

studentfilmmakers

January 2007

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HD and HDV

Lighting in Three Points

Summer Shorts Winners

Final Cut Pro Power Tips

Feature Film Fundraising



Welcome to the first 2007 issue of *StudentFilmmakers* magazine! It's a new year with new challenges and wonderful new opportunities including new tradeshows to visit, new contests to enter, new workshops to attend and new movies to make.

We will be attending many conferences and tradeshows this year, and we hope you can visit us again or introduce yourself, if you haven't already done so. One of our favorite shows that we hope to see you at is the NAB (National Association of Broadcasters) 2007 show in Las Vegas this April. It boasts as being the largest electronic media show in the world, where many new technologies debut to over 100,000 attendees and over 1500 exhibitors. I am curious about the RED camera that was such a hot topic last year.

To help you learn to use these new technologies in 2007, we will be offering lectures and workshops instructed by ASC members (American Society of Cinematographers) and other master level filmmakers. Visit our website to pre-register in your area and to sign up for our e-Newsletter to receive updates on times and locations.

The e-Newsletter is also a great way to find out about our contests. We are starting a new annual animation contest this year, and we will have the 3rd Annual Summer Shorts 2007 film and video competition this summer, so get your scripts ready now. Read about last years' Summer Shorts 2006 winners in this issue, and visit the website to watch their complete films.

Be sure to Ring in the New Year with *StudentFilmmakers*, the best educational magazine in the market place, and sign up if you haven't already. We cover everything from development to distribution with articles about cinematography, lighting, directing, acting, screenwriting and more.

Please e-mail me at kwelch@studentfilmmakers.com with your Letters to the Editor. We are here to help you meet the challenges and make the best movies you can with the most essential information on all levels. We offer free subscriptions for Universities and Film and Video Schools when bulk orders are formally requested per BPA guidelines by Professors or school administrators.

Make this your best year!

Truly,
Kim Welch
Publisher/Editor-in-Chief

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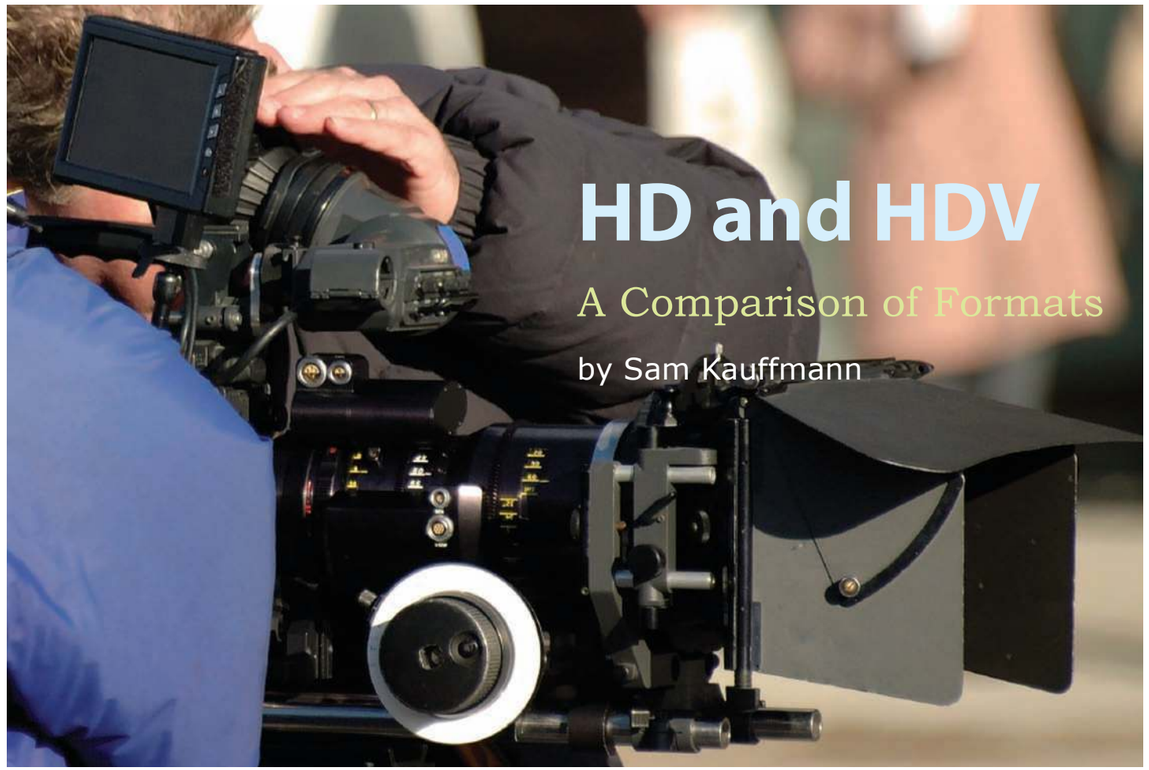
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Director Pete Chatmon with crew on the set of *Premium*.
Photo by Lynn Appelle.



