Camera Operator

Edited by
Prof. Chandrabhanu Pattanayak

- Camera shooting techniques
- Videography
- Cinematography
- Set lighting
- Film and digital camera operation
CAMERA OPERATOR

Skill Development Program

A Skill Development Programme on Camera Operator

(Aligned to MES/ Q 0902 of Media and Entertainment Skills Council, India)
CAMERA OPERATOR

This course has been developed with the support of the Commonwealth of Learning (COL). COL is an intergovernmental organisation created by Commonwealth Heads of Government to promote the development and sharing of open learning and distance education knowledge, resources and technologies.

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**About this Camera Operator Course**

The Camera Operator Course has been produced by the institute is structured as outlined below:

**How this Camera Operator Course is structured**

**The course overview**

The purpose of this overview is to provide you with a general introduction to this course and it will help you in understanding:

- If the course is suitable for you
- What you can expect from this course
- Study skills you will need
- Where to go for help
- Course assignments

**The course content**

This course is divided into units, each comprising:

- An introduction to the unit
- Unit outcomes
- New terminologies
- Core content of the unit with a variety of learning activities
- A unit summary
- Assignments
Welcome to Camera Operator Course

Welcome to the Camera Operator’s course. This course will give you an overview of what a camera operator does, her role in the film crew and teach you the basics of operating a professional video camera. After you have learnt the basics and followed the course to the end you will have to practice the skills you have been taught in this course in order to refine your skills and become more proficient in the operation of a video camera.

Is this course for you?

This course is intended for people who at this job need to operate the camera during shoots in accordance to instructions provided by the Director of Photography (DoP). They also need to coordinate efforts of the camera crew during shoots.

What is a Camera Operator?

A camera operator, sometimes informally called a cameraman, is a professional operator of a film or video camera. In filmmaking, the person designing the lighting is the cinematographer or director of photography, who is also informally called a "cameraman" though it is a different job. A camera operator in a video production may be known as a television camera operator, video camera operator, or videographer, depending on the context and technology involved, usually operating a professional video camera.

Camera Operator in the Media & Entertainment Industry supports the head of the camera department and performs a major role in the course of production. The camera operator is responsible for physically operating the camera and maintaining composition and throughout a given scene or shot. In narrative filmmaking, the camera operator will collaborate with the director, director of photography, actors and crew to make technical and creative decisions. In this setting, a camera operator is part of a film crew consisting of the director of photography and one or more camera assistants. In documentary filmmaking and news, the camera is often called on to film unfolding, unscripted events.

What does a Camera Operator do?

- A camera operator will typically do the following:
- Choose and present interesting material for an audience
- Work with a director to determine the overall vision of the production
- Discuss filming and editing techniques with a director to improve a scene
- Select the appropriate equipment, from type of camera to software for editing
- Shoot or edit a scene based on the director's vision

Many camera operators have one or more assistants working under their supervision. The assistants set up the camera equipment and may be responsible for storing it and caring for it. They also help the operator determine the best shooting angle and make sure that the camera stays in focus.
The increased use of digital filming has changed the work of many camera operators. Many prefer using digital cameras because these instruments give them more angles to shoot from. Digital cameras have also changed the job of some camera assistants: instead of loading film or choosing lenses, they download digital images or choose a type of software program to use with the camera.

The following are examples of types of camera operators:

**Studio camera operators**

- work in a broadcast studio and videotape their subjects from a fixed position. There may be one or several cameras in use at a time. Operators normally follow directions that give the order of the shots. They often have time to practice camera movements before shooting begins. If they are shooting a live event, they must be able to make adjustments at a moment’s notice and follow the instructions of the show’s director.

**Electronic news gathering operators**

- work on location as part of a reporting team. ENG operators follow events as they unfold and often record live events or breaking news. To capture these events, operators must anticipate the action and act quickly to shoot it. They sometimes edit their own footage in the field and then send it back to a studio to be broadcast.

**Cinematographers**

They usually have a team of camera operators and assistants working under them. They determine the best angles and types of cameras to capture a shot. They may use stationary cameras that shoot whatever passes in front of them or a camera mounted on a track that moves around the action. Some operators sit on cranes and follow the action. Others carry the camera on their shoulder while they move around the action. Some cinematographers specialize in filming cartoons or special effects.

Important camera operator skills include choreographing and framing shots, knowledge of and the ability to select appropriate camera lenses, and other equipment (dollies, camera cranes, etc.) to portray dramatic scenes. The principles of dramatic story telling and film editing fundamentals are important skills as well. The camera operator is required to communicate clearly and concisely on sets where time and film budget constraints are ever present.

**Course objectives**

The objectives of this course is to learn to -

- Set up the Camera Equipment prior to shoot
- Prepare for shoot
- Operate Camera during the shoot

**Course outcomes**

Upon completion of Camera Operator Skill Development Program you will be able to:

- Prepare for Shoots
- Have adequate Knowledge and Understanding of the Camera
- Develop Professional Skills
- Develop Technical Knowledge
Timeframe

- 3 months - Practical (70%) and Theory (30%)
- Minimum 10 hours of study per week.

Study skills

As an adult learner your approach to learning will be different from your school days: you will choose what you want to study, you will have professional and/or personal motivation for doing so and you will most likely dovetail your study activities with other professional or domestic responsibilities.

Essentially, you will be taking control of your learning environment. As a consequence, you will need to consider performance issues related to time management, goal setting, stress management, etc. Perhaps you will also need to reacquaint yourself with areas such as essay planning, coping with exams and using the web as a learning resource.

Your most significant considerations will be time and space, i.e. the time you dedicate to your learning and the environment in which you engage in that learning.

Assignments

There are 4 Units in this course and few assignments for you to complete.
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Unit 1
What is Videography

Introduction

Videography is all about capturing moving images in a digital form using a Video Camera or Camcorder. Have you ever wondered what Videography is? Is it a new buzzword that causes you to wonder what it means. Can you even pronounce it? Many define the term Videography as being the “process or art of making video films” or “the art or practice of using a video camera”. It is pronounced same way as photography by replacing photo with video.

“The word combines “video” from Latin, meaning “I see” or “I apprehend”, with the Greek terminal ending “graphy”, meaning “to write”. This term was first seen in an article titled “Videography” What Does It All Mean? (American Cinematographer, October 1972).”

It carries many references to video production, which some argue is the same thing, as filmmaking and cinematography. Looking back at the history and the progression of technology, videography itself has it roots in the advent of digital video and capturing images in digital format, especially with the arrival of the digital camcorder in the late 70’s.

Some videographers are a ‘one man army’ and others work in a whole team, but all work towards the same ultimate goal – a professional video piece with the purpose of promoting and giving a viral lift for your company, business, product, event, service or individual self, and in many cases producing short or feature length film, documentary or music video. Video production is still in many cases storytelling and audience engagement!

Upon completion of this unit you will be able to:

Learning Objectives

- Plan the different stages of the digital video production workflow.
- Design a film making process.
- Distinguish between analogue and digital editing.
- Identify the processes of operating a video camera
1.1 Role of a Camera Operator

The Responsibilities of a Camera Operator

PRE-PRODUCTION

- Read and digest the script.
- Discuss with the Director and Cinematographer/Director of Photography (DoP), all aspects of the script.
- Discuss style of shooting.
- Recce all locations.
- Review all set plans.
- Determine technical details such as – where tracks are to be laid, size of crane or dolly.
- Determine type of heads – remote, fluid, geared or hand-held and tripods.
- Or Steadicam (usually by a specialist operator).
- Or tracking vehicle.
- Check on any new equipment available.
- Discuss with the DoP choice of 1st AC, 2nd AC, Central Loader and Grip(s).
- Liaise with the DoP, Camera Crew and Grips on camera and grip equipment lists.
- Walk all locations, sets and stages with the Director and DoP.
- Shoot camera and lens tests, especially checking the ground glass ratios and format by shooting a leader.
- Check Projection in rushes theatre for any discrepancies of framing.

SHOOTING

- The camera operator will be closely involved at all times with the setting up of shots with the Director and DoP. Director’s may have very strong ideas on photographic style and/or framing and lenses and impose these on the production.
- Alternatively, Director’s are sometimes more concerned with their actors and performance and thus give the camera crew a freer hand in how the film looks.
- Normally it’s somewhere between these two examples.
- Once the way a sequence to be filmed has been decided in the way of rehearsals, the Operator will be involved with the Director and DoP on the choice of lenses and the way the camera may move.
- The Operator will then supervise the 1st and 2nd AC’s and the Grips to set up the shots while lighting and rehearsal of actors are in progress.
- The Operator will check with the Script Supervisor that directions and eye lines (lefts and rights) are correct – although for an Operator that should be instinctive.
- Liaise with the 1st AD of the extent of the shot so that extras and background action can be set, and not wasted in non-photographed areas.
- Check for any irregularities with make-up, hair and costume that may not have been spotted by their departments.
- Work with the art and props departments with the setting of any dressing on the set, either in the foreground or background.
- Check for any off-set items that may have crept onto the set such as lamp stands, cables and unwanted props or crew personal possessions.
- Rehearse the scene and fine tune all camera moves.
- Shooting involves the Operator looking through the eyepiece, panning and tilting the camera to follow the action.
- After each take the Operator will be able to say or should say to the Director and/or DoP whether or not the shot was good technically.
- With the almost universal use of video assist, many people can have an opinion about a shot, but the Operator should still have his say, as he knows what he’s looking at and what for.

