Basics of Camera, Lights & Sound

Tutorial

Unit-I Camera

A **camera** is an optical instrument for recording or capturing images, which may be stored locally, transmitted to another location, or both. The images may be individual still photographs or sequences of images constituting videos or movies. The camera is a remote sensing device as it senses subjects without any contact . The word *camera* comes from *camera obscura*, which means "dark chamber" and is the Latin name of the original device for projecting an image of external reality onto a flat surface. The modern photographic camera evolved from the camera obscura. The functioning of the camera is very similar to the functioning of the human eye. The first permanent photograph was made in 1826 by Joseph Nicéphore Niépce.

1. Introduction to video camera

A **video camera** is a camera used for electronic motion picture acquisition (as opposed to a movie camera, which records images on film), initially developed for the television industry but now common in other applications as well.

The earliest video cameras were those of John Logie Baird, based on the mechanical Nipkow disk and used in experimental broadcasts through the 1918s-1930s. All-electronic designs based on the video camera tube, such as Vladimir Zworykin's Iconoscope and Philo Farnsworth's image dissector, supplanted the Baird system by the 1930s. These remained in wide use until the 1980s, when cameras based on solid-state image sensors such as CCDs (and later CMOS active pixel sensors) eliminated common problems with tube technologies such as image burn-in and made digital video workflow practical. The transition to digital TV gave a boost to digital video cameras and by the 2010s, most video cameras were digital.

With the advent of digital video capture, the distinction between professional video cameras and movie cameras has disappeared as the intermittent mechanism has become the same. Nowadays, mid-range cameras exclusively used for television and other work (except movies) are termed professional video cameras.

Video cameras are used primarily in two modes. The first, characteristic of much early broadcasting, is live television, where the camera feeds real time images directly to a screen for immediate observation. A few cameras still serve live television production, but most live connections are for security, military/tactical, and industrial operations where surreptitious or remote viewing is required. In the second mode the images are recorded to a storage device for archiving or further processing; for many years, videotape was the primary format used for this purpose, but was gradually supplanted by optical disc, hard disk, and then flash memory. Recorded video is used in television

production, and more often surveillance and monitoring tasks in which unattended recording of a situation is required for later analysis.

Modern video cameras have numerous designs and uses.

- Professional video cameras, such as those used in television production, may be television studio-based or mobile in the case of an electronic field production (EFP). Such cameras generally offer extremely fine-grained manual control for the camera operator, often to the exclusion of automated operation. They usually use three sensors to separately record red, green and blue.
- Camcorders combine a camera and a VCR or other recording device in one unit; these are mobile, and were widely used for television production, home movies, electronic news gathering (ENG) (including citizen journalism), and similar applications. Since the transition to digital video cameras, most cameras have in-built recording media and as such are also camcorders. Action camera's often have 360° recording capabilities.
- Closed-circuit television (CCTV) generally uses pan tilt zoom cameras (PTZ), for security, surveillance, and/or monitoring purposes. Such cameras are designed to be small, easily hidden, and able to operate unattended; those used in industrial or scientific settings are often meant for use in environments that are normally inaccessible or uncomfortable for humans, and are therefore hardened for such hostile environments (e.g. radiation, high heat, or toxic chemical exposure).
- Webcams are video cameras which stream a live video feed to a computer.
- Camera phones have video cameras that are incorporated into mobile phones.
- Special camera systems are used for scientific research, e.g. on board a satellite or a spaceprobe, in artificial intelligence and robotics research, and in medical use. Such cameras are often tuned for non-visible radiation for infrared (for night vision and heat sensing) or X-ray (for medical and video astronomy use).

2. Parts of video camera and their functions

Video cameras can vary from Web cams for computers to small hand-held camcorders to large cameras used in film and television, but they all share a number of important parts. Each of these parts is needed for the camera to function properly, just like the human body, a car or any other complex machine.

Lens

The lens on a video camera serves as the same function as a still camera's lens. It draws in light and captures the image at which the camera points. This telescopic piece can have multiple lenses within it. A number of dials on the tube will shift the lens positions by turning them, and this controls how the lenses focus the light they receive to clarify the picture.

Viewfinder

The viewfinder is directly connected to the lens and is meant to provide access to the image for the user. This can be a simple eye-sized window, or it may be a small pixel screen that folds into the camera when not in use; many models have both versions. Viewfinders also double as a video screens for playing back the recorded image.

Microphone

The lens picks up only the visual images for the camera, meaning this alone would create a silent picture. Video cameras, therefore, also include microphones that record sound in the area. The microphone is usually mounted next to the lens and pointing in the same direction so the audio and video are closely in sync.

Recorder

The recorder processes the images received by the lens and the sound from the microphone and records them to memory. On older analog cameras, this would record the image onto a magnetic tape within a cassette. Some cameras would take full VCR tapes, but others require miniature versions of these cassettes or other formats like Hi8. Digital cameras eliminate the need for cassettes. The camera instead records the image as a computer video file. In most cases, this file is in JPEG format.

Controls

The camera's main controls include the Power switch and the Record button. It will also include playback buttons such as Play, Stop, Rewind, Fast Forward and Pause. The controls also include output ports to connect the camera for playback. All cameras should include the basic red/white/yellow RCA cables to connect to any playback machine, but they can also include USB or FireWire controls for connection to a computer.

Battery

Battery power is essential for camera use. Every camera is equipped with a rechargeable battery. Most batteries are lithium-ion based, and each is made and designed to work specifically with its camera model only. A full battery charge can usually take 12 hours, meaning an overnight charge will suffice.

3. Camera movement equipment

FILM MAKING TIPS: WHY CAMERA MOVEMENT EQUIPMENT?

When it comes to film making, one of the main factors that affects the movement of the camera is jitter. It’s very hard to get control of jitter manually; this is especially true in

certain conditions, such as when you're nervous, when the shot requires the camera to move swiftly, when the camera is heavy or when you have to hold it still for a long time.

So, how do you control camera movement without worrying about jitter? You need to use some sort of foreign device created to keep the camera steady as it moves and rotates. The camera movement equipment device will also need to have the ability to move and rotate in a variety of ways.

3 TYPES OF CAMERA MOVEMENT EQUIPMENT

Let's take a look at three types of camera movement equipment that top film schools teach you how to use in order to reduce jitter and make shots fluid: jibs, dollies and Steadicams.

1. CAMERA CRANES (AKA JIBS)

Jibs, also called cranes, are used as vertical camera movement equipment. They come in various sizes, and choosing the right size is dependent upon the type of camera you plan to use, as well as the type of shot you're hoping to shoot.

One of the most popular types of jibs is the Cobra Crane. People starting out in new film careers have produced great films using this crane. It's just right for stabilizing cameras up to 25 pounds, and it only takes one person to operate it.

Keep in mind that big cranes should only be used by professional camera operators. This is because they have the potential to be very dangerous. Film schools help students learn how to use them safely!

2. DOLLIES

A strong, solid dolly will give you the best camera support for both track-in and sideways shots. Avoid going with lightweight dollies, such as the ones made by Prosumer. They just make getting those really professional, smooth shots much harder to achieve. Instead, choose something much heavier, like a PeeWee dolly.

Dollies are also high-tech pieces of camera movement equipment that should only be operated by professionals. To get the job done right, hire a dolly grip. These professionally trained technicians are dedicated to operating camera dollies properly. Or, you can always learn how to make a movie using a dolly yourself at a film school!

3. THE STEADICAM

The Steadicam is the brand name of a very innovative camera movement equipment device made for keeping film making cameras stable. This is done by isolating the camera away from your body.

It's much less constraining than a dolly, although the dolly is the best choice in certain situations. For instance, the dolly is better for shooting a shot with sideways tracking on a smooth surface. However, if you're following your subject while moving the camera down rough ground, the Steadicam is the best choice to get a smooth shot.

4. Lenses – functions and types

Prime vs. Zoom

The first thing you need to understand is the difference between prime and zoom lenses. Prime lenses are also called "fixed lenses," because the focal length of a prime lens is fixed--meaning, you cannot zoom in or zoom out. You can only shoot from a single angle of view. If you want to add or remove certain elements from your picture, you will have to literally move yourself closer or farther away from your subject. A zoom lens, on the other hand, refers to any lens that has a variable focal length--meaning you can zoom in and out at will. With a zoom lens, you can remain in the same position but zoom in or out to change the content of your photo. There are pros and cons to both prime and zoom lenses.

Prime Lens

Prime Lenses: Pros

- Prime lenses tend to produce sharper images.
- They tend to perform better in low light conditions.
- They make you take your time when composing your images.
- They are lighter and more compact than zoom lenses.
- They tend to be less expensive than zoom lenses.

Prime Lenses: Cons

- You are not able to zoom in or out.
- You have to physically move in order to change the composition of your photo.
- You may end up carrying more than one lens with you.

Zoom Lens

Zoom Lenses: Pros

- You can zoom in and out as needed.
- They can replace two or more prime lenses.
- You do not need to physically change your position in order to recompose your image.

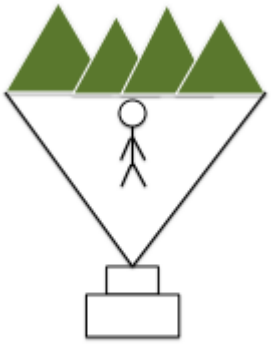
Zoom Lenses: Cons

- Zoom lenses are bulkier and heavier than prime lenses.
- Images may not be as crisp as with a prime lens.
- They may not perform as well as prime lenses in darker situations.
- They tend to be more expensive.

Now that we've clarified the difference between prime and zoom camera lenses, let's take a look at different types of lenses.

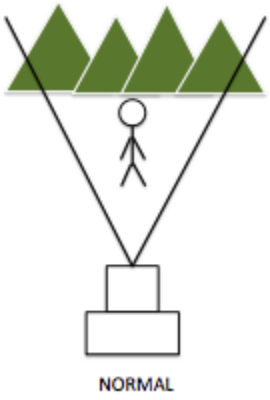
Wide-Angle Camera Lens

"Wide-angle" usually refers to lenses with focal lengths between 17mm and 40mm. Wide-angle lenses provide you with a broad view of the scene before you. This makes them ideal for photographing landscapes, small interior spaces that you want to look larger, events like concerts where you are very close to your subjects, street photography, and environmental portraits--portraits that also include your subject's surroundings. The biggest downside of wide-angle lenses is that they can create distortion--they tend to stretch things out and make them look larger, especially elements that are close to your lens. This makes them a less than ideal choice for portraiture, since they can be unflattering to your subject (no one wants their nose to look too big!).



