LIGHTING

Effective lighting is the essence of cinematography. Often referred to as painting with light, the art requires technical knowledge of film stocks, lighting instruments, color, and diffusion filters, and an understanding of their underlying concepts: exposure, color theory, and optics.

CREATING DIMENSION

The cinematographer must make a two-dimensional image—the frame projected on a screen—appear three-dimensional. Lighting is the primary tool used to perform this "magic." To create a convincing three-dimensional image, the subjects and layers of the scene must be separated from each other. This is accomplished with light or color, creating contrasts of light against dark or dark against light, and by strategic placement of lights and color elements.

The cinematographer must consider how light falls on and around actors, how colors bounce off objects and reflect onto faces, and where the highlights and shadows are. Several factors influence lighting style: the director's needs, the story, the budget, the experience and artistic vision of the cinematographer, lenses and lighting equipment, and the film's sensitivity.

There are two basic lighting philosophies:

- **Naturalism** follows the logical positioning of light sources in a scene and is often referred to as motivated lighting. For example, when two people are photographed facing each other in an exterior daylight scene, and one person is backlit, the other person should be in full sunlight.

- **Pictorialism** allows the use of light angles that violate Naturalism's logic for artistic effect. Though not realistic, both people might be backlit simply because it looks better.

There are two basic styles of lighting:

- **High-key** lighting is predominantly bright and allows few dark areas or shadows within the scene. This kind of lighting features strong illumination on the subject and often an equally exposed background.

- **Low-key** lighting enhances depth by using contrasting tones of highlights and shadow. Only a few areas are lit at or above key, resulting in more shadow areas. This ratio creates the low-key effect.

THE PROPERTIES OF LIGHT

Any source of light can be described in terms of four unique and independently respective properties:

- **Intensity**—Light can range from intense (sunlight) to subdued (match light). We measure intensity in units called foot-candles, which define the amount of light generated by a candle flame at a distance of one foot. Generally, we discuss different intensities of light in quantified terms of ***stops.***

- **Color**—Light has a color balance, or bias, which is dependent on the source (daylight, tungsten, etc.).

- **Quality**—Hardness (directness) or softness (diffuseness) of the light is referred to as quality.

- **Angle**—The angle of the source, relative to the reflective object or subject, affects intensity and quality.

ADDITIVE AND SUBTRACTIVE LIGHT

In exterior daylight settings, we may have too much light filling our subject. To compensate, we often use a technique called **subtractive** lighting. We use negative fill, which is the removal of some of the quantity of light to control shadows of varying densities.

Additive lighting is probably more familiar. When we add light, we often use electric lamps. But we can also use reflectors, bounce boards, and other tools to redirect light so that it falls on the subject. In so doing, we add light.

Cinematographers typically combine the techniques of additive and subtractive lighting in order to control and manipulate a scene's contrast.

CONTRAST AND LIGHTING RATIOS

Like painting, cinema is a two-dimensional representation of three-dimensional subjects. In order to define space and suggest shape, we create different levels of contrast on each subject.

When we introduce a level of contrast, we create the illusion of the third-dimension. That illusion is called **modeling.** The degree to which we execute that modeling is called the **contrast ratio.** We express that ratio in terms of **stops.**

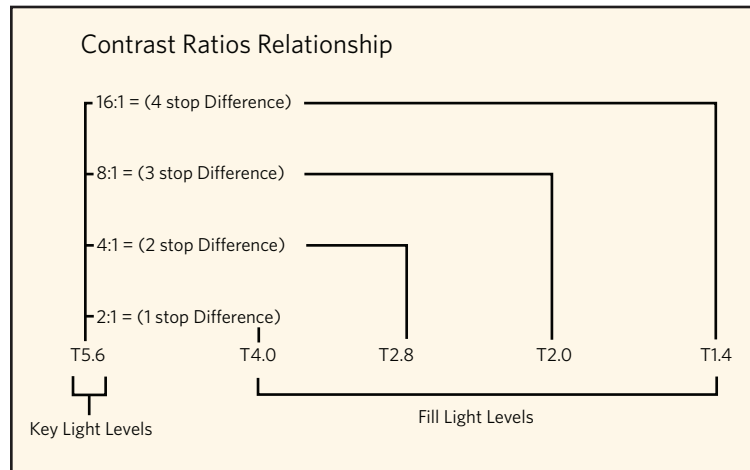Examples of contrast ratios:

A 2:1 contrast ratio

A 4:1 contrast ratio

The side of the face nearer the light is the **key side;** the light that illuminates it is known as the **key light.** The side of the face away from the light, the dark side, is known as the **fill side;** the light that illuminates it is known as the **fill light.** (See "Three-Point Lighting.")