**ROUND-UP**
- As the Operator is the member of the crew who looks through and operates the camera he or she must be fully conversant with any type of head.
- Also he or she should ideally have been a 2nd AC (Clapper Loader) and 1st AC (Focus Puller) prior to becoming an Operator so that the skills and difficulties in these grades can be appreciated.
- It is essential to know all crew members’ names. Standbys (carpenters, painters, riggers, plasterers and stage hands), Grips, Art department personnel, Props and Electricians are constantly working at the behest of the camera department.
- Occasionally the Actors – as well as the Director or DoP will ask the Operator for his or her opinion on some matter concerning a shot, at this time a certain amount of tact may be required.
- The essence of film-making is team work and the Camera Operator is right in the middle of it all, so he should be a good communicator.
- All departments ask the Operator questions and the answers should be forthcoming, or at least, fielded to the person who is better qualified to answer.
- The expertise and hard work of every department is eventually telescoped into those images produced by the motion picture camera which is why the Operator is such a key member of the crew.

**FINALLY**
- There is a great deal more to the Operators role than one wag was heard to say:- “the camera operators job is to keep the heads in – unless of course it’s a skating picture, then you keep the feet in!”
- And as many who have been camera operators during the course of their careers would say “It’s the best job in the business!!”

**How To Become A Camera Operator**
If you enjoy film and television, but wondered how a movie or series is filmed? Who is responsible for filming a cinematic television show or movie? Camera operators! A camera operator captures material for movies, television shows, documentaries, music videos, sporting
events, and news events. If camera operating sounds like an exciting to you, you may want to consider a career within the field!

**Why Become A Camera Operator**

Camera operators are responsible for shooting material to tell a story, entertain an audience, or record an event. Camera equipment plays a crucial role in their job responsibilities, as they utilize their skills to understand what film, lenses, and angles will be needed to film the material. Furthermore, camera operators are responsible for operating camera cranes and camera equipment throughout the entire production.

A camera operator will collaborate with many individuals on set, such as photographers, crew, and directors. Collaborating with a director is the most important aspect of their job, as they must determine the overall aesthetic and vision of the production. Camera operators may utilize traditional film cameras or digital cameras when filming a production.

**Qualities & Skills For A Camera Operator**

![Fig.2: Computer Operator](image)

If you are looking for employment within the field of camera operation, be aware that you will need to possess the following qualities and skills for a camera operator position.

1. **Communication Skills** – As a camera operator, it will be imperative that you have strong communication skills, as you will be working closely with various members of the production team, including the director.
2. **Creativity** – Camera operators utilize their creativity to film various angles and scenes while imagining the final outcome for an audience and director.
3. **Detail Oriented** – As a camera operator, you will need to be incredibly meticulous when filming a television series or movie. It is your responsibility to analyze every, single shot and how the director wishes to visualize the filming of a scene.
4. **Patience** – Camera operators may carry heavy equipment, work in severe weather, or stand for very long periods of time. The assignments of a camera operator can vary; it can take several weeks to several months to finish the filming of a film or television series. Camera operators typically work very long, sporadic hours throughout the production of films and television series; therefore, the position requires a vast amount of patience to complete a task.
5. **Manual Dexterity & Visual Skills** – As a camera operator, it is imperative that you are able to move with the action of a shot while holding the camera in a steady position. Camera operators must be able to clearly visualize and see what they are filming in order to achieve the perfect shot.

**Camera Operator Work Environment**

Camera operators may work on television and movie sets. Camera operators may travel quite frequently and be away for months at a time. As a camera operator, you may carry heavy equipment, work in severe weather, or stand for very long periods of time. The assignments of a camera operator can vary; it can take several weeks to several months to finish the filming of a film or television series.

Camera operators typically work very long, sporadic hours throughout the production of films and television series. The schedule and depth of their work depend on many factors such as location scouting, shooting days, and traveling.

**1.2. Camera Settings**

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**Body**

Body is the main part of camera which includes Sensor, Shutter and other technical stuff.

**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. There is no major difference 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. There are different types of lenses used for different purposes during shooting.

**Viewfinder**

Viewfinder is the visual source to refer what a camera operator is going to record. In Dslr it works through the (TTL) Through the Lens mechanism with a pentaprism or pentamirror. Video Cameras are having LCD screen to viewing the frame. Viewfinder is an important part of the camera which helps in composing the frame in a proper manner.
Shutter

Shutter is a device that allows light to pass for a determined period, exposing photographic film or a light-sensitive electronic sensor to light in order to capture a permanent image of a scene. In photography a shutter of variable speed is used to control exposure time of the film. The shutter is so constructed that it automatically closes after a certain required time interval. The speed of the shutter is controlled by a ring outside the camera, on which various timings are marked. Shutter is like an automatic gate which controls the exposure to light for a particular interval.

![Shutter Speed](image)

**Fig. 3: Shutter Speed**

**Aperture**

Light is an essential element in image or video capturing. When light falling on an object gets reflected and reaches to our eye we become able to see the object. Similar also is the case of camera. During the process of shooting when we press the button the aperture hole of the camera opens to allow the camera’s image sensor to catch the required scene.

The aperture, which can be adjusted by the camera operator is fixed by him in different situations in different manner to change the size of the hole. The larger the hole the more light that gets in – the smaller the hole, less is the light. Aperture is measured in ‘f-stops’.

**Sensor**

Sensor converts the light signal to electronic form. There are two types of sensors basically. 1. CCD (Charge Coupled Device) and 2. CMOS (Complementary Metal Oxide Semiconductor)
Memory Card

Memory card is a storage device which stores the processed image information from the sensor. These days there are many types of memory cards available in the market depending on their size. It has different Storage capacities and sizes and writing speeds are different also.

Aspect Ratio

Aspect Ratio is the ratio between the width and height of a particular frame. If the width is A and height is B then the aspect ratio is explained as A:B. E.g., 16:9, 3:2, 4:3, 1.85:1, 2.39:1 etc. the image aspect ratio varies for different types of visual media. The table below explains different types of aspect ratios and the medium for which it is used.

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<td>Fox Movietone aspect ratio</td>
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<td>1.25:1 (5:4)</td>
<td>Early television &amp; large-format computer monitors</td>
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<td>1.33:1 (4:3)</td>
<td>Traditional television &amp; computer monitor standard</td>
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<td>1.375:1 (11:8)</td>
<td>Academy standard film aspect ratio</td>
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</tr>
<tr>
<td>1.85:1</td>
<td>A common US widescreen cinema standard</td>
</tr>
<tr>
<td>2.35:1 or 2.39:1</td>
<td>A current widescreen cinema standard</td>
</tr>
<tr>
<td>2.414:1 The silver ratio</td>
<td></td>
</tr>
<tr>
<td>2.76:1 Ultra Panavision 70</td>
<td></td>
</tr>
</tbody>
</table>

CAMERA EXPOSURE:

Camera Exposure determines how brighter and darker the image is while recording. Exposure is controlled by three factors. They are (a). Aperture, (b). Shutter Speed and (c). ISO/Gain Control.

Fig.4: Camera Exposure
Camera gain is applied to the signal coming out of the sensor. It’s a bit like turning up the volume on a stereo amplifier. If you have a quite piece of music, turning up the volume makes it louder, but the original piece of music is still a quiet piece of music. Turning up the volume on your stereo, as well as making the music louder will also make any hiss or background noise in the music louder and it’s exactly the same with a video camera. As you increase the gain, as well as the wanted video signal getting bigger (brighter) all the unwanted noise also get bigger. So adding gain on your video camera doesn’t actually make the camera more sensitive, but it does make what light the camera has captured brighter in the recordings and output, giving the impression that the camera has become more sensitive, however this is at the penalty of increased background noise.

WHITE BALANCE:

Simply put, white balance in digital photography means adjusting colors so that the image looks more natural. We go through the process of adjusting colors to primarily get rid of color casts, in order to match the picture with what we saw when we took it. Why do we have to do this? Because most light sources (the sun, light bulbs, flashlights, etc) do not emit purely white color and have a certain “color temperature“. The human brain processes the information that comes from our eyes and automatically adjusts the color temperature, so we normally see the colors correctly. If you take a white sheet of paper and look at it outside, it would most likely look as white as if you were to look at it indoors. What most people do not realize, however, is that there is a huge difference in color temperature between bright sunlight and indoors tungsten light.

If you are a skier or a snowboarder, try this quick experiment: put on your ski goggles and look at the snow – it should change in color tone. If you have ski goggles with a yellow tint, the snow will look yellowish. However, after you ski for a little bit, your eyes and your brain will adjust for the color and the snow should look white again. When you take off your ski goggles after skiing, the snow will look bluish in color rather than pure white for a little bit, until your brain
adjusts the colors back to normal again. This example proves the fact that we are equipped with a very sophisticated color system that automatically adjusts colors in different lighting situations. While our brains automatically process the colors for us in such a smart way, digital cameras can only guess what the color.

