around the base to hold the contact wires against the side of the glass base. An adapter was available allowing the bulb to fit into flash guns that accepted the bayonet capped bulbs. The PF1 (along with the M2) had a faster ignition time (less delay between shutter contact and peak output), so it could be used with X synch below 1/30 of a second—while most bulbs require a shutter speed of 1/15 on X synch to keep the shutter open long enough for the bulb to ignite and burn. A smaller version, the AG-1 was introduced in 1958 which did not require the fibre ring. Though it was smaller and had reduced light output, it was cheaper to manufacture and rapidly supplanted the PF1.
Flashcubes, Magicubes and Flipflash

In 1965 Eastman Kodak of Rochester, New York replaced the individual flashbulb technology used on early Instamatic cameras with the Flashcube developed by Sylvania Electric Products.

A flashcube was a module with four expendable flashbulbs, each mounted at 90° from the others in its own reflector. For use it was mounted atop the camera with an electrical connection to the shutter release and a battery inside the camera. After each flash exposure, the film advance mechanism also rotated the flashcube 90° to a fresh bulb. This arrangement allowed the user to take four images in rapid succession before inserting a new flashcube.

The later Magicube (or X-Cube) retained the four-bulb format, but did not require electrical power. It was not interchangeable with the original Flashcube. Each bulb in a Magicube was set off by releasing one of four cocked wire springs within the cube. The spring struck a primer tube at the base of the bulb, which contained a fulminate, which in turn ignited shredded zirconium foil in the flash. A Magicube could also be fired using a key or paper clip to trip the spring manually. X-cube was an alternate name for Magicubes, indicating the appearance of the camera’s socket.

Other common flashbulb-based devices were the Flashbar and Flipflash, which provided ten flashes from a single unit. The bulbs in a Flipflash were set in a vertical array, putting a distance between the bulb and the lens, eliminating red eye. The Flipflash name derived from the fact that once half the flashbulbs had been used, the unit had to be flipped over and re-inserted to use the remaining bulbs. In many Flipflash cameras, the bulbs were ignited by electrical currents produced when a piezoelectric crystal was struck mechanically by a spring-loaded striker, which was cocked each time the film was advanced.

Electronic Flash

The electronic flash tube was introduced by Harold Eugene Edgerton in 1931; he made several iconic photographs, such as one of a bullet bursting through an apple. The large photographic company Kodak was initially reluctant to take up the idea. Electronic flash, often called “strobe” in the US following Edgerton’s use of the technique for stroboscopy, came into some use in the late 1950s, although flashbulbs remained dominant in amateur photography until the mid 1970s. Early units were expensive, and often large and heavy; the power unit was separate from the flash head and was powered by a large lead-acid battery carried with a shoulder strap. Towards the end of the 1960s electronic flashguns of similar size to conventional bulb guns became available; the price, although it had dropped, was still high. The electronic flash system eventually superseded bulb guns as prices came down.

A typical electronic flash unit has electronic circuitry to charge a high-capacitance capacitor to several hundred volts. When the flash is triggered by the shutter’s flash synchronization contact, the capacitor is discharged rapidly through
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a permanent flash tube, producing an immediate flash lasting typically 1/1000 of a second, shorter than shutter speeds used, with full brightness before the shutter has started to close, allowing easy synchronization of full flash brightness with maximum shutter opening. Synchronization was problematic with bulbs, which if ignited simultaneously with shutter operation would not reach full brightness before the shutter closed.

A single electronic flash unit is often mounted on a camera’s accessory shoe or a bracket; many inexpensive cameras have an electronic flash unit built in. For more sophisticated and longer-range lighting several synchronised flash units at different positions may be used.

Ring flashes that fit to a camera’s lens can be used for shadow-free macro photography. There are a few lenses with built-in ring-flash.

In a photographic studio, more powerful and flexible studio flash systems are used. They usually contain a modelling light, an incandescent light bulb close to the flash tube; the continuous illumination of the modelling light lets the photographer visualize the effect of the flash. A system may comprise multiple synchronised flashes for multi-source lighting.

The strength of a flash device is often indicated in terms of a guide number designed to simplify exposure setting. The energy released by larger studio flash units, such as monolights, is indicated in watt-seconds.

Canon and Nikon name their electronic flash units Speedlite and Speedlight respectively, and these terms are frequently used as generic terms for electronic flash equipment.

High speed flash

An air-gap flash is a high-voltage device that discharges a flash of light with an exceptionally short duration, often much less than one microsecond. These are commonly used by scientists or engineers for examining extremely fast-moving objects or reactions, famous for producing images of bullets tearing through light bulbs and balloons (see Harold Eugene Edgerton). An example of a process by which one can create a high speed flash is the exploding wire method.

Multi-flash

A camera that implements multiple flashes can be used to find depth edges or create stylized images. Such a camera has been developed by researchers at the Mitsubishi Electric Research Laboratories (MERL). Successive flashing of strategically placed flash mechanisms results in shadows along the depths of the scene. This information can be manipulated to suppress or enhance details or capture the intricate geometric features of a scene (even those hidden from the eye), to create a non-photorealistic image form. Such images could be useful in technical or medical imaging.
Drawbacks

Using on-camera flash will give a very harsh light, which results in a loss of shadows in the image, because the only light source is in practically the same place as the camera. Balancing the flash power and ambient lighting or using off-camera flash can help overcome these issues. Using an umbrella or softbox (the flash will have to be off-camera for this) makes softer shadows.

A typical problem with cameras using built-in flash units is the low intensity of the flash; the level of light produced will often not suffice for good pictures at distances of over 3 metres (10 ft) or so. Dark, murky pictures with excessive image noise or “grain” will result. In order to get good flash pictures with simple cameras, it is important not to exceed the recommended distance for flash pictures. Larger flashes, especially studio units and monoblocks, have sufficient power for larger distances, even through an umbrella, and can even be used against sunlight at short distances. Cameras which automatically flash in low light conditions often do not take into account the distance to the subject, causing them to fire even when the subject is several tens of metres away and unaffected by the flash. In crowds at sports matches, concerts and so on, the stands or the auditorium can be a constant sea of flashes, resulting in distraction to the performers or players and providing absolutely no benefit to the ‘photographers’.

The “red-eye effect” is another problem with on camera and ring flash units. Since the retina of the human eye reflects red light straight back in the direction it came from, pictures taken from straight in front of a face often exhibit this effect. It can be somewhat reduced by using the “red-eye reduction” found on many cameras (a pre-flash that makes the subject’s irises contract). However, very good results can be obtained only with a flash unit that is separated from the camera, sufficiently far from the optical axis, or by using bounce flash, where the flash head is angled to bounce light off a wall, ceiling or reflector.

On some cameras the flash exposure measuring logic fires a pre-flash very quickly before the real flash. In some camera/people combinations this will lead to shut eyes in every picture taken. The blink response time seems to be around 1/10 of a second. If the exposure flash is fired at approximately this interval after the TTL measuring flash, people will be squinting or have their eyes shut. One solution may be the FEL (flash exposure lock) offered on some more expensive cameras, which allows the photographer to fire the measuring flash at some earlier time, long (many seconds) before taking the real picture. Unfortunately many camera manufacturers do not make the TTL pre-flash interval configurable.

Flash distracts people, limiting the number of pictures that can be taken without irritating them. Photographing with flash may not be permitted in some museums even after purchasing a permit for taking pictures. Flash equipment may take some time to set up, and like any grip equipment, may need to be carefully secured, especially if hanging overhead, so it does not fall on anyone. A small breeze can easily topple a flash with an umbrella on a light stand if it is not tied...
down or sandbagged. Larger equipment (e.g., mono-blocks) will need a supply of AC power.

### Check Your Progress

3. What is a halogen lamp?
4. When was electronic flash introduced?

### 10.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. A softbox diffuses the light into a pleasing soft, even light. When used properly, it reduces harsh shadows.
2. Umbrella is used to soften the effect of flash in photography.
3. A halogen lamp is an incandescent lamp consisting of a tungsten filament sealed into a compact transparent envelope that is filled with a mixture of an inert gas and a small amount of a halogen such as iodine or bromine.
4. The electronic flash tube was introduced by Harold Eugene Edgerton in 1931.

### 10.5 SUMMARY

- The challenges of using natural light are quite similar to those faced when shooting in artificial light.
- Using multiple artificial light sources offers total control of your lighting and is ideal for producing consistent imagery.
- Unlike natural light, which produces shifts in colour and intensity every time the sun goes behind a cloud, or as it moves throughout the sky, artificial lights produce the same colour and intensity of light over and over again.
- When photographing with strobes or battery-operated flash units, you have total control over which exposure settings you use for your shots. Simply set the camera to your preferred exposure settings and adjust the power and distance of your lights accordingly.
- Designed specifically for photography, a photoflood bulb is capable of producing an intense white light for accurate colour and shadow control when used in conjunction with other photoflood bulbs.
- A halogen lamp, also known as a tungsten halogen, quartz-halogen or quartz iodine lamp, is an incandescent lamp consisting of a tungsten filament sealed into a compact transparent envelope that is filled with a mixture of an inert gas and a small amount of a halogen such as iodine or bromine.
A carbon filament lamp using chlorine to prevent darkening of the envelope was patented in 1882, and chlorine-filled “NoVak” lamps were marketed in 1892.

Fixed-mount lamps are used in indoor and outdoor flood lighting, although improvements in LED systems are displacing halogen lamps.

A flash is a device used in photography producing a flash of artificial light (typically 1/1000 to 1/200 of a second) at a colour temperature of about 5500 K to help illuminate a scene. A major purpose of a flash is to illuminate a dark scene.

A typical electronic flash unit has electronic circuitry to charge a high-capacitance capacitor to several hundred volts.

An air-gap flash is a high-voltage device that discharges a flash of light with an exceptionally short duration, often much less than one microsecond.

A camera that implements multiple flashes can be used to find depth edges or create stylized images. Such a camera has been developed by researchers at the Mitsubishi Electric Research Laboratories (MERL).

10.6 KEY WORDS

- **Diffuser**: A flash diffuser spreads the light from the flash of a camera. In effect, the light will not come from one concentrated source (like a spotlight), but rather will spread out, bounce from reflective ceilings and walls, thus getting rid of harsh light, and hard shadows.

- **Softbox**: A soft box is a type of photographic lighting device, one of a number of photographic soft light devices.

10.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

**Short-Answer Questions**

1. How does using artificial light aide photography?

2. Write a short note on the history of halogen lamps.

3. What is the use of flash bulb in photography?

**Long-Answer Questions**

1. What are the steps to be followed while controlling depth of field and length of exposure?

2. What are the main techniques used to soften light from the flash?
3. What are the various kinds of flash? Discuss.
4. What are the drawbacks of using a flash?

10.7 FURTHER READINGS


UNIT 11  VARIOUS TYPE OF PHOTOGRAPHY

Structure

11.0 Introduction
11.1 Objectives
11.2 Photographing People and Portrait Photography
  11.2.1 Composing a Photograph
11.3 Photographing Men, Women, Couples and Groups
  11.3.1 Posing and Body Language
  11.3.2 Importance of Clothing and Dressing Styles
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  11.3.5 Correcting Aesthetics
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11.9 Answers to Check Your Progress Questions
11.10 Summary
11.11 Key Words
11.12 Self Assessment Questions and Exercises
11.13 Further Readings

11.0 INTRODUCTION

When we talk about photography aesthetics, the first question that arises in the mind is what is aesthetics? In simple words, aesthetics is the beauty of the subject you are referring to. When you refer and talk about aesthetics in people and portrait photography, you talk about all the important aspects and other things that you should keep in mind while photographing people. Aesthetics is a very important part of any kind of art. Since photography is an art as well, aesthetics play as much an important role as the techniques which are used for photographing any subject.
11.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss about portrait and still photography
- Describe various genres of photography
- Understand the art of photographing people

11.2 PHOTOGRAPHING PEOPLE AND PORTRAIT PHOTOGRAPHY

In this section, the different areas that are important for people and portrait photography or the aesthetics of people photography are discussed.

Although a camera behaves like a human eye, there are a lot of differences in the way camera sees the frame. The very first thing that a photographer must learn is how to see like the camera. Some amazing photographs that you see in photo galleries and on the Internet have been taken from the common surroundings that you live in. Once you learn how to see like a camera, you will be able to spot a lot of photographic opportunities that you usually miss when you are not observing your surroundings properly.

There are a lot of factors which play an important role in creating a photograph. One of them is ‘abstracting’. Whenever you are walking around in a natural environment, the fragrance of the flowers or the cool breeze or the warmth of the sunlight is some things that you would enjoy. How to capture these things in a photograph? This is what abstracting is all about. This is how you convert your feelings into a visual form. It requires a very good understanding of human emotions in relation to visual arts.

Another factor that plays a very important role in creating good photographs is the centre of attraction or the focus of the image. Photographers should always look for visually interesting objects that can serve as the focus of the image. Identifying the most important objects of interest and arranging them creatively in a frame will definitely give you a nice photograph.

The fundamental difference between the human and camera vision is the difference in perspective. Basically, the camera sees in two dimensions, as compared to humans whose vision is stereoscopic, that is three-dimensional. You will see different kind of patterns being created by the placement of objects in the foreground and background, and the distance between objects will not be perceived, so the environment will look flat, just like a photograph.

If the photographs will make the environment look 2-D or flat, then it would not be a very good representation of the environment which has been photographed. So, it is important that compositional techniques that are used should be able to
create depth in the image. Usually, this is done by creating different kind of diagonal lines, foreground-background relationships, overlapping in the scene and other techniques which can bring out the depth.

11.2.1 Composing a Photograph

Once you learn to see like the camera, the next step that you will take will be for composing your photographs. Composition is important because your image cannot speak and guide the viewer’s eyes in the photograph. Compositionally, elements like leading lines guide the viewer’s eye in the photograph. In addition, there will be a lot of different points of interests that you would want the viewer to see. Once the viewer sees what you want to show him, your message is delivered and your photograph is a success.

Composition plays several important roles like creating the mood of an image, expressing the emotions, telling the viewer the story. To understand the fundamentals of composition, study the paintings and photographs of great masters and observe how they have composed their images and why. This is a very easy way to learn, by observing and analysing good photographs and paintings.

Now, when you talk about the practical aspect of composing a portrait, there are a few things that you should consider so that you’re not only taking pictures but are creating images. Portrait photography is not the same as any other type of photography. Here, your subject is very direct and physical. While photographing a person, the most important part of the image has to be the person. Posing and lighting play very important roles in portrait photography but the importance of composition is still great.

The factors to be considered while taking a portrait photograph are as follows:

- Fill the frame
  The real purpose of taking a portrait photograph is to show your subject. So you should not hesitate in zooming very close to the subject. In portrait photography there is no such thing as too much zoom. You are free to take any kind of shots whether to fill the frame with the complete body of the subject or just the face or hands etc. This is one very important thing to consider in portrait photography. If you experiment with filling the frame and leaving the frame empty you would mostly find that almost all the photograph where you have filled the frame completely are much more appealing.

- Position the eyes carefully in the frame
  The most common position for a rise in portrait photography is at the level of upper one third. This is followed as a general rule for placement of the eyes. Since the eyes are the most important part of a person’s face, placing them at the level of upper one third is also a direct derivation from the rule of thirds, as the important elements are placed at the level of the upper dividing line. Generally, there are no deviations from this unless the photographer is deliberately trying to induce tension into a photograph, which
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is not very common for portrait photographs. This rule may not apply sometimes when the subject is placed in the lower one third of the photograph, especially when you are creating photographs with a lot of background elements in it.

- **The framing of the photograph must draw attention to the subject**

This rule is a very obvious one in case of portrait photographs. The real idea behind a portrait photograph is a very physical one, that is, the subject. You always use the framing to drive attention to a specific place in the photograph, and in case of a portrait photograph it has to be the subject. You must place the background elements and the other elements of composition which are available in the frame and also the framing of the photograph should be done such a way that everything draws attention towards the subject, generally towards the eyes of the subject to be more specific. Unless of course, you want to highlight any other feature. As a matter of fact, you should try to create a virtual frame in the environment while taking photographs of a person and place him or her at the centre of it.

- **Use textures**

Generally, you avoid using very heavy or cluttered backgrounds or taking portrait photographs as they may be distracting. But sometimes, when it is not possible to avoid them you can creatively come out with a solution in which you can create texture with the same background.

For example, you can use a brick wall which is very common and forms a great background for shooting portrait photographs in an exterior environment. You can use the pattern on the furniture or wood or other objects in case of interior photographs. A nice way of doing the same is to maintain a little distance between the subject and the background and use the maximum available aperture on the lens. This will keep the subject sharp and will blur the background as much as possible to artistically create texture out of an unwanted element in the scene. However, this is merely an idea. Situations will change every time and photography is all about creating new pictures using new ideas and techniques.

- **Use lines**

Using lines is also a great way of drawing attention to the subject no matter where the subject is placed in the frame or how big or small the subject is. Although lines are a part of framing, they greatly impact the final look of the photograph and guide the eye to the photograph. The same brick wall you talked about in the previous example can also be studied for creating lines in the photograph. You can use lines from skyscrapers, roads, metal plates, grades, windows, fences, buildings around you, etc. to create good backgrounds which will lead the viewer’s eye towards the subject. However,
you should make sure that the lines are not working against you by drawing attention away from the subject. As stated earlier, lines strongly affect the photograph as they ensure that the viewer’s eye pays sufficient attention should be given to it.

- Experiment with different angles.
  Sometimes it may not be possible to get rid of the background elements or some very unappealing or distracting object in the foreground. So the solution is to change the point of view. Change your camera angle, move to a side, move up or down and try a new perspective. This can easily help you remove the unwanted element from the frame and also can give you a better perspective and even better lighting specially in natural environments or open environment. With portrait photographs you have two experiment a lot because all the humans have their best side and the worst one. You need to try different angles not only for the problem which we discussed earlier with the background and foreground objects, but also for finding the best angle to achieve better photographed of a person. Experimenting is as important to photography as a camera.

**Choosing the Best Lens and Other Settings for a Particular Composition**

Once the composition is defined, you will need to get the composition in the frame of your camera; different compositions will require different angles of view. To change the angle of view, the focal length of the lens must be set properly. The choice of lenses and other optical accessories will depend on the composition itself. If your composition makes use of a large view angle, then you will have to use good-quality wide-angle lenses. If the composition has a clear enlarged view of the subject, you will need longer lenses. For good compositions of small objects, you will need macro lenses. You should have at least three to four different kind of lenses to achieve any kind of compositions.