HD and HDV

A Comparison of Formats

by Sam Kauffmann

I'm sure you've noticed how often various high tech gurus, self-appointed or real, have importantly declared: "This is the year of High Definition (HD)." And when nothing comes of it, they come back the next year, stating with even more conviction, "No, this really is the year!" While waiting patiently for their prognostications to come true, we have gone about our business of creating powerful, effective, and useful videos in standard definition (SD).

If you're like me, you've probably hesitated to dip your toes into the murky HD waters for several reasons: the equipment seems prohibitively expensive, the data rates are enormous, and there exists a dizzying array of competing standards. But the main reason is this: you haven't been able to figure out what to do with an HD tape if you had one.

It's hard to find film festivals that want them, and you don't know of any movie theater, museum, or public screening facility that will play them. So, if no one wants the darn things, why shoot HD?

You're right, but you're wrong. I'm going to have to finally agree with the techies. The year of HD has finally arrived; it's time to grapple with the whole HD mess. What made me change my mind? Three things: first, HD isn't just 16:9 video with a lot more detail. HD now offers many different looks – it's got a film look, a video look, and something in between. Second, your digital editing software can now edit several HD flavors over FireWire. And third, it's a lot easier to convert HD to SD. But I'm getting ahead of myself.

It's the Quality

People have been shooting television shows and commercials on 16mm and 35mm film for many years, even though none of us have film projectors in our homes. *The Sopranos*, *Lost*, *24 Hours*—you name the prime time drama and it's been shot on film. Though it starts out as film, most people watch the shows on standard definition television. So why do TV producers go to all the trouble and expense of shooting on film? Because of the quality of the image. The look of film carries over no matter what format it ends up on. The same argument applies to HD. Shoot HD and finish in HD, or convert the signal to standard definition for a better looking SDTV image.

Unfortunately, HD has always been too expensive on the shooting end, and too expensive and complicated on the editing

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end to convince us to take the plunge. But now, Avid's software on a Mac or a PC, or Final Cut on a Mac can handle HD without forcing us to buy expensive RAID drives or fancy break-out boxes. We can now shoot HD, capture over FireWire, edit HD, and output to HD, or output to standard definition NTSC tapes.

With the post-production end finally within reach and affordable, we can start looking at the various HD and HDV flavors.

HD Flavors

High Definition used to mean a 16:9 aspect ratio with a *lot* more detail in the image. But now, HD has evolved to the point where producers can choose from a number of HD flavors, depending on the look they want.

In the beginning there were just two players in the HD world: Sony and Panasonic. And they came at the problem with two different approaches. Panasonic developed an HD system called 720p and Sony developed 1080i. ABC and Fox chose Panasonic's approach, while NBC and CBS picked Sony's.

There are now many HD flavors within these two approaches. Most HD systems use a progressive scan; while one uses an interlaced scan. And there are many frame rates to choose from, depending on the look you're after. If you want your dramatic project to have a "film look," you choose a progressive HD format with a frame rate of 23.976. If you want your sports programming to look like video, you choose an interlaced HD format running at 29.97. If you want your reality TV show to look in between, you choose a progressive HD format running at 29.97. The choice is yours.