![Good white balance](image1.jpg) ![Bad white balance](image2.jpg)

*Fig. 5: White Balance*

<table>
<thead>
<tr>
<th>Light Type</th>
<th>Color Temperature in Kelvin (K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candle Flame</td>
<td>1,000 to 2,000</td>
</tr>
<tr>
<td>Household Lighting</td>
<td>2,500 to 3,500</td>
</tr>
<tr>
<td>Sunrise and Sunset</td>
<td>3,000 to 4,000</td>
</tr>
<tr>
<td>Sunlight and Flash</td>
<td>5,000 to 6,000</td>
</tr>
<tr>
<td>Noon Sun and Clear Sky</td>
<td>6,000 to 6,500</td>
</tr>
<tr>
<td>Cloudy Sky and Shades</td>
<td>6,500 to 8,000</td>
</tr>
<tr>
<td>Heavily Overcast Sky</td>
<td>9,000 to 10,000</td>
</tr>
</tbody>
</table>

**BLACK BALANCE:**

Watch this video on Black Balance at [goo.gl/rgvnZZ](http://goo.gl/rgvnZZ)

Video cameras can possess a function called black balance which calibrates the signal for no light, just as they have a "white balance" function which gives reference to true white to the CCDs. Unlike white balance, black balance is not adjusted every time.

The main purpose of black balance is to eliminate any residual current being output from the pixel sites under conditions of complete darkness, often referred to as thermal noise. This is why the camera automatically closes the iris completely when it does the black balance.
Conditions under which black balance are typically done are when the camera experiences a large change in operating temperature, especially from colder to warmer. Otherwise, it is a periodic thing to allow for other minor factors that could come into play.

With CMOS sensor technology, black balancing may not be as necessary as it is with CCD type devices. It is common to talk about how clean and relatively noise free CMOS sensors are by design.

**Preset**

Preset is available in many cameras to shoot accordingly to the lighting situation or depends on the type of photography a Director demands. Often they are called "night scene" presets. This setting varies from camera to camera but the general preset is to slow down the shutter speed to allow a lot of light into the camera.

Most of today's cameras, whether digital or film, have some presets. These are camera settings that are preprogrammed into the camera so that the photographer only has to turn a dial to change several settings at once. These presets have become widely varied between camera manufacturers with everything from "foliage" to "beach" presets. Some cameras even have "fireworks" presets. However, there are a few presets that are almost standards and appear on a wide variety of cameras.

Once you learn about these more common presets you will better understand the idea behind the more specialized presets as well. These common presets come in two types. These types are basic and advanced. The basic presets are meant to do almost all of a photographer's thinking for the photographer. In these modes the camera figures out the correct exposure and makes all the camera settings within the preset preferences. The advanced presets are geared towards photographers who know a bit more about their cameras and want some level of control while still speeding up the picture taking process. Some of these presets still allow the camera to maintain proper exposure while the photographer makes one or two setting changes. Others leave all of the settings up to the photographer.

Watch this video on Camera Preset at [goo.gl/dSn5X8](http://goo.gl/dSn5X8)

Fig. 6: Camera Preset
IRIS

The iris is an adjustable opening (aperture), which controls the amount of light coming through the lens. The video camera iris works in basically the same way as a still camera iris -- as you open the iris, more light comes in and the picture appears brighter.

Focus

The standard definitions of focus are: The position at which rays of light from a lens converge to form a clear and sharply defined image on a focal plane. The action of adjusting the distance between the lens and subject to make light rays converge to form a clear and sharply defined image of the subject.

Focal point

Before we get too deep into the mechanical aspects of focus, let's understand where focus occurs. Technically, it's the point where rays of light converge. Each point of convergence is called a focal node.

Watch this video on Camera Focus at goo.gl/9gJ7hl
Unit Summary

In this unit you learnt the role of a Camera Operator in a production. How to use a Video Camera or Camcorder. How to set the technical parameters as per the requirement.

The user/individual on the job needs to know and understand how to:

SB3. Identify any problems with successful execution of the task and resolve them in consultation with the production team.

Assignment

Shoot a Real Life Event

Or

Cover an event that is taking place near you
Unit 2
Camera Aesthetics

**Introduction**

When we talk about aesthetics, we mean that some things are generally more pleasing to the eye—whether it be in a photograph, painting, or sculpture.

One thing that often happens when discussing the quality of pictures is that people are self-conscious about their own photographic abilities, and therefore think they can’t judge a picture. Anyone can evaluate a picture and express whether they like it not; you don’t need to be an expert to convey your own views.

The difference between a photographer and anybody else is not their ability to notice beauty, it is that the photographer should also be able explain why some elements are pleasing while others are not. The understanding of aesthetics are ingrained in everybody. Anyone can see them, but only few can actually analyze a picture and are able to explain the compositional techniques to create a beautiful picture.

These techniques were not “invented” by some expert painters, they were discovered in many different disciplines. For example, the golden ratio is not only of importance in photography or paintings, but also in architecture, mathematics, and even in the arrangement of flowers. This means we can apply some of these universal rules to create pictures that, visually speaking, most human beings will find harmonic.

Photography aesthetics is all about Composition how to compose a frame creatively and use Multiple Cameras to achieve the desired effect. The camera operator on the job needs to know and understand how to ensure that all necessary equipment and materials available meets the technical and artistic requirements of production.

**Outcomes**

*Upon completion of this unit you will be able to:*

- Compose a frame
- Setting Up Multi Cameras for Events
- PTC for TV interview
- Able to News Production

Watch this video on Camera Aesthetics at [goo.gl/iEjemy](http://goo.gl/iEjemy)
2.1 Photography Composition

Rule of Thirds
Rule of thirds may be defined as dividing a frame into thirds horizontally and vertically. We will get 4 golden points. We must position the subject or object on these golden points. Not at the centre. This unit is about deciding the shot framing and composition, marking out the camera positions and carrying out rehearsals prior to shoot.

![Rule of Thirds](image)

Fig. 7: Rule of Thirds

Rule of Golden Triangle is drawing a diagonal of a frame. And putting a perpendicular from any of the corner to the diagonal. And then compose the lines or spiral diagonally.

![Rule of Golden Triangle](image)

Fig. 8: Rule of Golden Triangle

Leading Lines
The viewer’s eye is automatically led by lines and other geometrical figures. Leading lines help to put an emphasis on the subject, making them the center of attention. If the natural eye movement can follow these lines and ends up on the subject, it gives a very harmonic impression. Conversely, fighting against this flow can be very stressful.

Triangles
Geometrical symbols help to control the flow of the picture. They build a basic framework for the viewer to follow, and create some dynamic movement because symbols like triangles or circles aren’t a dead end.

Rule of Odds
The picture above already shows an example of three subjects that form a triangle. But it’s not only three subjects that are pleasant for a viewer—5 or even 7 points of interest can increase the aesthetic value of the image tremendously. The psychology behind this odd rule is that even subjects are easy to organize, easy to pair (2,4,6 etc.), and this is an uninteresting task for our brain.
180 Degree Rule
In film making, the 180-degree rule is a basic guideline regarding the on-screen spatial relationship between a character and another character or object within a scene. An imaginary line called the axis connects the characters, and by keeping the camera on one side of this axis for every shot in the scene, the first character is always frame right of the second character, who is then always frame left of the first. The camera passing over the axis is called jumping the line or crossing the line; breaking the 180-degree rule by shooting on all sides is known as shooting in the round.

The 180-degree rule enables the audience to visually connect with unseen movement happening around and behind the immediate subject and is important in the narration of battle scenes.

2.2 Multi-Camera Set Up
Multi-camera arrangement is designed for events and news production. Depending on various kinds of shots while filming the event or news production

In multi camera arrangement the master camera (wide angle) is fixed. Another two cameras records the close ups (if it’s for a two character) and shooting an event; along with master cameras other cameras record different magnification of the subject. Panning Tilting also works if needed.
Unit Summary

In this unit you learned the basics of framing and composition and the use of Multi Camera Arrangement for events and news productions.

Assignment

Watch a TV News Production
Or
Talk Show
And try to identify the different frames and compositions used. Then try to shoot some photographs using the same frames and compositions. Compare your photographs and the productions you saw.
Unit 3
Dynamics of Videography

Introduction
Dynamics of Lens Management, shot taking. Types of Shots. Camera Angles etc. Lensing is required to get proper magnification with proper eye perception. E.g., 50 mm (Normal Lens) for taking a Close Up.

Outcomes
Upon completion of this unit you will be able to:

- Prepare to shoot a Documentary
- Get a Sense of use of different lenses in particular situations
- Edit the shots as per visual editing with respect to Camera Shots, Camera Angles and Camera Movements.

3.1 Lens Management

3.1 There are basically three types of lenses available.
3.2 (A) Wide Angle, (B) Normal and (C) Telephoto
3.3 Zoom Lenses used in certain Process.
3.4 Block Lenses basically used in Films/Cinema.

<table>
<thead>
<tr>
<th>Focal Length</th>
<th>Lens Type</th>
<th>Common Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>8mm - 24mm</td>
<td>Ultra wide angle</td>
<td>Wide panoramas and skyscapes, artistic</td>
</tr>
<tr>
<td></td>
<td>(fisheye)</td>
<td></td>
</tr>
<tr>
<td>24mm - 35mm</td>
<td>Wide angle</td>
<td>Interiors, architecture, landscapes</td>
</tr>
<tr>
<td>35mm - 85mm (50mm</td>
<td>Standard</td>
<td>General purpose</td>
</tr>
<tr>
<td>common)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>85mm - 135mm</td>
<td>Short telephoto</td>
<td>Portraits, candid</td>
</tr>
<tr>
<td>135mm - 300mm</td>
<td>Medium telephoto</td>
<td>Close sports, action</td>
</tr>
<tr>
<td>300mm+</td>
<td>Super telephoto</td>
<td>Far sports, wildlife, nature, astronomy</td>
</tr>
</tbody>
</table>

Lens focal lengths, types, and uses

3.2. Types of Shots:
The cinematographer's art often seems as much black magic as technique, taking a few actors milling around a set and turning it into something cinematic, evocative and occasionally iconic. Amidst all the voodoo and mystery, however, there is concrete science behind those money shots so we've identified thirty of the most important camera shots to help you distinguish your dolly zooms from your Dutch tilts.
**Extreme Long Shot**: This can be taken from as much as a quarter of a mile away, and is generally used as a scene-setting, establishing shot. It normally shows an EXTERIOR, eg the outside of a building, or a landscape, and is often used to show scenes of thrilling action eg in a war film or disaster movie. There will be very little detail visible in the shot, it's meant to give a general impression rather than specific information.