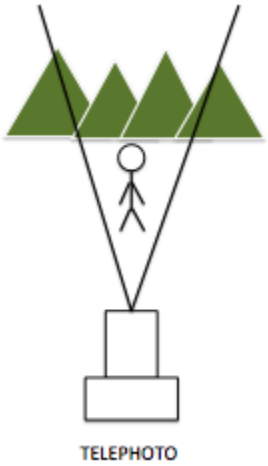
Normal or Standard Camera Lens

Lenses with a focal length of about 40mm to 60mm are considered “normal” lenses because they tend to replicate most accurately what the naked human eye sees. They do not have as much distortion as wide-angle lenses, but they are still wide enough to replicate the peripheral vision of the human eye. Because of these qualities, normal lenses are great for photographing portraits, creating precise compositions, street photography, and documentary photography projects. This is a very useful and flexible lens. When asked which single lens they would choose if they could only have one, many professional photographers answer “my normal lens.”



Telephoto Camera Lens

Any lens with a focal length of about 70mm and longer is considered a telephoto lens. These lenses produce the least distortion--making them another excellent choice for flattering portraits. They are also extremely useful in situations where you cannot get too close to your subject--photographing a sports event, or while on safari, for example. The downsides to these lenses is their size and weight--they tend to be quite heavy--and the fact that you cannot photograph subjects that are too close to you.



Specialty Camera Lenses: Macro and Fisheye Lenses

Macro lenses are used to create extreme close-up images, typically of very small objects, such as flowers and insects. A macro lens can produce a life-size or even larger-than-life size scale image of tiny subjects. They also allow you to get much closer to your subject than a typical lens while still retaining sharp focus. If you're interested in photographing nature, or perhaps cataloguing your coin or stamp collection, a macro lens will prove extremely useful. There are some downsides to macro lenses, however. Because you are so close to your subject, you need to keep your camera extra steady, so you may need to use a tripod. Macro lenses also tend to produce images with a very blurry background, so you must be very careful and precise when you focus the lens.

A fisheye lens is an ultra wide-angle lens--any lens with a focal length less than 15mm. These types of lenses tend to have about a 180-degree field of vision. The effect you achieve with this lens makes it seem like you are seeing the world from inside a fishbowl--hence they name, "fisheye." Everything along the edges of your photo becomes extremely distorted, and your subject will seem much larger than normal. Some common uses of fisheye lenses are for photographing action sports, landscapes, and to capture unusual perspectives. These lenses are great for getting creative--but be warned, their novelty tends to wear off pretty quickly!

Unit-II Visualization

visualization is the cognitive process of purposefully generating visual mental imagery, with eyes open or closed, simulating or recreating visual perception, in order to maintain, inspect, and transform those images, consequently modifying their associated emotions or feelings, with intent to experience a subsequent beneficial physiological, psychological, or social effect, such as expediting the healing of wounds to the body, minimizing physical pain, alleviating psychological pain including anxiety, sadness, and low mood, improving self-esteem or self-confidence, and enhancing the capacity to cope when interacting with others.

1. Composition – different types of shots,

When asked about the biggest piece of advice he could give to aspiring actors, Edward Norton once famously said, “The more you do your homework, the more you’re free to be intuitive; but you’ve got to put the work in.” That said, understanding the craft of filmmaking isn’t just a way to compliment your acting skills but to showcase your professionalism and adaptability as an actor – something directors (and all importantly casting agents) love.

If you’re looking to work in film and television, it’s no secret you’ll have to get familiar with the camera and knowing the basic shots and angles can be hugely propitious for your skills to shine. So here are 12 of the most popular camera shots all actors should know:

THE AERIAL SHOT

It’s all in the name – this shot is filmed from the air and is often used to establish a location (usually exotic and/or picturesque).

THE ESTABLISHING SHOT

Again, it’s in the name – this shot is at the head of the scene and establishes the location the action is set on, whilst also setting the tone of the scene(s) to come. It usually follows directly after an aerial shot in the opening of films and is beloved by TV directors.

THE CLOSE-UP (CU)

This is perhaps the most crucial component in cinematic storytelling and is arguably an actor’s most important moment on camera. This shot is usually framed from above the shoulders and keeps only the actor’s face in full frame, capturing even the smallest facial variations. As it eliminates any surrounding elements that may be relevant to the scene’s narrative, it’s really up to the actor’s skill and focus to shape the story.

THE EXTREME CLOSE-UP (XCU)

This shot is traditionally used in films and focuses on a small part of the actor’s face or body, like a twitching eye or the licking of lips in order to convey intense and intimate emotions. This unnaturally close view is used sparingly as the multiplication of the subtlest movements or details need to be justified in the dramatization and boldness of that particular scene.

THE MEDIUM SHOT (MS)

Also referred to as a ‘semi-close shot’ or ‘mid-shot’, this generally shoots the actor(s) from the waist up and is typically used in dialogue scenes. It aims to capture subtle facial

expressions combined with their body language or surrounding environment that may be necessary to provide context.

THE DOLLY ZOOM

This shot sees the camera track forward from the actor whilst simultaneously zooming out, or vice-versa. So the foreground generally stays the same while the background increases or decreases across the frame. First invented by Alfred Hitchcock in Vertigo to create a dizzying, vertiginous effect, it's become quite the filming technique among the industry's top filmmakers. However, as it's a tough shot to get right, actors really need to be on their A-game when filming and a little patience goes a long way.

THE OVER-THE-SHOULDER SHOT

This is where the camera is positioned behind a subject's shoulder and is usually used for filming conversations between two actors. This popular method helps the audience to really be drawn into the conversation and helps to focus in on one speaker at a time. Seeing as the non-speaking actor is seen only from behind, it's common for major production sets to substitute actors with stand-ins or doubles for these shots.

THE LOW ANGLE SHOT

This shot films from a lower point and shoots up at a character or subject, making them appear larger so as to convey them as heroic, dominant or intimidating. It's also another way of making cities look empty.

THE HIGH ANGLE SHOT

In contrast with the low angle shot, this one films from a higher point and looks down on the character or subject, often isolating them in the frame. Basically the direct opposite of the low angle, it aims to portray the subject as submissive, inferior or weak in some way.

THE TWO-SHOT

This is a medium shot that shows two characters within the frame. Pretty straight-forward but can be pivotal in establishing relationships between the characters.

THE WIDE (OR LONG) SHOT

This shot normally frames the subject from the top of their head to their feet whilst capturing their environment. It's typically used to establish the setting of the particular scene – so similar to the establishing shot, but focused more on characters and actors and the contextual relationship with their surroundings.

THE MASTER SHOT

Often confused with the establishing shot, this too, identifies key signifiers like who is in the shot and where it's taking place. However, unlike the establishing shot that has a tendency to focus more on location, the master captures all actors in the scene and runs the entire length of the action taking place. This allows for other smaller shots like close-ups or mid-shots to then be interwoven into the master, showcasing different angles of the same scene. It's usually the first scene to be filmed so by choosing a physical action that can be easily repeated throughout multiple takes can ensure the actor gets major brownie points from the director.

camera angles and camera movements

Camera Angles

1. Eye level – camera points straight ahead. Intention is to be objective.
2. Low angle – camera points up from a lower angle. It makes the subject dominating.
3. High angle – camera points down from a higher angle. It makes the subject diminutive. A variation: Top angle or bird's eye view – special case when you want to show the topography of a location. Aerial shots fall under this.
4. Dutch – tilted angle. It draws attention to the fact it's not a balanced frame. Something is literally off kilter.
5. Over the shoulder (OTS) – not strictly an angle, but it's a specialized shot that deserves its own place. Confrontational by nature.

Shot Sizes

1. Close up – facial features and expression is more important than anything else. Variation: Extreme close up – you probably want to chop something off for an even closer look.
2. Long shot – When you want to add action and location along with the subject. Variation: Extreme long shot – when the location is more important than the character at that moment.
3. Medium shot or Mid shot – half of a person, roughly, where body language is important while eliminating distracting elements of the background.
4. Single, two shot, three shot. etc. – Number of people in frame decide this. You can combine this with a CU, MS or LS.
5. POV – as if the audience were the subject.

Camera Movement

1. 360 degree – showcase the subject by moving around it.
2. Zoom – when you want to get closer or further away without making an emotional statement.

3. Pan and tilt – when you want to observe the space from a single vantage point, follow the subject so you feel like you're a spectator observing. The movement happens on a pivot.
4. Tracking shot, crane, dolly – when you want to follow the subject and be more involved with the space and location. The audience is drawn into the world.
5. Random – camera shake or motion to provide energy.

Compound Motion

You can combine motion into more complex shots. The two most popular examples are:

1. Dolly Zoom or Vertigo Shot – where the camera dollies in/our and zooms in/out (the opposite direction to the dolly movement) at the same time.
2. Single take shot – where the action is a complex choreography of different camera angles, shot sizes and motion. The toughest and most time consuming to pull off.

That's it! By using a combination of angles, shot sizes and motion you can create an infinite variety of shots. Happy filmmaking!

2. Aesthetics in visual composition

Aesthetics is an enormous topic. Like most areas of philosophy it has a rich history of debate and change. Over the course of this class you'll be exposed to several different points-of-view on what constitutes "correct" aesthetics. As a quick definition I'm just going to post a Wikipedia def. to get us going:

Aesthetics is a branch of philosophy dealing with the nature of art, beauty, and taste, with the creation and appreciation of beauty. It is more scientifically defined as the study of sensory or sensori-emotional values, sometimes called judgments of sentiment and taste.[3] More broadly, scholars in the field define aesthetics as "critical reflection on art, culture and nature."

More specific aesthetic theory, often with practical implications, relating to a particular branch of the arts is divided into areas of aesthetics such as art theory, literary theory, film theory and music theory. An example from art theory is aesthetic theory as a set of principles underlying the work of a particular artist or artistic movement: such as the Cubist aesthetic.

So, google Aesthetics. Check out the different kinds from different cultures. For instance, the Japanese visual aesthetic developed in a different fashion from the Western European aesthetic, which is the one that dominates the works of our culture. Look at paintings from all different eras and see how the Medieval aesthetic was different from what superseded it in the Renaissance, again, the one that still has sway over much of the visual composition of a film frame today.