In the HD world, things are described a bit differently than in the standard definition world. First, HD formats are described by how many horizontal lines they contain. Thus we have systems with 720 horizontal lines or 1080 horizontal lines. HD formats are also described by the way in which those horizontal lines are scanned, whether progressive or interlaced. A lower-case "p" or "i" is added to the number of lines, as in 720p or 1080i, for identification purposes. Finally, the frame-per-second rate is often used to help differentiate between similar HD formats.

Let's begin our examination of HD by reviewing what we know about standard definition, but using HD terminology. We'll use DV (mini-DV and DVCAM) for purposes of comparison.

DV

Aspect ratio: 4:3.
Interlaced scanning.
Pixel aspect ratio is 720x480
Frames per second rate: 29.97
210,000 pixels per frame

Using HD nomenclature, our DV format would be called 480i/29.97, meaning there are 480 visible horizontal lines, with interlace scanning, running at 29.97 frames per second.

Now, let's look at the same variables in the HD world.

720p

Aspect ratio: 16:9.
Progressive scanning.
Pixel aspect ratio is 1280x720
Frames per second rates: 23.976, 24, 29.97, 30, and 60
921,600 pixels per frame

This is Panasonic's format, and the one JVC adopted. Because 720p is a progressive format, it looks very pleasing to the eye and has a filmic look to it. Because its data stream is smaller than the other flavors of HD, this is the choice for many independent filmmakers. Avid and Final Cut software systems can capture and output this format through a FireWire connection.

1080i

Aspect ratio: 16:9.
Interlaced scanning.
Pixel aspect ratio is 1920x1080
Frames per second rates: 29.97 frames (59.94i) and 30 (60i)
1,555,200 pixels per frame

This is Sony's baby—and a big one it is. This is the format producers choose when they want HD to look like video—or reality TV. Network sports want an interlaced HD look, and they achieve it with 1080i. It produces a huge data stream, seven times greater than DV—well beyond the capacity of a FireWire based system, like Xpress Pro HD. You need a high-end Avid like the Media Composer Adrenaline HD to capture 1080i.

For several years, these were the two choices, but Sony recently developed a third choice, used to compete more directly with motion picture film.

1080p

Aspect ratio: 16:9.
Progressive scanning
Pixel aspect ratio is 1920x1080
Frames per second rates: 23.976, 24, 25p, 29.97, 30, 59.94i, 60i
2,073,600 pixels per frame

This is the latest HD flavor and the largest. Again, Sony is its parent. This HD has 2,073,600 pixels per frame, about ten times more pixels than a standard definition frame. Storage needs are immense. This is the HD flavor that comes closest to 35mm film in terms of look and picture quality. Every year more and more features and prime time television dramas are shot on this HD format because it offers progressive scanning, like film, and offers film's 24 frames-per-second rate.

HDV

This is an HD-light format that generated a lot of buzz when it first came out in 2003 with JVC's GY-HD10. It's a sort of fudged high definition format that uses MPEG-2 encoding, just like DVD's encoding. Now Sony, Canon, and JVC all have excellent HDV cameras under $8,000. These are real HD signals that get crammed, by way of a great deal of compression, onto a mini-DV tape. The JVC version is a 720p camera, while Canon and Sony are 1080i HDV cameras. (Panasonic takes a different approach. Instead of selling an HDV camera, it sells an HD camera in this price range—but with fewer pixels than true HD). What makes HDV difficult to capture and edit is the complicated encoding system.

For comparison, let's look at any standard DV camera. The camera compresses the signal using a 5:1 compression ratio as it records it to DV tape. When we capture the DV tape into our computers, our editing software deals with what it's given—already compressed frames. But in HDV, some of the frames contain all the picture information—we'll call them the "Big Frames"—while others carry only the information that has changed from the previous Big Frame (this explanation is somewhat simplified and uses my own terminology).