*The extreme long shot on the left is taken from a distance, but denotes a precise location - it might even connote all of the entertainment industry if used as the opening shot in a news story.*

Opening shot or sequence, frequently an exterior 'General View' as an Extreme Long Shot Example: Sun or object of faraway distance.

![Extreme Long Shot](image)

Fig.11: Extreme Long Shot

**Long Shot**: This is the most difficult to categorise precisely, but is generally one which shows the image as approximately "life" size ie corresponding to the real distance between the audience and the screen in a cinema (the figure of a man would appear as six feet tall). This category includes the FULL SHOT showing the entire human body, with the head near the top of the frame and the feet near the bottom. While the focus is on characters, plenty of background detail still emerges: we can tell the coffins on the right are in a Western-style setting, for instance. Long Shot shows all or most parts of a fairly large object and usually much of the surroundings. Example, a person, animal or something similar.
**Mid Long Shot:** This shot is also called as three quarters shot. Here the shot is taken till the knee level.

**Mid Shot:** Contains a figure from the knees/waist up and is normally used for dialogue scenes, or to show some detail of action. Variations on this include the TWO SHOT (containing two figures from the waist up) and the THREE SHOT (contains 3 figures...). NB. Any more than three figures and the shot tends to become a long shot. Background detail is minimal, probably because location has been established earlier in the scene - the audience already know where they are and now want to focus on dialogue and character interaction.
**Over-The-Shoulder-Shot** - Another variation in this category is the OVER-THE-SHOULDER-SHOT, which positions the camera behind one figure, revealing the other figure, and part of the first figure's back, head and shoulder. This shot is till the waist level.
**Mid Close-up:** Frames a subject's head and cuts off around mid-chest. The focus is on the subject. Reveals only a little of the surroundings.

![Image](image1.png)

*Fig.16: Mid Close-up*

**Close Up:** This shows very little background, and concentrates on either a face, or a specific detail of mise en scène. Everything else is just a blur in the background. This shot magnifies the object (think of how big it looks on a cinema screen) and shows the importance of things, be it words written on paper, or the expression on someone's face. The close-up takes us into the mind of a character. In reality, we only let people that we really trust get THAT close to our face - mothers, children and lovers, usually - so a close up of a face is a very intimate shot. A film-maker may use this to make us feel extra comfortable or extremely uncomfortable about a character, and usually uses a zoom lens in order to get the required framing Frames a subject's face and cuts off mid-neck, showing the face and entire head.

![Image](image2.png)

*Fig.17: Close up shot*
**Extreme Close Up:** As its name suggests, an extreme version of the close up, generally magnifying beyond what the human eye would experience in reality. An extreme close-up of a face, for instance, would show only the mouth or eyes, with no background detail whatsoever. This is a very artificial shot, and can be used for dramatic effect. The tight focus required means that extra care must be taken when setting up and lighting the shot - the slightest camera shake or error in focal length is very noticeable. Frames only a part of the object. Frames just the facial features.

![Extreme Close Up](image)

**Fig. 18: Extreme Close Up**

**Wide Shot:** This shot is used to show an object in a wide setting.

![Wide Shot](image)

**Fig. 19: Wide Shot**
**Point of View Shot:** This shot is used to show a particular object in a emphasized manner

![Image](image.png)

*Fig. 20: Point of View*

### 3.3. Camera Angles:

The relationship between the camera and the object being photographed (i.e., the ANGLE) gives emotional information to an audience, and guides their judgment about the character or object in shot. The more extreme the angle (i.e., the further away it is from eye level), the more symbolic and heavily-loaded the shot. The camera angle marks the specific location at which the movie camera or video camera is placed to take a shot. In different situations, different types of angles are used to take shots.

**The Bird's-Eye View:** This shows a scene from directly overhead, a very unnatural and strange angle. Familiar objects viewed from this angle might seem totally unrecognizable at first (umbrellas in a crowd, dancers' legs). This shot does, however, put the audience in a godlike position, looking down on the action. People can be made to look insignificant, ant-like, part of a wider scheme of things. Hitchcock (and his admirers, like Brian de Palma) is fond of this style of shot.
**Low Angle:** A low-angle shot, is a shot from a camera angle positioned low on the vertical axis, anywhere below the eye line, looking up.

![Fig. 21: Low Angle](image1)

**High Angle:** Not so extreme as a bird's eye view. The camera is elevated above the action using a crane to give a general overview. High angles make the object photographed seem smaller, and less significant (or scary). The object or character often gets swallowed up by their setting - they become part of a wider picture. A high-angle shot is a cinematic technique where the camera looks down on the subject from a high angle and the point of focus often gets "swallowed up"

![Fig. 22: High Angle](image2)
**Eye Level:** A fairly neutral shot; the camera is positioned as though it is a human actually observing a scene, so that eg actors' heads are on a level with the focus. The camera will be placed approximately five to six feet from the ground.

![Fig. 23: Eye Level](image)

**Oblique/Canted Angle:** Sometimes the camera is tilted (ie is not placed horizontal to floor level), to suggest imbalance, transition and instability (very popular in horror movies). This technique is used to suggest POINT-OF-View shots (ie when the camera becomes the 'eyes' of one particular character, seeing what they see — a hand held camera is often used for this.

### 3.4. Camera Movements

A director may choose to move action along by telling the story as a series of cuts, going from one shot to another, or they may decide to move the camera with the action. Moving the camera often takes a great deal of time, and makes the action seem slower, as it takes several second for a moving camera shot to be effective, when the same information may be placed on screen in a series of fast cuts. Not only must the style of movement be chosen, but the method of actually moving the camera must be selected too.
**PAN:** A movement which scans a scene horizontally. The camera is placed on a tripod, which operates as a stationary axis point as the camera is turned, often to follow a moving object which is kept in the middle of the frame. Movement of Left to right or vice versa. Panning is when you move your camera horizontally; either left to right or right to left, while its base is fixated on a certain point. You are not moving the position of the camera itself, just the direction it faces. These types of shots are great for establishing a sense of location within your story.

![Camera PAN (Left to Right)](image1)

*Fig. 24: Camera PAN*

**Tilt:** Tilting is when you move the camera vertically, up to down or down to up, while its base is fixated to a certain point. Again, like panning, this move typically involves the use of a tripod where the camera is stationary but you move the angle it points to. These shots are popular when introducing a character, especially one of grandeur, in a movie. A movement which scans a scene vertically, otherwise similar to a pan.

![Camera Tilt](image2)

*Fig. 25: Camera Tilt*

**Hand-held Shots:** The hand-held movie camera first saw widespread use during World War II, when news reporters took their windup Arriflexes and Eyemos into the heat of battle, producing some of the most arresting footage of the twentieth century. After the war, it took a while for commercially produced movies to catch up, and documentary makers led the way, demanding the production of smaller, lighter cameras that could be moved in and out of a scene with speed, producing a "fly-on-the-wall" effect. This aesthetic took a while to catch on with mainstream Hollywood, as it gives a jerky, ragged effect, totally at odds with the organised smoothness of a dolly shot. The Steadicam (a heavy contraption which is attached a camera to an operator by a harness)

The camera is stabilized so it moves independently was debuted in Marathon Man (1976), bringing a new smoothness to hand held camera movement and has been used to great effect in movies and TV shows ever since. No "walk and talk” sequence would be complete
without one. Hand held cameras denote a certain kind of gritty realism, and they can make the audience feel as though they are part of a scene, rather than viewing it from a detached, frozen position.

**Dolly:** A dolly is when you move the entire camera forwards and backwards, typically on some sort of track or motorized vehicle. This type of movement can create beautiful, flowing effects when done correctly. If you want to attempt a dolly, make sure your track is stable and will allow for fluid movement.

**Truck:** Trucking is the same as dollying, only you are moving the camera from left to right instead of in and out. Again, it is best to do this using a fluid motion track that will eliminate any jerking or friction.

**Pedestal:** A pedestal is when you move the camera vertically up or down while it is fixated in one location. This term came from the use of studio cameras when the operators would have to adjust the pedestal the camera sat on to compensate for the height of the subject. A pedestal move is easy to do when the camera is fixated to an adjustable tripod.

**Rack Focus:** Rack focus is not as much of a camera move as it is a technique, but many amateurs overlook this essential skill. You adjust the lens to start an image blurry and then slowly make it crisper, or vice versa. It is an extremely effective way for you to change your audience’s focus from one subject to another.

**Crane Shots:** Basically, dolly-shots-in-the-air. A crane (or jib), is a large, heavy piece of equipment, but is a useful way of moving a camera - it can move up, down, left, right, swooping in on action or moving diagonally out of it. The camera operator and camera are counter-balanced by a heavy weight, and trust their safety to a skilled crane/jib operator.