THE ARRANGEMENT OF ELEMENTS, COLOR, TONE AND LINE IN THE MISE EN SCENE

In looking at the mise en scéne we are beginning to take a look at how form and content work together to convey meaning. Form is the manner in which the elements are arranged and content is the elements themselves. This causes us to look at how we can formally and less formally arrange our actors, the setting, the camera placement and the color and lighting for a given shot to achieve the greatest possible impact for what we are trying to say.

For the simplest entrance into using these tools for analysis lets look at just a few components of the visual frame how we might look at them, again from that entry level handy place to start from, Wikipedia on Composition in Visual Art:

Some principles of organization affecting the composition of a picture are:

- Shape and proportion
- Positioning/Orientation/Balance/Harmony among the elements
- The area within the field of view used for the picture ("cropping")
- The path or direction followed by the viewer's eye when they observe the image.
- Negative space
- Color
- Contrast: the value, or degree of lightness and darkness, used within the picture.
- Geometry: for example, use of the golden mean
- Lines
- Rhythm
- Illumination or lighting
- Repetition (Sometimes building into pattern; rhythm also comes into play, as does geometry)
- Perspective
- Breaking the rules can create tension or unease, yet it can add interest to the picture if used carefully

Some basic words to use in relation to the film frame:

Symmetry:

The frame divides into two matching images. In the human body we would say that the left and right half are symmetrical, though that's somewhat of an illusion if you know that the two halves of our face are slightly different and if they were exact it would be slightly disconcerting. Here is the favorite box office start of the moment, Ryan Gosling. Original face vs. Clone right side vs. Clone left side. Your favorite?

For our purposes lets look at a frame from the King of Symmetrical shots, director Wes Anderson, from *Moonlight Kingdom:*

Asymmetry

The frame is not exactly equally balanced, but balance is achieved through a combination of objects and intensities of color and size. Asymmetry can be pushed to the level of making it unpleasant aesthetically, which would mean creating an imbalance of such proportion that it would draw "unwanted" attention to the composition itself.

We'll start from one of the great asymmetrically balanced paintings you all know: "Starry Night" by Van Gogh:

Notice the balance of the painting being achieved by size, shape and contrast in color. Asymmetry tends to feel more "life-like" in its distribution of elements, though Van Gogh could hardly be called realistic in his use of the paint.

Here is a beautiful asymmetrical shot from *House of Flying Daggers*. Notice how the brighter tone of her green dress helps balance the darker half of the frame, which contains his darker tones and the darker grass.

Graphic focus

The ability of the artist to use geometric line and shape to convey meaning by directing our eye to a particular place in the frame or to create an emotional or psychological mood. A couple of examples, first from the first director to push heavily into the use of graphic design in the cinema frame, Russian director, Sergei Eisenstein.

The Odessa Steps sequence from *Battleship Potemkin (1925)*

From *October (1929)*

Odessa Steps Sequence *Battleship Potemkin (1925)*

Rule of Thirds

This refers to imagining the frame to have a grid overlay that divides the space into thirds horizontally and vertically. lines to dive the space. In "classic" composition for film the eyes of the character we are focusing on lay somewhere along the line of the top 1/3 of the frame. As in all of these "rules" they are guidelines that are often ignored in favor of a position that is chosen for a narrative reason that can override "standard beauty."

Look-space

Having enough visually empty space between the character's gaze and the opposite frame edge for the viewer to sense the visual energy of the off-screen presence of another character or action.

Michelle Williams, from *Wendy and Lucy (2008)*

Production Design

The combination of settings and costuming that makes up everything in the visual frame other than lighting, which is the purvey of the cinematographer and his/her crew. Audiences notice obviously flashy versions of design for film and they are often the one's receiving the awards, but the work that is less noticed is often the most extraordinary. Some examples:

Poppy and her roommate's apartment in *Happy-Go-Lucky (2008)*

American Hustle (2013)

Lighting

There are many ways to design and describe lighting for film: high-key, low-key, high-contrast, low-contrast, soft, hard, cool, warm, hot, cold and many variations in-between. Again, there is much out there on color theory that we won't go into now, but you should be able to recognize the following:

Key Light: The main "source" of light for a given shot. It may be sunlight through a window, a lamp on a desk, the daylight on a patio in the morning, etc.

Fill Light: Any secondary source of light for a shot, meaning it's not as strong or intense as the key light. A room may be lit by a lamp on the desk, but there is a fire in the

fireplace that gives a soft glow from the other side. Fill light is often used to gain three-dimensionality as a visual "sculpting" tool.

High-key Lighting: The primary lighting source for the shot is bright and illuminates fairly evenly allowing most of the frame to be seen. Harsh shadows are avoided and an upbeat feeling is given that is often used in comedy.

Low-key Lighting: The primary lighting for a shot is dimmer and more of the shot falls off into areas of darkness. The irregularity of lighting levels tends to give a more realistic feel that lends itself to more serious dramatic work.

High-contrast Lighting: The shot tends to be lit from only one source or that source so dominates that the fill light is barely noticeable. Film Noir makes high use of this technique, developed to a great extent by German Expressionist filmmakers of the 1920's, during the silent era.

Cool vs. Warm Lighting: Cool light tends toward the blue range while warmer tones emphasize yellows, ambers, etc.

Soft vs. Hard Lighting: Soft light is diffused either through natural means cloud cover, for instance, or through cloth materials such as nylon. Hard light refers to more direct lighting from sources either natural or not. Shadows are hard edged and colors, such as skin tones are shown in a harsher manner.

Important note! Color temperatures and soft and hard edged lighting are often mixed in a scene or from shot to shot.

3. Subject - camera relationship.

Have you ever taken a photograph, looked at the final image, and thought “man, I thought that was going to come out so much better than it did”? You’re not alone. Portrait photography is not a simple and straightforward as it may seem to be, although with a little bit of knowledge under your belt you’ll be snapping professional-looking portraits in no time!

All you’ll need is a camera capable of shooting in manual mode (a DSLR is ideal), a willing model, yourself and an open mind. Let’s begin!

If you’d like a bit of a refresher on the different modes of a DSLR camera, we’ve got you covered. Head on over to our beginners DSLR course and learn how to use your camera to its fullest extent.

Choosing Your Subject

What you photograph and where you photograph are two very important aspects of any image. After all, it's what the viewer sees when they look at your photograph! If you're just starting out with portrait photography, it would be wise to choose a model that you feel comfortable around. Since you may be fumbling around with your camera a bit to get familiar with the settings, leave the professional models to a later date. A sibling, significant other or best friend is the perfect model for this situation.

I wouldn't worry too much about the styling, since you can focus more on that once you are more familiar with your camera. Have them show up in whatever they feel the most comfortable in, since it'll make the photograph seem more natural.

Choosing Your Location

In order to make things easier on yourself, choose a location outdoors. The light inside often tends to be troublesome; the white balance always seems to be off, or there's never the perfect amount of light. If you're trying to go for a more street style urban feel, head to your downtown area and find an area where there are plenty of aesthetically pleasing brick buildings. If you're going the more natural route, head out to your favorite field or forest and find an area that isn't too dark. Usually you can determine a location based on what your model is wearing, unless you're going the high-fashion route. Is your model dressed for a day out on the town? Photograph them in the city. Is your model dressed for a day working out on the farm? Photograph them in the country.

A note on lighting: you'll usually find that overcast or shade is your best friend when taking portraits. This type of light is dispersed evenly, leading to a beautiful, even skin tone in the final photograph. If you try to shoot your model in bright sunlight, you'll soon realize that the direct sun causes unflattering shadows and tends to make part of the face much too light while the other part is much too dark. By choosing overcast lighting, you'll minimize the amount of exposure problems you'll have.

Choosing the Right Aperture

When shooting portraits, often you want your model to be the main subject of the photograph. In order to draw a viewer's eye directly to the model, the background of the photograph should be blurred. Many photographers swear on prime lenses for portrait photography. Why? Because the lens can open up wider than a traditional zoom lens. Lenses such as the 50mm f/1.8 and the 85mm f/1.4 are two very popular portrait lenses. The 50mm f/1.8 can be picked up for less than $200 if you're just starting out. Shooting at an aperture of 2.8 or lower will create a very pleasing "bokeh" in the background of your photographs, which refers to the aesthetic quality of the blur in the image. Having everything but your model blurred out will create a more dramatic effect than if you were to take a simple snapshot, often using an aperture of f/8 or higher.

Getting Creative

Maybe your photographs have been looking lackluster because you haven't stepped out of your comfort zone. Sure, it feels right to stand directly in front of your subject, tell them to look into the camera and say "cheese", but will this create an interesting portrait? Probably not. It's important to think outside of the box when taking portraits. Try some of these ideas and see how they change your final images.

- Shoot from different angles! Lie down on the ground, climb a tree, peek out from the side of a building; do whatever you can to get yourself moving around the subject and creating different compositions.
- Try candid portraits. Sometimes posed portraits can look a little *too* posed. By capturing your subject in a natural state, the entire photograph will seem more genuine.
- Experiment with lighting. Having your subject partly hidden in shadow can create an intriguing dramatic effect. Play around with light, shadow, and even colored gels over your flash or smoke bombs to create more dramatic effects.
- Have your subject look both at the camera and away from the camera. Being able to connect with the subject's eyes can be wonderful, but having the subject look away from the camera can add a bit of mystery to the photograph.
- Add a prop into the scene. While adding a prop or having the background also be part of the scene may take away some of the focus on your model, sometimes this is a good thing. Photographing your subject in their home or with their favorite material item can add an interesting story to the image.

If You Don't Have a DSLR

Many cameras are simply point-and-shoot cameras, unable to take any direction from you other than composition and whether or not the flash is on. These types of cameras can certainly take good photographs, but they don't offer the wide range of apertures like a DSLR does. If you want beautiful the beautiful bokeh created by an f/1.4 lens, you won't be able to achieve that with a point-and-shoot. If you're serious about getting involved in portrait photography, it may be wise to upgrade. I know that DSLRs can be extremely expensive! Often you can find older models of Canon or Nikon (both reliable cameras) that will be just as good as buying a new model.

The best rule to remember is to keep experimenting and keep shooting. The more ideas you try and the more you practice, the better you will get. By understanding the way your camera works and how to interact with your model to create natural looking photographs, you'll be a pro in no time.

If you want a more in-depth look on portrait photography, Udemy has a great course that will teach you how to take stunning portraits with minimal equipment!