The first frame is a Big Frame, but the next thirteen frames are "shells." They hold only what has changed. The next frame—the 15th frame in the group—is also a Big Frame, and is related to the previous thirteen "shells." Fifteen frames make a Group of Pictures (GOP) that relate to each other. The sixteenth frame is part of the next group and starts the process over again.

If the subject you are shooting is static, the 13 in-between frames don't have much new information and so are fairly empty. But if the shot is a quick pan, or a subject with lots of motion, those in-between frames get really taxed.

Not all HDV cameras use a 15 frame GOP—some use a 6 frame GOP, but you get the idea. Sometimes the images don't look great if there's a lot of motion. This Group of Picture system is tough on desktop and laptop editing machines because when you hit play, the editing software has to fill in the shells with all that material. You need the fastest processors with as much RAM as you can get.

Although the world of HD is a bit more complicated than standard definition, because of the many choices, it's not rocket science. As HD and HDV formats gain wider acceptance, more and more people will choose to shoot their projects on them. In a few years we'll forget we ever shot in standard definition, and what seems complicated now will soon become standard operating procedure.

Sam Kauffmann is the author of *Avid Editing: A Guide for Beginning and Intermediate Users* from Focal Press. He's also the head of the film production program at Boston University.





The Eyes Have It… The Marvel of Viewing Filters

Various Filters and Applications

by Ira Tiffen

Next time you venture out into the sun, take a few seconds to notice how bright it is. Almost blinding, isn't it? But, before long, your eyes will adjust, the pupils shrinking in size, reducing the amount light entering the eye, and making it all appear normal again. What, you say, you've done this before? Many times?

Then you are already familiar with the core of what we'll be discussing this month…the difference between what your eye sees and what the camera records, and the need to reconcile between the two if we are to obtain the images we want.

When George Eastman set up his filmmaking establishment, he knew early on that he'd need optical filters to get the most from the emulsions. He brought in Frederick Wratten to help him in his quest to make his film perform as needed. While this would make a good story for another time, it suffices here to note that even then it was important to adjust the realities of the world to the characteristics of the recording medium.

Your eyes have a unique advantage over the camera – your brain. It has been shown that the images your eye forms on its own really aren't as clear as we'd suppose. In fact, the brain performs a significant amount of image processing to make the world around us adequately visible.

When you took in some sun, as earlier, you went from the expectedly dimmer interior to the relatively brighter exterior. Initially, your eye's iris was open enough to provide visibility at the dimmer level; once outside, it began to 'automatically' adjust smaller to handle the increase in luminance. Camera shutter and lens diaphragm adjustment accomplishes something similar in terms of luminance. Automatic metering, with its varied means of measuring light at different points within the scene, and then using those measurements to determine an exposure setting, of course brings us even closer.

Given enough time, upwards of about twenty minutes, your eyes can adjust to a very wide range of luminance levels, allowing us to see in both the brilliance of snow-clad mountains, as well as in the dim shadows of the forest at night, without the aid of exterior optics. Sunglasses do make it more comfortable, and visibility can be enhanced with optics, but the point is that the eyes can handle a lot of variation on their own.

The eye/brain team accomplishes a good deal more for us than luminance compensation. The brain uses visible known references to evaluate and render color. When you see a white object in different kinds of light, it still looks white. The brain compares it to the other objects in the scene and makes a relative determination of how to portray it. If everything else looks 'un-white' next to it, then white it shall be. It has been determined that you can peer through a color as spectrally biased as a Wratten #25 Red filter long enough to still discern colors in the scene, as well as white.

Cameras, on the other hand, have only recently begun developing 'brains' of their own to deal with color, as well as luminance. Digital white balance, for instance, comes closest. They also have pre-sets to handle known color temperatures, for known types of lighting. There are many ways to maximize the results of these capabilities, which is a substantial subject on its own. For now, we're interested in the fact that the eye sees the world differently than does the camera, and if we are to record images of greatest value, we need to not only understand how this works, but how to turn that understanding to our best advantage.