### 3.5. Zoom Lenses

A zoom lens contains a mechanism that changes the magnification of an image. On a still camera, this means that the photographer can get a 'close up' shot while still being some distance from the subject. A video zoom lens can change the position of the audience, either very quickly (a smash zoom) or slowly, without moving the camera an inch, thus saving a lot of time and trouble.

The drawbacks to zoom use include the fact that while a dolly shot involves a steady movement similar to the focusing change in the human eye, the zoom lens tends to be jerky (unless used very slowly) and to distort an image, making objects appear closer together than they really are. Zoom lenses are also drastically over-used by many directors (including those holding palmcorders), who try to give the impression of movement and excitement in a scene where it does not exist. Use with caution - and a tripod
**Zooming In:** Hold your camera and point it at whatever you want to record. Either look at the screen or through the viewfinder depending on the model of camera you have. Now press and hold the button used to zoom the lens of your camcorder in. Release this when the subject is the right size on the screen.

There are normally two segments to the zooming bar. If you continue zooming past the first point, then this will be using digital zoom. When using digital zoom, the quality of the image will be lower so it's worth bearing this in mind.

**Zooming Out:** Zooming out is also very simple. Simply press and hold down the opposite button and the camera should start to zoom out. This will mean that the image will start to look much smaller on the screen.

Zooming can be very useful to make the subject in your video look much closer even if it's a very long way in the distance. This is especially useful when trying to record videos of animals. Many birds will be frightened away by you, which is why it's so easy to use zoom to get close without scaring anything away.

**The Aerial Shot:** An exciting variation of a crane shot, usually taken from a helicopter. This is often used at the beginning of a film, in order to establish setting and movement. A helicopter is like a particularly flexible sort of crane - it can go anywhere, keep up with anything, move in and out of a scene, and convey real drama and exhilaration — so long as you don't need to get too close to your actors or use location sound with the shots.

![Fig.27: Aerial Shot](image-url)
Unit Summary

In this unit you learned types of shots, lens management and camera movements and their application

Assignment

Give a detailed explanation of -

- Continuity Film

Or

- Advertisement Film
Unit 4
Photography Design

Introduction
Design using photographic Lights and Camera Filters.

Outcomes
Upon completion of this unit you will be able to:

- Lit Up a Scene
- Light a Single Character or Multi Character
- Use of Camera Filters Creatively.

4.1. Lighting

Light is the most important part of every photo we take, it's what creates everything that we see and affects how it appears. Understanding a little bit about it can really help to improve the quality of our photos and videos.

Natural Light:

Light is what allows us to see. It is what shapes and colors every object we can see with out eyes, it creates depth, mood, and color. The word photography comes from “photo” or “light” and “graphy” or “writing”, so photography essentially means “light writing” .The objective of this tutorial is to learn how to see light and use it to our advantage and create interesting and exciting photos. At the end of this tutorial you should have a basic understanding of the following fundamentals of light:

1. Exposure - how bright a scene is and how it effects our image.
2. Quality - how focused or diffuse light is.
3. Color - the color of the light in an image.
4. Direction - where is the light coming from?
5. Highlight - the brightest part of the image
6. Shadow - the darkest part of the image.
7. Contrast - The difference between the bright part of an image and the dark part of an image

Watch this video on Lighting at goo.gl/dFKNCj
How we see:

When we see an object we are seeing the light reflected off of it. Sunlight contains light of every color and when it illuminates an object we are seeing certain colors of light reflected by that object that then travel into our eyes. Red objects reflect red light, and green objects reflect green light. Dark objects reflect less light than bright objects. For the purposes of this lesson the most important thing we need to know is that what we see is created by light reflecting off of everything and traveling into our eyes. A photograph is created by capturing the light that is reflecting off of our scene and traveling into our camera, where it is captured by film or a digital sensor.

There is at least one entire field of physics devoted to the study of light and how it behaves, however this type of in depth study is beyond the scope of this tutorial.

4.2. Basics of Light

1. Exposure

Exposure is the overall brightness or darkness of a scene. A neutral or normal exposure is one which creates an image that looks similar to how we see it with our eyes. A typical scene during the day has about 10 stops of light in it, and the average high end DSLR captures between 5 and 7 stops. Our eyes can take in somewhere around 20 stops. What this means for us is that what we see in real life is not what we get in the camera or on the screen or in print.

2. Quality

As well as being light or dark, light can also be soft or hard. This is primarily a function of how large the light source is compared to the subject. A large light source close to the subject creates a very soft light with soft shadows if any, the light wraps around the subject. A small bright light far from our subject creates a hard light with hard well defined shadows.

Sunlight may at first appear to be a small light source, however it is both small and soft as the earth’s atmosphere diffuses a lot of it, and it also tends to bounce and reflect off of lighter or bright objects. Fog and cloud also do a lot to diffuse and soften sunlight. While a single ray of sunlight in the forest can be fairly hard, full late afternoon sun in a brighter location (snow, concrete parking lot, dusty dirt lot) is a lot softer. Part of this has to do with the angle the sunlight travels through the atmosphere. In the morning and evening the sun is at a low angle and travels through significantly more of the atmosphere than it does at mid day, this helps to make early and late light a lot softer than midday light. Evening light in developed areas of the world is also softer than morning light as air pollution builds during the day and helps to diffuse the sunlight further. This pollution normally dissipates a lot at night when temperatures are cooler and the world is asleep, making morning light crisper and cleaner. Crisp early morning light.

3. Colour

Sunlight varies in color greatly and this color is measured as temperature in degrees Kelvin. Normal daylight film used to be calibrated at about 5600K which produced a nice image in the middle of the day but was much warmer (towards the red side) in the morning and evening. The diffusing effect of the atmosphere also colors daylight, and normally daylight can vary from a warm 4000K in the late evening to a cool 6500K on a cloudy day. 6500K is considered to be the actual color of daylight without the effect of
the atmosphere. Tungsten light bulbs put out a light that is really orange at around 3200K and fluorescent bulbs can now vary greatly in color. Note that when you are adjusting the color of a RAW photo with the color slider it makes changes opposite to what you would think initially. Moving the slider to a lower number makes images appear cooler, while a higher number makes images appear warmer.

4. Direction

Light travels in a direction for the most part. It may be hard or soft, but the sun is a single light source and that light travels in straight lines radiating out from it. It may bounce and reflect off of things, but try to keep in mind that it has direction. Because of this things can look quite different depending on which direction we view them from, they can be front lit, back lit, or side lit. And everything in between. Remember that this applies to all light sources as well and not just the sun.

We can use natural objects to block or redirect (reflect) the light and change it’s direction, or we can place objects ourselves.

This image is a front lit shot of the exact same trail at almost the same time of day as the back lit shot below.

5. Highlight

The highlight is the brightest part of an image. When we are dealing with a single light source this is normally a reflective surface or object facing the light source.

6. Shadow

Shadow is the darkest part of an image. When we are dealing with a single light source this is normally a non-reflective object or surface facing away from the light source or in the shadow of something else.

7. Contrast

Contrast in an image is the measurement of the difference between the highlights and the shadows. If there is a lot of range between the two there is very little contrast, if there is little range between the two then an image is said to have high contrast. Images shot on a cloudy day usually are low in contrast, and images shot in the bright sun are generally high in contrast.

4.3. Things to consider when shooting

1. See the light - What does it look like?

Learn to see what the light actually looks like before you shoot. Take a look around, is it bright or dark? Where is the light coming from? Are there shadows and highlights? How is the contrast?

Take the time to evaluate the scene you are shooting and look at it from different angles, not just for composition but for light as well. If you’re shooting front lit in an area of high contrast i.e. bright highlights and dark shadows, it may be very difficult to see anything, try looking at it from a backlit angle. Look at large areas of light and shadow and see if you can use them compositionally. Plants and greenery and other translucent objects often look better backlit.
2. Control the light - Can you make the light work for you?

Can you use a scrim to block unwanted light, or a reflector to add some light? Sometimes it doesn’t take much to change average light into good light. The easiest way is usually to choose a different time of day when the light works for you. Early morning or late afternoon/evening traditionally has the best light, but sometimes there is less than an hour of the day when the light might be perfect for what you need. Light between two trees or buildings for example.

**Three-point lighting** is a standard method used in visual media such as theatre, video, film, still photography and computer-generated imagery.[1] By using three separate positions, the photographer can illuminate the shot's subject (such as a person) however desired, while also controlling (or eliminating entirely) the shading and shadows produced by direct lighting.

![Three Point Lighting](image)

**Fig.28: Basic 3 Point Lighting Setup**

**Flat light**

When you have your light source facing directly at the front of your subject, this is flat lighting. Flat lighting on a face will mean that your subject is well lit and you are unable to see any shadows along their face.

This is not a heavily desired look in portraits as you need shadows to draw your subject to life. However, there are circumstances where it’s beneficial. Since shadows can draw out imperfections and textures, flat lighting is beneficial when photographing babies in their acne skin weeks, teens with heavy blemishes, and elderly people feeling insecure about their wrinkles. If you have a photo that is oozing character and personality, you can also get away with flat light on your subject.

**Broad light**

With broad light (a type of side lighting), the face of your subject is at an angle and the most well-lit side of the face is closest to the camera and the shadow falls on the back side of the face. This type of light can make a face look fuller so it’s ideal for those with very narrow faces.