3. Aperture control and depth of field

What is depth of field? Understanding depth of field is one of the first big hurdles in photography. Knowing how your aperture, focal length and focusing work together to affect depth of field and control what appears sharp in your photos will give you incredible confidence as a photographer.

What is 'depth of field'?

A camera can only focus its lens at a single point, but there will be an area that stretches in front of and behind this focus point that still appears sharp.

This zone is known as the depth of field. It's not a fixed distance, it changes in size and can be described as either 'shallow' (where only a narrow zone appears sharp) or deep (where more of the picture appears sharp).

Because depth of field has an impact on both the aesthetic and technical quality of a picture. Sometimes you'll want to use an extensive depth of field in order to keep everything sharp.

A classic example is when you're photographing a landscape, where generally the most desirable outcome is to capture detail from the foreground to the horizon.

Other times, a shallow depth of field will be preferable. It enables you to blur background and foreground details, causing distractions to melt away and allowing you to direct viewers to the focal point in a picture.

OK, so where do I find the depth of field control on my camera?

Many digital cameras come with a Depth of Field Preview button near the lens mount, or enable you to assign the same function to one of the other buttons. However, this doesn't have any effect on the depth of field.

The image you normally see through the viewfinder or on the Live View screen is displayed at the lens's maximum, or widest, aperture; the aperture you dial in on the camera body will only be set when you take a picture.

However, pressing the Depth of Field Preview button allows you to view the scene at the working aperture, so that you can see what areas will appear sharp.

There's a range of ways to control the depth of field - the choice of aperture, focus distance and the type of camera. In a nutshell, wider apertures and closer focusing distances lead to a shallower depth of field.

Remind me what you mean by 'wide' aperture…

Wide or large apertures correspond with the small f-stop numbers available on your camera. So an aperture of f/2.8 is wide, while an aperture of f/22 is small.

Again, focusing distance plays a part on the overall effect, with wide apertures offering considerably more depth of field when focused on a subject far away than they do when focused on a subject that's close to the lens.

However, changing the focusing distance is often the least convenient way to control depth of field - it's much easier to simply select an alternative aperture setting.

The only thing you need to be aware of is that shifting from a large aperture to a small one can lead to blurred photos.

They can do, but the choice of aperture has to be balanced with the shutter speed and ISO in order to maintain a consistent exposure.

Check out our guide to the Exposure Triangle for a more detailed explanation, but here's a brief overview. Larger apertures let in more light, so faster shutter speeds can be used to freeze movement. Switch to a smaller aperture, and the amount of light passing through the lens is reduced.

Consequently, the shutter speed has to become slower, increasing the risk of camera shake and subject movement. To get round this, you could increase the ISO (What is ISO? Click here!). This allows you to use smaller apertures to increase the depth of field and use faster shutter speeds.

OK, so how does the type of camera affect depth of field?

It's the size of the imaging sensor inside the camera that makes the difference. The larger the sensor, the shallower the depth of field will be at a given aperture.

This is because you'll need to use a longer focal length or be physically closer to a subject in order to achieve the same image size as you get using a camera with a smaller sensor - and remember the effect that focusing closer has on depth of field.

This is why a full-frame camera produces a much shallower depth of field than an APS-C DSLR or compact system camera (CSC) at equivalent focal lengths and apertures.

Is it true that longer lenses produce a shallower depth of field?

The focal length of the lens does appear to have a significant impact on depth of field, with longer lenses producing much more blur. A 200mm lens focused at 12ft will have a wafer-thin depth of field compared to a 20mm lens focused at 12ft.

However, if the subject occupies the same proportion of the frame, the depth of field (the area that appears sharp) is essentially the same whether you're shooting with a wide-angle lens or a telephoto!

You would, of course, have to move closer with a wide lens or further away with a telephoto lens to maintain the same subject size.

The reason longer lenses appear to produce a shallower depth of field is thanks to their narrow angle of view: compared to a wide lens, a telephoto will fill the frame with a much smaller area of background, so any blur appears magnified too. Use this characteristic to add a professional sheen to your portraits.

How to... make depth of field a priority

Three classic situations where you'll want to stay firmly in control of focusing and depth of field.

Portraits

Whether you're shooting people or animal portraits, the most successful shots are frequently those where the background is beyond the depth of field and consequently blurred. Longer focal lengths and wide aperture settings are a good choice here, although focusing needs to be bang-on.

Landscapes

For maximum front-to-back sharpness in a landscape or cityscape, use short focal lengths and apertures of around f/16 or smaller, and focus about a third of the way into the scene. To keep the camera steady during the longer exposure, use a tripod or increase the ISO instead.

Close-ups

Depth of field decreases the closer you focus, so when it comes to photographing miniature subjects the choice of aperture becomes crucial. Even the smallest aperture available on a lens may only give a depth of field measured in millimetres when the lens is used at its closest focusing distance.

How to... get it right in camera

Learn how to make best use if the Depth of Field Preview feature.

Activate Live View

Your DSLR's Depth of Field Preview function can be used for viewfinder or Live View shooting, but the larger, brighter Live View image makes it easier to judge what is sharp and what is soft. Here, a wide f/2.8 aperture has been selected.

Press DOF Preview

The Depth of Field Preview control is usually found on the front of the camera, next to the lens mount. Press and hold this button and then rotate the camera's control dial to cycle through the apertures available on the lens.

Preview and shoot

The image will become very dark when smaller apertures are selected, although the backlit Live View screen makes it easy to see the effect. Once you're happy with the depth of field, release the DOF preview button and take the shot.

Unit-III Lights

1. Lights and its properties

The optical properties of crystals are, next to x-ray diffraction and direct chemical analyses, the most reliable properties available to distinguish and identify minerals. The optical properties depend on the manner that visible light is transmitted through the crystal, and thus are dependent on crystal structure, crystal symmetry, and chemical composition of the mineral.

In order to understand the optical properties of crystals we must first understand something about light and how it interacts with matter.

Light

Light is electromagnetic radiation that has properties of waves. The electromagnetic spectrum can be divided into several bands based on the wavelength. As we have discussed before, visible light represents a narrow group of wavelengths between about 380 nm and 730 nm.

Our eyes interpret these wavelengths as different colors. If only a single wavelength or limited range of wavelengths are present and enter our eyes, they are interpreted as a certain color. If a single wavelength is present we say that we have ***monochromatic light***. If all wavelengths of visible light are present, our eyes interpret this as white light. If no wavelengths in the visible range are present, we interpret this as dark.

Interaction of Light with Matter

Velocity of Light and Refractive Index

The energy of light is related to its frequency and velocity as follows:

$$E = h\nu = hC/\lambda$$

where E = energy
h = Planck's constant, 6.62517×10^{-27} erg·sec
ν = frequency
C = velocity of light = 2.99793×10^{10} cm/sec
λ = wavelength

The velocity of light, C, in a vacuum is 2.99793×10^{10}cm/sec. Light cannot travel faster than this, but if it travels through a substance, its velocity will decrease. Note that from the equation given above-

$$C = \nu\lambda$$

The frequency of vibration, ν, remains constant when the light passes through a substance. Thus, if the velocity, C, is reduced on passage through a substance, the wavelength, λ, must also decrease.

We here define ***refractive index***, n, of a material or substance as the ratio of the speed of light in a vacuum, C, to the speed of light in a material through which it passes, C_m.

$$n = C/C_m$$

Note that the value of refractive index will always be greater than 1.0, since C_m can never be greater than C. In general, C_m depends on the density of the material, with C_m decreasing with increasing density. Thus, higher density materials will have higher refractive indices.

The refractive index of any material depends on the wavelength of light because different wavelengths are interfered with to different extents by the atoms that make up the material. In general refractive index varies linearly with wavelength.

Materials can be divided into 2 classes based on how the velocity of light of a particular wavelength varies in the material.

1. Materials whose refractive index not depend on the direction that the light travels are called ***isotropic*** materials. In these materials the velocity of light does not depend on the direction that the light travels. Isotropic materials have a single, constant refractive index for each wavelength. Minerals that crystallize in the isometric system, by virtue of their symmetry, are isotropic. Similarly, glass, gases, most liquids and amorphous solids are

isotropic.

2. Materials whose refractive index does depend on the direction that the light travels are called ***anisotropic*** materials. These types of materials will have a range of refractive indices between two extreme values for each wavelength. Anisotropic materials can be further divided into two subclasses, although the reasoning behind these subdivisions will become clear in a later lecture.

    a. Minerals that crystallize in the tetragonal and hexagonal crystal systems (as well as some plastics) are ***uniaxial*** and are characterized by 2 extreme refractive indices for each wavelength.

    b. Minerals that crystallize in the triclinic, monoclinic, and orthorhombic crystal systems are ***biaxial*** and are characterized by 3 refractive indices, one of which is intermediate between the other two.

Air, since it is a gas, is isotropic. The refractive index of air is usually taken as 1.0, although its true value is 1.0003.

Reflection and Refraction of Light

When light strikes an interface between two substances with different refractive indices, two things occur. An incident ray of light striking the interface at an angle, i, measured between a line perpendicular to the interface and the propagation direction of the incident ray, will be reflected off the interface at the same angle, i. In other words the angle of reflection is equal to the angle of incidence.

If the second substance is transparent to light, then a ray of light will enter the substance with different refractive index, and will be refracted, or bent, at an angle r, the angle of refraction. The angle of refraction is dependent on the angle of incidence and the refractive index of the materials on either side of the interface according to ***Snell's Law***:

$$n_i \sin(i) = n_r \sin(r)$$

Note that if the angle of incidence is 0^o (i.e. the light enters perpendicular to the interface) that some of the light will be reflected directly back, and the refracted ray will continue along the same path. This can be seen from Snell's law, since

$\sin(0^o) = 0$, making $\sin(r) = 0$, and resulting in $r = 0$.

There is also an angle, i_c, called the ***critical angle for total internal reflection*** where the refracted ray travels along the interface between the two substances.

This occurs when the angle $r = 90^o$. In this case, applying Snell's law:

$$n_i \sin(i_c) = n_r \sin(90^o) = n_r \quad [\text{since } \sin(90^o) = 1]$$

$$\sin(i_c) = n_r/n_i$$

Dispersion of Light

The fact that refractive indices differ for each wavelength of light produces an effect called ***dispersion***. This can be seen by shining a beam of white light into a triangular prism made of glass. White light entering such a prism will be refracted in the prism by different angles depending on the wavelength of the light.