So what's the biggest difference between the eye and the camera that we need to manage? When you look at a scene to evaluate its lighting, to determine whether you have lit the scene properly for the effect you desire, your eye almost immediately begins to make compensation for what it sees. Look into the shadows, the iris enlarges; shift your gaze slightly to peer into a bright reflective area and the iris diminishes accordingly. You will have a tough time trying to see the scene as the camera will, because the camera can make no such accommodations; it's stuck with whatever you give it. Balancing the luminance levels of both highlights and shadows to provide proper levels of detail (or of no detail, if that's what you want) within each is therefore hard to gauge by eye.

Sure, experience helps, but why not use a simple tool to give you the edge? That tool is the viewing filter. Available in several versions for various applications, viewing filters all have one key characteristic in common – they alter the perception of the eye to more closely match the less-adaptive characteristics of the recording medium. They optically remove the 'advantages' of the eye/brain team to make your eye see more like the camera.

The primary use of viewing filters is to evaluate lighting contrast within the scene. You want to know whether there is the right amount of light to show what you want and obscure what you want. These filters are best used by looking at the scene for only a few seconds at a time, before your eye begins to adjust, during which you see what's visible and what's not. The trick is to use the filter often enough to learn through comparisons of what you see to what you record how to use the filter properly. So experience is still a factor, but the filter does make it easier and the results are more consistent.

Lighting contrast viewers generally are smallish filters, large enough only to fit into an eyeshade-style mount that covers just one eye; you close the other eye in use. The filter, then, has the ability to adjust the eye to various types of evaluation.

The initial use for viewing filters was for black and white imaging. The filter developed for this is a deep amber color. Its density makes it hard for the eye to see too much into shadows, a common trait amongst the lighting contrast viewers. Its color adapts the color of the world to a mono-chromatic rendition that simulates the gray-scale rendering of black and white recording media.

There is more than one type of color viewer. The darker versions are for slower EI or ISO-equivalent 'speeds' – the measure of the amount of light needed to render a proper 'normal' exposure for that recording medium. The greater the ability of the camera to record in dimmer light due to a greater EI or ISO equivalent speed, the greater the need to allow the eye to see into darker areas, and so the filter needed becomes necessarily lighter.

For many years, the standard color viewer was a ND 2.0, meaning that it was a neutral density filter, essentially a dark gray that transmitted only about 1% of the overall light. This worked fine for the slower speed media. Years ago, people at Kodak approached me with a request to produce a new filter for the faster speeds becoming available. Their testing had shown a lighter filter, one that transmitted about 4% of the light, seemed to work best. That collaboration yielded the first lighting contrast viewer for what was to become the ubiquitous faster speeds.

Viewers also come in other colors to accommodate process imaging, for instance. Green, blue, and even red-screen work involves being able to determine whether the lighting is both adequate for the effects, and that spill is not going to be problematic. Primary green, blue, and red filters are used for these purposes.

Another application is to use a contrasting color filter to inspect a rear-illumined screen for holes. A red filter will readily highlight pinholes in a blue or green screen. The hole will be bright red while the rest of the screen will be almost black.

The blue filter has an additional use in adjusting video monitors using color bars. Adjust the bars to render properly even brightness of both darker and lighter bars when made monochromatic by looking through the blue filter.

Finally, one additional type of filter, the 'gaffer glass,' provides sufficient protection from the damaging rays of the sun to allow determining the timing of cloud cover more effectively. This filter can also be used to judge the condition and position of a filament in a light to determine proper placement when installing a new bulb, or trying to see whether a new one is imminently needed.

The various filter manufacturers that are the prime sources of these filters provide important safety information regarding their use. Please read, understand, and apply this information accordingly.