**Short light**

Another type of side lighting, short light is the opposite of broad light in that the face is at an angle and the shadow falls on the side of the face closest to the camera. This type of light works well to thin a face and is flattering on most people. One thing to keep in mind is that shadows draw out textures and imperfections. While broad light is a wonderful way to emphasize freckles, it will also draw out imperfections like acne and scars. Knowing how your subject feels about those imperfections is important so you know if you should hide them with another type of lighting or if they’re okay with you showcasing them with short light.
Split light
Split lighting is another type of side lighting but it is defined as light that hits your subject from the side at a 90 degree angle. You can easily recognize split lighting in an image by half of the subject being lit and the other half in the shadows. With a face specifically, you’ll see the shadow line straight down the middle of the forehead, nose, and chin.

Split lighting tends to make your subject look tough and masculine so you want to really consider your subject when choosing this type of lighting.

Backlight
Backlight is just that, light that comes from behind your subject. This is commonly seen in photos from the beloved golden hour, when the sun is low in the horizon and starting to set, but can be done at all hours of the day. Sources of backlight can include a window behind your subject in the middle of the day to a flash placed behind with a colorful gel for something fun.

As beautiful as backlight is, it comes with its own challenges which can include a look of haziness and lack of clarity in your subject. Because of this, I like to do a few things…

Semi-siilhouette: One of favourite ways to use backlight is to let the light just barely creep into the frame. When doing this, there’s a pretty glow that creates a welcome contrast to a dark background. In this situation,

Reflector: Sometimes you may want the strong haze that comes with the sun warmly filling the frame but losing clarity in subject’s face is no good. To combat the loss of clarity I use a reflector to pop some of that sunlight back onto subject. When using a reflector, place it opposite the light source and then adjust the angle to direct the light exactly where you want it. You’ll also want to move the reflector closer to your subject for stronger light and further away from for softer light.

Off camera flash: Similar to a reflector, off camera flash combats the lack of clarity that comes with lots of backlight. Off camera flash is used just the same as a reflector, to light the face. While a reflector is cheaper and easier to carry around, off camera flash has more power (aka light) and won’t encourage squinting (very important to consider if your subject is extra sensitive to light).

Rim light
Rim light falls under the backlight category but deserves a spot of its own. With backlight you often see the hazy or airiness from the light in the background resulting in highlights but you don’t have that with rim light. With rim light, you’ll see the light from behind only highlight the edges of your subject (there’s a little haze falling into the top right of the frame below but you can see how the rim light separates the subject from the background). This is great to use when you need to separate your subject from the background.

Butterfly light
With butterfly light, the light is placed above and in front of your subject to create a small shadow under the nose resembling a butterfly (hence the name). This type of light beautifully highlights prominent cheekbones which is why you most often see it used on women. However, it emphasizes the shadows from deep set eyes. Again, know your subject’s face and how the light will affect their features. Butterfly light is also commonly referenced as paramount light.
**Loop light**

Loop lighting is pretty much used in creating light. With loop lighting, the light is about 45 degrees to the side and slightly above eye level. This position of the light creates a shadow just under and to the side of one nostril and the nose. This is a flattering type of light on most everyone.

**Key light**

The key light, as the name suggests, shines directly upon the subject and serves as its principal illuminator; more than anything else, the strength, color and angle of the key determines the shot's overall lighting design.

In indoor shots, the key is commonly a specialized lamp, or a camera's flash. In outdoor daytime shots, the Sun often serves as the key light. In this case, of course, the photographer cannot set the light in the exact position he or she wants, so instead arranges it to best capture the sunlight, perhaps after waiting for the sun to position itself just right.

**Fill Light**

The fill light also shines on the subject, but from a side angle relative to the key and is often placed at a lower position than the key (about at the level of the subject's face). It balances the key by illuminating shaded surfaces, and lessening or eliminating chiaroscuro effects, such as the shadow cast by a person's nose upon the rest of the face. It is usually softer and less bright than the key light (up to half), and more to a flood. Not using a fill at all can result in stark contrasts (due to shadows) across the subject's surface, depending upon the key light's harshness. Sometimes, as in low-key lighting, this is a deliberate effect, but shots intended to look more natural and less stylistic require a fill.

In some situations a photographer can use a reflector (such as a piece of white cardstock mounted off-camera, or even a white-painted wall) as a fill light instead of an actual lamp. Reflecting and redirecting the key light's rays back upon the subject from a different angle can cause a softer, subtler effect than using another lamp.

**How to read light**

One of the first very important skills is the ability to breakdown lighting and determine approximate camera settings in images taken by other photographers. If you understand how the direction of light and its degree of diffusion are controlled and how they affect images, it should be easy for you to train yourself to "read" lighting in the images you see in magazines, on billboards and in your favorite photographers’ portfolios.

It's like speaking a secret language. It's fun and very helpful for your ability to set and control lighting in your own photos. In other words, it will be easier for you to successfully select your camera settings and set up correct lighting to get what you envisioned to achieve, or what your client is asking you for.

It is not difficult at all and you can train yourself to do it well if you are familiar with the mentioned above photography fundamentals. The more you challenge yourself and practice guessing lighting setups and camera settings in other photographers' work, as well as shoot and analyze your own images, the easier it will become.

Although, if something really falls out of your understanding of lighting in a photo there’s always a chance that you’re looking at a photo-montage, or the lighting was significantly altered in post-production in it. And again, it will be easier for you to identify such things the more you shoot and analyze your own pictures and lighting.
I will share the list of cues, which help me breakdown lighting setups and camera settings in photos, in two articles, and today you can read the first part. But before we begin I’d like to remind you what we're dealing with.

4.4. Every Photographer Must Know

The basics is where it all starts, and how well one knows and understands them will often determine the quality of work he or she produces. Just as much it is important to understand highlights and shadows rendering and know human anatomy for a professional classic portrait painter, understanding the light behavior and the basic elements of exposure is necessary for any photographer.

Direct light creates hard-edged dark shadows. The smaller the light source (relative to the size of the subject) or the farther away it is from the subject, the sharper and darker the shadows will be. The hardest light is created by a point or spot light source - a light small enough or far enough from the subject that its actual size is irrelevant. Think the sun in a clear sky, a spotlight on a performer on a stage - the shadows are dark and hard.

Diffused light scatters onto the subject from many directions, the shadows are very bright or absent altogether. The closer the light source to the subject or the larger it is (relative to the size of the subject), the softer and brighter the shadows will be. Think a heavily overcast sky, when entire sky becomes the source of light. Or light coming in through a big window on the northern side of a building - the shadows are very bright and soft, you can barely see their outline.

Practical implementations:

- Use diffused - reflected or direct fill - light to soften shadows in your images.
- Brighter shadows help visually even out bumpy or aged skin, so use this quality of diffused light to your advantage when working with clients or models whose skin is not very even.
- Side lighting emphasizes facial features and reveals textures like that of skin. Make sure to avoid it when shooting female portraits, or in the mentioned above situations. Otherwise you will add post-production time and cost and create problems that you could have easily avoided by the correct choice of lighting.

Make sure to educate yourself on the purposes of and differences between light-shaping tools – light modifiers, flags, diffusers, grids, reflectors, etc. – and what you can do with them. The truth is, in order to consistently set up beautiful lighting you need to know the basic principles of light behavior and absolutely do not need to buy expensive equipment and props, because you can replace them with DIY tools that can help you shape the light just as well.

4.5. How to "READ" LIGHT

Allow me to share the main cues that will help you to "read" lighting and exposure settings in photos taken by other photographers:

1. The size and shape of catch lights in the eyes.

This will help you to identify what light sources were used, how large or small they were, where and how close to the face they were placed.
This is what catch lights created by a strobe or small flash look like:

_This is what catch lights created by a beauty dish with a diffuser sock on look like:_

You will also sometimes notice an even darker spot in the center of the round catch lights - that's a reflection of a beauty dish with no diffuser on, and the hardness of the shadows on the model's face will usually confirm it.

Also, you will often see only a half of the circle of the round catch lights - that's because normally the main light is placed higher than the model's eye level, so the upper halves of the catch lights are cut off by the eyelid and eyelashes.

Needless to say, that the circle of the catch lights will be smaller or bigger depending on how far or close the light with a beauty dish was placed to the model's face.

2. **Approximate aperture size.**

This will help you to identify how wide the aperture was open when the photo was taken. The focal length and the distance between the camera and the subject will also affect the width of the focus plane, so remember to take this detail into account. Look for cues to determine how wide the plane of focus (depth of field) and how blurred the background is when looking at a photo.

3. **Ambient light conditions and fill light.**

This often can be determined by the darkness of the shadows in the shot. If the shadows are very dark it may suggest that there was no fill light (reflector or any additional lighting) used, and no bright walls or other reflective surfaces around the subject in the shot. If the image is also very sharp throughout the frame it also tells you that a higher f-number was used (small aperture).

The opposite lighting conditions and camera settings (a lot of fill light, bright surroundings and wide open aperture) will result in the opposite outcome - bright or no shadows in the image.

4. **Rim light.**

You can judge the output power of the light source pointed at the model's back (not necessarily a controlled light source) and its positioning by the brightness and the width of the rim light.

_Click on the photo to enlarge it:_

To successfully identify whether or not any rim light was used, what light source it was and where it was placed, I usually also look for other hints besides the obvious rim light itself. Shadows and highlights in reflective surfaces are the best helpers.