**Choosing the Best Light**

Humans cannot see anything in the absence of light. The objects in the shade appear darker and the objects near the light, appear brighter. Though these are pretty simple things, but they can help you control the overall composition and mood of the photograph. Generally, bright light is related to good feelings and emotions and darkness to sadness, depression and other negative feelings and emotions. Darkness is also associated with mystery. Brightness and darkness in an image can help define the complete, perfect mood. In portrait photography, light plays a very important role because of the shadows which are created. For example, if you place the light source below the high level of the subject, then all the shadows will be created in the upward direction. This is the kind of look is usually seen in horror movies, creates a very spooky feeling. On the other hand, when you see a model on the cover page of the magazine, you see the lighting is very soft and generally the shadows are faded out and the direction of the shadow
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is typically downwards. Therefore, just by altering the type of lighting, the mood of the image can be completely changed. The harsh sun of the afternoon gets converted to a very romantic colourful light at the sunset and if you compare the mood of both the images, it is very different. Later in this unit, you will learn more about light and lighting equipment.

Finding the Right Exposures

Finding the right exposure and choosing the suitable light are vital factors for creating clear and detailed photographs. Different kinds of exposure will give different kind of images, high-key image, low-key image or a neutral image. Right exposure is also important for getting the maximum possible detail in your photographs. If the exposure is not correct, you will lose detail either in the highlights or in the shadows. However, overexposing or underexposing the photograph is not necessarily always wrong.

Selecting Photographs from a Photo Shoot

After you are through with a photo session, the next activity is choosing the best photographs from the lot. While shooting, you seek a certain set of conditions and criteria for taking good photographs. A photographer usually takes a lot of photographs as he sees fit during a photo shoot. Still, for the final delivery, you have to select very few but excellent photographs. The choice of these photographs decides the overall outcome of your project. Selecting the right photographs is very crucial to any photographer’s portfolio.

These are not the only elements that define the aesthetics of any photograph, but definitely these are the essential ones. It should be kept in mind that the aesthetics cannot be ignored for any reason. If you consider photography to be an art, then aesthetics is the soul of photography.

Check Your Progress

1. What is the real purpose of taking a portrait photograph?
2. What is the most common position for rise in portrait photography?

11.3 PHOTOGRAPHING MEN, WOMEN, COUPLES AND GROUPS

When you are a photographer who photographs people, your subjects will come in all varieties; men or women, singles or couples and groups. All these subjects require different considerations and aesthetics. There are some factors which are common to all and there are definitely certain things that are considered different in each case. For example, the background that you use for a man may not look nice with a woman. The requirement of framing of a single solitary subject will vary from the framing of a group or team. In this section, the different aspects that a
photographer must keep in mind while photographing people is discussed. In addition, this section will explain how to photograph different people depending on their age groups, gender. These different considerations are due to the fact that different age groups and different genders have different likings, personalities, activities. The primary purpose of portrait photography is to represent the person as he or she is. So, for the photograph to be true, these things have to be considered differently for different subjects.

11.3.1 Posing and Body Language

Posing is a very important element of composition in photography. It helps in creating dynamic lines and different patterns in the composition. A portrait photograph need not necessarily be a close-up. When you introduce complete body into the frame, the gesture or the pose is the first thing that will be noticed in that particular image. Usually, both the male and female subjects will follow similar posing and body language. However, the important factors which discriminate both the genders will be very dominant, like the aggression in the image is generally not visible in a photograph of a female subject; similarly, soft, elegant and feminine poses would not work well with male subjects. It should be always kept in mind that the pose also defines the attitude and personality which will differ from gender to gender and subject to subject. The posing of different body parts plays a very important role in composition and also in defining the mood and emotion of the image.

Eyes

If the photograph shows a face, then the eyes will not only be the centre of attraction, but also the most dominant element in the scene. That is why while focusing the camera, the focus should be perfectly on the eyes. Eyes are known to be the gateway to one’s soul. Eyes speak a lot, not with words but with expressions. If the eyes are not perfect in a photograph, then the image cannot be perfect. Depending on the mood and emotion, there are different ways of posing eyes. When the eyes are looking directly at the camera, moving the chin down will make them appear bigger and moving the chin up will make them look smaller. The first thing that the viewer will get attached to in a photograph, are the eyes. Whenever the eyes are looking outside the frame, it also leads the viewers’ eyes. By controlling where the eyes are looking, you can control where the viewers would look. Figure 11.1 explains this concept.

Fig. 11.1 Camera Focussing on Eyes
Hands

In a composition, the hands are the second most important elements after the eyes. People talk, signal, specify measurements and size and even express speed and emotions with their hands. People, who cannot speak, use hands for communication. Since your photograph cannot speak, the position of the hands will make it speak. A hand is very broad when directly faced with the camera, so it can become a very dominant object. So, normally the hands are used at an angle. The positioning of the fingers and the direction in which the fingers are pointing can lead the viewer’s eyes. Using the hands in a creative way can also give very expressive portraits. Hand gestures and facial expressions make a great combination for creating expressive portraits, because they convey the emotions and expressions very clearly and directly to the viewer. Figure 11.2 shows the posing of a hand.

Feet

In photography, posing the feet is not only important for full-length shots, but also important for close-ups or upper body photographs, as they define the way you stand and make you feel comfortable or uncomfortable, depending on the balance. Normally, the body weight is divided equally between both the legs; still, you usually prefer to keep your weight on one leg. The way you divide our body weight and keep a balance completely alters the look that is achieved in a photograph.

There are different ways in which photographers use feet for posing. Posing both feet square onto camera presents a very aggressive pose. Keeping one foot back at an angle of 90° to the camera, twists the hips and torso, which makes a subject look thinner. A variation of this pose would be to shift the weight on the back foot and point the front foot towards the camera creating a very elegant feminine pose. In case of male subjects, usually both the feet are firmly planted on the ground and the weight is evenly distributed, which creates a very confident look.

Torso

Just like the feet, the position and angle of the torso in a particular pose will change the way the subject appears in a photograph. When the shoulders are square onto
the camera, then the subject looks heavier and the look is more aggressive as the body appears wider. When using the back foot to support the weight of the body, the torso is also twisted so the shoulders appear narrower, making the body look thinner. Tilting the torso to one side also affects the mood of the image. Twisting and tilting the torso can be used for creating dramatic photographs.

The torso is a very important element in defining the gender of the subject for obvious reasons. In case of male subjects, the torso bent backwards and square onto the camera shows confidence, torso slouched forwards with the shoulders drooping and the head bent upwards shows a very aggressive attitude, just like a charging bull. In case of female, the torso is kept straight to give a more confident look and a slight bending from side to side can add to the beauty of the photograph by adding a relaxed look.

**Hips and legs**

In photography, hips and legs play a very important role in establishing the personality of the subject. They can make a subject look confident, nervous, confused, troubled or anything else as the photographer desires. This is specially made use in fashion and glamour photography. When the body weight is equally divided on both the legs, the knees locked, then the subject gives a strong confident pose. When the bodyweight is shifted to one of the legs, knee and the ankle is bent, it creates naturally relaxed pose. Pushed out hips in a portrait conveys a confrontational attitude.

Other than standing, it is also possible for the subject to be sitting comfortably. A sitting posture should be considered in a different manner than a standing pose. If the subject is sitting on a chair, make sure the pose is a good one and that the subject is not slouching or looking uncomfortable or unnatural. When sitting on a chair, experiment with different angles; either the subject could be resting on the back or leaning forward to put some weight on the feet and create a different balance. Different camera angles should also be tried. Another way of seating the subject is on the floor. This creates some dramatic and memorable photographs. There are lots of possibilities for posing. The subject could be crouching, lying comfortably on the floor, or on his/her side. Different poses will create different dynamic effects. The position of legs, hips and torso can be changed in a lot of different ways, because the bodyweight is not directly onto the feet. Since the subject is seating lower than the camera and the lights, this vantage point will create a different kind of photograph altogether. As far as the texture of the floor is concerned, it should be very subtle and too much patterns or rich colours should be avoided.

When it comes to posing while seated, there are a lot of opportunities and possibilities as discussed earlier. So the photographer should keep a collection of suitable chairs that can be used for different poses. Along with positioning the body, the positioning of the furniture, is also very important. Turning the chair away from the camera is a good idea because the subject will naturally turn to face
Various Type of Photography

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the camera while being seated on the chair, and the twisted torso and shoulders will
make the subject look thinner and elegant. It is not always necessary for the
subject to be sitting formally on the chair. They could be sitting in a different manner
relaxed. Resting the arms on the chair handles and back also provides different
posing opportunities. Corporate and formal seating photographs should be taken
with the subject sitting straight on a chair with the back straight and the head held
high.

11.3.2 Importance of Clothing and Dressing Styles

Proper clothing and dressing styles are very important again as they are a part of
the subject himself. The dressing style gives a sense of overall style of the subject
and a taste of his personality. Clothing should never be neglected and sufficient
attention must be given to clothing to bring out the personality. As all the subjects
will have different kind of clothing just like their personalities, so the photographer
must be able to judge what kind of clothing will suit which kind of people. Now,
let us discuss about the different dressing styles.

Formal dresses

When the subject is wearing a formal dress, usually a suit with tie or a bow, it
should be given proper attention. Whenever the subject is wearing a tie, ensure
that the knot of the tie is coming up to the collar; it is not twisted or too long, the
top button on the collar is not open. Attention must be given to the cuffs too. If
the female subjects are wearing suits for formal portraits, usually, the tie is not
worn. So, the attention must be given to the line of the court around the bust and
any gaping on the front of the jacket. In case a skirt is being worn, and the
subject is sitting, attention must be given that it does not look inappropriate. If
the skirt is too short, the body must be slightly turned away from the camera for
dignity.

Casual dresses

Not all the subjects will be wearing formal dresses; whenever the subject is wearing
casual dresses, attention should be focused on the patterns and the colours of the
clothing. In casual clothes there is no need to be perfect in terms of the seam or
wrinkles. The only point that should be considered is that the clothing should not
distract the viewer. Very bright colours and strange patterns should be avoided. A
T-shirt and jeans will work fine with almost all the subjects whether young or
elderly, male or female.

Importance of sleeves, shoulders and necklines

The sleeves of the clothing can change the way the upper arms look. When
sleeveless tops are worn, they exaggerate the upper part of the arms and make
them look much bigger than they actually are. This happens due to the shadows
and lighting. Generally, for people with very thin arms it is a good idea, especially
in portraits of male subjects, this can exaggerate the upper arms and give a massive, muscular look to the portrait which is preferred by some subjects. This can be undesirable for females. However, usually it is the females who wear sleeveless tops. If the exaggeration is to be avoided, then the subject should be turned in such a way that the lights are directly falling on the upper arms and do not create a pattern of light and shadows that can exaggerate the size. Another thing that needs to be considered regarding sleeves is that by the sleeves should not be too long to obscure the wrist and hands. Folded sleeves are a complete no-no in a formal photograph but they can enhance casual clothing. Folded sleeves give a very relaxed look to the photographs and show confidence in the subject.

One more factor that has to be considered especially in dressing of female subjects is the shoulders and necklines. A plunging neckline draws attention to the bust and can be suitable for some women, but not all. A scoop neckline is ideal for women with short neck as it makes the neck looked longer than it actually is. On the other hand, a polo neck make the neck look shorter. If a lady with short neck wears a polo neck, the photo obviously will not be very attractive. To highlight the graceful shoulders of a female subject, an off shoulder dress would be very useful. It will also give a very confident and glamorous look.

Colour of the clothes versus background also plays a very important role. The colours can either be similar or in contrast depending on the requirement. Using light clothing against a dark background or dark clothing against a light background will highlight the subject and show every curve on the contour of the subject. This may not work very well with people who have attractive figures. Using a background with the same tone as the clothing will make the subject appears thinner. That is, if you use bright clothing on bright backgrounds or dark clothing on dark backgrounds, it will be very useful for those who are not in perfect shape.

Framing

How you frame your photograph also tells a lot about the subject. As a portrait photographer, it is very important for you to understand that the way you take a photograph will later define the personality of the subject to a viewer. So apart from all the technical stuff, the artistic side of photography is very vital. Framing a photograph for creating a composition is the first step, when you talk about art of photography.

Importance of eyes

In portrait photography eyes are supposed to be the most dominant subject in any photograph. The importance of eyes cannot be underestimated, so in a composition they play a major role. Whenever you frame the photograph try to make the eyes as the centre of interest; this particular technique will usually bring out good results. Whenever there are multiple subjects in a frame, tried to place their eyes at different levels, heights and angles.
11.3.3 Rules of Composition and Breaking Rules

One of the common rules followed in composing a photograph is the rule of thirds. According to this rule, the entire frame is divided into three parts—horizontally as well as vertically, by two horizontal and vertical lines. This creates four points of intersection of those lines. These points are the places where you should try to place the centre of interest in a photograph. This way, the particular photograph will have pleasant balance. According to the rule, you should try to make some interesting patterns or shapes in a photograph using different subjects or interesting objects. In portrait photographs, generally the shape that is created is a triangle. The peak is at the head and the base of the triangle is along the width of the body. Figure 11.3 shows a picture which explain the rule of thirds.

![Rule of Thirds](image)

Cropping

In a portrait, how you crop your photograph also has some visual impact. In a close-up, the photographs should be cropped at the centre of the neck. In a head and shoulders portrait, it should be cropped slightly above the chest. If you want to cover a larger area, you should crop a photograph above the waist. In a three-fourths portrait, a good place to crop the photograph is the centre of the thigh. Generally, whenever you talk about the photograph of a human being, as a rule, you do not crop exactly over the joints like knee or ankle. Whenever taking a complete photograph try to give more space above the subject and to one side. Try not to place the subject at the exact centre of the photograph.

Also remember the fact that rules are meant to be broken; and that the most dramatic photographs are achieved when the rules are broken. So the proper method would be: first learn the rules and then break them.

Camera positions and placements

There are different vantage points for different emotions. Using the same vantage point every time you take a photograph will be very boring and predictable. Try experimenting with different camera positions and placements. Placing the camera at a very high vantage point, sometimes very low, using an ultra-wide-angle lens are other techniques that will create very unique and different photographs. Usually children are best photographed where the camera is at their eye level. High angle is useful for taking photographs of a group; it can give you some very creative and interesting photographs. It is not always necessary to shoot directly from the front;
you can also shoot from the side. Choosing a different vantage point will give you opportunities to create a different composition every time. A good portrait photographer is one who experiments and delivers completely different compositions every time he takes a photograph.

11.3.4 Highlighting Relationships in Photographs with more than One Subject

A portrait does not necessarily have to be of a single subject all the time. Usually, you encounter families, friends or groups, couples whom you have to photograph. Now, photographing a single person is a different matter than photographing these. While taking photographs of groups, remember that different people will have different attitudes, emotions and personalities.

The secret of good group photographs lies in understanding the relationships. When you photograph a family, remember that you are not photographing three or four different people but a single family. So, the important thing here is to understand that the personality in focus; this time it is the personality of the family and not the individuals. Such a kind of photograph must reveal something about the relationship between the subjects, then only you can get a successful photograph.

Couples

An engaged or married couple will usually be very passionate about the relationship and it should be very much visible through the poses. Posing them will be great fun as they will be usually very cooperative and you can get some creative photographs. Such a photograph must show the kind of bonding they share. Depending on the dressing style, the composition would vary. Usually such photographs work very well with casual clothing and bright lights.

Parent and child

The bonding of two human beings can be best captured in this relationship. A parent and child’s relation is a wonderful relation and very visible. Some of the best photographs in the history of photography are from this particular category. There is lot of cliché involved with these photographs, as lots of different experiments have been done and lot of possibilities have been tried and tested. There is no reason why you cannot get a new look to these photographs. Just focus on the relationship, think around it and you will definitely find something that will work for the photograph. Figure 11.4 shows the special moment of a mother with her child.
Family photographs are sometimes confused with photographs of friends. Usually the reason for this is the lack of understanding of the photographer. As a rule, the families come in all different shapes and sizes. Generally, there is a typical type of framing which is used for these photographs; the parents are placed at the centre and the children are usually radiating outwards. However, other compositions can also be creatively achieved and will usually work.

**11.3.5 Correcting Aesthetics**

As a photographer, you must not only focus on capturing a person’s personality but also on enhancing it. A lot of people have problems with aesthetics. As the photographer, it will be your responsibility to take care of these things. These problems are usually pretty simple and easily dealt with. There are as follows:

**Eyeglasses**

This is one of the most common problems with people of all ages. Eyeglasses have a tendency to create reflections. As you know that the eyes are always the centre of interest and eyeglasses are the biggest hurdle in capturing the detail in the eyes. To get rid of the reflection on the glasses, there are different ways; you can raise the height of the main light or the key light and the reflections of this light will be minimized. You can also ask the person to change the angle of the glasses by moving the arm of the eyeglasses slightly higher. This can get rid of the unwanted reflections, although using a circular polarizer might help but it usually creates more problems rather than solving one.

**Eye defects**

Squint is usually caused by bright light shining directly at the eyes or it could be natural facial characteristic. In case it is being caused by bright lights, try reducing the brightness of the lights or move the subject in such a way that bright light is not falling directly on the eyes. If it is due to natural characteristics, then the solution would be to ask the subject to lower his or her head and then look at the camera; this will cause the eye to open slightly wider. In case of unevenly sized eyes, do not go for a frontal portrait; instead adopt a two-thirds pose. In this particular pose, the eyes will not be visible directly to the viewer and the difference in the size will not be noticeable.

**Double chin**

Dealing with double chin is a pretty simple process. Ask the subject to lift his head higher and also place camera at a slightly higher level. This will cause the neck to stretch and reduce the double chin. Another method is to hide that area by bending down slightly and covering it with their hands with an elegant pose.
Hair problems (baldness)

Make sure that you never use a hair light for people who are bald. That light will cause a lot of shining on the head and will distract the viewer. A simple solution is to switch off this light and use a low-key style of portrait. Choose the camera angle creatively to make this problem look subtle.

Difference of heights in couples

This is the most common thing in couple portraits. The solution is also very simple. Ask the taller person to sit down and then compose a photograph with the shorter person standing up. Another way of reducing the height difference is to ask the taller person to lean back against a background and the shorter person should be standing upright, this way the difference will be reduced at least by 5 to 6 inches. Sometimes, this difference in heights can be used creatively to enhance the look of the photograph. Posing the couples seated down on the floor or other furniture will also be a good idea as the difference will not be visible in that case.