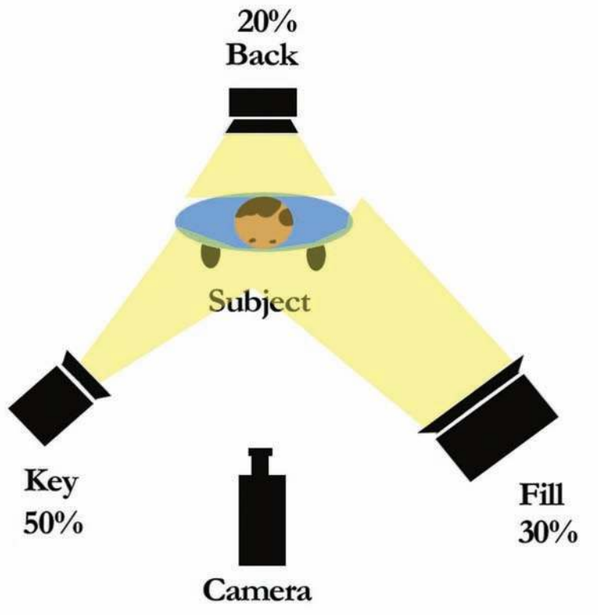
The offerings from each maker will vary, but the intention is the same – to give your eye the ability to see more like the camera does, and to use that ability to get the lighting right. Succeed in this, and you'll agree that the eyes really do 'have it.'

In over 30 years of making optical filters, Ira Tiffen created the Pro-Mist, Soft/FX, Ultra Contrast, GlimmerGlass, and others, netting him both a Technical Achievement Award from the Academy of Motion Picture Arts and Sciences and a Prime-Time Emmy Award. Elected a Fellow of the SMPTE in 2002, he is also an Associate member of the ASC, and the author of the filter section of the "American Cinematographer Manual."

Feature Film Lighting in Three Points

Key Light, Fill Light, and Back Light

by George Avgerakis



There are many new lighting products now on the market, ranging from fluorescents, which came out a few years ago, HMIs before that, and now LED location lights.

Regardless of the technology behind *making* the light, the same techniques for *using* the light persist from today, back to the days of Edison. All techniques for using light are based on creating a predictable effect on film or video that illuminates and models the objects being photographed.

Cinematographers refer to the creative side of their work as "painting with light," and the term is accurate, because the end result (so far) is a 2D screen. However, unlike the flat surface of a painting, lighting requires attention to 3D space because that is where our actors, props and sets live.

Most lighting in 3D space requires at least three lighting instruments. You can use fewer to get special effects, like silhouettes, and certainly more to cover complex scenes, but three lights per significant object is the rule. This is commonly referred to as "Three-Point Lighting."

The three instruments can be almost any kind of light – even natural light, from the sun or a window, but as you will soon see, the three lights must have a controllable ratio of brightness. The need for control may sometimes rule out a certain source, either because it is too bright in relation to the other lights, or too dim.

The three instruments are named according to their task and position in the scene. The positions are based on an imaginary circle, drawn on the floor around the object to be lighted. In addition to the three lights, the camera's position is considered first, so let's call that position on the circle, north.

The brightest light on the set is called the Key Light, and is placed either to the right or the left of the camera at about the northeast or northwest point on the circle. The Key Light is usually a focusing spot light that features a means of adjusting the "cone" of light from the instrument from a wide to a tight, spotted setting. A Lowell 1,000 watt DP-Light is a good example of a useful Key Light for location or set work, where one or two actors are going to be illuminated.

The purpose of the Key Light is to model the most important side of the object. Used alone, the key would create a highly dramatic effect, where one side of the object (or actor) would be brightly lit, and the other side left in darkness. Such effects are often intentionally produced to add a sense of danger or suspense.

The second brightest light is called the Fill Light. The fill light is placed on the opposite side of the camera from the Key Light at either the northeast or northwest point on the circle. This light is usually a soft light source. Soft light sources may not be controllable except by the size of bulb(s), or by a "variac," a device that varies the electric voltage supplied to the instrument. A Chimera Softbox, fitted with a 500 watt Mogul base lamp, would be a suitable compliment to the Lowell Key Light above.