The refractive index for longer wavelengths (red) are lower than those for shorter wavelengths (violet). This results in the a greater angle of refraction for the longer wavelengths than for the shorter wavelengths. (Shown here are the paths taken for a wavelength of 800 nm, angle r_{800} and for a wavelength of 300 nm, angle r_{300}). When the light exits from the other side of the prism, we see the different wavelengths dispersed to show the different colors of the spectrum.

Absorption of Light

When light enters a transparent material some of its energy is dissipated as heat energy, and it thus looses some of its intensity. When this absorption of energy occurs selectively for different wavelengths of light, they light that gets transmitted through the material will show only those wavelengths of light that are not absorbed. The transmitted wavelengths will then be seen as color, called the ***absorption color*** of the material.

For example, if we measure the intensity of light, I_o, for each wavelength before it is transmitted through a material, and measure the intensity, I, for each wavelength after it has

passed through the material, and plot I/I_o versus wavelength we obtain the absorption curve for that material as shown here. The absorption curve (continuous line) for the material in this example shows that the light exiting the material will have a yellow-green color, called the ***absorption color***. An opaque substance would have an absorption curve such as that labeled "Dark", i.e. no wavelengths would be transmitted.

Sunlight, on passing through the atmosphere has absorption curve as shown, thus we see it as white light, since all wavelengths are present.

Polarization of Light

Normal light vibrates equally in all direction perpendicular to its path of propagation. If the light is constrained to vibrate in only on plane, however, we say that it is plane polarized light. The direction that the light vibrates is called the ***vibration direction***, which for now will be perpendicular to the direction. There are two common ways that light can become polarized.

- The first involves reflection off of a non-metallic surface, such as glass or paint. An unpolarized beam of light, vibrating in all directions perpendicular to its path strikes such a surface and is reflected. The reflected beam will be polarized with vibration directions parallel to the reflecting surface (perpendicular to the page as indicated by the open circles on the ray path). If some of this light also enters the material and is refracted at an angle 90^o to the path of the reflected ray, it too will become partially polarized, with vibration directions again perpendicular to the path of the refracted ray, but in the plane perpendicular to the direction of vibration in the reflected ray (the plane of the paper, as shown in the drawing).

- Polarization can also be achieved by passing the light through a substance that absorbs light vibrating in all directions except one. Anisotropic crystals have this property in certain directions, called privileged directions, and we will discuss these properties when we discuss uniaxial and biaxial crystals. Crystals were used to produce polarized light in microscopes built before about 1950. The device used to make polarized light in modern microscopes is a Polaroid, a trade name for a plastic film made by the Polaroid Corporation. A Polaroid consists of long-chain organic molecules that are aligned in one direction an placed in a plastic sheet. They are placed close enough to form a closely spaced linear grid, that allows the passage of light vibrating only in the same direction as the grid. Light vibrating in all other directions is absorbed. Such a device

is also called a ***polarizer***.

If a beam on non-polarized light encounters a polarizer, only light vibrating parallel to the polarizing direction of the polarizer will be allowed to pass. The light coming out on the other side will then be plane polarized, and will be vibrating parallel to the polarizing direction of the polarizer. If another polarizer with its polarization direction oriented perpendicular to the first polarizer is placed in front of the beam of now polarized light, then no light will penetrate the second polarizer. In this case we say that the light has been extinguished.

Polaroid sunglasses use these same principles. For example, incoming solar radiation is reflected off of the surface of the ocean or the painted hood of your car. Reflected light coming off of either of these surfaces will be polarized such that the vibration directions are parallel to the reflected surface, or approximately horizontal (as in the first method of polarization discussed above). Polaroid sunglasses contain polarizers with the polarization direction oriented vertically. Wearing such glasses will cut out all of the horizontally polarized light reflecting off the water surface or hood of your car.

2. Different types of lights

1. 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.

2. 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.

3. 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.

4. 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.

5. 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-silhouette:

One of my favorite 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, I often expose my subject darker than usual to further that contrast and create a warm and relaxing feel to an image.

Reflector:

Sometimes I want the strong haze that comes with the sun warmly filling the frame but losing clarity in my subject's face is no good. To combat the loss of clarity I use a reflector to pop some of that sunlight back onto my 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.without a reflector

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 like my son).

6. 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.

7. 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.

8. Loop light

Loop lighting is pretty much my go-to when 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.

3. Other tools used in lighting – diffusers, reflectors, cutters & gels

If you need to light up your life, you need to learn to control the light.

"Lights, camera, action!" is about as clichd as you can get, but there is a reason they say "lights" first. Video and films always look better if you light them well. This doesn't mean the scene has to be awash in light. It does mean that there is a well designed plan behind the lighting and the resulting picture has rich blacks and bright whites. To achieve a well-lit scene, you need the right tools. A good light kit with plenty of accessories, as well as a variety of reflectors and diffusers will make designing the lighting in a scene easier. The video that you shoot with that good lighting will look great.

In this article, we will introduce a variety of lighting instruments and accessories, as well as some different reflectors and diffusers available. Use the accompanying buyer's guides to help you in your search for the right lights, light kits, reflectors and diffusers.

Lighting Instruments

There are primarily four types of lighting instruments from which to choose: the broad or pan light, the reflector spot, the Fresnel and the soft light. We've defined these four categories by the way the light works, but each category has a variety of styles. For example, some manufacturers have three or four types of reflector spots that go by a variety of different names. Let's take a closer look at these four categories.

Broad or Pan Light

The broad or pan light is an open-faced lighting instrument that is broader than it is tall. Its lamp is a long horizontal tube. The larger version of this rectangular light is a broad. Lighting designers use large powerful versions of this light in television and theatre for set lights and area lighting. The smaller versions used in video production are also used for lighting large areas and providing fill light in a scene. The Cool-Lux Broad Light ($270) is a good example. In this category Lowel has its Tota ($110) and V-Light ($100) and Desisti has its Cosmobroad ($210). These lighting instruments all vary in size, wattage and accessories, giving you different price points for the different models.

Reflector Spot

The reflector spot is an open-faced light that has a bulb surrounded by a highly reflective bowl. This light is a multi-purpose light that you use for key, back or fill lighting. These lights come in a variety of sizes and styles and every lighting manufacturer has many models from which to choose. Lowel lighting has a number of reflector spots including the tiny Pro-Light ($105), the Omni-Light ($130 - $154) and the workhorse DP-Light ($155). Mole Richardson, a standard on the film set, offers the 600W Teenie-Weenie Mole ($219), the 650W Teenie Mole ($240), the 1,000W Mickey Mole ($285) and the 2,000W Mighty Mole ($340).

Fresnel

The Fresnel is a light with a special glass lens (a Fresnel lens) in front. This lens features a specially designed series of steps that focuses the light forward. Whether it's the Mole-Richardson 1,000W Baby Solarspot ($420), the Lowel Fren-L 650 ($360) or the LTM Pepper series ($180 - $350), the Fresnel provides an even, focusable light that is ideal for using as your key.

Soft

A soft light is a large, diffuse lighting instrument that provides perfect light for an interview or washing a large area in soft, shadowless light. The soft light comes in a wide variety of styles. It can be a one-piece unit such as the Lowel Caselight ($730 - $1,050) or might be made up of a reflector spot with a large diffusion softbox attached such as the Arri Softbank D1 Kit ($1,665). We'll take a look at softboxes in more detail later on when we cover diffusers.

Types of Lamps

There are four major types of lamps (bulbs) used in lighting instruments: incandescent, halogen/quartz, fluorescent and Hydrargyrum Medium arc-length Iodide (HMI).

The incandescent light is like the lights most of us use at home in our living room. They give off a very soft, warm (orangish) light and primarily are too weak and colored for use in video production.

The halogen or quartz bulb is the most common lamp used in video lights. It burns very brightly, comes in a variety of wattages and is color rated for video, meaning that it is mostly white. However, halogen lamps also burn very hot, which can be a distinct and dangerous disadvantage.

The fluorescent lamp has been making inroads into video lighting quite a bit lately. This light tube provides a bright, steady light, yet gives off very little heat. It is used primarily in soft lights although Kinoflow offers the Kamio System ring light used in fashion shoots and Desisti offers a series of fluorescent Fresnels ($740-$873). Other advantages

of fluorescents are their low power usage and the ability to change the tubes from indoor to daylight color temperatures easily.

Professionals use the HMI light because of its daylight color temperature and intense, even lighting. These lights are relatively expensive and require an external ballast for power control.

4. Basic lighting techniques

Paramount. Loop. Rembrandt. Split. Rim. Bill Hurter provides light-by-light instructions and diagrams to show you how to create these essential portrait setups in this excerpt from his Amherst Media book.

This excerpt from *The Best of Photographic Lighting* is provided courtesy of Amherst Media. To purchase the book and learn more about the publisher, visit the Amherst Media Web site.

As you progress through the following lighting setups, from Paramount to split lighting, keep in mind that each pattern progressively makes the face slimmer. Each also progressively brings out more texture in the face because the light is moved father and farther to the side. As you read through the lighting styles, you'll also notice that the key light mimics the course of the sun across the sky; at first it is high, then it gradually grows lower in relation to the subject. It is important that the key light never dip below the subject's head height. In traditional portraiture, this does not occur—primarily because it does not occur in nature.

The setups described presume the use of parabolic lights. However, most contemporary portrait photographers prefer diffused light sources, which are very forgiving and which do not create sharp-edged shadows. If you choose to create the five lighting patterns described here using diffused sources, very little changes—with the exception that the key light is usually placed closer to the subject in order to capitalize on the softest light.

In such soft-light setups, the background, hair, and kicker lights may be diffused as well. For instance, strip lights and similar devices can be used to produce soft, long highlights in hair, on the edge of clothes, and on the background.

The overall aesthetic of using soft light is not only seen as more contemporary, emulating the images seen in the fashion world, it is also a lot easier to master. Big soft light sources are inherently forgiving, and since the subject is basically wrapped in soft light, retouching is minimized. Also, the transfer edge, where shadow and highlight areas meet, is much more gradual than with undiffused lights.

The diagrams below show the five basic portrait lighting setups. The fundamental difference between them is the placement of the key light. Lighting patterns change as the key light is moved from close to and high above the subject to the side of the subject and

lower. The key light should not be positioned below eye level, as lighting from beneath does not occur in nature. You will notice that when the key and fill lights are on the same side of the camera, a reflector is used on the opposite side of the subject to fill in the shadows.