Enlarged features like ear and nose; in case of big ears, the natural solution is to cover them with hair. The overall lighting of the image should not be too bright and make sure that the ears are not silhouetted against a background. Usually, a two-thirds face shot will work nicely. An exaggerated nose can be flattened by cleverly changing the position of lights. Moving the lights towards the centre of the face will reduce the shadows and will thus flatten the face, reducing the exaggerated nose.

Remember that no human being is perfect and that even if you try, you cannot make them perfect. However, the objective is to enhance the aesthetics of the photograph that you are taking. Never overdo it, it might completely change the person, his personality and appearances, making your photographs look fake.

Check Your Progress

3. What is the most dominant subject in portrait photography?
4. What is the rule of thirds?

11.4 WILDLIFE PHOTOGRAPHY

Wildlife photography is a genre of photography concerned with documenting various forms of wildlife in their natural habitat. As far as requiring photography skills is concerned, wildlife photographers may need field craft skills. For example, some animals are difficult to approach and thus knowledge of the animal’s behaviour is needed in order to be able to predict its actions. Photographing some species may require stalking skills or the use of a hide/blind for concealment.

While wildlife photographs can be taken using basic equipment, successful photography of some types of wildlife requires specialist equipment, such as macro lenses for insects, long focal length lenses for birds and underwater cameras for aquatic species.
marine life. However, a great wildlife photograph can also be the result of being in the right place at the right time and often involves a good understanding of animal behaviour in order to anticipate interesting situations to capture in photography.

**History**

In the early days of photography, it was difficult to get a photograph of wildlife due to slow lenses and the low sensitivity of photographic media. Earlier photos of animals were usually pets, stuffed, and zoo animals. These included photos of lion cubs taken at the Bristol zoo in 1854 and in 1864, photos of the last Quagga by Frank Hayes. Wildlife photography gained more traction when faster photography emulsions and quicker shutters came in the 1880s. Developments like these lead to photos such as the ones taken by German Ottomar Anschutz in 1884, the first shots of wild birds in action. In July 1906, National Geographic published its first wildlife photos. The photos were taken by George Shiras III, a U.S. Representative from Pennsylvania. Some of his photos were taken with the first wire-tripped camera traps.

**Gear**

Wildlife photography requires different specialized lenses and equipments than most other disciplines. Most wildlife lenses have a very long focal length between 150mm and 600mm, allowing the photographer to get a tighter image filling the frame with their chosen subject. Some other specialized gear includes camera traps, hides, and flash extenders. While the majority of wildlife is shot with a long, telephoto lens, when a wide angle lens is used, it can be very striking.

**Check Your Progress**

5. What is wildlife photography?
6. Why was it difficult to get a photograph of wildlife in early days of photography?

### 11.5 ENVIRONMENT PHOTOGRAPHY

Environmental photography involves images that showcase natural surroundings and landscapes. This type of photography includes nature photography as well as environmental portraits. Most of the time, environmental photography is used to bring light to issues regarding the environment and conservation efforts. The social issue aspect of this photography style has led to many environmental photography award programs and exhibitions to acknowledge individual photographers who successfully use their work to bring awareness to these issues.

Environmental portraits are one aspect of environmental photography. This style showcases the photo’s subject in their natural surroundings to better showcase their personality. The theory behind this is the assumption that showcasing a person...
or an animal in a familiar setting will allow them to be more comfortable and express themselves in a more authentic way.

The use of environmental photography has been to document the effects of climate change on natural features. A well-known example is the series of pictures taken of various glaciers in the United States, Canada, and elsewhere. The pictures document the retreat of the glaciers as a consequence of a warming environment, and are evocative evidence of the reality of global warming.

The Extreme Ice Survey, created by photojournalist James Balog, was begun in 2006. It uses time-lapse photography to record changes to glaciers in places such as Alaska, the Rocky Mountains, Greenland, Iceland, Bolivia, and the Alps. The project uses 26 cameras to record images hourly during daylight hours. Ultimately, the project will release a documentary film illuminating its findings in spring 2010.

Impacts and Issues

Environmental photography has helped increase environmental awareness by visually displaying both the beauty of nature and the consequences to that beauty of accidental and deliberate environmental degradation. Orbiting satellites are able to photograph nearly all of Earth’s surface, leaving little surface environmental damage undetected.

Environmental photography can be combined with measurements of temperature and other parameters taken at the site of the photograph to provide a detailed survey of the site at that moment in time. When similar information is gathered over time, trends can become evident. In this way, photographs have been valuable in demonstrating the changes taking place in the natural world, which can be correlated with increasing atmospheric temperature.

Check Your Progress

7. What does environmental photography involve?
8. When did the Extreme Ice Survey begin?

11.6 SPORTS PHOTOGRAPHY

When the idea of sports photography comes to one’s mind the first question would be, what the requirement is, what makes sports photography different from regular photography, and how to achieve great photographs from sports. For any kind of photography, it is very important to understand the basics and the story behind the subject. So, in this case, to understand sports photography, you should have a good knowledge of what a particular sport is all about. This knowledge will tell you all about the kind of equipment that you will require, what kind of compositions will work and most importantly what kind of photographs are expected to sell.
Certain tips for beginners and amateur sports photographers are as follows:

- Planning and preparation should be the topmost priority before going out for any sports photography event.
- A good knowledge of the location and the vantage point available is vital to achieve good photographs.
- Gather all the relevant information about the game and the event that is going to happen.
- Understand the sport, study the key players and whether they are likely to set the record and also understand their signature style of gameplay.
- Practise using your camera. A good control on manual focus and tracking a fast moving object in the frame are the basic skills you must possess.
- Get different lenses and use them effectively. Do not hesitate to change lenses or use multiple camera bodies.
- Frame your photographs tightly; get the faces in the frames.
- Start photographing before the game play starts and do not stop once the gameplay is over. Make sure you photograph the ceremonies before and after the game. Even during the break time, take photographs of resting players and other surroundings.
- Good lenses with wider apertures will certainly improve your photographs by giving you access to higher shutter speeds.
- Possess the necessary equipment for setting white balance and exposure in case your camera fails to do so, especially when photographing indoors or in artificial light.
- Use reflective surfaces to your advantage. Look for interesting lines and patterns that can improve the composition of your images.
- Understand the etiquettes of a game. Be respectful to all the people you are photographing.
- Make it a habit to regularly look at photographs published in magazines and newspapers, this will help you get more ideas and understand the techniques of great photographs.

Let us first discuss briefly about the equipment that would be required in general for sports photography. The amount of equipment that must be purchased for photography in a sports event can be overwhelming. Although the basic requirements are the same as any other type of photography, like camera, tripods, filters etc., but there will be a great need for other accessories too.

11.6.1 Camera Body

Selecting a suitable camera body for your needs is not a difficult task but it can be a little confusing, as nowadays the availability and the choices are great. Usually,
the choice depends on the cost of the camera body. Most professional level cameras are almost as expensive as small cars. So, the obvious choice is the camera body that suits the budget. Besides the cost factor, the other thing that you should take into consideration is that the foreign cameras which will be used for sports photography, must be able to take photographs at a faster rate, as the sports are dynamic and things change pretty fast. In addition, the cameras must have fast autofocus abilities, which will ensure crisp photographs. Most of the professional level cameras are able to focus within a fraction of a second and are also capable of taking almost 5 to 10 photographs in one second. The burst mode on camera also provides great opportunities, although it is available on almost all professional cameras, the faster it is, the better. The resolution of the captured images is also one of the factors that should be kept in mind and sought after.

Although the new cameras that you use are generally automatic, as a photographer, you must practice using a camera with manual settings beforehand. This is required so as to get suitable photographs because, sometimes, the automatic mode does not give you what is required. Camera may capture the exposure correctly but it doesn’t know what is required to capture the mood.

Understanding of aperture, shutter speed controls and sufficient knowledge to choose the correct settings plays a vital role in capturing great photographs. Whether to use selective focus or to shoot with everything in sharp focus, whether to freeze a particular moment or to capture the motion blur to get a feeling of extreme action, the choice makes all the difference.

After achieving the correct exposure, it is also important to get the correct white balance so that the photographs are true to life. In sports, lighting condition can vary from direct sunlight to overcast skies. In case of indoor sports, the lights can be of various colours like incandescent, fluorescent or halogens. So, it is important to understand the lighting conditions and select the white balance accordingly. Use of a grey card can also prove to be useful if you are not able to calculate the colour temperature accurately. Table 11.1 shows the lighting conditions and their corresponding temperature tables.

<table>
<thead>
<tr>
<th>Lighting Condition</th>
<th>Colour Temperature (K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incandescent</td>
<td>2500 K to 3500 K</td>
</tr>
<tr>
<td>Twilight</td>
<td>4000 K</td>
</tr>
<tr>
<td>Fluorescent</td>
<td>4000 K to 4800 K</td>
</tr>
<tr>
<td>Sunlight</td>
<td>4800 K to 5400 K</td>
</tr>
<tr>
<td>Cloudy daylight</td>
<td>5400 K to 6200 K</td>
</tr>
<tr>
<td>Shade</td>
<td>6200 K to 7800 K</td>
</tr>
</tbody>
</table>
11.6.2 Lens Selection

If the choice of the camera body is correct, then it should have the ability to change the lenses. All the professional cameras are capable of using interchangeable lenses; this provides many choices in terms of lens selection. The primary difference between different lenses is the focal length, which controls the angle of view. However, there are also other small, subtle differences. The cameras which are commonly available nowadays have got different sensor sizes, which give them different magnification ratio. This means that the same lines will provide a larger image on these cameras.

For example, a 300-mm lens on a camera body which has got 1.5 magnification ratio, will behave like a 450-mm lens on a camera with regular size sensor. This may prove to be disadvantageous if you want to use wide angle lenses because if you use a 20-mm lens, the output will be close to 30-mm lens. This means that you cannot use wide angle lenses to the minimum focal lengths they provide, it will always be one and a half times larger than that.

Telephoto zoom lenses are among the most favoured lenses among sports photographers. These lenses provide longer focal lengths and also the ability to change the focal length to a certain extent. These are great for shooting close ups and getting inside the game. Wide-angle lenses are also used along with fisheye lens to cover the entire field in sports photography, to establish the environment at that moment. Along with telephoto lenses, extenders and teleconverters are also used. These are used to further increase the focal length and achieve even more extreme close-ups. Although using extenders and teleconverters will reduce the sharpness to some extent but they cannot be ruled out because of their role in getting the photographer close to the players.

Other accessories like monopods and tripods are also necessary. It is almost impossible for the photographer to handhold a long lens and take sharp photographs. Tripods are usually a problem because of their immobility. Usually, the photographers are not allowed to use tripods close to the boundary of the field. In this case, monopods come in handy. Although it does not provide the stability that tripod does, but because of its ability and ease of carrying it around and also less space required for placing monopods compared to tripods, it is favoured over tripods. Other accessories include waist bags and jackets. Time is a luxury that a sports photographer does not have. So, all the equipment that is supposed to be used must be accessible as fast as possible during the photography session. The waist bags and jackets will help you keep your equipment ready to use and immediately available when required. Photographers should generally practice changing lens’s filters and other accessories so that these processes do not take up much time while in the field.
9. Which lenses are among the most favoured lenses among sports photographers?
10. What is the primary difference between different lenses?

### 11.7 USEFULNESS OF THE PHOTOGRAPHS

Usefulness of any photograph decides whether the photographer of that picture is good or not. Selling pictures is not an easy task if you do not know the things that make any photograph useful. Commonly, the sports photographs serve two purposes:

- They are used in magazines, newspapers.
- They are used in commercial photography.

In other words, they can be used for editorial purposes, like in case of newspapers and magazines; or they can be used in advertisements or used by a client, called the commercial purpose. However, for both kinds of uses, there are some common factors that are looked for. Some of the things considered are:

- The appearance of the subject
- Quality of the image in terms of sharpness
- Clarity
- Contrast
- Framing
- The ability to be cropped to fit into the layout of the publication

The editor may choose to keep a few photographs or all of them depending on his own choice.

#### 11.7.1 Editorial Use

Editorial use means that the photographs will be used in newspapers, magazines or other publications. The photographs will be similar to photojournalism in nature. The use of these photographs is very clearly defined, the photographs should tell the story. In this case, the editors need only those photographs which vividly display whatever the writer is reporting, photographs are used in the context to the article being published. They should convey the theme that is conveyed in the text. Usually, the photographs of important event in the game and the key players serve the purpose. A careful study of the previous publications of a particular magazine or newspaper would clearly tell you what other kinds of photographs a particular publication requires and uses. Although being creative and experimental is not completely ruled out but the main focus should be on telling the story with a
photograph. Due to these points, in a way this particular purpose requires photographs of a sport shot in the way photojournalism photographs are taken.

### 11.7.2 Commercial Use

For a commercial project, the use of photographs is quite different from that of editorial. Usually, these editors look for the photographs which convey a message that the client or the customer wants. These photographs not necessarily have to tell a story but usually they must convey a very strong message in terms of mood, emotion or feeling. The clients could be the manufacturers of the products, which are used by sports persons. They might need to see their logos in the photos along with strong personalities, which helps them create their brand and helps audiences relate to it. Usually, in this case it is the photographs of the players that are being used the client needs to have rights to the sportsman or the team. If it is not so, then he might be looking for photographs of the environment or other subjects like goalpost, grass and other landmark objects. There is a very interesting rule called the rule of six. The rule of six says that you can consider six bodies in a photo as a photo of the team and not just the individual players in the frame. In football, usually this brings about the need for horizontal group action photos.

### 11.7.3 Evaluating a Photograph

The basic criteria an editor uses to evaluate photographs are:

- **The image quality**
- **Peak action**
- **Uniqueness of the shots**
- **Stock images**

#### Image quality

Just like any branch of photography, the correct exposure is the first thing that is noticed in any photograph. Although sometimes good photographs may not be properly exposed, they are considered based on other properties. This implies that getting the correct exposure increases the chances of the photograph to be considered by the editor.

#### Peak action

Sports photography is all about getting action. The photographs need not be showing something being performed like a goal or a basket, but they should have great action. Catching the action at the perfect time will require very fast reflexes. However, this will ensure that the photograph is always appreciated and also can make for cover pages and spreads. These types of shots are always in demand, whether framed horizontal or vertical; these have to be usually very tightly zoomed in. Horizontal action is easier to get than vertical action short because it is sometimes very difficult to keep the subject in the centre of the frame in fast action sports.
Uniqueness

Unique photographs are always looked out for by most editors. These shots can be either action or feature photographs. Sports involve a lot of emotion, which is always different, to get unique photographs even when the game is the same every time it is played. A lot of action happens even outside the field, look for the coach of the team or the manager, their emotions and feelings also make subjects of great photographs.

Stock photographs

Stock photography is great for any commercial photographer. This is another method of making proper commercial use of your photography skills. Usually, the best way to get stock photographs is to shoot anything that you can think of and keep a huge collection of photographs. Consider this example: there was a photographer who used to take photographs of players of football. He used to shoot each and every player in the game every time the team played. He also photographed non-important events like somebody standing outside the field, sitting on benches or during the water break. He collected photographs of almost all the players doing everything in sports league. The action shots were good but rest of the images were merely very simple. This guy could make a lot of money because every time a client needed a photograph of a particular year, this photographer had something to offer every time. This necessarily does not mean that you should photograph everything that happens, but collect nicely exposed photographs of anything that you feel can be used in commercial projects, including not only the players and the field but also important people like coach, manager of the team, the team mascot and also the team ambassador if any.

11.8 LANDSCAPE PHOTOGRAPHY

Landscape photography involves photographing scenery from a single point. Photographers agree that a landscape photograph is the one in which humans, animals, and manmade buildings are not present or at least not close to the camera. They can only be used to demonstrate the scale of the scene. The term ‘landscape’ itself refers to land including all the natural features that are present on it. Photographers agree that the presence of far away any animals, humans or other structure is acceptable in a photograph of a landscape, as far as they are not the main subject. In a landscape photograph the natural scenery has to be the dominating subject.

The landscapes can be photographed in different styles by different people.
- A very simple and straightforward style called the “representational” style is all about taking photographs without any manipulations in its natural form. This does not mean that taking a representational style photograph is just about clicking the button, it involves a lot of thinking about composition,
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lighting conditions, weather. In this case, the photographer, instead of using other methods to manipulate the reality, uses his strong sense of composition to bring out the beauty in the photograph.

- ‘Impressionistic’ landscape photography is another style. This is used to take photographs which have elusive qualities. Though these photographs appear surreal, they have the ability to be called landscape photographs. These photographs, rather than the clarity of a representational style, give an ‘impression’ of landscape.

- ‘Abstract’ photography of landscapes is all about graphics art. Just like other abstract arts, the elements can be rendered as unrecognizable. Usually, a lot of manipulation is done; the photographs are intentionally overexposed or underexposed to create a work of art rather than a photograph. Use of extreme wide-angle lenses, fisheye lenses or other special effect filters is also very common with this type of photography. The emphasis is not on the subject, but on the design.

In landscape photography, visualization plays a very important role. Since the subject is not going anywhere and the lighting does not change very fast, the photographer gets enough time to think and plan the shot. Taking photographs from different angles, usually, helps in understanding the landscape. Once the photographer realizes the unique characteristic of the landscape most of the work is done. Many paintings, created by great painters in the Renaissance period, inspire photographers and play a very important role in understanding the concept of art and composition.

Landscape photography has also become an invaluable tool for creating awareness among people about the environment. Many photographers work for environmental protection organizations providing them with beautiful pictures of untouched landscapes. These play an important role in preservation of the environment and creating awareness about the same.

11.8.1 Understanding Different Types of Landscapes

Landscape photography becomes all the more interesting because of its work environment, which includes beaches, riverbanks, deserts, mountains, plains and forests. This makes landscape photography all the more enjoyable. In this section, we will discuss about different type of landscapes and the right way to photograph them.

Forests

Photographing forest presents a completely different set of challenges. There is so much variation in the subject, that the first step must involve, identification of the primary characteristic of the forest. On the basis of location, forests are classified as:

- Moist tropical forests
- Dry tropical
Various Type of Photography

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- Subalpine
- Montane subtropical
- Montane temperate forests
- Alpine

These can be further divided into various categories.

No two forest landscapes are same, as the nature of forests range from wet evergreen forests to dry deciduous forests. Owing to this difference in the nature of the forest and climate, there are differences in the flora and fauna found in them. The subject of photography can vary from a dry tree trunk, a colourful wildflower to a water stream flowing through the forest. Thus, choosing a subject is critical in forest photography. Whether you are shooting a forest from inside or outside or from a top of a cliff, you need to look for various patterns, lines and compositional elements that can be used. Lines may include rows of trees and natural patterns can be found on the rocks. Telephoto lenses and wide-angle lenses can be used to get different variations in the photographs. While wide-angle lens can make the subjects look huge, telephoto lens, by reducing the apparent distance between the trees, can make them look overcrowded.