The purpose of the Fill Light is to flatten the scene's dramatic qualities, fill in the opposite side of the actor's face, and generally, to beautify the object. Sometimes fill lights are used alone to create a flat, TV style lighting, or to enhance the "reality" of a scene, by imitating the kind of ambient light that permeates most natural locations.

The third brightest light in the troika is the Back Light. This light goes at the south point on the circle, pointing directly at the camera, but so not as to shine in the lens, is positioned high and pointed steeply down at the back of the object. A Lowell 750 watt Tota-Light makes a good back light, although the attached barn doors must be carefully adjusted to keep this bright light from spilling anywhere but on the back of the object(s).

The purpose of the Back Light is to provide a bright highlight to the outline of the object, such as the shoulders of an actor, thus separating the object from the background. Without a back light, the object tends to fade backwards into the set, losing its individualism.

Using only a back light creates a stark silhouette which is not very useful except in the classic "anonymous" interviews one often sees on crime dramas, where the unapprehended felon is confessing evil deeds to the camera.

Once all three instruments are in place, it is important to assign them a specific ratio of light to each other. While this ratio may be adjusted to create various effects and moods, the starting point, when beginning to light the scene is to assign the Key Light to 50% of the light that will fall on the object, the Fill Light to 30% and the Back Light to 20%.

The amount of light of the Key and Fill can be measured with a simple photographic light meter by placing the light meter close to or in place of the object and pointing the light meter at the camera. This kind of light measurement is called incidence light reading because the meter is reading the light that is falling on the object to be photographed. Some light meters allow the user to point the light meter at the object itself. This is called reflectance metering. Do not use reflectance metering to determine the percentages of light in this process.

Begin with the Key Light by placing it and shining it on your object or actor. Adjust the light's position, barn doors, and focus knob or variac. Add scrims and/or filters as desired. Then measure the light level and write the number down.

Next, add the Fill Light and adjust its intensity based on the light meter's reading to provide a little more than half the intensity of the Key. This can be done with the variac, scrims, filters or simply moving the light closer or further from the object. Obviously, you will need to extinguish the Key Light while measuring the intensity of the Fill.

Once the Key and Fill are balanced, the Back light is added. Be careful to light only the back and top edges of the object. Kill the Key and Fill lights and measure the Back light's intensity by pointing the incident light meter to the ceiling. This will give you an approximately correct measurement. The best measurement for a Back Light is to turn on all the lights and then to flip the Back Light on and off. If the effect is too bright on the edges, add a scrim, use a smaller bulb or reduce the voltage of the Back Light.

Once you think your three lights are balanced, it is important to ascertain if the objects themselves are suited to the light. I once tried to light a bowl of ice cream with the lights described above. This was not a good thing. We eventually used fluorescent lights, which of course are cooler. It is difficult getting a good effect with a fluorescent Back Light, so that one stayed incandescent – and hot – so we had to work fast.

Another issue is how bright the lights are for actors and non-actors. Actors are paid well to do their jobs without squinting or complaining. Non-actors, however, particularly physicians, CEOs and children, can cause a cinematographer to go to great lengths. Common methods of relieving the discomfort caused by lights are to use cooler lights, soft lights with voltage controls, reflectors and tents. Tents are composed of fabric or translucent plastic and suspended above the set. All the other lights are placed as before, above the tent, and the tent merely softens the result to a comfortable level.

Employing natural lighting, the wise cinematographer will first choose the brightest natural source first as the Key Light, since this will usually not be adjustable. Often it is the sun. When using the sun, for instance, the Fill Light can be a reflector – usually composed of a flexible metal fabric, stretched over a circular wire frame that is easily collapsed. Pocket mirrors, sides of white buildings and standing water can also be used by the clever lighting designer to provide sources of natural reflected light.

Now that you have the basics of three-point lighting, you are encouraged to experiment and gather skill in adapting these basic rules to ever more complex situations. Keep a notebook of each of your lighting plots, the instruments used, and, if possible, a photograph of the result.

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