Paramount Lighting

Paramount lighting, sometimes called butterfly lighting or glamour lighting, is a traditionally feminine lighting pattern that produces a symmetrical, butterfly-like shadow beneath the subject's nose. It tends to emphasize high cheekbones and good skin. It is less commonly used on men because it tends to hollow out cheeks and eye sockets too much.

Paramount lighting

Key Light. For this lighting setup, the key light is placed high and directly in front of the subject's face, parallel to the vertical line of the subject's nose (see diagram above). Since the light must be high and close to the subject to produce the desired butterfly shadow, it should not be used on women with deep eye sockets, or no light will illuminate the eyes.

Fill Light. The fill light is placed at the subject's head height directly under the key light. Since both the key and fill lights are on the same side of the camera, a reflector must be used opposite these lights and in close to the subject to fill in the deep shadows on the neck and shaded cheek.

Hair Light. The hair light, which is always used opposite the key light, should light the hair only and not skim onto the face of the subject.

Background Light. The background light, used low and behind the subject, should form a semicircle of illumination on the seamless background (if using one) so that the tone of the background grows gradually darker the farther out from the subject you look.

Loop Lighting

Loop lighting is a minor variation of Paramount lighting. This is one of the more commonly used lighting setups and is ideal for people with average, oval-shaped faces.

Loop lighting

Key Light. To create this setup, the key light is lowered and moved more to the side of the subject so that the shadow under the nose becomes a small loop on the shadow side of the face.

Fill Light. The fill light is also moved, being placed on the opposite side of the camera from the key light and close to the camera–subject axis. It is important that the fill light not cast a shadow of its own in order to maintain the one-light character of the portrait.

The only position from which you can really observe whether the fill light is doing its job is at the camera. Check carefully to see if the fill light is casting a shadow of its own by looking through the viewfinder.

Hair and Background Lights. The hair and background lights are used in the same way as they are in Paramount lighting.

Bill McIntosh created this homage to Hollywood lighting using a 31-inch umbrella as a key light and a weak umbrella fill light, about three stops less than the key-light intensity. You can see the Paramount lighting pattern on the man produced a small butterfly-like shadow under the nose. The woman's face, because her head was turned slightly toward the light, has more of a loop lighting pattern. A characteristic of the Hollywood style was the weak fill light, which enhanced not only the lighting contrast, but the dramatic nature of the lighting.

Rembrandt Lighting

Rembrandt lighting (also called 45-degree lighting) is characterized by a small, triangular highlight on the shadowed cheek of the subject. The lighting takes its name from the famous Dutch painter who used skylights to illuminate his subjects. This type of lighting is dramatic. It is most often used with male subjects, and is commonly paired with a weak fill light to accentuate the shadow-side highlight.

Rembrandt lighting

Key Light. The key light is moved lower and farther to the side than in loop and Paramount lighting. In fact, the key light almost comes from the subject's side, depending on how far his head is turned from the camera.

Fill and Hair Lights. The fill light is used in the same manner as it is for loop lighting. The hair light, however, is often used a little closer to the subject for more brilliant highlights in the hair.

Background and Kicker Lights. The background light is in the standard position described above. With Rembrandt lighting, however, kickers are often used to delineate the sides of the face (particularly the shadow side) and to add brilliant highlights to the face and shoulders. When setting such lights, be careful not to allow them to shine directly into the camera lens. The best way to check this is to place your hand between the subject and the camera on the axis of the kicker. If your hand casts a shadow when it is placed in front of the lens, then the kicker is shining directly into the lens and should be adjusted.

Allegro Haynes is a talented violinist who plays with the Virginia Symphony and the Harbor String Quartet. She is frequently featured as a solo violinist. Bill McIntosh wanted this portrait to look as if could be a movie set in the eighteenth or nineteenth century. He used a 31-inch umbrella as the key light and a weak umbrella fill set at about

three stops less than the key. Two small kickers from the right and left rear of the subject lit her hair, and a small background light illuminated the painted background. The lighting pattern falls between the Rembrandt and loop lighting patterns.

Split Lighting

Split lighting occurs when the key light illuminates only half the face. It is an ideal slimming light. It can be used to narrow a wide face or nose. It can also be used with a weak fill to hide facial irregularities. For a highly dramatic effect, split lighting can be used with no fill.

Split lighting

Key Light. In split lighting, the key light is moved farther to the side of the subject and lower than in other setups. In some cases, the key light is actually slightly behind the subject, depending on how far the subject is turned from the camera.

Other Lights. The fill light, hair light, and background light are used normally for split lighting.

Split lighting divides the face into halves—one side highlighted, one side in shadow. Vicki Taufer used large softboxes to produce a wraparound light on the highlight side of the face and a silver reflector on the shadow side to produce a moderate lighting ratio and good facial modeling.

Profile Lighting

Profile lighting (also called *rim lighting*) is used when the subject's head is turned 90 degrees from the camera lens. It is a dramatic style of lighting used to accent elegant features. It is used less frequently now than in the past, but it still produces a stylish portrait.

Rim lighting

Key Light. In rim lighting, the key light is placed behind the subject so that it illuminates the profile of the subject and leaves a polished highlight along the edge of the face. The key light will also highlight the hair and neck of the subject. Care should be taken so that the accent of the light is centered on the face and not so much on the hair or neck.

Fill Light. The fill light is moved to the same side of the camera as the key light and a reflector is used to fill in the shadows (see the rim-lighting diagram above).

Hair and Background Lights. An optional hair light can be used on the opposite side of the key light for better tonal separation of the subject's hair from the background. The background light is used normally.

4. Accessories used in lighting

As with everything in the video world, lights come with a variety of accessories. Here are some accessories that you will definitely want to include in your kit.

- **Accessory Mounts.** If you find yourself in situations where you need to get your lights into places where you can't use a normal light stand, you'll need a variety of accessory mounts. Look for mounts such as c-clamps, scissors clamps (especially for drop ceilings) and flexible arms for maneuvering your reflectors and flags and door hangers.
- **Barndoors.** Barndoors are the adjustable flaps in front of a light that give you the ability to block or shape the light beam and spill.
- **Carrying case.** It's no fun having all the toys if you can't bring them with you, so a good case is a must. Keep in mind that you will be carrying these kits, so make sure they aren't so heavy that you have to rent some elephants to move them.
- **Gels.** Most light kits have a supply of gels. These gels help control the intensity of light (ND Filters), change indoor light to outdoor (color-temperature blue (CTB) gels) and change outdoor window light to indoor light (color temperature orange (CTO) gels). The kits may also include gel frames to mount the gels on the lights.
- **Scrims.** A scrim is a metal mesh screen that you place over the light to decrease its intensity. Scrims come in full, half and a variety of densities. You might use a half scrim to change the intensity of only half of the light, for example.
- **Softboxes.** These large diffusion boxes fit on the front of reflector spots and Fresnels to turn them into soft lights.
- **Adjustable.** Most reflector spots and Fresnels have an adjustable bulb so that you can move it from the flood to spot position. This gives you greater flexibility in the type and intensity of your key light.
- **Stands and stand height.** It is important to know what type of video you normally shoot. If you do a lot of work where your talent is standing, you will need a light stand that has a greater height than for seated interviews. Professionals often choose to position the key light at an angle of about 45-degrees above the talent. That's pretty high and requires a stand that raises to at least eight feet.
- **Umbrellas.** The umbrella is a great tool for changing a bright key light into a large soft fill light.

Unit-IV Sound

1. Audio fundamentals

- Sound, Sound Wave and Sound Perception
- Sound Signal
- Analogy/Digital Conversion
- Quantuzation and PCM Coding
- Fourier Transform and Filter
- Nyquest Sampling Theorem

- Sound Sampling Rate and Data Rate
- Speech Processing

2. Various audio elements used in video programmes - lip synchronized sound, voice, music, ambience, sound effects

Lip sync (short for **lip synchronization**) is a technical term for matching a speaking or singing person's lip movements with prerecorded sung or spoken vocals that listeners hear, either through the sound reinforcement system in a live performance or via television, computer or cinema speakers in other cases. The term can refer to any of a number of different techniques and processes, in the context of live performances and audiovisual recordings.

In film production, lip-synching is often part of the postproduction phase. Dubbing foreign-language films and making animated characters appear to speak both require elaborate lip-synching. Many video games make extensive use of lip-synced sound files to create an immersive environment in which on-screen characters appear to be speaking. In the music industry, lip-synching is used by singers for music videos, television and film appearances and some types of live performances. Lip-syncing by singers can be controversial to fans attending concert performances who expect to view a live performance.

Lip-synching is considered a part of *miming*. It can be used to make it appear as though actors have substantial singing ability (e.g., *The Partridge Family* television show), to simulate a vocal effect that can be achieved only in the recording studio, e.g. Cher's *Believe*, which used an Auto-Tune effects processing on her voice; to improve performance during choreographed live dance numbers that incorporate vocals; to misattribute vocals entirely (e.g., Milli Vanilli, a band which lip-synced to recordings made by other singers), or to cover deficiencies in live performance. It is also commonly used in drag shows. Sometimes lip sync performances are forced on performers by television producers to shorten the guest appearances of celebrities, as it requires less time for rehearsals and hugely simplifies the process of sound mixing, or to eliminate the risk of vocal errors. Some artists lip sync because they are not confident singing live and want to avoid singing out of tune.

Because the film track and music track are recorded separately during the creation of a music video, artists usually lip-sync their songs and often imitate playing musical instruments as well. Artists also sometimes move their lips at a faster speed than the recorded track, to create videos with a slow-motion effect in the final clip, which is widely considered to be complex to achieve. Similarly, some artists have been known to lip-sync backwards for music videos such that, when reversed, the singer is seen to sing forwards while time appears to move backwards in his or her surroundings. Notable exceptions to this trend include Bruce Springsteen's hit "Streets of Philadelphia", which only uses the instruments as a backing track while the vocals were recorded with a microphone attached on the singer, giving a different feel to it.

On *American Bandstand* and most variety shows of the 1960s, vocals and instrumentals were all (with a few notable exceptions on American Bandstand) synced to pre-recorded music. Since the advent of MTV in the 1980s, many artists have focused on visual effects, rather than singing, for their live shows. Artists often lip-sync during strenuous dance numbers in both live and recorded performances. Some singers habitually lip-sync during live performance, both concert and televised, whereas others do lip syncing only for certain songs or types of performances.