Photographers shooting in the forests must be aware of the different kinds of wild animals and other harmful elements present in a forest. They should always go with a person who has sufficient knowledge of the environment and the flora and fauna of the forest. They should carry sufficient supply of food and water and also take good quality protective coverings for their equipment.

Plains

Plains are wide-open areas, which due to lack of interesting elements are hard to be photographed. Plains are found at the bottom of valleys and on plateaus at high elevations. Usually, they are devoid of any kind of forest or other interesting element like hills, cliffs etc. Plains can be primarily classified into the following:

(i) Coastal plains: This is a low-lying land area adjacent to the sea.
(ii) Fluvial plains: These are formed by rivers.
(iii) Lava plains: These are formed by sheets of flowing lava.

The most common problem, as discussed earlier, with plains is that it is difficult to find a suitable subject for photography, as the land usually does not have many natural features on it. Thus, the photographer needs to be very creative and use any possible object as a subject for photography. These landscapes provide good opportunities to the photographer to play around with wide-angle lenses. Just like every forest, every plain has its own characteristics; the photographer needs to spend some time on it and find out what it is. Some features which he can look for may include a stream, a fence, line patterns in grasslands.
Deserts

In landscape photography, some of the best pictures are that of deserts. The main characteristics of any desert include lack of any kind of vegetation, extremely dry climate and extreme temperature. Deserts may be hot or cold, extreme in both cases. There are different kinds of deserts, the most common being, sand deserts. Stony deserts have gravel surfaces and rock deserts have huge rocks. Plateau deserts and mountain deserts are also types of deserts.

The sand deserts present amazing photography opportunities during the day. In the middle of the day, the heat of the sun creates desert winds, which in turn create wave patterns on the sand. This particular pattern is among the most popular photographed patterns in the history of photography.

Deserts can help you make some really very dramatic photographs. There is no humidity and usually no artificial lights, so the nights are very dark and the weather is very clear. This helps in getting perfect photographs of stars and the night sky. Even at sunrise and sunset, the sky gives amazing hues which are fascinating to look at. In cold deserts, snow replaces sand and sand colour gets replaced with white colour, giving amazing monochrome photographs.

Beaches or seacoasts

Photographing beaches is a different experience altogether. The climate is very predictable; temperature is always moderate, with bright shining sunlight and a very clear view of sky till the horizon without any fog in the environment. The first step here also is to think about the character of the shore and then proceed. Palm trees are the only kind of vegetation that one can expect to find on beaches. These thin tall trees can be used to create frames in your compositions. Waves, sand, the blue sky and the water then combine with your creative vision and give some very amazing photographs. If it is too windy, you should take care that the sand does not get inside your equipment. Sufficient care of equipment should also be taken while going close to the water. You can experiment with different shutter speeds to get different effects of the waves, use faster shutter speeds to freeze them or use slow shutter speeds to create blurred and ghostly images of the water. Wide-angle lenses can take amazing landscape photographs when the horizon is included. Telephoto lenses are also great for photographing the palm trees. These open environments also provide great opportunities to use the fisheye lens.

Mountains

Mountains are the most primitive landscapes. They usually have very clear and well-defined characteristics. Snow-covered, volcanic or any other type, they can be amazing subjects for the photographs. While photographing mountains, the photographer must always look for patterns and dynamic lines as these landscapes can give surprisingly unexpected and wonderful compositions. Once you feel that you have understood a mountain landscape, think again and take a close look, you will definitely find new dynamic lines and symmetrical patterns to photograph.
Landslakes with flowing water

Flowing streams can be used to divide frames creatively. Water can be the centre of interest in the image or it can help you support your main subject. It can also be a diagonal, horizontal or vertical line that can help you enhance your compositions.

Reflection in water can also enhance photographs, by creating a mirrored symmetry of the landscape. Using a polarizing filter helps, if the reflection is too strong or distracting for the composition. Sometimes, due to reflection in water, there could be problems in the photograph. To overcome these, you can change your vantage point or date for a while and let the elevation of the sun change. Different shutter speeds can give completely different meanings to the photographs. Humans have always been very attracted to water. Presence of water or flowing water can greatly impact the feeling conveyed through a photograph.

Tips for photographing waterfalls

Most waterfall images highlight smooth water. Although it appears to be a professional technique, amateurs can easily capture similar results with any DSLR camera. Professional nature photographers regularly capture stunning images of cascading waterfalls using a combination of technique and equipment. Highlighted by silky-smooth water textures, dramatic contrast and tranquil atmosphere, amateur photographers, are most of the time awed by these professional images. Thankfully, with today’s DSLR cameras, amateurs can easily capture similar quality results by following three simple steps: using the proper equipment, shooting at the right time and properly setting up the camera.

Equipment

While each camera lens, filter and accessory has its place, amateur photographers need only a few common pieces of equipment to be added to their dSLRs to capture stunning photos of cascading water.

Much like architectural photography, a sturdy tripod is the backbone of any slow-shutter landscape image. Whether buying an inexpensive version at a department store or a carbon-fiber version at a local camera store, the photographer should look for a tripod which has a good amount of weight to hold steady and a quick release head. A shutter release cable can also increase the stability of the camera by limiting the photographer’s contact with it. A simple polarizing filter can be used to produce vivid colours, while decreasing shutter speeds, dramatically. A circular polarizer works best, but it requires the photographer to dial the filter into the correct position relative to the sun. Another option is a neutral density filter, which decreases shutter speeds by two to three full stops.

Time

Waterfalls images must be created before the sunrise or after sunset. Unless located in a well-shaded area, images created during the other parts of the day will either have too high shutter speed or blown out detail in the background. Shooting at
either dusk or dawn gives photographers the perfect light required to lower the camera’s shutter speed without losing detail in the bright portions of the background. The even lighting will limit shadows throughout the frame, but may lead to white balance problems. All digital sensors react differently in this situation, but the camera may need the white balance set to shade.

Camera settings

After setting the camera on a tripod in proper light conditions, and with a strong composition, it is important to use the proper camera settings to capture the desired image. There is a variety of shooting modes available; however, the general rule is to use a small aperture with a long shutter speed.

Whether using shutter priority, aperture priority or manual mode, select the camera’s lowest ISO setting. Next, select an aperture between f/11 and f/22 and a shutter speed well above 1. The slow shutter speed will create the desired silky water texture, while the small aperture will create sharp detail through a large depth of field. Use the LCD screen to verify results and adjust the aperture and shutter speed combination to obtain the desired image.

11.8.2 Understanding Lighting, Climate and Weather Conditions

Because of the nature of the landscapes it is not possible to use artificial lights while shooting them. It is very easy to light your subject the way you want, when you are inside a studio, however, when it comes to landscape photography using artificial lighting to get proper control of the scene is just not possible. Thus, to get good photographs in such a situation the photographer must use the natural and available lights to the maximum possible efficiency. This makes the understanding of lighting, climate and weather conditions crucial for the photographer.

Lighting

As discussed earlier, lighting depends on the sun and the skylight. However, these considerations are different in case of architectural and landscape photography. In landscape photography, the subjects vary and generally the horizon is visible, which is not the case in architectural photography. Also, for shooting architectural photographs, you need sufficient light, generally bright light, but in case of landscape photography it is not always necessary to have bright light; sometimes low lights, as during sunset and sunrise, also turn out to be very beautiful.

Let us now discuss the different lighting situations for landscapes. In nature the lighting situations directly depend on the time of day.

- **Dawn:** This is the time of the day, just before sunrise, when there is not sufficient light in the environment. The sky is not completely dark as some brightness begins to appear in the east as the sun is about to rise. To capture the beauty of this time, long exposure is required. A very good and stable tripod along with a good wide-angle lens can make some very interesting photographs. This is the time when the sky is saturated with colours,
birds have started moving out of their nests, and other animals have just started their activities. These can be very good subjects for photographs. Because of the collapse of the sky, it is easy to get surreal and impressionistic photographs.

- **Early morning hours:** This is the time of the day when the sun is at a very low angle, that is, very close to the horizon. The sky is not dark anymore, and there is sufficient light in the environment. This time is also called as the golden hour as the timing and light is just perfect for all kinds of landscape photography. Sunrise presents a good subject of photography, the effect of sunrise on the environment is very amazing to watch and photograph. This is the time when everything changes, night creatures go to sleep and day creatures get up from sleep. There is a complete transition in the environment. Thus, if you choose your subject wisely, you can surely get great photographs.

- **Late morning hours:** At this time of the day, the sun has moved away from the horizon, the sky is very bright and the intensity of the light is also very high. During this time, the sun has reached very close to its full intensity and the dominant colour in the environment is the colour of sunlight which is light yellow or white. In shade, you start getting a light blue tint because of the bright blue sky. This is also a good time for photography as the lighting is sufficient for high shutter speed photographs. The angle of the sun is around 45° which is perfect for revealing the texture of any landscape. During this time, the daily activities of birds and animals are in full motion. Thus, during this time, you can get a wide variety of subjects to photograph.

- **Noon:** At noon, the sun is exactly over the head, and the sunlight’s intensity is at its maximum. The sky is equally bright in all directions but still the intensity of skylight is very less compared to that of sun. At this time, the photographs which are taken usually have a very high contrast and the shadows are exactly below the subjects, so it is not the preferred time for photographing some subjects.

- **Evening:** This time is very similar to late morning hours and the sun is at a similar angle, but in the opposite direction. Usually, in evening, the colours are different. During this time, the angle of the sun is good for photographing all kinds of objects, as it brings out the textures of the surface. The colour of the sun also gets a little more saturated now, and this requires some colour correction or setting up the correct white balance. Since early times, sunset has been a popular subject for photography. Human mind is always fascinated by sunset, as it marks the beginning of the night when the environment is very dark and all activities are minimized.

- **Twilight:** This is another beautiful time of the day when the sun has set, but the sky is not completely dark. This is a short period of time when the intensity of the light in the environment starts decreasing and any kind of hue

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**NOTES**

**Various Type of Photography**

**Self-Instructional Material**

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can occur in the sky. This is the most favourite time of the day for many landscape photographers. Sometimes, there is a tendency among the photographers to pack their cameras as the twilight begins, as the light is not sufficient for shooting, but one should take advantage of this condition. During this time, the sky has some beautiful colours, and by using long exposures, great photographs can be taken.

- **Night:** Throughout the night, the illumination remains the same, as there is no sun and the sky is completely dark. But the beauty of stars and moon can only be captured at this time. Although it may not seem likely, but the intensity of the moonlight on some days is bright enough to take good landscape photographs using long exposure. Infrared photography is also done during night-time. Beautiful photographs of the stars and moon along with the silhouette of the landscape can be very eye-catching.

Thus, since the same landscape can look different at different times of the day. To have good photographs, it is very necessary to choose the right time of the day.

**Climate and weather conditions**

Just like the effect of the time of the day, the effect of climate and weather conditions can completely change the look of a photograph. We have discussed about normal weather conditions in the architectural photography section; however, in this section we will talk about bad weather conditions and how they can be utilized by a photographer. Usually, when the weather is bad, most photographers put the camera in the bag and run for shelter, however, the ones who stay behind and face the weather can really capture some rare and amazing photographs. Let us talk about different weather conditions that can be utilized.

**Rain**

Whenever it rains the water tends to create a shiny surface on almost all the materials which are exposed to the rain. In cities, all the buildings, roads, trees and every structure that is present in open begins to shine. The roads start reflecting the environment, similar to the way a water body does. These can become very interesting subjects for photographs. In case of forests or other natural landscapes, water collects in holes on the ground, on the leaves, wets the tree trunks and other objects, when photographed, these objects and structures give reflection and look very shiny in the photograph, as opposed to photographs taken in normal weather conditions. Capturing animal portraits can also present some amazing opportunities, as due to the rain the animals tend to curl up and hide inside small openings. During the rain, usually, long exposures are required as due to the presence of clouds, the environmental lighting is not bright enough for using faster shutter speeds with smaller apertures. It is also important to take care of the photography equipment, as moisture is one of the biggest enemies of any optical and photographic equipment. Good waterproof covers should be used and care must be taken to ensure that
the water does not enter the camera or lenses. Since long exposures are required, carrying along a tripod is usually a good idea.

**Snowfall**

Snow can change a landscape into a wonderful fairytale landscape. The whiteness of the snow creates amazing contrast with objects present in a particular environment, and this helps in creating very artistic photographs. Generally, the snow photographs are much more appealing than any other kind of photographs and people can very easily relate with these photographs. Although snow is not present everywhere and it may be difficult to reach such environments, but it usually pays.

As discussed earlier, if there is a lot of white in the frame there may be a problem with accurate exposure. Whenever there is a lot of snow inside the frame or composition, the camera may tend to give an underexposed photograph, because it is fooled by the presence of so much white. To solve this problem, it is necessary to manually overexpose whatever values the camera decides. Another problem with snow is that in this case, the camera finds it difficult to choose the right white balance. Thus, it must be decided manually.

**Lightning**

This is one of the most challenging photography subjects. Photographers wait for hours to get the recent photograph of lightning, and when they do, it is worth the wait. A very good tripod and very long shutter speeds are must for capturing lightning photographs. Since lighting is not in our control, and we do not know in which direction and when lightning will appear, the commonly used technique for taking lightning photographs is to set up the tripod and position the camera in such a way that the composition is complete, and then wait for the lightning bolt. Usually, bulb exposure is used. This involves keeping the shutter open, waiting for the lightning bolt to appear, and then closing the shutter. This particular type of photography is all about timing, and good anticipation and patience are must.

**Storm and other severe weather conditions**

This kind of photography demands dedication and a very adventurous spirit. There are many photographers who have devoted their careers and lives to this kind of photography, which shows amazing effects of nature. This type of photography involves many dangers, but the photographs are so highly priced that these dangers are usually forgotten. These photographs present nature in the most extreme and powerful form and by inducing fear in the mind of the viewer, forces them to think about the power of nature. The equipment required for this kind of photography is very different from that used in normal photography. Usually, two different methods are followed in this photography. One is when the photographer tries to stay away from the storm and is only exposed to the rain and strong winds. The equipment used by these photographers usually have
Various Types of Photography

NOTES

Covers and lens cleaners that can be used to get rid of water droplets quickly and to protect the equipment from damage due to water. The other type of photography is done by staying close or even inside the storm. In this method, special type of tripods are used that can be drilled into the ground and the cameras are fixed with protective gear. This kind of equipment is left in the parts of the storm and is operated by remote control from a safe location. After the storm has passed, the equipment is collected.

11.8.3 Urban Landscape Photography

A newly developed branch of landscape photography is urban landscape photography. Generally, in landscape photography we try to avoid man-made structures, but in urban landscape photography, as the name suggests, the urban structures are the main subject. Although the name is urban landscape photography, it is not like natural landscape photography; in fact it is quite different. It is a very specialized branch of photography, which is related to cities with high-rise buildings.

Just like landscape photography, in urban landscape as well one needs to find the character in a particular cityscape. It is very important to understand the character of the city itself to understand the character of the building. Some cities present very beautiful landscapes during the day, while some do the same at night. Finding a suitable subject is as important as finding a suitable vantage point. In cityscapes or urban photography, the vantage point is the key to success. Sometimes you may need to go to the top of a very tall skyscraper and sometimes the view from the street may work just fine. The nice compositional elements to play around with in an urban landscape are the lines. Dynamic lines can be found very easily in urban environment. Manipulation of these lines can be very interesting and can help you to get good photographs.

Different areas in the city have different functions, and so do the different buildings. Understanding the functionality of an area and the buildings in that area is necessary to understand the character of that particular environment. In some places you would find very colourful buildings just like flowers in the garden, while some places would look like concrete jungles. Corporate buildings, big stadiums, busy markets, residential complexes are just some of the variations that you could find. In contrast to natural landscapes, where you find trees and other flora and fauna, in urban landscapes you find elements like glass, metal, steel in abundance. Reflection of the glass, shine of metal and toughness of concrete present the real character of the landscape to the viewers.

Usually there is no special photographic gear required to shoot in the city, just the ordinary gear that is used will be sufficient. However, to manipulate the reflections on the glass surfaces, you may need the circular polarizing filter. Some other filters like natural density filters and graduated filters might also be required. It is also advisable to carry colour meter and light meter. Good
tripods, wide-angle and ultra-wide-angle lenses also help. Fisheye lens can also be used for some creative and memorable shots. Sometimes, in a city, some structures are prohibited for photography. You must be aware of these prohibitions, such that you do not break any law. Carry a map of the city with you and learn about all areas, what activities happen in those areas and anticipate the right time for photography in that area. The same area can give you different photographs, depending on different times of the day. A busy business street might acquire a completely different character in the evening after the office hours.

The photograph shown in Figure 11.5 was taken in New Delhi at sunset. The high contrast and low-key image with saturated single tone gives a feeling to the image that will make it memorable.

![A Sunset in the City](image)

So, to conclude we can say that effective urban photography involves understanding the character of the city and choosing the correct area, correct time and the correct vantage point.

### 11.8.4 Industrial Disasters

Photography is not as easy as it appears to be. In some cases, photographers are also required to risk their lives in order to get the desirable results. Just like other photographs, photographers also capture industrial disasters through their lenses. Industrial disasters such as Bhopal Gas Tragedy reach us through the lenses of photographers only.

**Check Your Progress**

11. What does landscape photography involve?
12. How are plains classified?
11.9 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The real purpose of taking a portrait photograph is to show your subject.
2. The most common position for a rise in portrait photography is at the level of upper one third.
3. In portrait photography eyes are supposed to be the most dominant subject in any photograph.
4. According to the rule of thirds, the entire frame is divided into three parts—horizontally as well as vertically, by two horizontal and vertical lines.
5. Wildlife photography is a genre of photography concerned with documenting various forms of wildlife in their natural habitat.
6. In the early days of photography, it was difficult to get a photograph of wildlife due to slow lenses and the low sensitivity of photographic media.
7. Environmental photography involves images that showcase natural surroundings and landscapes.
8. The Extreme Ice Survey began in 2006.
9. Telephoto zoom lenses are among the most favoured lenses among sports photographers.
10. The primary difference between different lenses is the focal length, which controls the angle of view.
11. Landscape photography involves photographing scenery from a single point.
12. Plains are classified as coastal, fluvial and lava plains.