For example, in the first photo you can see very apparent highlights on the bottom lip and in the further eye created by the rim light, and the subtle light on the model's cheek, chin and the hair confirms the use and direction of rim light in this picture.

In the second photo you can see the sconces, so it is a no-brainer. But even if they were out of the frame, you could tell that there were two light sources behind the model by the direction of the shadows on the bed and the model's body, as well as the visible rim lights. But if you look at this picture a little closer, you will also notice that there was light coming from above - just look at the model's fingers above her head.

So, now you can tell that there were two lights behind the model, one light above her and, and, by the fact that the shadows are not completely black on the front of her body, you can determine there was either fill light placed in front of the model or a bright surface (a wall or a reflector), off which the existing light bounced back onto the model.
And finally, in the last photo, the direction of the sunlight is obvious from the light and shadows on the grass behind the model. The rim light on her hair and outlining her body is also caused by it. But if you take another second to breakdown the lighting in this picture you will also see the rim light created by the diffused evening light on her right as well... did I say evening? How would you know that? By the length of the shadows in the background, and also judging by the fact that the rim light on her hair is created by the sun that is in a lower spot in the sky, not above the model, otherwise the top of her hair would be lit by it as well.

Lastly, the big catchlights in her eyes and the direction of the shadow on her chest behind her hand suggest that there was a large source of light in front of the model as well. Most likely a reflector, considering the large aperture (shallow depth of field) that was used when taking this picture.

_Four kinds of artificial light sources for photography:_

Light, is the main ingredient in a photograph. There are of course other ingredients: time, composition, subject matter, emotion and your unique style, but light is the thing that makes photography work.

Light is the thing that early inventors had to hold or fix, in order to make a photograph stick around.

We call nature’s light, natural or available. Think of sunlight or moonlight.

Artificial light is everything else.

To keep things simple, it’s best to start your learning using natural light. But there comes a time when:

- you’ll want more light
- you’ll want different light
- or you’ll want more control of the light for creative purposes

_There are four common types of artificial light used for photography today_

- Incandescent
- Fluorescent
- LED
- Studio Strobe

**Incandescent**

This lighting ranges from the common light bulb to large tungsten “hot lights” used in the studio and on movie sets. They are warm in colour temperature compared with natural daylight.

The light from a bare bulb is pretty harsh. That’s why we use lampshades on lights in our homes. The quality of incandescent lighting can be modified using flags, reflectors and diffusion material. They get hot to touch, so you need to be very careful around children and when photographing things that melt – like plastic or ice cream.
Fig. 29: Incandescent Light

Fluorescent

Most public buildings and offices are lit with fluorescent lighting tubes. They’ve been around for decades. They aren’t common in photography, but we sometimes get stuck with them if we’re shooting in corporate offices. One problem is that the tubes come in different colour temperatures. Traditionally they were greenish, and you had to have a magenta filter on your lens to correct for it.

Now they come in many different flavours: cool white, warm white, daylight balanced, traditional green. As a result, it’s hard to white balance for fluorescent lighting, as you never know which type of bulbs are in the ballasts, or even if the bulbs match the ones next to them. You could have a room that has 2 or 3 different coloured tubes. In this case I’d definitely recommend doing a custom white balance using a grey card.

New CFL curly bulbs

Now there’s a new fluorescent kid on the block: The CFL or compact fluorescent light. These are supposed to solve the energy crisis, but in reality they are more trouble than good. Many of the CFL bulbs give off dirty electricity.

Fig. 30: New CFL Curly Bulb
Not to mention, they have mercury in them. If one breaks or burns out, you need a hazmat team to dispose of them. You can’t just toss mercury into the garbage. Keep children away! CFLs are not suited for domestic use like the common light bulb, but rather meant to be kept on for long periods of time, so they are great for warehouses where the lights are on all the time. For more info on CFLs read the research of Howard M. Brandston and his Save the Bulb campaign.

There are some new studio lighting kits on the market that use these CFL bulbs. They really push them in the video market. But the lower end kits often suffer from mixed white balance because of low quality bulbs. They really don’t make good photography or video lighting.

**LED**

LED stands for light emitting diodes. Usually there are a series of hundreds small light diodes on one of the LED panels. These lights are really new on the photography and video market and their use is getting more common, especially as perimeter lighting for domestic use. You probably also use one if you ride a bicycle.

Depending on the brand name and quality of LEDs, they can range from very stable in colour temperature to very unstable. The brightness can be varied with a built in rheostat and some models have two colour temperatures, or slide in filter panels.

![Fig.31: LED Light](image)

The quality of the light from LED’s tends to be a bit harsh and doesn’t spread out much, so you might need to soften this light with a spun diffusion material, or bounce it off a wall.

It can be said they require a burn in period of about 72 hours. That will help stabilize the colour temperature variations. You may require colour correction gels, and it’s a good idea to use Custom White Balance on your camera. Don’t believe the colour temperature ratings given by the manufacturer. Do your own tests.

Some LED’s aren’t bright enough to shoot still photographs with, unless you use a high ISO (800+) or put them very close to your subject. If you’re shooting inanimate subjects – like
products, you’ll be fine. They are great for video and can be transported easily without worrying about breakage.

**Flash and Studio Strobe**

Remember the high school dances with the flashing strobe light and the mirror ball? Well that’s exactly what your camera flash is. Strobe (or flash) lighting is not continuous like the other lights I have talked about here, rather it bursts out a huge amount of light in a fraction of a second. As such it’s a bit harder to visualize how that light is going to look on your photos.

Strobe lighting is probably the most common used artificial lighting in photography. Strobe lighting is not suitable for video, as the duration of the flash is too short.

The light from your camera flash is very harsh as well. Most people like to modify the light by bouncing it off a small card or by putting plastic diffusers in front of the flash head.

Photographers have been using studio strobe lighting for many years, and it’s not going out of style any time soon. There are many manufacturers of strobe lighting systems and many light modifying accessories to go with them such as umbrellas and softboxes.

**4.6. What’s the best artificial light for your photography?**

The first step may be to get an off camera flash for your camera. This is a great way to get into using artificial light. You can also use these types of flashes for good fill light when shooting outdoor portraits.

Many camera flashes can rotate and have bounce capabilities and a bounce card built into them. You can use them in full auto mode or control the output more carefully.

![Camera Flash](image)

**Fig.32: Camera Flash**

**Flashes can be used off the camera** with wired or wireless triggers. You can hand hold your flash and change the angle of the light or get an off camera flash bracket or a small light stand to hold it. I’ve also use a tripod when in a pinch.

As the light is very harsh from a flash, you may want some extra accessories such as a small umbrella to soften the light for portraits.

When you’re ready for more power you can add extra flashes to your lighting setups. If you get into family or group photography, you will likely need studio strobe lights, as they have more power.

There are many great resources for off camera flash tips and training, notably Joe McNally and Strobist.
If you’re shooting indoors in controlled situations where there are no kids running around, you might consider the CFL kits. This would be great if you are shooting still life photos. Personally I’m not a huge fan of the CFL bulbs, but they are very cost effective and can also be used for video.

4.7. Camera Filters and Colors

Watch this video to learn use of filters in camera at goo.gl/nCzLsc

Importance of Color Reproduction in Microscopy Images

Through our eyes, seeing is not always believing. Under different lighting conditions, we tend to see the same objects as having the same color. For example, an apple will appear red whether it is lit by daylight or candlelight and a white sheet of paper will be perceived as being white regardless of the light source. This is something that we do subconsciously and is known as ‘color constancy’ or ‘chromatic adaptation’. Our eyes receive light via two photoreceptors: cones and rods. The visual cortex processes this information and color constancy allows our brains to recognise objects regardless of lighting conditions.

This is all very well when we are interacting with the ever-changing contrast of the world around us. However, when it comes to viewing microscopic specimens with a monitor or capturing microscopy images with a camera, the colors we perceive down the eyepieces will differ to those viewed on the screen or captured by the camera.

Importance of Color Reproduction

Does it matter if the images we see down the microscope don’t match those captured by the camera? Well, for samples involving color, such as histology slide stained with hematoxylin and eosin, it is very important. This is to ensure the image can be correctly analyzed and can also be compared with previous samples. With poor color reproduction there is a chance that important information may be missed because the contrast between colors isn’t clear. Therefore, we need to adjust images taken on the microscope to account for the light source.

In image processing, this chromatic adaptation is referred to as ‘white balance’ or ‘color balance’. Data are collected by image sensors (such as photomultiplier tubes or camera sensors) and processed for color reproduction on computer screens or camera displays. Obviously, electronic image sensors and processors don’t match our cones and rods, and those sensors and processors can’t always tell that an apple is red in candlelight. Therefore, it’s important to take color correction into account when viewing and capturing images from microscopes.
**Color Correction by Camera Sensors**

The human eye and the image sensors employed in microscopy differ in perception of light and color. It’s important to match, as closely as possible, the colors we view down the eyepieces to the colors displayed on a monitor or camera.

Two of the most common image sensors in microscope camera are the Charge Couple Devices (CCD) and Complementary Metal Oxide Semiconductors (CMOS). Cameras with CCD sensors are sensitive to infrared (IR) light, which can have the effect of reducing image contrast. Some cameras incorporate IR filters that can compensate for this sensitivity, or filters can be used in the microscope set-up.

Color reproduction will also vary between microscopes, room set-ups, and lighting conditions. Furthermore, colors will also vary depending on the samples, stains or fluorophores that are used. If possible, always use the same microscope system and ensure it is correctly aligned for Koehler Illumination.