The **human voice** consists of sound made by a human being using the vocal tract, such as talking, singing, laughing, crying, screaming, etc. The human voice frequency is specifically a part of human sound production in which the vocal folds (vocal cords) are the primary sound source. (Other sound production mechanisms produced from the same general area of the body involve the production of unvoiced consonants, clicks, whistling and whispering.)

Generally speaking, the mechanism for generating the human voice can be subdivided into three parts; the lungs, the vocal folds within the larynx (voice box), and the articulators. The lung, the "pump" must produce adequate airflow and air pressure to vibrate vocal folds. The vocal folds (vocal cords) then vibrate to use airflow from the lungs to create audible pulses that form the laryngeal sound source. The muscles of the larynx adjust the length and tension of the vocal folds to 'fine-tune' pitch and tone. The articulators (the parts of the vocal tract above the larynx consisting of tongue, palate, cheek, lips, etc.) articulate and filter the sound emanating from the larynx and to some degree can interact with the laryngeal airflow to strengthen it or weaken it as a sound source.

The vocal folds, in combination with the articulators, are capable of producing highly intricate arrays of sound. The tone of voice may be modulated to suggest emotions such as anger, surprise, or happiness. The human voice is used to express emotion, and can also reveal the gender and age of the speaker. Singers use the human voice as an instrument for creating music.

Music is an art form and cultural activity whose medium is sound organized in time. The common elements of music are pitch (which governs melody and harmony), rhythm (and its associated concepts tempo, meter, and articulation), dynamics (loudness and softness), and the sonic qualities of timbre and texture (which are sometimes termed the "color" of a musical sound). Different styles or types of music may emphasize, de-emphasize or omit some of these elements. Music is performed with a vast range of instruments and vocal techniques ranging from singing to rapping; there are solely instrumental pieces, solely vocal pieces (such as songs without instrumental accompaniment) and pieces that combine singing and instruments. The word derives from Greek μουσική (*mousike*; "art of the Muses")..

In its most general form, the activities describing music as an art form or cultural activity include the creation of works of music (songs, tunes, symphonies, and so on), the criticism of music, the study of the history of music, and the aesthetic examination of

music. Ancient Greek and Indian philosophers defined music as tones ordered horizontally as melodies and vertically as harmonies. Common sayings such as "the harmony of the spheres" and "it is music to my ears" point to the notion that music is often ordered and pleasant to listen to. However, 20th-century composer John Cage thought that any sound can be music, saying, for example, "There is no noise, only sound."

The creation, performance, significance, and even the definition of music vary according to culture and social context. Indeed, throughout history, some new forms or styles of music have been criticized as "not being music", including Beethoven's *Grosse Fuge* string quartet in 1825, early jazz in the beginning of the 1900s and hardcore punk in the 1980s. There are many types of music, including popular music, traditional music, art music, music written for religious ceremonies and work songs such as chanteys. Music ranges from strictly organized compositions–such as Classical music symphonies from the 1700s and 1800s, through to spontaneously played improvisational music such as jazz, and avant-garde styles of chance-based contemporary music from the 20th and 21st centuries.

Music can be divided into genres (e.g., country music) and genres can be further divided into subgenres (e.g., country blues and pop country are two of the many country subgenres), although the dividing lines and relationships between music genres are often subtle, sometimes open to personal interpretation, and occasionally controversial. For example, it can be hard to draw the line between some early 1980s hard rock and heavy metal. Within the arts, music may be classified as a performing art, a fine art or as an auditory art. Music may be played or sung and heard live at a rock concert or orchestra performance, heard live as part of a dramatic work (a music theater show or opera), or it may be recorded and listened to on a radio, MP3 player, CD player, smartphone or as film score or TV show.

In many cultures, music is an important part of people's way of life, as it plays a key role in religious rituals, rite of passage ceremonies (e.g., graduation and marriage), social activities (e.g., dancing) and cultural activities ranging from amateur karaoke singing to playing in an amateur funk band or singing in a community choir. People may make music as a hobby, like a teen playing cello in a youth orchestra, or work as a professional musician or singer. The music industry includes the individuals who create new songs and musical pieces (such as songwriters and composers), individuals who perform music (which include orchestra, jazz band and rock band musicians, singers and conductors), individuals who record music (music producers and sound engineers), individuals who organize concert tours, and individuals who sell recordings and sheet music and scores to customers.

In filmmaking, **ambience** (also known as **atmosphere**, **atmos**, or **background**) consists of the sounds of a given location or space. It is the opposite of "silence." Ambience is similar to presence, but is distinguished by the existence of explicit background noise in ambience recordings, as opposed to the perceived "silence" of presence recordings.

Every location has distinct and subtle sounds created by its environment. These sound sources can include wildlife, wind, music, rain, running water, thunder, rustling leaves, distant traffic, aircraft and machinery noise, the sound of distant human movement and speech, creaks from thermal contraction, air conditioning and plumbing noises, fan and motor noises, and harmonics of mains power.

Reverberation will further distort these already faint sounds, often beyond recognition, by introducing complex patterns of peaks and nulls in their frequency spectrum, and blurring their temporal characteristics. Finally, sound absorption can cause high frequencies to be rolled off, dulling the sound further.

Ambience is normally recorded in *stereo* by the sound department during the production stage of filmmaking. It is used to provide a movie location with sonic space and normally occupies a separate track in the sound edit.

Sound effects (or **audio effects**) are artificially created or enhanced sounds, or sound processes used to emphasize artistic or other content of films, television shows, live performance, animation, video games, music, or other media. In motion picture and television production, a sound effect is a sound recorded and presented to make a specific storytelling or creative point *without* the use of dialogue or music. The term often refers to a process applied to a recording, without necessarily referring to the recording itself. In professional motion picture and television production, dialogue, music, and sound effects recordings are treated as separate elements. Dialogue and music recordings are never referred to as sound effects, even though the processes applied to such as reverberation or flanging effects, often are called "sound effects".

3. Types of microphones

1. **Large Diaphragm Condenser Mics**
2. **Small Diaphragm Condenser Mics**
3. **Dynamic Mics**
4. **Bass Mics**
5. **Ribbon Mics**
6. **Multi-Pattern Mics**
7. **USB Mics**
8. **Boundary Mics**
9. **Shotgun Mics**

4. Use of audio mixers for recording & editing of sound

In sound recording and reproduction, **audio mixing** is the process of combining multitrack recordings into a final monaural, stereo or surround sound product. These tracks that are blended together are done so by using various processes such as equalization and compression. Audio mixing techniques and approaches can vary widely, and these can greatly affect the qualities of the sound recording.

Audio mixing techniques largely depend on music genres and the quality of sound recordings involved. The process is generally carried out by a mixing engineer, though sometimes the record producer or recording artist may assist. After mixing, a mastering engineer prepares the final product for production.

Audio mixing may be performed on a mixing console or digital audio workstation.

A mixer (mixing console, mixing desk, mixing board, or software mixer) is the operational heart of the mixing process. Mixers offer a multitude of inputs, each fed by a track from a multitrack recorder. Mixers typically have 2 main outputs (in the case of two-channel stereo mixing) or 8 (in the case of surround).

Mixers offer three main functionalities:

- **Mixing** – summing signals together, which is normally done by a dedicated summing amplifier or in the case of digital by a simple algorithm.
- **Routing** – allows the routing of source signals to internal buses or external processing units and effects.
- **Processing** – many mixers also offer on-board processors, like equalizers and compressors.

A simple mixing console

Mixing consoles used for dubbing can often be seen as large and intimidating, due to the exceptional amount of controls. However, because many of these controls are duplicated, much of the console can be learnt by studying one part of it. The controls on a mixing console will typically fall into one of two categories: processing and configuration. Processors are the controls used to manipulate the sound. These can vary in complexity, from simple internal level controls, to sophisticated outboard reverberation units. Configuration controls deal with the signal routing from the input to the output of the console through the various processes.

Digital audio workstations (DAW) have many mixing features which potentially have more processes available than that of a major console. The distinction between a large console and a DAW equipped with a control surface is that a digital console will typically consist of dedicated digital signal processors for each channel. It is thus designed not to "overload" under the burden of signal processing, which may crash or lose signals. DAWs can dynamically assign resources like digital audio signal processing power, but may run out if too many signal processes are in simultaneous use. This overload can be solved fairly easily by simply plugging more hardware into the DAW, although the cost of such an endeavour may begin to approach that of a major console.

5. Different audio equipment for studio and location recording

Studios go through **4 KEY stages** in their evolution:

1. **Bedroom Studio** – which is typically a small setup next to your bedside, and is the absolute minimum you need to record sound into your computer.
2. **Dedicated Home Studio** – which is typically a room in your house used *solely* for recording, that includes both studio furniture, and acoustic treatment.
3. **Semi-Pro Studio** – which can be either at your home, or a different location, and typically includes the equipment necessary to record multiple musicians simultaneously.
4. **Pro Studio** – which is typically located at a commercial facility, and includes whatever tools necessary to produce professional results in the most efficient way possible.

***STAGE 1*: The "Bedroom" Studio**

1. **Computer**
2. **DAW**
3. **Audio Interface**
4. **Microphones**
5. **Headphones**
6. **Studio Monitors**
7. **Cables**
8. **Microphone Stands**
9. **Pop Filter**

1. Computer

- 

2. Digital Audio Workstation (DAW)

The **digital audio workstation** is the primary software used to record, edit, and mix music on your computer.

3. Audio Interface

 Once you've got the software, the next thing you'll need is an **audio interface**…

Which has the primary purpose of providing all the necessary connections to send your music:

- **INTO the computer when recording, and…**
- **OUT the computer during playback.**

But today's modern interfaces have evolved into incorporate many other features as well. Those include:

- **digital conversion**
- **mic preamps**
- **DI boxes**
- **headphone amps**
- **monitor management**

In **pro studios**, each of these items normally exist as high-end stand-alone units, organized within a rack.

In **home studios** though, these "all-in-one" budget interfaces can be a great way to save money, and still get exactly what you need.

4. Microphones

The oldest item on this list by far…

Microphones have been around since long before recording studios ever existed.

Recording studios typically carry several-dozen mics or more…each one used to achieve:

- **a *different* sound**
- **from *different* instruments**
- **in *different* situations**

5. Headphones

Unlike most studio gear, headphones are one item that we're all thoroughly familiar with.