11.10 SUMMARY

- Aesthetics is a very important part of any kind of art. Since photography is an art as well, aesthetics play as much an important role as the techniques which are used for photographing any subject.
- There are a lot of factors which play an important role in creating a photograph. One of them is ‘abstracting’.
- Composition is important because your image cannot speak and guide the viewer’s eyes in the photograph.
- Once the composition is defined, you will need to get the composition in the frame of your camera; different compositions will require different angles of view. To change the angle of view, the focal length of the lens must be set properly.
When you are a photographer who photographs people, your subjects will come in all varieties; men or women, singles or couples and groups. All these subjects require different considerations and aesthetics.

Posing is a very important element of composition in photography. It helps in creating dynamic lines and different patterns in the composition.

One of the common rules followed in composing a photograph is the rule of thirds. According to this rule, the entire frame is divided into three parts—horizontally as well as vertically, by two horizontal and vertical lines.

A portrait does not necessarily have to be of a single subject all the time. Usually, you encounter families, friends or groups, couples whom you have to photograph.

As a photographer, you must not only focus on capturing a person’s personality but also on enhancing it. A lot of people have problems with aesthetics. As the photographer, it will be your responsibility to take care of these things.

Wildlife photography is a genre of photography concerned with documenting various forms of wildlife in their natural habitat.

Environmental photography involves images that showcase natural surroundings and landscapes. This type of photography includes nature photography as well as environmental portraits.

When the idea of sports photography comes to one’s mind the first question would be, what the requirement is, what makes sports photography different from regular photography, and how to achieve great photographs from sports.

Usefulness of any photograph decides whether the photographer of that picture is good or not.

Landscape photography involves photographing scenery from a single point. Photographers agree that a landscape photograph is the one in which humans, animals, and manmade buildings are not present or at least not close to the camera.

11.11 KEY WORDS

- **Abstract**: Abstract is from a Latin word meaning ‘pulled away, detached,’ and the basic idea is of something detached from physical, or concrete, reality.

- **Composition**: Composition is the placement or arrangement of visual elements or ‘ingredients’ in a work of art, as distinct from the subject.

- **Aesthetics**: Aesthetics is a branch of philosophy that deals with the nature of art, beauty, and taste and with the creation and appreciation of beauty.
11.12 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. What are the factors to be considered while taking a portrait photograph?
2. How can one choose the best lens and other settings for a particular composition?
3. What are the rules of composition?
4. What is the usefulness of sports photographs?

Long-Answer Questions

1. What is wildlife photography? Comment on its history.
2. How does body language play a role in photography? Discuss.
3. What are the impacts and issues of environmental photography?
4. Mention certain tips for beginners and amateur sports photographers.
5. What are the different styles in which landscape can be photographed?
6. Discuss different lighting situations for landscape.

11.13 FURTHER READINGS


12.0 INTRODUCTION

Technology has had some tremendous impact on photography, be it the way the final product is processed or the way we store our photographs, the technology advancements have left a massive impact on the industry. One of the great things about digital photography is that you are able to see your photos right after you take them. If you shoot with film, you need to get your photos processed before you can see the finished product.

12.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the importance of photography in advertising
- Understand the use of war photography
- Learn about social photography

12.2 CONFLICT, WAR AND POLITICAL PHOTOGRAPHY

War photography involves photographing armed conflict and its effects on people and places. Photographers who participate in this genre may find themselves placed
in dangerous situations, and are sometimes killed trying to get their pictures out of the war arena.

Origin

Roger Fenton was one of the first war photographers. He captured images of the Crimean War (1853–1856). With the invention of photography in the 1830s, the possibility of capturing the events of war to enhance public awareness was first explored. Although, ideally photographers would have liked to accurately record the rapid action of combat, the technical insufficiency of early photographic equipment in recording movement made this impossible. The daguerreotype, an early form of photography that generated a single image using a silver-coated copper plate, took a very long time for the image to develop and could not be processed immediately.

Since early photographers were not able to create images of moving targets, they recorded more sedentary aspects of war, such as fortifications, soldiers, and land before and after battle along with the re-creation of action scenes. Similar to battle photography, portrait images of soldiers were also often staged. In order to produce a photograph, the subject had to be perfectly still for a matter of minutes, so they were posed to be comfortable and minimize movement. A number of daguerreotypes were taken of the occupation of Saltillo during the Mexican–American War, in 1847 by an unknown photographer, although not for the purpose of journalism.

John McCosh, a surgeon in the Bengal Army, is considered by some historians to be the first war photographer known by name. He produced a series of photographs documenting the Second Anglo-Sikh War from 1848–49. These consisted of portraits of fellow officers, key figures from the campaigns, administrators and their wives and daughters, including Patrick Alexander Vans Agnew, 911 Hugh Gough, 1st Viscount Gough; the British commander General Sir Charles James Napier; and Dewan Mulraj, the governor of Multan. He also photographed local people and architecture, artillery emplacements and the destructive aftermath. McCosh later photographed the Second Anglo-Burmese War (1852–53) where he photographed colleagues, captured guns, temple architecture in Yangon and Burmese people.

The Hungarian–Romanian Károly Szathmáry Papp took photographs of various officers in 1853 and of war scenes near Oltenița and Silistra in 1854, during the Crimean War. He personally offered some 200 pictures albums to Napoleon III of France and Queen Victoria of the United Kingdom in 1855.

Profession Today

Journalists and photographers are protected by international conventions of armed warfare, but history shows that they are often considered targets by warring groups—sometimes to show hatred of their opponents and other times to prevent
the facts shown in the photographs from being known. War photography has become more dangerous with the advent of terrorism in armed conflict as some terrorists target journalists and photographers. In the Iraq War, 36 photographers and camera operators were abducted or killed during the conflict from 2003–2009.

Hilda Clayton photographed the fire-accident of a mortar that killed her and 4 other soldiers in Afghanistan during 2013. Several have even been killed by US fire; two Iraqi journalists working for Reuters were notably strafed by a helicopter during the July 12, 2007, Baghdad airstrike, yielding a scandal when WikiLeaks published the video of the gun camera. Hilda Clayton was killed when the mortar she was photographing accidentally exploded. War photographers need not necessarily work near active fighting; instead they may document the aftermath of conflict. The German photographer Frauke Eigen created a photographic exhibition about war crimes in Kosovo which focused on the clothing and belongings of the victims of ethnic cleansing, rather than on their corpses. Eigen’s photographs were taken during the exhumation of mass graves, and were later used as evidence by the International Criminal Tribunal for the former Yugoslavia.

Social media, as an instantaneous source of communication, makes it very hard to maintain control over how images are presented. In the past few years, the rapid and undetermined spread of war photography on social media has diluted its meaning. At the same time, professional photographs have become seemingly interchangeable with amateur photographs. This changes both the political and aesthetic purposes of the photographer. Anyone can take a graphic picture and obtain thousands of likes in a few minutes, but experienced photographers have a better chance at touching and informing people on wider issues all at once. The project to give the viewer an access to conflicts is supported by an artistic process. The role of civilians who share images of a dramatic event happening around them should not be dismissed or undermined, but they do not have the same function as professional photographers do. Amateur photographs often carry high shock value and might be decisive in an emergency situation to ask for public safety, but professional war photographers who embrace both political and aesthetic concerns in their work offer a better prospect of people understanding and acknowledging the broader conflict it illustrates.

In a world where anyone can take a viral photograph, without explanation or context, war photographers are certainly the most equipped to record complex events and a “nuanced truth.” War photography might not be a pure window into violent conflicts, informing us of pure facts; if appreciated and understood as art with a particular perspective, though, it is an incredibly powerful tool for populations far away from danger to cultivate a better understanding of the reality of war.
12.3 SOCIAL PHOTOGRAPHY

Social photography or social documentary photography or concerned photography is the recording of how the world looks like, with a social and/or environmental focus. It is a form of documentary photography, with the aim to draw the public’s attention to ongoing social issues. It may also refer to a socially critical genre of photography dedicated to showing the life of underprivileged or disadvantaged people.

Origin of social documentary photography

Social documentary photography has its roots in the 19th Century work of Henry Mayhew, Jacob Riis, and Lewis Hine, but began to take further form through the photographic practice of the Farm Security Administration (FSA) in the USA. The FSA hired photographers and writers to report and document the plight of poor farmers. Under Roy Stryker, the Information Division of the FSA adopted a goal of “introducing America to Americans.” Many noted Depression-era photographers were fostered by the FSA project, including Walker Evans, Dorothea Lange, and Gordon Parks. The photographers documented the situation of poor farmers, whose economic existence was threatened, and created a new style with photographic documentation of social problems.

FSA made 250,000 images of rural poverty, but only about half survive. These are now housed in the Prints and Photographs Division of the Library of Congress and online. From these some 77,000 different finished photographic prints were originally made for the press, plus 644 color images from 1,600 color negatives.

Characteristics of social documentary photography

Social documentary photography or concerned photography may often be devoted to ‘social groups’ with socio-economic and cultural similarities, showing living or working conditions perceived as shameful, discriminatory, unjust or harmful. Examples include child labor, child neglect, homelessness, poverty among segments of society, impoverished children and the elderly, and hazardous working conditions. The poor, the social outcasts, or lower classes are portrayed in compassionate observation. The documentary power of the images is associated with the desire for political and social change.

Photography for Advertising

Advertising and photography are interlinked. Nothing speaks greater than imagery and photographs are perfect options for advertisements to gauge a larger audience and connect with them through photographs. Digital age has introduced several new measures for the advertisements through which they can take advantage of photography and convey their message to a larger audience.
Check Your Progress

1. What does war photography involve?
2. What is social documentary photography?

12.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. War photography involves photographing armed conflict and its effects on people and places.
2. Social documentary photography or concerned photography is the recording of how the world looks like, with a social and/or environmental focus.

12.5 SUMMARY

- War photography involves photographing armed conflict and its effects on people and places.
- Photographers who participate in this genre may find themselves placed in dangerous situations, and are sometimes killed trying to get their pictures out of the war arena.
- Roger Fenton was one of the first war photographers. He captured images of the Crimean War (1853–1856).
- Since early photographers were not able to create images of moving targets, they recorded more sedentary aspects of war, such as fortifications, soldiers, and land before and after battle along with the re-creation of action scenes.
- Hilda Clayton photographed the fire-accident of a mortar that killed her and 4 other soldiers in Afghanistan during 2013.
- Social media, as an instantaneous source of communication, makes it very hard to maintain control over how images are presented.
- Social documentary photography or concerned photography is the recording of how the world looks like, with a social and/or environmental focus.
- It is a form of documentary photography, with the aim to draw the public’s attention to ongoing social issues.
- Social documentary photography or concerned photography may often be devoted to ‘social groups’ with socio-economic and cultural similarities, showing living or working conditions perceived as shameful, discriminatory, unjust or harmful.
12.6 KEY WORDS

- **Documentary**: Documentary refers to a film or television or radio programme that gives facts and information about a subject.
- **Photography**: The art or practice of taking and processing photographs is called photography.
- **Journalism**: The activity or profession of writing for newspapers, magazines, or news websites or preparing news to be broadcast is called journalism.

12.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

**Short-Answer Questions**

1. What is war photography?
2. Write a short note on social documentary photography.
3. How to use photography for advertising?

**Long-Answer Questions**

1. How did war photography come into existence? Discuss.
2. Discuss the role of some of the greatest war photographers in the popularity of war photography.
3. What are the characteristics of social documentary photography?

12.8 FURTHER READINGS

UNIT 13 NEWS VALUE AND PHOTO FEATURES

Structure
13.0 Introduction
13.1 Objectives
13.2 News Values and Features
   13.2.1 Photo Essays
   13.2.2 Photo-Journalism
13.3 Picture Magazines: Colour Photography
   13.3.1 Preservation Issues
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13.5 Summary
13.6 Key Words
13.7 Self Assessment Questions and Exercises
13.8 Further Readings

13.0 INTRODUCTION

News values are general guidelines or criteria which determine how much prominence a media outlet gives a news story. So, they apply news values to decide which stories to publish. They retain the most newsworthy ones and filter out information that is of little interest to their audience. Hard news generally refers to up-to-the-minute news and events that are reported immediately, while soft news is background information or human-interest stories. Politics, war, economics and crime are considered hard news, while arts, entertainment and lifestyles are considered soft news.

13.1 OBJECTIVES

After going through this unit, you will be able to:

- Learn about news values for pictures
- Discuss about photo essays- photo features
- Understand the qualities for photo-journalism
- Describe picture magazines and colour photography
13.2 NEWS VALUES AND FEATURES

Among the many lists of news values that have been drawn up by scholars and journalists, some like Galtung and Ruge’s attempt to describe news practices across cultures, while others have become remarkably specific to the press of certain (often Western) nations. These lists show the considerable overlap in the conceptualization of news values, while at the same time point to the vastly different aspects of news production that news values may refer to.

Galtung and Ruge, in their seminal study put forward a system of twelve factors describing events that together are used as a definition of ‘newsworthiness’. Focusing on newspapers and broadcast news, Galtung and Ruge devised a list describing what they believed were significantly contributing factors as to how the news is constructed. Their theory argues that the more an event accessed these criteria, the more likely it was to be reported on in a newspaper. Furthermore, three basic hypotheses are presented by Galtung and Ruge: the additivity hypothesis states that the more factors an event satisfies, the higher the probability that it becomes news; the complementarity hypothesis states that the factors will tend to exclude each other; and the exclusion hypothesis states that events that satisfy none or very few factors will not become news.

According to A. Boyd: “News journalism has a broadly agreed set of values, often referred to as ‘newsworthiness’...” The language of news is linear, elaborating an event report along a single dimension with added information, illustration, quotation and discussion. More often than not it is the news value of a particular event that slots it on the number one position. News values, sometimes called news criteria, determine how much attention a news story is given by a media outlet, and the attention it is given by the audience. They explain how editors and other journalists decide that one piece of information is news while another is not. News values are not universal and can vary widely between different cultures. In Western practice, decisions on the selection and prioritization of news are made by editors on the basis of their experience and intuition, although analysis by J. Galtung and M. Ruge showed that several factors are consistently applied across a range of news organizations. This theory tested on the news presented in four different Norwegian newspapers from the Congo and Cuba crises of July 1960 and the Cyprus crisis of March-April 1964, and the data in the majority of cases found to be consistent with their theory. Some of these factors are listed below, together with others put forward by Schlesinger and Bell. According to Ryan, “there is no end to lists of news criteria”. In 2001, this 1965 study was updated by Tony Harcup and Deirdre O’Neill, in a study of the British press. The findings of a content analysis of three major national newspapers in the UK were used to evaluate Galtung and Ruge’s original criteria critically and to
propose a contemporary set of news values. Forty years on, they found some notable differences including the rise of celebrity news values and that good news (as well as bad news) was a significant news value, as well as the newspaper’s own agenda. They examined three tabloid news papers.

**News Values for Pictures**

Seven news values are used to determine the worthiness of a story: impact, timeliness, prominence, proximity, bizarreness, conflict, and currency.

1. **Impact:** The number of people whose lives will be influenced in some way by the subject of the story. For instance, a bakery strike may have less impact than a postal strike.

2. **Timeliness:** Recent events have higher news value than earlier happenings. Of particular value are stories brought to the public ahead of the competition. These are known as scoops.

3. **Prominence:** For the same occurrence, people in the public eye have higher news value than obscure people. For example, we cared that basketball pro Magic Johnson and actor Rock Hudson had AIDS, while an ordinary citizen with AIDS would not have commanded the attention of the national news media.

4. **Proximity:** Stories about events and situations in one’s home community are more newsworthy than events that take place far away. For example, journalists assess the value of a news item reporting tragic deaths by comparing the number of deaths with the distance from the home community. For instance: if 1,000 persons drown in a flood in a faraway country, the story has about the same news value as a story describing how 100 persons drowned in a distant part of the United States. In turn, that 100 person story has about the same news value as a story concerning 10 flood victims within our own state.

Finally, a story about those ten victims has about the same value as a story describing a flood which drowns one person in our local community.

5. **Bizarreness:** A classic example of this is dog-bites-man vs. man-bites-dog. Man-bites-dog is more bizarre. Dog-bites-man usually is not news.

6. **Conflict:** Strife is newsworthy. War. Public anger or bitter disagreement over fundamental issues.

7. **Currency:** More value is attributed to stories pertaining to issues or topics that are in the spotlight of public concern rather than to issues or topics about which people care less. Stories come and stories go. For example:

   At the beginning of the 1990s, there were stories about the First Gulf War, the Savings and Loan Crisis, and Senate confirmation hearings on Clarence Thomas for the Supreme Court.
As time passed, those stories became less interesting and were replaced by the Los Angeles Riots, the Miami hurricane, the new World Wide Web, a comet colliding with Jupiter, World Trade Center bombing, Unabomber life sentence, and the presidential elections.

In turn, those stories were replaced by Somalia, Bosnia, O.J. and Haiti.

13.2.1 Photo Essays

A photo-essay is a set or series of photographs that are made to create series of emotions in the viewer. A photo essay will often show pictures in deep emotional stages. Photo essays range from purely photographic works to photographs with captions or small comments to full text essays illustrated with photographs. Examples of photo essays include:

- An article in a publication, sometimes a full page or a two-page spread
- A book or other complete publication
- A web page or portion of a web site
- A single montage or collage of photographic images, with text or other additions, intended to be viewed both as a whole and as individual photographs. Such a work may also fall in the category of mixed media
- An art show which is staged at a particular time and location. Some such shows also fall into other categories category
- In fashion publishing especially, a photo-editorial – an editorial-style article dominated by or entirely consisting of a series of thematic photographs

Photographers known for their photo-essays include:

- W. Eugene Smith
- Ansel Adams: Adams’s Born Free and Equal (1944) documented Japanese Americans held at the Manzanar War Relocation Center during World War II.
- James Nachtwey

Photo-essays moved from printed press to the Web.

13.2.2 Photo-Journalism

Photojournalism is a particular form of journalism (the collecting, editing, and presenting of news material for publication or broadcast) that employs images in order to tell a news story. It is now usually understood to refer only to still images, but in some cases the term also refers to video used in broadcast journalism. Photojournalism is distinguished from other close branches of photography (e.g., documentary photography, social documentary photography, street photography or celebrity photography) by complying with a rigid ethical framework which demands that the work be both honest and impartial whilst telling the story in strictly journalistic terms. Photojournalists create pictures that contribute to the
news media, and help communities connect with one another. Photojournalists must be well informed and knowledgeable about events happening right outside their door. They deliver news in a creative format that is not only informative, but also entertaining.