**Factors Affecting Colour Reproduction**

**Light Source**

You’ve probably heard colours being referred to as ‘warm’ or ‘cool’ referring to ‘colour temperature’. Colour temperature is measured in Kelvin (symbol ‘K’). A bit counter-intuitively, higher temperature colours are called ‘cool colours’ (such as blue or white) and the lower temperature colours are known as ‘warm colours’ (such as red and yellow).

Microscope light sources vary with colour temperature. For example, daylight is regarded as 5000 K and a tungsten halogen lamp has a temperature of around 3200 K. Filters can be used in microscope systems to raise or lower the temperature of the light source. Colour temperature isn’t everything, though. A variety of light sources may have the same colour temperature, but have different spectral properties. Also, colour temperature isn’t a reliable prediction of how specimens will be viewed and processed by the microscope imaging system.

**Camera Type**

CCD and CMOS cameras can be adjusted electronically for white balance. However, the light sensing elements of these sensors are monochromatic and colour balance is achieved by either passing the light through red, green and blue (RGB) filters covering the whole sensor, or by individual sensors which cover each pixel in the sensor array. Different cameras have different colour correction systems. The software alone controls some systems and others require both software and hardware adjustments. Some settings cannot be altered by the user, meaning it is important to select a camera that has good colour reproduction and colour correction.

**Choice of Monitor**

Colour reproduction will vary between monitors. Monitors must be calibrated when first installed. Calibration should be performed at regular intervals over the lifetime of the display. Additionally, if correct colour balance is important for imaging of your samples, then several companies offer medical display monitors. These specialized monitors offer a more accurate reproduction of colour than standard monitors.
4.8. **What Is Colour Temperature?**

Often misunderstood, colour temperature is an important concept which can have serious implications for the images which we create.

In the picture above, you can see three versions of the same image—each shot with different in-camera white balance (colour temperature) settings:

- Top left: incorrectly balanced at 3200K (tungsten)
- Top right: correctly balanced at 5600K (daylight)
- Bottom: final colour correction, based on the properly balanced 5600K shot

**Planning Ahead**

Mixed light sources can often cause problems, and unless you are intentionally lighting with mixed sources for creative purposes, it is well worth keeping a single colour light source in mind when planning ahead. A location recce goes a long way to determining how an area is lit during the day, at night, and what practical light sources are present.

By planning ahead and identifying potentially problematic lighting conditions beforehand, you can make informed decisions about how to tackle lighting different locations and what equipment you will need.

By understanding colour temperature, you will always be ready to balance your camera even in situations where you have no control over lighting at all.

Correctly setting your colour temperature in-camera is easy. It’s definitely not something you want to fix in post, so always attempt to get your in-camera colour temperature right and avoid the headaches that incorrectly balanced images can cause.

**Colour**

**7 Ways to Create Powerful Photos with Colour**

Colour is everywhere. We're surrounded by it, we can't avoid it and therefore we tend to take it for granted when we take photos. But take it for granted, and you're likely to end up with mediocre photos. Just because colour is everywhere doesn't mean you shouldn't pay attention to how it affects your images. We see so many average photos each day - in magazines, on the internet, in books - that sometimes it's easy to forget that colour photography can be a magical, evocative medium.

We've put together seven tips to help you get the most out of colour. At the end of the article is a section of links to photographers who use colour to create powerful photos. With a little bit of thought, so can you.

Now is the time to start using colour to create powerful photos. Colour is an important part of a photo's composition (unless you're shooting black and white of course), although you may not have thought of it that way before. Colour is as much as part of a photo's composition as other building blocks such as shape, form, texture, lines and light.
1. Use Strong, Bold Colours

Deep, saturated colours have impact. The key to using strong colours successfully is in keeping the composition simple. Including lots of different colours in a photo lessens their impact. For maximum effect, stick to a few blocks of bold colour.

This photo is a good example of strong but simple colour. The composition can be divided up into two large blocks of colour; green and blue.

**Tip:** Use a polarising filter. Polarising filters work by blocking reflected light off non-metallic surfaces. The result is deeper, purer colour, including the sky. Compare these two photos, they were taken one after the other, the bottom one with a polarising filter, the top one without. The sky in the polarised photo is dramatically darker:

![Fig.33 Use a polarising filter](image)

2. Use Subtle, Pastel Colours

Colour photography isn't just about strong colour. Colour photography can be very subtle, almost monochrome. You're more likely to get pastel colours on a dull cloudy day. This type of light, which is so soft that there are almost no shadows, is ideal for subjects like portraiture, flowers, still life and waterfalls - anything where too much contrast could ruin the photo.

You can also de-saturate colours by using the Hue/Saturation command in Photoshop. This is a good way of controlling colour in post-production.

This photo of an old wooden chair has soft, subtle colours; nothing bright or attention grabbing.

3. Use One Colour Against a Neutral Background

The two most important elements in the composition of this photo of an old car are the colour and texture. The neutral grey of the background accentuates the car's blue paintwork. Placing a strong colour against a neutral background emphasises the colour because there are no competing hues to detract attention from it.
How do you find a neutral background? Anything that's grey or black will do, and it can also work if the background is in deep shadow.

4. Let One Colour Dominate

Let one colour dominate. The colour becomes the main subject of the photo, as in this photo of plant pots against a terracotta coloured wall. Terracotta is the dominant hue of the photo. The effect is even stronger when the dominant colour is a primary colour (red, yellow or blue). You can see that in the photo of a blue wall used to illustrate the next point (below).
5. Colour Balance

This diagram is called a colour wheel and explains the relationships between different colours. Colours close to each other on the wheel complement each other. If you want to create a photo with a calm, mellow feel, then use colours that are close to each other on the wheel. Good examples are a blue sea underneath a blue sky - or an autumnal woodland scene composed of yellow, red and brown hues. This photo of a blue wall is another example, it uses the colours blue, green and purple which are all close on the wheel.

The opposite approach is to create a photo with high colour contrast - you do this by using colours that are on opposite sides of the wheel. For example, a girl wearing a yellow dress against a bright blue sky. Or red flowers in a green field:

Red, yellow, orange and brown are warm colours. Blue is a cool colour. Green and purple are somewhere in-between. Warm colours appear to come forward in a photo, and cool colours to recede. If you place a warm coloured subject against a cooler coloured background, the subject stands out. You can see this effect in the photo of the red flowers (above).

![Fig. 36 Colour Balance](image)

6. Colour Temperature

Light has colour. The light cast by the setting sun or a candle has an orange cast, for example. The light in the shadows of a sunny sky has a blue cast. Our eyes adjust to this automatically.

Your camera will adjust automatically as well, but only if you set the white balance setting to automatic (check your manual for instructions). It also comes with pre-set white balance controls. These are normally daylight, shade, cloudy, flash, tungsten and fluorescent; although they may vary from camera to camera. You can set these to match the light source that’s lighting your subject.
You can give a photo mood by setting the ‘wrong’ white balance. Understand this concept, and you can use it to create more powerful photos.

Tip: If you’ve set your camera to record photos in the JPEG format, then it's important to set the white balance correctly when you're taking the photos. This is because white balance can't be adjusted afterwards in Photoshop. You can change the colour balance, but this isn't the same as changing the white balance, and you may be left with a colour cast that you can't eliminate.

If your camera is recording photos in RAW format, you can adjust the white balance afterwards with the RAW converter that you normally use. This is a good reason for shooting in RAW, as it means you can fine tune the white balance setting in post-production if required. You can also change the white balance for artistic effect.

Try this for shooting portraits. Set the camera's white balance to cloudy. This creates a photo with a beautiful, flattering warm tone. For those of you familiar with film photography, this is the equivalent of using an 81B filter with daylight balanced film.

![Fig.37 Colour temperature](image)

The top portrait was processed with the white balance set to daylight, and the bottom one with the white balance set to cloudy.

Landscapes can also benefit from a warm white balance. But some landscapes benefit from a colder light balance. Waterfalls, for example, can look beautiful in cool light, as can any wintry scene.

Cool colours balance warm colours - but only when the area of cool colour is much larger than the area of warm colour. If both were of equal size, the warm colour would dominate the composition. Create balance and harmony within the image by placing a small patch of warm colour against a large area of cool colour. The two balance each other out.
7. Colour and Emotion

Colour has emotional value - when you see colour in a photo, you will have an emotional response to it, especially if colour has been used strongly in the composition.

The same colour may evoke different emotions depending on the context in which it's used. It may also provoke different emotional responses in some people than others (this is more likely when the people are from different cultures). But generally speaking colours provoke a near universal response.

Red, for instance, is a warm colour. It can also mean danger (it's the colour of blood) or anger (seeing red).

Blue is a cool, relaxing colour. Think tropical islands under a clear blue sky. But it can also be a cold, frigid colour. Imagine a dark, wintry scene with ice and snow.

Green is fresh and vibrant, like plants and trees in the spring.

Where to Find Further Inspiration

One of the best ways to learn about photography is by studying the work of talented photographers. These are some of our favourite colour photographers - three acknowledged masters and five contemporary photographers who display their work on Flickr. Bear in mind that some of these photographers shoot in black and white too, but we've chosen them because they have a strong colour vision.
Unit Summary
In this unit you learned the basic aesthetics and techniques of lighting and use of camera filter using in a Video Camera.

Assignment
Lighting and Execute a Scene

Or
Short Film Exercise