For pro audio, there are 2 special types of **studio headphones** intended for 2 very *specific* tasks:

1. **closed back headphones**

2. **open back headphones**

6. Studio Monitors

In the pro audio world, we call them either **studio monitors**, or **nearfield monitors**.

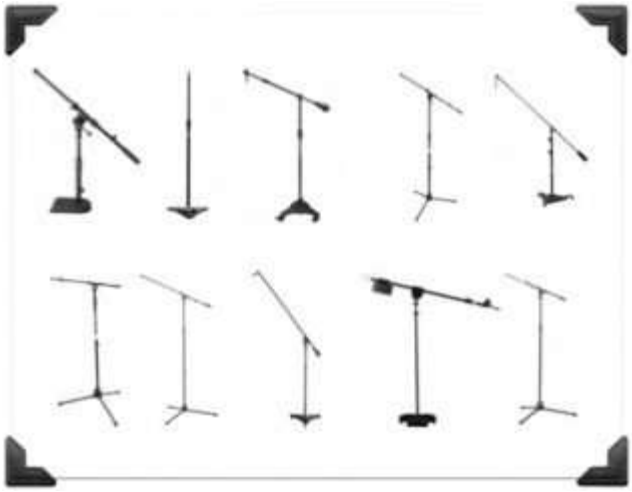
7. Cables

In a typical pro studio, you're likely to find hundreds of cables…

The good news is…in the beginning, all you need is 3:

- **One XLR cable to connect a mic to your audio interface.**
- **And two more to connect the interface to your monitors.**

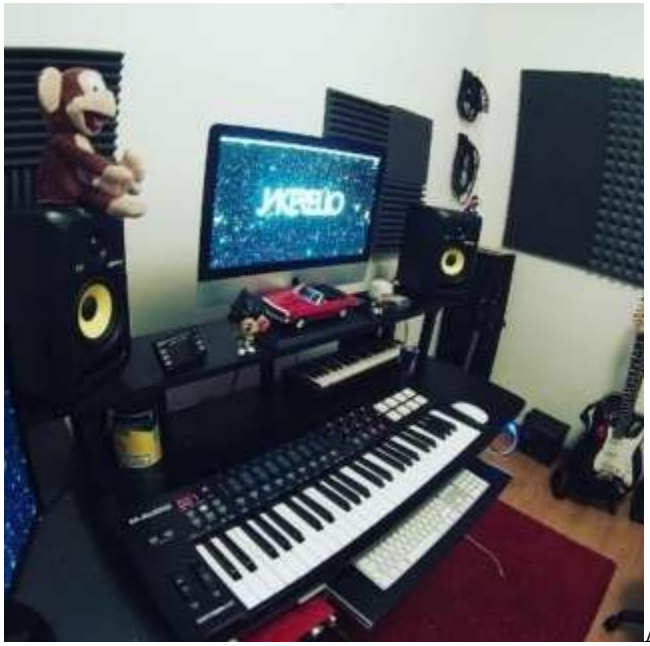
8. Microphone Stands

 The same concept applies with microphone stands as with studio cables.

9. Pop Filter

 Despite the fact that pop filters are in no way “essential” to a bedroom studio…

STAGE 2: The Dedicated Home Studio


After recording music in a simple bedroom studio for a few months…

So when that time comes, here are the 8 KEY items you need:

1. **Desk/Workstation**
2. **Studio Chairs**
3. **Bass Traps**
4. **Acoustic Panels**
5. **Diffusers**
6. **Reflection Filters**
7. **Monitor Isolation Pads**
8. **Studio Monitor Stands**

1. Desk/Workstation

In virtually any home studio, regardless of size or purpose…

The centerpiece of the room will undoubtedly be the desk.

2. Studio Chairs

Just like with your desk…a high-end studio chair, while nice to have, is not a necessity.

3. Bass Traps

The fact is…that without some acoustic treatment in your room…

Chances are slim-to-none that you will have any chance at recording decent sound.

And the first type of acoustic treatment to add is…**bass traps**.

4. Acoustic Panels

While they don't absorb bass frequencies very well…

Acoustic panels are great at absorbing frequencies in the low-mid to high range.

5. Diffusers

The final item to add to add to your room is…**diffusers**.

In pro studios, with big budgets and big rooms…

Diffusion is an important element of their acoustic treatment plan because creates a nice natural ambience without removing too much of the "liveliness" from the room.

Diffusers do this by scattering whatever sound energy exists in the room…

6. Reflection Filters

While "*real*" acoustic treatment will always be ideal…

Often times, it's simply too expensive for a small project studio.

In which case, **reflection filters** offer a workable alternative.

Intended mainly for vocal recording, this device allows you to skip the hassle of treating your entire studio…

7. Monitor Isolation Pads

Once you've gotten the acoustic treatment part out of the way…

You can still improve your sound one step further with **monitor isolation pads**.

You see…by placing your studio monitors directly on the desk, sound vibrations transfer through the surface of the desk…

Which decreases the accuracy of the monitors themselves, and can even create new and unpredictable resonances from any other objects receiving those vibrations.

8. Studio Monitor Stands

To take monitor positioning one step further…

A better option might be to use **studio monitor stands** instead.

STAGE 3: The "Semi-Pro" Studio

 The biggest problem with the studio we just set up…

Is that it only offers a limited number of input channels.

So if you're ready…let's begin with this new round of equipment:

1. **Rack Mount**
2. **Power Conditioner**
3. **Microphone Preamp**
4. **Headphone Amp**
5. **Monitor Management**
6. **Virtual Instruments**
7. **MIDI Controller**
8. **Electronic Drum Kit**
9. **Control Surface**
10. **Software/Plugins**
11. **Snake Cable**
12. **Uninterruptible Power Supply**
13. **Direct Box**

Now let's look at each one in more detail…

1. Studio Rack Mounts

The final “BIG milestone” in the evolution of your home studio…

Is the inevitable addition of your first **rack-mounted setup**.

Because prior to this step, the simple desktop gear you’ve been using can only record a *small number* of simultaneous tracks.

And if you want to record bands (which most people eventually do) you need more channels.

2. Power Conditioner

While every person’s rack setup will be entirely unique…

The one item common to virtually every rack is a **power conditioner**.

And as a HUGE side-benefit, it also filters the power using various technologies such as:

- **surge protection**
- **voltage regulation**
- **noise filtration**

3. Microphone Preamp

 Now that the rack and the power is taken care of…

4. Headphone Amp

 Once you have plenty of input channels to work with…

The *next* thing you'll need is a few more OUTPUT channels.

5. Monitor Management

 Now that you've got plenty of output channels for headphones…

The next thing you may want to add is some extra outputs for multiple studio monitors.

6. Virtual Instruments

If you record mainly by yourself…

Then you already know how difficult it can be to play the part of "*multi-instrumentalist*".

Not only do you have to be at least semi-proficient at a bunch of different instruments…

7. MIDI Controller

 The biggest problem with virtual instruments is…

It SUCKS to play them on a computer keyboard and mouse. Not only is it *no-fun*…

- **it takes forever to program even a simple rhythm/melody, and…**
- **the level of "feel" you can inject into a performance is minimal.**

Because to truly add your own expressive touch, you need an actual "*physical*" instrument to control your "*virtual*" instrument.

And that's where **MIDI controllers** come in…

8. Electronic Drum Kit

 While virtual instrument drums might be good enough for some…

For ***drummers***, probably not.

9. Control Surface

The stereotypical fantasy which initially sucks us into the world of recording is…

- **that vision of *you*…**
- **in the control room…**

Crafting your latest masterpiece on the massive analog mixing board of your million dollar studio.

10. Software/Plugins

These days, virtually all DAW's offer a bundle of free software plugins as part of their package.

11. Snake Cables

At this stage in the game, with the gear you now own…

12. Uninterruptible Power Supply (UPS)

Do you know what can happen during a recording session when the power goes out?

If your studio uses a desktop computer (*instead of a laptop, which has batteries*), and the computer SHUTS OFF improperly…

All of your work can potentially be LOST.

Which is why anytime a computer holds important data, it makes sense to use an **uninturruptible power supply (UPS)**.

13. Direct Boxes

In the studio, where cables sometimes extend as long as a hundred feet to reach their destinations…

Guitar cables are especially susceptible to excessive signal noise.

And **direct boxes** solve this problem by taking an (unbalanced) **instrument level signal**, and converting it to a (balanced) **mic level signal**…

STAGE 4: The "Pro" Studio

For 99.9% of us, STAGE 3 will have been the final level of our journey.

Because the truth is…it's extremely tough to be successful in the pro audio business.

And most of us aren't really looking to be professionals anyway.

But since many of you are at least curious about it, I might as well give you a few examples of how pro studios differ from amateur ones.

So if you're ready, here's the final list of equipment for STAGE 4:

1. **Digital Converters**
2. **Master Clocks**
3. **Analog Hardware**

And here's more about each one…

1. Digital Converters

Hidden within your audio interface, and many other devices in your studio…

Is a device known as a digital converter, that has 2 simple jobs:

- **converting analog audio into digital (A/D), and…**
- **converting digital audio into analog (D/A).**

The reason you may not have heard of it is…in 99% of cases, digital converters exist as a side-feature within *some other* device.

2. Master Clocks

Another little-known device hidden within virtually every digital recording device is…

The **master clock** (aka word clock, aka digital clock).

Whenever you connect digital signals from two or more devices…

3. Analog Hardware

Long before the days when mixing was done with software plugins…

Common tools like EQ and compression existed only as stand-alone hardware in a rack.

5. Audio post production – mix and unmix tracks

No recording just finishes once it has been tracked in a studio, it needs to be merged and balanced together to create a mix in post production. This step is all too often skipped or guessed at on amateur recordings and it makes them sound…well, amateur! Careful consideration of each recorded instrument and how they relate to each other is paramount, taking into account factors such as frequency, dynamics, space and effects to create a well balanced representation of your project. A good mix can also help lock your track down within a genre or give it that extra feel or energy it may have lacked while tracking. While it is always best to obtain the best possible results while tracking, mixing can help to correct or enhance issues that are noticed post recording.

Once all the separate instruments have been mixed they are bounced to a single stereo file where mastering processing takes place. This is where overall changes to the song are done often smoothing out frequency and dynamics and where all songs of an album are adjusted to help them fit and flow better together. The volume is increased to a commercially acceptable level while still keeping the quality and finishing touches a master offers.