- **Timeliness:** The images have meaning in the context of a recently published record of events.
- **Objectivity:** The situation implied by the images is a fair and accurate representation of the events they depict in both content and tone.
- **Narrative:** The images combine with other news elements to make facts relatable to audiences.

Like a writer, a photojournalist is a reporter, but he or she must often make decisions instantly and carry photographic equipment, often while exposed to significant obstacles (e.g., physical danger, weather, crowds, and physical access).

Photojournalism works within the same ethical approaches to objectivity that are applied by other journalists. What to shoot, how to frame and how to edit are constant considerations. Photographing news for an assignment is one of the most ethical problems photographers face. Photojournalists have a moral responsibility to decide what pictures to take, what picture to stage, and what pictures to show the public. For example, photographs of violence and tragedy are prevalent in American journalism because as an understated rule of thumb, that “if it bleeds, it leads”. The public is attracted to gruesome photographs and dramatic stories. A lot of controversy arises when deciding which photographs are too violent to show the public.

Photographs of the dead or injured arouse controversy because, more often than not, the name of person depicted in the photograph is not given in the caption. The family of the person is often not informed of the photograph until they see it published. The photograph of the street execution of a suspected Viet Cong soldier during the Vietnam War provoked a lot of interest because it captured the exact moment of death. The family of the victim was also not informed that the picture would run publicly. Being exposed to such violence can have physiological and psychological effects on those who document it and is but one of many different forms of emotional labor that photojournalists report experiencing.

Other issues involving photojournalism include the right to privacy and the compensation of the news subject. Especially regarding pictures of violence, photojournalists face the ethical dilemma of whether or not to publish images of the victims. The victim’s right to privacy is sometimes not addressed or the picture is printed without their knowledge or consent. The compensation of the subject is another issue. Subjects often want to be paid in order for the picture to be published, especially if the picture is of a controversial subject.

Another major issue of photojournalism is photo manipulation—what degree is acceptable? Some pictures are simply manipulated for colour enhancement,
whereas others are manipulated to the extent where people are edited in or out of the picture. War photography has always been a genre of photojournalism that is frequently staged. Due to the bulkiness and types of cameras present during past wars in history, it was rare when a photograph could capture a spontaneous news event. Subjects were carefully composed and staged in order to capture better images. Another ethical issue is false or misleading captioning. The 2006 Lebanon War photographs controversies is a notable example of some of these issues, and see photo manipulation: use in journalism for other examples.

The emergence of digital photography offers whole new realms of opportunity for the manipulation, reproduction, and transmission of images. It has inevitably complicated many of the ethical issues involved.

Often, ethical conflicts can be mitigated or enhanced by the actions of a sub-editor or picture editor, who takes control of the images once they have been delivered to the news organization. The photojournalist often has no control as to how images are ultimately used.

The National Press Photographers Association (NPPA) is an American professional society that emphasizes photojournalism. Members of the NPPA accept the following code of ethics:

1. The practice of photojournalism, both as a science and art, is worthy of the very best thought and effort of those who enter into it as a profession.
2. Photojournalism affords an opportunity to serve the public that is equalled by few other vocations and all members of the profession should strive by example and influence to maintain high standards of ethical conduct free of mercenary considerations of any kind.
3. It is the individual responsibility of every photojournalist at all times to strive for pictures that report truthfully, honestly and objectively.
4. Business promotion in its many forms is essential, but untrue statements of any nature are not worthy of a professional photojournalist and we severely condemn any such practice.
5. It is our duty to encourage and assist all members of our profession, individually and collectively, so that the quality of photojournalism may constantly be raised to higher standards.
6. It is the duty of every photojournalist to work to preserve all freedom-of-the-press rights recognized by law and to work to protect and expand freedom-of-access to all sources of news and visual information.
7. Our standards of business dealings, ambitions and relations shall have in them a note of sympathy for our common humanity and shall always require us to take into consideration our highest duties as members of society. In every situation in our business life, in every responsibility that comes before us, our chief thought shall be to fulfil that responsibility and discharge that
duty so that when each of us is finished we shall have endeavoured to lift the level of human ideals and achievement higher than we found it.

8. No Code of Ethics can prejudge every situation, thus common sense and good judgment are required in applying ethical principles.

Photo Features: Qualities for Photo-journalism

Photojournalism has qualities that make it different from other branches of photography. These factors help photojournalists come up with images that stir the mind and touch the soul:

1. **Relevance**

The main objective of photojournalism is to tell a story better than the text or write-up that usually accompanies the photos. Therefore, it should capture images that have meaning or relevance to the story being told.

For example, a story about a mother reunited with her daughter after being apart for 20 years will be more effective if it is accompanied by a photo showing them rushing into each other’s arms.

2. **Time**

Photojournalism should tackle current issues. It should feature something that’s on the news, or something people are talking about. This will make the images more interesting to the audience or reader.

After her triumph in the London Olympics, for example, numerous photos of US gymnast Gabrielle “Gabby” Douglas in action were spread throughout the Internet. These photos were accompanied by short descriptions of how Gabby captured the attention of the crowd and the judges. The images helped people from different parts of the world to experience her victory and celebrate with her.

3. **Objective**

Photojournalism is not biased. It does not take sides. Therefore, the images should accurately show events as they are. Some photographers, however, argue that to be completely objective is quite difficult. According to them, the term “honest” is more appropriate in describing photojournalism. No matter what a photojournalist believes in; whether he prefers to be objective or honest, the most important thing is for him to present the images as is.

The secret is not to force the situation. For example, a photojournalist shooting a burial scene should not force his subject to shed tears because he wants to create a dramatic effect. Real emotions are captured candidly.

4. **Narrative**

Photojournalism works best if it is presented as a narrative. The photos should come with a short write-up or article stating important facts about the incident or event. It should tell a story.
For example, a photo that shows two little girls lifting a small box of old clothes tells a clearer story than one that shows a box marked with “old clothes”.

5. Aesthetically interesting

Photojournalists follow certain photography principles that are intended to help them produce photos that catch the attention of different audiences. Photos with the right focus, angle and colour will attract more people than those that come out blurry or unfocused.

Different Fields of Photojournalism

If you are a serious photojournalist, you should be flexible enough as there are several photojournalism fields that you may be assigned to.

- General News pertains to any event that is planned ahead of time. Examples are press conferences, product launch ceremonies and fund raising dinners.
- Spot or Breaking News – refers to any event or incident that is unplanned. You don’t know where or when it will happen, and sometimes, it shouldn’t even have happened! Examples: a house or building fire, a burglary or a car accident.
- Documentary Photojournalism – this refers to long term photography projects like trailing a candidate during the campaign period or documenting the life of an orphaned child.
- Sports Photography – the most action-packed side of photojournalism. You can take photos of any sport: a basketball game, a football championship match and even a special Taekwondo tournament.
- Portrait Photojournalism – this is not your typical portrait photo. In photojournalism, portrait shots involve significant members of the community shown in their usual environment, like a race car driver beside his car, a doctor inside the operating room or the US President in the Oval Office.

Basic Photojournalism Tips

Even if you’ve been taking photos for years, you cannot be called a good photojournalist if you do not know the basic rules of the practice. Good photos tell a story better than the text that comes with it. And in order to tell a story, your photos should have the following elements:

- humans or people
- emotions, i.e. facial or non-verbal expressions
- action
- something extraordinary or unusual (like a blind father braille-reading a story to his kid)
Your photos should focus on the faces of people, not on their backs or the backs of their heads. Take photos of people in action; of people doing things. Avoid taking photos of people shaking hands or handing out awards as these tend to bore the audience.

Make sure that your subject is always in focus. Know what your central subject should be. For example, when taking photos of people stranded because of a storm, your focus should be on the people, not on the torrent of rains. If you want to focus on the rain, your story should be about the storm, not the stranded people.

Think twice or thrice before deciding to take photos of naked people. This practice can be quite tricky as the photos might be misinterpreted by some groups or individuals. Study the circumstances first before taking the photos. For instance, when doing a story about bare-chested native women, you need to determine first how to take the photo in a manner that won’t come out offensive, or in a way that can be interpreted as gratuitous. Ask yourself if the nudity can really add something to the story before making a decision.

Finally, always take note of the angle of the shots you are taking. To make sure that you choose the right angle, take a couple of shots in different perspectives. This is similar to what film directors do when they want to capture the scenes of their movies in different points of view.

Photojournalism is an effective way of telling stories and disseminating information to a diverse group of people. Compared to texts or plain articles, photos are more attractive. People are drawn to them because the images are colourful and interesting. Best of all, photojournalism works because it does not rely only in words and phrases; photographs paint real pictures of events and emotions.

Unethical Practices

Most photojournalists consider stage-managed shots presented as candid to be unethical. There have been examples in the history of photojournalism of photographers purposefully deceiving their audience by doing so.

Mike Meadows, a veteran photographer of the Los Angeles Times, was covering a major wild fire sweeping southern California on 27 October 1993. His picture of a Los Angeles County firefighter, Mike Alves cooling himself off with water in a pool in Altadena ran both in the Times and nationally. Prior to submitting the photograph for a Pulitzer Prize, Meadows’ assignment editor, Fred Sweets, contacted the firefighter, who reportedly said he had been asked by Meadows to go to the pool and splash water on his head. Meadows denied the accusation, claiming “I may have been guilty of saying this would make a nice shot, but to the best of my recollection, I did not directly ask him to do that. ... I’ve been doing breaking news stories for years and years and I’ve never in my life set up a picture.” Meadows was suspended without pay for a week and picture was withdrawn.
from any prize competitions - the Times called it a “fabrication” and the paper’s
photography director, Larry Armstrong, said “when you manipulate the situation,
you manipulate the news.”

Edward Keating, a Pulitzer Prize winner from The New York Times,
photographed a young boy pointing a toy gun outside a Middle Eastern grocery
store, near a town where the FBI raided an alleged Al Qaeda cell. Other
photographers at the scene claimed that Keating pointed with his own arm to
show the boy which way to look and aim the gun. After the Columbia Journalism
Review reported the incident, Keating was forced to leave the paper.

Check Your Progress

1. What are news values?
2. Define a photo-essay.

13.3 PICTURE MAGAZINES: COLOUR
PHOTOGRAPHY

Colour photography is photography that uses media capable of reproducing colours.
By contrast, black-and-white (monochrome) photography records only a single
channel of luminance (brightness) and uses media capable only of showing shades
of gray.

In colour photography, electronic sensors or light-sensitive chemicals record
colour information at the time of exposure. This is usually done by analyzing the
spectrum of colours into three channels of information, one dominated by red,
another by green and the third by blue, in imitation of the way the normal human
eye senses colour. The recorded information is then used to reproduce the original
colours by mixing various proportions of red, green and blue light (RGB colour,
used by video displays, digital projectors and some historical photographic
processes), or by using dyes or pigments to remove various proportions of the
red, green and blue which are present in white light (CMY colour, used for prints
on paper and transparencies on film).

Monochrome images which have been "colourized" by tinting selected areas
by hand or mechanically or with the aid of a computer are "coloured photographs",
not "colour photographs". Their colours are not dependent on the actual colours
of the objects photographed and may be very inaccurate or completely arbitrary.

The foundation of virtually all practical colour processes, the three-colour
method was first suggested in an 1855 paper by Scottish physicist James Clerk
Maxwell, with the first colour photograph produced by Thomas Sutton for a
Maxwell lecture in 1861. Colour photography has been the dominant form of
photography since the 1970s, with monochrome photography mostly relegated to
niche markets such as art photography.
### 13.3.1 Preservation Issues

Experimentation with creating photographs that mirrored the colours of real life began in the 1840s. Each process may require different methods of preservation.

Colour photographic materials are impermanent and are by nature unstable. Chromogenic colour photographs, for example, are composed of yellow, magenta, and cyan organic dyes, which fade at different rates. Even when in dark storage and enclosed in the proper archival materials, deterioration is unavoidable. However, when given the proper preservation care, fading, colour shifting, and discolouration can be delayed.

### 13.3.2 Factors

Numerous factors can deteriorate and even destroy photographs. Some examples include:

- High temperature and high relative humidity (RH)
- Air pollution and dirt
- Light exposure
- Biological threats such as fungi and insects
- Residual processing chemicals
- Base and emulsion deterioration
- Handling and usage
- Improper storage and enclosures

Three signs of age that affect colour photography are:

1. **Dark fading** occurs regardless of the procedures taken to preserve a photograph and is unavoidable. It is instigated by temperature and RH. Cyan dyes will typically fade more quickly, which will make the image appear too red in colour.

2. **Light fading** occurs when materials are exposed to light, e.g., while on display. The intensity of the light source and ultraviolet (UV) rays will affect the rate of change and fade. Magenta dyes will typically fade the quickest.

3. **Highlight staining** occurs with older colour photographic papers, and is a yellowing of the border and highlight areas of a photograph.

### 13.3.3 Storage

In general, the colder the storage, the longer will be the “life” of colour photographs. Frost-free refrigeration, more commonly known as cold storage (below freezing) is one of the most effective ways to bring a halt to developing damage to colour photographic materials. Selecting this type of storage environment is costly and requires special training to remove and return items. Therefore, cool storage (above freezing) is more common and less costly, which requires that the temperature is...
consistently between 10–15 °C (50–59 °F) with 30–40% relative humidity with special attention to dew point to eliminate concerns for condensation. General dark storage in light tight enclosures and storage boxes is always advised for individual items. When materials are exposed to light during handling, usage, or display, light sources should be UV-filtered and intensity kept at minimum. In storage areas, 200–400 lux is recommended.

Recommended Storage

The usage of enclosures is the easiest method of preserving photographic materials from being damaged through handling and light exposure. All protective materials should pass the Photographic Activity Test (PAT) as described both by the American National Standards Institute (ANSI) in standard IT9.2–1988, and the International Organization for Standardization (ISO) in standard 18916:2007(E), Photography – Processed Photographic Materials – Photographic Activity Test for Enclosure Materials. The PAT is an archival science test that determines what kind of enclosures will preserve, prevent, and/or prolong from further deterioration while in storage.

The recommended use of archival enclosures includes each item having its own enclosure and that each enclosure is of the appropriate size. Archival enclosures may come in two different forms: paper or plastic. Choosing either option has its advantages and disadvantages.

- Paper enclosures should be non-acidic, lignin-free paper and may come in either buffered or non-buffered stock. An advantage of paper is that it is generally less costly than plastic enclosures. The opaque quality of paper protects photographs from light exposure, and the porous quality protects photographs from humidity and gaseous pollutants. However, for images to be viewed, they must be removed from the enclosure, putting the materials at risk for mishandling and/or vandalism.

- Archival quality plastic enclosures are made of uncoated polyester, polypropylene, or polyethylene. The transparent quality of plastic lends itself to easier access to the image because there is no extra step to remove the photograph. Plastic is also less resistant to tears in comparison to paper. Some disadvantages include being prone to static electricity and a risk of ferrotyping (the act of moisture becoming trapped between the enclosure and item, causing the materials to stick to one another).

After photographic materials are individually enclosed, housing or storage containers provide another protective barrier such as folders and boxes made from archival paperboard as addressed in ISO Standards 18916:2007 and 18902. Sometimes these containers have to be custom-made in order to properly store odd sizes. In general, flat storage in boxes is recommended because it provides more stable support, particularly for materials that are in more fragile condition. Still, boxes and folders should never be over-filled with materials.
**Photo (French magazine)**

*Photo* is a French magazine about photography previously published by Hachette Filipacchi Médias, and currently owned by EPMA. *Photo* was started by Hachette Filipacchi Médias as a monthly magazine in 1960. It was modeled on the magazine *American Photo*. The magazine is now published ten times a year. It concentrates on the artistic aspects of photography, rather than technical aspects. The editorial line is tripartite: fashion/nude/glamour, historical images of wars/guillotines/poverty and selected journalism news photos from around the world. It is read and distributed around the world, and is known featuring naked models, colourful saturated graphic images, and its annual amateur photography contest. It was sold by Hachette Filipacchi in 2011.

An American edition was published under the name *Photo World* from 1973 to 1978.

**People (Australian magazine)**

*People* is a fortnightly Australian lad’s mag owned by Bauer Media Group. The magazine has been published since 1950. It is not to be confused with the gossip magazine known by that name in the United States; that magazine is published under the name *Who* in Australia.

*People* focuses on celebrity interviews and scandal, glamour photography, sex stories sent in by readers, puzzles, crosswords, and a jokes page. The publisher is Bauer Media Pty Ltd. The headquarters is in Sydney.

*People* was reportedly the first weekly magazine in Australia to feature topless models.

**Moving Pictures (magazine)**

*Moving Pictures* was a quarterly magazine focusing on the film industry and the art of film. It was published from 1989 to 2012. The corporate motto was “Going places other film magazines fear to tread”.

The *Moving Pictures* brand began publishing in 1989 at the Cannes Film Festival and Market. The magazine was published on a quarterly basis. In 2004, *Moving Pictures* underwent a major makeover. The prototype for the new magazine was launched at the 2004 Cannes festival, expanding coverage and distribution to a wider audience.

The editor-in-chief was Elliot V. Kotek from 2005 to 2009, then former The Hollywood Reporter editor Howard Burns and then Kotek again for three months in 2012 when he left to take the reins of Celebs.com. The magazine, which celebrated its fifteenth anniversary in 2005, was published by the Maitland Primrose Group. In 2007 Jay Milla was named by the Maitland Primrose Group as the publisher of the magazine, which was based in Los Angeles. The magazine ceased publication in 2012.
Picture Post

*Picture Post* was a photojournalistic magazine published in the United Kingdom from 1938 to 1957. It is considered a pioneering example of photojournalism and was an immediate success, selling 1,700,000 copies a week after only two months. It has been called the UK’s equivalent of *Life* magazine.

The magazine’s editorial stance was liberal, anti-Fascist and populist and from its inception *Picture Post* campaigned against the persecution of Jews in Nazi Germany. In the 26 November 1938 issue a picture story was run entitled “Back to the Middle Ages”: photographs of Adolf Hitler, Joseph Goebbels and Hermann Göring were contrasted with the faces of those scientists, writers and actors they were persecuting.

### Check Your Progress

1. What is colour photography?
2. Where was *Picture Post* published?

### 13.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. News values are general guidelines or criteria which determine how much prominence a media outlet gives a news story.
2. A photo-essay is a set or series of photographs that are made to create series of emotions in the viewer.
3. Colour photography is photography that uses media capable of reproducing colours.
4. *Picture Post* was a photojournalistic magazine published in the United Kingdom.

### 13.5 SUMMARY

- News values are general guidelines or criteria which determine how much prominence a media outlet gives a news story.
- Among the many lists of news values that have been drawn up by scholars and journalists, some like Galtung and Ruge’s attempt to describe news practices across cultures, while others have become remarkably specific to the press of certain (often Western) nations.
- Seven news values are used to determine the worthiness of a story: impact, timeliness, prominence, proximity, bizarreness, conflict, and currency.
A photo-essay is a set or series of photographs that are made to create series of emotions in the viewer. A photo essay will often show pictures in deep emotional stages.

Photojournalism is a particular form of journalism (the collecting, editing, and presenting of news material for publication or broadcast) that employs images in order to tell a news story.

The emergence of digital photography offers whole new realms of opportunity for the manipulation, reproduction, and transmission of images. It has inevitably complicated many of the ethical issues involved.

Photojournalism has qualities that make it different from other branches of photography. These factors help photojournalists come up with images that stir the mind and touch the soul.

Good photos tell a story better than the text that comes with it.

Most photojournalists consider stage-managed shots presented as candid to be unethical. There have been examples in the history of photojournalism of photographers purposefully deceiving their audience by doing so.

Colour (or colour) photography is photography that uses media capable of reproducing colours. By contrast, black-and-white (monochrome) photography records only a single channel of luminance (brightness) and uses media capable only of showing shades of gray.

Experimentation with creating photographs that mirrored the colours of real life began in the 1840s. Each process may require different methods of preservation.

13.6 KEY WORDS

Hypothesis: A supposition or proposed explanation made on the basis of limited evidence as a starting point for further investigation is called hypothesis.

Photo Essays: A photo-essay is a set or series of photographs that are made to create series of emotions in the viewer.

Publication: The preparation and issuing of a book, journal, or piece of music for public sale is called publication.

13.7 SELF ASSESSMENT QUESTIONS

Short-Answer Questions

1. What are the seven news values that determine the worthiness of a story?
2. Give some examples of photo essays.
3. Write a short note on photo journalism.

4. What are the factors that help photo-journalists create wonderful photos?

**Long-Answer Questions**

1. What is photo-journalism? Mention the different fields of photojournalism.

2. What are the unethical practices involved in photojournalism? Discuss.

3. What are the factors that can deteriorate photographs? Discuss the measures that can be taken to store photographs for a long time.

**13.8 FURTHER READINGS**


UNIT 14 IMPACT OF TECHNOLOGY
AND FIELD ASSESSMENT

Structure
14.0 Introduction
14.1 Objectives
14.2 Impact of Technology
14.3 Field Assignment and Their Evaluation
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14.0 INTRODUCTION

Digital technology shapes and reshapes the world with each release of new technology or new breakthroughs. Photography is one of many things that went through dozens of changes thanks to the advancements in the field of digital tech. Digital cameras have significantly changed the lives of photographers worldwide. Back in the “digital free” days, photographers had to be a very skilled artist who had to handle dozens of factors to make a good photo. Taking a perfect shot was somewhat of science.

14.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the impact of technology on photography
- Discuss the practical and economic impact on photography
- Learn about artistry and digital imaging

14.2 IMPACT OF TECHNOLOGY

One can witness some really exciting as well as worrisome changes in photography. In an extremely short timeframe, photography has experiences changes from the traditional optical/chemical processes of the past to the new digital technology. The music industry was the first to experience this transition and the movie industry will surely follow. For a film, image storage still needs to achieve the capacity to economically handle 30 frames a second at high resolution.
Economic Impact

Economically, photographers have been impacted negatively in a number of ways. The current economic slowdown has reduced revenues, already meagre for many in the arts. This slowdown comes at a time when substantial re-investment in education and in new and fast depreciating equipment and software is needed. For example, in a one year time span, a top professional digital SLR camera body priced at $46,000 was replaced with a newer and superior model for $11,000. If you were one of the photographers who purchased one, you would have lost $35,000 on this one piece of equipment alone. There are other similar dramatic examples in printing equipment, computers and photographic software.

The catch 22 is that if photographers switched early, they would have suffered substantial financial loss but would now be ahead professionally. If they waited, they saved money but have now fallen behind technologically. In either case, years of investment in traditional professional cameras, enlargers and processing equipment are now almost worthless.

Digital printing materials have increased the price of printing for the professional photographer. For example, optical/chemical printing papers cost 38 cents for an 8” x 10” sheet. Pictro and Dye sublimation materials cost approximately $3.80 for the same size - a 10 fold increase. This increase in cost is in some cases offset by a reduction in labour costs.

Another economic impact has been the fact that with scanners and inexpensive photo quality printers now in many homes illegal copying of work has become increasingly simple. In addition, an ever increasing number of clients now request images in electronic format.

Selling images in electronic format without an order for prints is a problem because traditionally, no professional photographer ever “sold” their negatives. Session fees were kept low and used as loss leaders to attract clients. Photographers depended for a large part of their income on print sales. With reduced print sales, photographers should compensate by raising their session fees and charging for the rights to reproduce their work, but many have been reluctant to do so.

This reluctance is based on two reasons. One is the perception that the value of a disc with computer data is less valuable than a set of finely finished and retouched prints. Another is that too many competing photographers have entered the field. Often, the only way new and less experienced (and sometimes even more established) photographers believe that they can attract clients is with lower prices – this forces others to follow suit making it even more difficult to survive in this challenging industry.

The Learning Curve

The digital learning curve is very steep, especially for people who are not well versed in computer technology. Even with knowledge of computers, it takes several
years to adapt your thinking to digital imaging. Almost every day a photographer needs to learn something new and once a new technique has been mastered, a newer version to purchase and learn is released. For digital workflow to be smooth and successful, many new concepts need to be understood and mastered. Here are but a few of the new concepts to be mastered in digital photography.

Mega pixels, bit depth, capture software, histogram, electronic white balance, electronic file handling, tif, gif, jpg, psd, pdf, interpolation, anti aliasing, moiré and noise suppression, pixel painting, gamma, curves, levels, file storage/servers and back-ups, Firewire, USB, Ethernet, DVD and CD burning, digital portfolio management, colour management, calibration, digital retouching, un-sharp masking, digital filters and plug-ins, RGB, CMYK, Lab space, ICC colour profiles, pictro printing, dye sublimation, and the list goes on.

The Client

For clients digital technology has been a winner. In the digital studio, they can see the entire creation process in “real time”. All of the images can be immediately viewed with great colour and detail on a large projection screen. Changes can be made on the spot and input from clients and art directors can be instantly incorporated. No longer are there any unpleasant surprises after the film has been processed that might require additional photo sessions and the resulting increased costs. For publication, the internet and print, images can be sent via e-mail or FTP, saving valuable time and courier charges.

An estimated 35% of professional photographers already have partial digital capability but still shoot film. A much smaller percentage offer both full digital capture and in-house printing. More photographers are joining the digital revolution every day and most are thinking about converting in the next few years. I believe that only photographers who switch to digital in the next year or two will still be able to compete. In this fast changing world, clients expect good quality, speed and service. They will no longer wait several weeks just to see the “proofs”.

Artistry and Digital Imaging

Every day we are exposed to a barrage of mediocre images. For an image to stand out from the crowd, ever more exceptional work needs to be created. The new tools are exciting and offer endless possibilities for creativity and new art forms previously only dreamed of. The bar for artistry and excellence in image making is being set ever higher by the true professional.

There are also many who do not value quality and there is the false perception that photography has become easier. I recently talked to an intelligent and successful businessman who sincerely believed that you can take average pictures, “fix” them in Photoshop and end up with professional looking results. Nothing could be further from the truth. Only properly composed and executed images will print well, get noticed and have the desired impact. There will never be a fix for poor art direction and composition and you can never rectify improper lighting.
Photographic Education

“Most providers of photographic training are now outfitted with equipment designed to support the industry as it was in yesteryears, making the task of providing relevant training increasingly challenging.”

It is no exaggeration to say that photography today is re-inventing itself, and that many of the associated challenges are comparable to those faced in 1839 when photography first emerged from fine art painting. We currently face challenges that are unprecedented in the life of our institutions.

We need to review curricula for widespread obsolescence, modification and addition of courses. In addition, embracing digital imaging has staffing implications: when instructors were hired, they typically came to their positions with sound technical training and a wealth of industrial experience. However, the re-invention of photography demands a degree of knowledge-maintenance far exceeding “keeping up with changes in the industry” – which educational providers have done all along.

Additional challenges are posed by equipment/material price increases, decreasing currency value, higher cost of new technologies, and the need for frequent upgrades. Educational budgets have decreased severely over time, and capital funds – when and where they exist – are typically but a pale caricature of what they need to be.

Without a substantial increase in resources it is highly unlikely photographic education providers will be able to ensure training relevancy for much longer. Ours are challenging times, for we currently witness both the re-invention and expansion of photography.”

The Environment

The environment has surely been the biggest winner in the advent of digital photography. In the past years, traditional photo processors used 220-volt to power their pumps and heaters. The photo wash water would run 8 or more hours a day. Developers and bleach fixers were required to process prints and the effluent discharge wound up in the sewers. Contact sheets and proofs needed to be printed in order to preview the images. Inevitably, each year millions of discarded proofs found their way into landfill sites. All prints where protected with a spray coating of lacquers. Operators worked in spray booths and wore special protective masks to keep the toxic fumes from reaching their lungs.

One of the great things about digital photography is that you are able to see your photos right after you take them. If you shoot with film, you need to get your photos processed before you can see the finished product. Waiting to see your photos brings anticipation and a fun surprise when you finally see them developed. It feels extremely rewarding to receive a great roll of film when you had no idea of
how the final product would look. Sometimes the beauty in photos is the “rawness”. When you can’t see the result right away, you can’t retake the photo to make it perfect. What you get is an authentic and real photo.

Old to New
Just like the transition of photography from film to digital, the way we store photos has also changed. Before digital photography, photos were printed and stored in photo albums or boxes. Now, many people opt to not even print photos, they just have digital files on their smartphone or on their computer. However, many people still like the features new technology offers but enjoy having a physical copy of their photos.

Photo Booths
Photo booths are a great example of old and new technology working together. People love photo booths because they are fun, different, and you get a physical copy of your photos. TapSnap combines the old school fun of printing photos with completely customizable booths. You can have GIFs, animated borders and overlays, photo props, and unique backgrounds. After guests have snapped their photo and added customizations, they can print a hard copy of their photo while sharing it digitally on social media at the same time!

Practical
1. 5 ‘yes’, 5 ‘no’
If you’re interested in street photography, often the fear of rejection is worse. If you want a simple assignment to build your confidence, try the “5 yes, 5 no” challenge. The concept is simple: approach a bunch of strangers and ask for permission to make their portrait. You have to keep asking until you get 5 people to say “yes” and 5 people to say “no.” You will discover it is harder to get a “no” than a “yes”. If you’ve got all 5 “yes’s” but not 5 “no’s” — you need to purposefully go out and look for the scariest people you think will say “no.”

Purpose: The purpose of this assignment is to help you face rejection. In life, photography, and everything else — we are slaves of fear. This will help you face your fear head-on.

2. 10 ‘no’
If you’re really afraid of getting rejected, try out this assignment (a variation of the 5 ‘yes’/5 ‘no’ assignment). Go out and try to get 10 people to reject having their photos as quickly as possible.

Purpose: If you go out and try to find people to say “yes” to getting their portrait shot — you might become paralyzed. Instead, only approach people who you think look unfriendly and will say “no.”
3. Exposure compensation

Essentially the camera chooses the aperture/shutter speed for you, as well as the exposure. If you want to get better exposures in your photos (in P mode) — try experimenting with exposure-compensation. Ask a person to stand in the bright sun, and take a series of different photos (with different exposure compensations):

- 0
- +1
- +2
- +3
- -1
- -2
- -3

Then look at your LCD screen, and look at the exposure of each photo. Then look at the real world — how does your exposure-compensations change how your photos end up looking?

Don’t get too nerdy with this — figure out what exposure-compensations work well for your camera, in different settings. Each camera thinks differently and has different exposure compensation modes. So treat this assignment as a way for you to better understand the light, and how your camera thinks.

**Purpose:** If it is really bright outside, one should generally photograph at -1 exposure-compensation, to make the skin tones of the subject look more natural, and also to darken the shadows. Furthermore, if you’re shooting in the shade, you will often need to shoot +1 exposure-compensation to light your scene better. But once again — experiment with different exposure-compensations, and figure out what works best for you.

4. 1,000 photos in a day

If you’re a photographer who only takes 1-2 photos of a scene and tends to run away, try this assignment. The assignment: take 1,000 photos in a single day.

**Purpose:** The purpose of this assignment is for you to learn how to “work the scene”. If you see a good scene, try to take at least 10 photos of each scene. This will allow you to capture better perspectives, angles, and moments. I don’t want you to always take 1,000 photos every day. But this might help you break through “photographer’s block.”

5. Eye contact/no eye contact

If you are shooting candid, try to come close to your subject, and take multiple photos, until they notice your presence. Then wait for them to notice you, and then
take a photograph when they make contact. Then when you go home, you have the decision of choosing between two versions of a photo: one with eye contact, and one without. Sometimes eye contact works better, sometimes it doesn’t.

6. **Ask your subject to look up, down, left, right**

If you approach a stranger, and ask permission to make their portrait (or if you’re photographing a model) — it is hard to direct your subject. Ask them to look in different directions.

For example, ask your model to look into the camera, and don’t smile. Then ask them to look up, down, left, and right. Often people have a “better side.” Not only that, but by having your subject look up and down, you change the mood of the photo. When your subject is looking up, they look more confident, encouraged, and powerful. When your subject is looking down, they look more downtrodden, depressed, and negative. Ask your subject to look at your hand while you’re photographing them. Then move your hand, and see how their eyes track your hand.

**Purpose:** Changing the eye and head position of your subject will change the emotion of the photo. Experiment with different head positions with your subject, and you will have more photos to choose from.

7. **Photograph things that are on the ground**

When it comes to photography, we often just photograph what is in front of us, at eye-level. Yet we never look down, and we never look up. As a simple assignment, do a photo project of just photographing stuff on the ground. You will find lots of interesting subject-matter if you look closely enough.

**Purpose:** The world is a rich and beautiful place to take photos. Sometimes we complain that there is “nothing to photograph.” Yet in reality — we’re just not looking hard enough. Change your perspective and view. Don’t just look ahead. Look down. Look up. Look into cracks in-between walls. Be curious, and change your perspective.

8. **Take at least 10 photos of each scene**

One of the mistakes we make as photographers is that we’re easily satisfied with 1-2 photos, and we move on. The problem with only taking 1-2 photos (and then checking our LCD screen) — we don’t push ourselves. When in doubt, try to photograph 25% more than you think you need to photograph.

This will force you to be more creative. You will try to photograph your scene from different distances (close, far) and from different angles (left, middle, right). You can also switch up your positioning (crouching, standing, or tippy-toe).

**Purpose:** It is rare to see a good photo-moment. Don’t settle with just 1-2 photos.
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9. Limit yourself to only 36 photos in a day

For this assignment, you’re only allowed to take 36 photos in a day (same amount of photos in a roll of film). This exercise will help you learn restraint. It will balance out some of the other assignments which encourage you to take more.

**Purpose:** If you only had 36 photos you could take in a day, how much more selective would you be with your shooting? What superfluous photos would you not shoot? You can do this assignment on a digital camera, or on a film camera.

10. Shoot 1 street corner for an hour

In street photography, we’re impatient. Rather than sticking in one good area and waiting for our subjects to come to us, we run around (often wasting our energy) to just find a few good photos.

**The solution:** find an interesting street corner, don’t move, and photograph it for an hour.

**Purpose:** The purpose of this assignment is to realize that it can be more effective to find a good scene, background, or area — and wait for your subjects to come to you.

Not only that, but if you stay put in one area — you will get to know the area better. You will observe the flow of subjects, and get a feel of a place better. Not only that, but you will be more “invisible” in the scene — people will ignore you.

11. Delete all the photos from your social media account

An occasional purge is good for our physical, mental, and spiritual health. Try to do this every once in a while: delete all the photos from your social media, and start from scratch. Don’t delete the original photos. Keep them on your hard drive, print them out, or archive them.

However if you have a lot of photos cluttering your social media account, make a practice of doing a 100% purge. Delete all the photos (or mark them private), and then re-start from scratch.

**Purpose:** Often we let our past work prevent ourselves from innovating and creating new future work. Purge your past. And start refreshed.

12. Go a month without using social media

Often as photographers we fall victim to the “social media” treadmill — of always uploading a photo every day, just to feel relevant. We want it for the likes, the comments, the new followers. Yet we get addicted to social media like heroin. Without our daily “hit” of external affirmation — we feel our photography is pointless.
Yet photography should be a personal pursuit. Why care about what others think about your photos? How do you feel about your own photos? Uninstall all the social media apps from your phone (don't worry you can re-install them after a month). Don’t upload any photos, look at anyone else’s photos, and try your best not to cheat.

**Purpose:** By “fasting” from social media from a month — you will get a better sense of why you make photos. And I can guarantee you; you will feel less stressed and anxious to keep up with the “social media rat race.”

13. **Only shoot black and white for a year**

We don’t see the world in monochrome. Black and white is an abstraction in the world. That is why it looks more “artistic” to the average person. It is novel, unique, and different. However it takes a while for you to train your eye to see the world in monochrome.

Many photographers shoot black and white their entire life, and still never master it. I’ve also found that if I switch between black and white and colour too often—I can never learn how to really see the world in one. The assignment is to shoot only black and white for an entire year. You can shoot RAW+JPEG with a black and white preview. And perhaps you can just use the black and white JPEG’s. If not, apply a simple black and white preset to all of your RAW photos (upon importing them).

**Purpose:** How would you visualize the world in monochrome? I’ve found myself looking more for emotions, mood, smoke, shadows, lines, graphical elements, and minimalism. This will be different for you — but learn how to see in monochrome.

14. **Only shoot colour for a year**

The opposite assignment to the prior one; shoot only colour for a year. To see the world in colour is different than seeing the world in black and white. Personally, I’ve found shooting colour to be more difficult than shooting black and white. Why? Because colour leads to more complexity. You need to compose and frame a scene well, but also think about the colour-combinations of a scene.

Not only that, but different colours evoke different moods and emotions. Monochrome is easy to use because it reduces and removes distractions. Colour introduces more complexity and distractions. I would personally recommend most photographers to first try to master monochrome before taking on colour photography.

**Purpose:** Colour photography also requires your exposures to be better, and for you to shoot in better lighting conditions. For colour photography, try to shoot sunrise and sunset (golden hour), or use a flash. Train your eyes to become sensitive to different colours — and play and have fun with it. See how you can mix different colours in a scene, whether they be complementary colours or contrasting colours.
15. Only shoot JPEG for a month

RAW and post-processing is a blessing and a curse. The problem is that many of us modern photographers over-rely on fancy post-processing techniques to improve our (mediocre) photos.

Shoot only JPEG for a month. If you’re really anxious, shoot JPEG+RAW (but only use the JPEG’s) for a month.

**Purpose:** This way you can’t rely on fancy post-processing techniques to “salvage” your photos. A great photo shouldn’t require any excessive post-processing.

16. Only shoot with your smartphone for a month

We often make the excuse that we don’t always have our cameras with us. I know personally when I owned a DSLR, it would be a pain in the ass to carry with me everywhere I went. But today we’re blessed by modern technology— especially with the smartphone. The smartphone is the ultimate camera— it is always with us, fits in our front pocket, and can also be used to edit/post-process/publish our photos.

If you have a big bulky camera and never take photos, take this challenge upon yourself: only shoot with your smartphone for a month. Lock up your “real” camera in a drawer, and see how you can be the most creative with just your smartphone.

**Purpose:** The purpose of this assignment is to realize that photography is less about the gear — more about your personal vision, and how you see the world. The tool isn’t as important as your eye. This assignment might also teach you the importance of just always having your camera with you, ready, and prepared to click.

17. Stick to one camera, one lens for a year

We’re rich. We live in a culture of abundance. Most photographers I know aren’t starving. Most photographers have an over-abundance of cameras, lenses, and gear. If you’re a photographer who has too much “choice anxiety” from owning too much gear— only stick to one camera, one lens for a year. Lock up your other gear in a drawer, better yet, sell it or give it away to friends.

**Purpose:** If you really want to hone in your photographic vision; you don’t want to be distracted by gear. Also it takes a long time to get to know one camera and one lens/focal length quite well. By sticking with consistent gear, you will have fewer gear distractions — which will give you more creative focus.

18. Only shoot horizontal, vertical, or square for a month

Believe in “creative constraints” — by having fewer options, you are forced to be more creative. For example, take framing. Try to only shoot horizontal (landscape), vertical (portrait), or square-format for a month.
Purpose: Framing and composition is all about knowing what to leave out of the frame. Restrict yourself to one orientation for a month — and you will find more visual consistency with your work. And you will be forced to compose more creatively.

19. Only shoot one square block for a month

With unlimited options, we become paralyzed. We don’t know what direction to take our creative work. Restrict yourself geographically. For a month, only shoot one square block (both sides). This way, you will really have to dig deep, and find something very interesting in that one square block. The benefit of this project is that you know exactly where to shoot. And I think it is better to get to know one area very well, rather than knowing a lot of different areas superficially.

Purpose: Being a great photographer isn’t about travelling the world, to exotic places, and making interesting photos overseas. Being a great photographer is making the best out of what you have. Do not complain about where you live; and be the best photographer in your own home town.

20. Shoot everyday for a month

The only way to become a better photographer is to shoot more. The more you shoot, the more feedback you will get, and the more connected you will feel with the world. For a month, take at least 1 photo every day. It can be with your smartphone, DSLR, or whatever camera you have.

Just make sure it is something personally-meaningful to you. Don’t just take the photo for the sake of it. Take a photo everyday of something that stirs your heart. That makes your soul sing.

Purpose: The Zen masters recommended having a “daily practice.” By repetition, we reach a deeper understanding of “truth.” In photography, we can read a hundred photo theory books, and still not learn anything. We only learn through taking photos, repetition, feedback, critique, and constantly seeking to improve ourselves. Don’t put pressure on yourself that every day the photo has to be great. But just build the habit.

21. Don’t shoot for a month

To balance out the prior experiment; try to go a month without taking any photos. You’re not allowed to take photos for a month.

Purpose: Ironically enough, this assignment might be the best way to re-invigorate your passion for photography. Why? We take photography for granted. But when something is taken away from us — we appreciate it more.

22. Shoot “selfies” for a week

Many of us complain that we don’t have interesting subjects to photograph. Not true; your best subject is yourself because you’re always available, and you won’t say “no” to yourself.
There are different ways you can shoot ‘artistic selfies’ of yourself. Photograph your shadow, reflection, or put your camera on a tripod and setup a scene and shoot yourself.

**Purpose:** To photograph yourself is an incredibly intimate experience. It is an experience that allows you to be comfortable on the other side of the camera. Not only that, but it makes you realize that no matter what, you can always photograph something — who better than yourself?

23. **Have your portrait (professionally) shot**

If you don’t like being photographed, have another photographer (professionally) shoot your headshot. You will learn what is comfortable (and what isn’t comfortable) being a subject.

**Purpose:** If you are a photographer, yet you don’t like having your own photo taken, you debilitate yourself. You assume everyone else doesn’t like having their photo taken (not true).

The secret is how can you make a photo of others (and of yourself) that makes the subject comfortable, at ease, and happy to be photographed?

24. **Shoot with a focal length (you’re uncomfortable with) for a week**

We all have our preferences for a certain lens or focal length. If you want to push your creative boundaries, shoot with a focal length that you are very unfamiliar or uncomfortable with for a week. If you’re a 28mm guy, try shooting only with a 200mm lens for a week. If you’re usually a 200mm telephoto type of person, try a 35mm lens. If you usually shoot with a 50mm lens, try a 28mm lens.

**Purpose:** By shifting our focal length, we shift our perspective, how we see the world, and how we approach our subjects. By pushing ourselves outside of our comfort zone for a week, you will gain a new perspective and also perhaps find more gratitude for the focal length you’re already comfortable with. Or better yet, you might find a new focal length you prefer — that can help you be more creative and innovative with your work.

25. **“.7 meter challenge” (1-arm length challenge)**

If you’re uncomfortable getting close to your subjects, pre-focus your lens to .7 meters (about 1-arm length distance), and only shoot that distance for a month.

**Purpose:** This assignment will force you to get physically and emotionally closer to your subjects. You don’t need to shoot all your photos candidly. Ask for permission. The more comfortable you’re shooting at a close distance— the easier it will be for you to take a step back.

26. **Decapitate heads for a week**

We often find that the photos of hands, feet, or body gestures more interesting than faces. So the assignment is to take photos of your subjects without including their faces/heads in the photo.
Purpose: Try it out— for a week “decapitate” your subjects (don’t photograph their faces). This will force you to see the other characteristics and attributes of your subject on a deeper level.

27. Buy a mannequin (and use it as a test subject)

If you want to learn how to make better portraits, how to better use studio/flash, or how to frame — buy a mannequin as a test subject.

The great thing about having a mannequin is that you will always have a willing subject. Try using different focal lengths, different settings, different apertures, shutter-speeds, different lighting setups, and anything else you want to experiment with.

Purpose: This will allow you to better understand how to use your camera technically, how light (especially artificial light) works. Not only that, but you will have a forever patient subject at your disposal (whenever).

28. Only shoot with a flash for a week

There is a bias in photography against shooting with a flash. People say it looks “harsh” and unnatural” when compared to using natural light. Yet the flash helps us overcome difficult lighting situations. It gives us more freedom to shoot at different points in the day, when the light might not be so nice.

For a week, experiment taking photos only with a flash. You will discover how the flash works during the day, in the shade, indoors, and other effects it might have on your images.

Purpose: Having a flash is a good tool in photography. It can help you open up creative doors and opportunities. It will give you more freedom to shoot at all points during a day. You don’t always need to shoot with a flash, but try to learn it to the best of your ability, and you can use it in special situations (or in all situations).

29. Put together a photo album

Today’s world is (mostly) digital. In photography, we spend 99% of our efforts sharing our photos online. Very rarely do we print our work, arrange and edit our work, and create physical objects with our photography. Buy a cheap photo album at the store or online. Print a bunch of your photos as small 4×6’s. Then put together a photo album.

Do it with your partner, children, or friends. Make a theme, concept, or a story. Have fun. Spread the 4×6 prints on the floor, and figure out what kind of pairing, sequencing, and flow you want to add to your album.

Purpose: Handling physical prints is a different experience than just looking at them on your computer or phone. The physicality of photography adds another dimension — for us to be more creative, to find more by-chance connections, and for us to be more engaged with others.
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Making a photo album is a nice communal activity — something that families did a lot in the past. Making photo albums can help us re-connect ourselves with the past, but also create physical documents that will be well-preserved into the future.

30. Print your portfolio

Most of us have our portfolios online. Few of us have printed portfolios. Look at your entire library of images, and ask yourself: Which of these 10 photos represent who I am as a photographer?

Then print out those photos at any size you like. Figure out how you would like the photos to be sequenced. Then carry them around with you, and share them with your friends. Ask them to sequence your photos according to their emotion and feeling.

Learn to show your photos as prints, rather than just a phone or computer. See how people react differently to your photos, and see how it feels different for you as a photographer.

**Purpose:** Photos don’t exist until they’re printed. When photos exist in atoms, we have a deeper connection with them as humans. When we can hold a photo, or a memory in our hands — it feels more real. We appreciate it more, and we feel more connected with them.

31. Give away a photo everyday (for a week)

The best gift you can give others as a photographer is prints. Why? Because prints are meaningful, easy to transport, and relatively inexpensive to print. As an assignment, print out a bunch of your photos, and for a week, give out at least 1 print a day (to a stranger, friend, your barista, family member, etc). See how it affects their mood, and your own mood.

**Purpose:** Photos are about sharing moments, art, and history. Share a little bit of your own soul by giving away your photos. You might discover that giving away your photos for free is more meaningful than selling them.

32. Start your own photography blog and blog consistently for 30 days straight

When you create your own blog, you have more flexibility. You can publish your photos, text, and ideas in different format. If you own the blogging platform (I recommend wordpress.org) you then really own your content. Blogs are great because they are historical documents of our past. Blogging is more difficult than sharing photos on social media — but it is also more personally-meaningful.

Furthermore, if you have a blog, it is easier indexed by Google. And anyone with a web browser can access your work — rather than only people on a certain social media platform. The assignment is to start your own blog and blog consistently for 30 days straight. It can be about anything. You can just upload a photo every
day, upload photos that inspire you, or share some personal stories behind your favourite images. Don’t take it too seriously— but try it for a consistent month.

**Purpose:** By making a blog, you gain more ownership of your own photography, creativity, and work on the internet. If you’re a slave to a social media platform, your influence is very limited— and you don’t have as many different ways to express yourself creatively.

33. Write down a list of photographic subjects you don’t like to photograph

How do you know what your “style” is in photography? It is about being aware of what you don’t like to photograph. For this assignment, figure out what genres of photography you dislike. Write them down, and simply avoid taking those photos.

Then by process-of-elimination — figure out what kind of photographer you are (based on what you don’t like to photograph). Most people I know who are interested in street photography don’t like to take photos of sunsets and landscapes. People I know who like to shoot flowers don’t like to take photos of people. Photographers who like to shoot monochrome generally dislike shooting colour (and vice-versa).

**Purpose:** Find out who you are via subtraction and process-of elimination. Treat your photographic style the same. What do you not like photographing? Then just don’t photograph it — photograph the opposite.

34. Intentionally try to take “shitty” photos for a week

One of the biggest barriers in our photography is that we always try to take really good photos. But it is rare that we make good photos. So flip the concept upside down — try to intentionally shoot “shitty photos” for a week. Get rid of your concepts of good composition, framing, and light. Just take shitty photos of whatever you find interesting.

Follow your gut, soul, and instincts. Just click. Don’t think too much. Then after a week, see if you feel more lose in your photography, less “blocked” creatively. Do you take yourself less seriously? Are you having more fun?

**Purpose:** Perfectionism ruins us. Seek to make “good” photos. And in order to do so give yourself permission to make bad photos.

35. Create your own photography portfolio website

If you want to be more serious with your photography (and taken more seriously), make a photography portfolio website. It can just be your firstnamelastname photo.com (or better yet, firstnamelastname.com). Make your own photography website, and put on your 3 best projects (restrict each project to your 10 best photos). This way, you will be able to think more about long-term projects, rather than getting swept away in the social media madness of just uploading a single (random) photo a day.
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Self-Instructional Material

Purpose: When you pass away, what kind of body of work do you want to leave behind? Do you really think that your social media profile will exist after you pass away? Will anyone even look at it? Having a website (instead of just having social media) is better—but not the best. Aim on creating a body of work and several bodies of work—then publish them as books.

36. **Buy one photo book a month (for a year)**

Gear quickly gets outdated. A great photo book will increase in value over time—both monetarily and its value to you as a photographer. I recommend trying to invest in at least one photo book a month (for a year). You don’t need to buy an expensive photo book—invest in a book that you plan on re-reading over and over again.

Buy photo books whenever you have the urge to buy a new piece of gear. Why? Photo books will actually help improve your photography, and the novelty of a new photo book will inspire you.

**Purpose:** Every photographer needs inspiration from somewhere. Most of us get our inspiration online, on social media. There are great photographers online, but if you really want to learn the work of the masters, invest in photo books. Photographers spend many years, thousands of dollars, to create their own book. Therefore you’re more likely to get better images in a photo book, than just when looking online.

A good photo book will last for your entire life—and will always be a great source of inspiration for you.

37. **Look at all the portfolios of all the Magnum photographers**

You are what you eat. If you look at the work of great photographers, you will aspire to make great photographs. I also go this assignment from my buddy Charlie Kirk—go to the magnumphotos.com website and study all the portfolios of the Magnum photographers.

Write a list of which photographers you admire. Analyze their work, and ask yourself, “Why” you like their work. Furthermore, when you find a photographer whose work really speaks to you, buy all their photo books, watch all their YouTube interviews, and learn as much about them as you can from them.

**Purpose:** The more great images we look at, the more inspired we will be to make great photos. By analyzing great compositions and images, we will subconsciously take better photos when we’re shooting.

Also you will find there are a lot of Magnum photographers whose work you don’t “get” or “like.” That is fine—just think to yourself, “What about their work do I not like? And why would other people like their work?”
38. **Attend a photography workshop**

Photography workshops are great— because you get a “shortcut” in your learning and education. For a workshop, you get a distilled source of information from your teacher — often in a few days or a week. I personally think that photography workshops are a much better “bang for the buck” than photography schools. And they’re much shorter, focused, practical, and hands-on.

Find a photography workshop on a topic that interests you. And know that you’re investing your money into your education — always the best investment for your money.

**Purpose:** If you want practical instruction in photography, to learn, have any questions addressed, attend a workshop or two.

39. **Learn how to process black and white film**

Digital is not better than film, nor is film better than digital. They’re different but more similar than dissimilar. The process of shooting film, and learning how to develop it, makes you appreciate the art and process of photography much more.

If you’ve never processed your own black and white film, give it a try. There are tons of YouTube tutorials on how to do it. By processing your own black and white photos, you will feel a lot more connected with your images. You might fall in love with the process and the magic.

**Purpose:** If you’ve never processed your film before, give it a go. And not only that, but try to print your photos in a darkroom at least once — the experience might totally change how you view photography.

40. ** Photograph only hand gestures for a day**

Great photos tend to have two things: 1) Great composition and 2) Great emotion. We all know how to make better compositions. Few of us know how to capture emotions.

A practical way to capture better emotions: capture hand-gestures and body language of your subjects.

So for a whole day, do nothing but photograph people doing interesting hand-gestures. Not only that, but afterwards, look at your photos (with hand-gestures in them), and mimic the hand-gesture. This will help you connect emotionally, and empathize with your subjects.

**Purpose:** Photos of people just walking (and doing nothing with their hands) tends to be boring. Hand-gestures are much more dynamic, interesting, and emotional.

Much of communication is body-language and hand-gesture based. Photos are silent and don’t say words. But hand-gestures do.
14.3 FIELD ASSIGNMENT AND THEIR EVALUATION

There are various field assignments provided to the students, under the photography course, such as:

- Abstract
- Depth of field
- Faces
- Familiar Faces
- Fast and slow
- Fractured view
- Frame within a frame
- Interest in individuals
- Into the distance
- Leading lines
- Long and shallow
- Long exposures
- Near and Far
- Pattern
- Shutter speeds
- Time
- Unknown

The demonstration of each element is taken into consideration during the evaluation of the assignments. The focus, content and composition are important characteristics which are considered during the evaluation of photography assignments.

Check Your Progress

1. In the context of photography, give one example of old and new technology working together.
2. Mention any two field assignments provided to the students under photography course.

14.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Photo booths are a great example of old and new technology working together in photography.
2. Two field assignments provided to the students under photography course are abstract and leading lines.

14.5 SUMMARY

- One can witness some really exciting as well as worrisome changes in photography. In an extremely short timeframe, photography has experienced changes from the traditional optical/chemical processes of the past to the new digital technology.
- Economically, photographers have been impacted negatively in a number of ways. The current economic slowdown has reduced revenues, already meagre for many in the arts.
- Digital printing materials have increased the price of printing for the professional photographer.
- Another economic impact has been the fact that with scanners and inexpensive photo quality printers now in many homes illegal copying of work has become increasingly simple.
- The digital learning curve is very steep, especially for people who are not well versed in computer technology.
- For clients, digital technology has been a winner. In the digital studio, they can see the entire creation process in “real time”.
- Every day we are exposed to a barrage of mediocre images. For an image to stand out from the crowd, ever more exceptional work needs to be created.
- “Most providers of photographic training are now outfitted with equipment designed to support the industry as it was in yesteryears, making the task of providing relevant training increasingly challenging.”
- The environment has surely been the biggest winner in the advent of digital photography. In the past years, traditional photo processors used 220-volt to power their pumps and heaters. The photo wash water would run 8 or more hours a day.
- Photo booths are a great example of old and new technology working together. People love photo booths because they are fun, different, and you get a physical copy of your photos.

14.6 KEY WORDS

- Digital printing: Digital printing refers to methods of printing from a digital-based image directly to a variety of media.
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- Photo booth: A photo booth is a vending machine or modern kiosk that contains an automated, usually coin-operated, camera and film processor.
- Digital photography: Digital photography is the process of using electronic and computing appliances to capture, create, edit and share digital images/photographs.

14.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. What is the impact of technology on photography?
2. Write a short note on photographic education.
3. How has the environment been impacted by the advent of digital photography?

Long-Answer Questions

1. What are the economic consequences that photographers have faced due to technological advancements?
2. ‘Photo booths are a great example of old and new technology working together.’ Comment on the statement with reference to the text.
3. What are some practical tips that can improve photography skills? Discuss.

14.8 FURTHER READINGS