The difference between the key and the fill, expressed in stops, is the **contrast ratio.** The fill light is always the "1" in the ratio. Conventional contrast ratios are applied to relatively small areas, primarily people. To maintain lighting continuity it can be helpful to express the mood of the shot or sequence in terms of a contrast ratio. A low-key shot has a higher ratio of key-to-fill than a high key shot. In a nighttime shot, for example, the fill light

level can be at least two stops darker than the key light. With a higher ratio, the lighting shows greater contrast. By comparison, in a high-key shot, the fill light level is much closer to the key light level, so a flatter, lower-contrast look results.

To determine the lighting ratio, a light meter reading is taken from the key light side of the subject. This reading is compared to the fill light reading. Thus, the resulting ratio is referred to as key-to-fill.

Contrast Ratios Relationship

16:1 = (4 stop Difference)
8:1 = (3 stop Difference)
4:1 = (2 stop Difference)
2:1 = (1 stop Difference)

T5.6   T4.0   T2.8   T2.0   T1.4

Key Light Levels   Fill Light Levels

This chart is an example of the relationship between the contrast ratios, camera stops, and T-stop readings.

DIRECT AND INDIRECT LIGHT

Light output from a **direct source** travels in an aligned, focused path. That light is known as **hard light.**

Light output from an **indirect source** travels in a non-aligned, diffuse path. That light is known as **soft light.**

The largest natural source of soft light is our atmosphere. That light is often further softened when it passes through the clouds of an overcast sky. Any time light is broken up, redirected, or diffused, it becomes softer. When we create soft light artificially, we usually bounce a hard source off of an irregular, reflective surface or project the light through a diffusion medium.

Important: A light's relative hardness or softness has nothing to do with the intensity, or quantity, of that light. An overcast day may be dark compared to a sunny day, but there is still a massive quantity of soft light coming through those clouds. A match flame, one of the hardest sources to find, produces only a tiny amount of light.

There are valid applications for both hard and soft light:

- Soft light is flattering to most faces because it creates few shadows and tends to wrap around objects. That same quality makes it less useful for creating modelling and depth definition.

- Hard light creates deep, intense shadows and it is easier to control. The trick is using it appropriately, because it can tend to look fake or "sourcey."

THREE-POINT LIGHTING

While we can describe a light in terms of its properties, we name it based on its function.
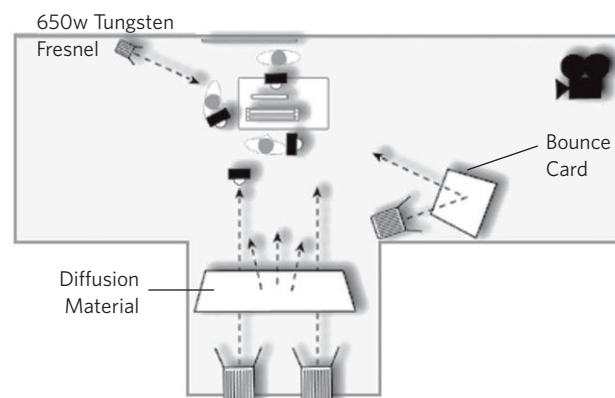
The **key light** is often the main source of illumination in a scene. Its technical purpose is to produce a level of light that will permit proper exposure. The side of the subject nearer the light is the **key side;** the light that illuminates it is known as the **key light.** The side of the subject away from the light, the dark side, is known as the **fill side;** the light that illuminates it is known as the **fill light.**

The **fill light** is the source that illuminates the shadow areas—we "fill in" the shadows. Its technical purpose is to reduce contrast. The side of the subject that is opposite the key is called the **fill side.**

The **back light** is the source that lights the side of the subject opposite the lens. We use a back light to separate the subject from the background and to enhance the feeling of depth.

99.9% of all lights can be described in terms of **property** and **usage:**

Property

Intensity . . . . Bright or dim
Color . . . . Daylight or tungsten
Quality . . . . Hard or soft
Angle . . . . Placement relative to subject

Usage

Key . . . . Main source of illumination
Fill . . . . Contrast management
Back . . . . Background separator

Fill Light: A light reflected off bounce cards.

CONTROLLING LIGHT

So that the cinematographer remains in control of the project's look—day or night, interior or exterior, a variety of materials are used to diffuse, diminish, soften, and spread light beams. Dense diffusion material generally has greater light scattering properties than less dense material. Reflector board, typically foam core and beadboard, is often positioned to bounce light where needed. Scrims, usually made of metal mesh and mounted to the lights, can be used to reduce the intensity of light. A single scrim cuts the light by half a stop; a double scrim cuts light by a full stop.

 When faced with a dark set or practical interior, we start by placing lights and accessories, and attempt complete control over the light levels in the scene. Lights can also be added when shooting outside during the day to gain control. Furthermore, the sun can be blocked, bounced, reflected, or diffused if needed.
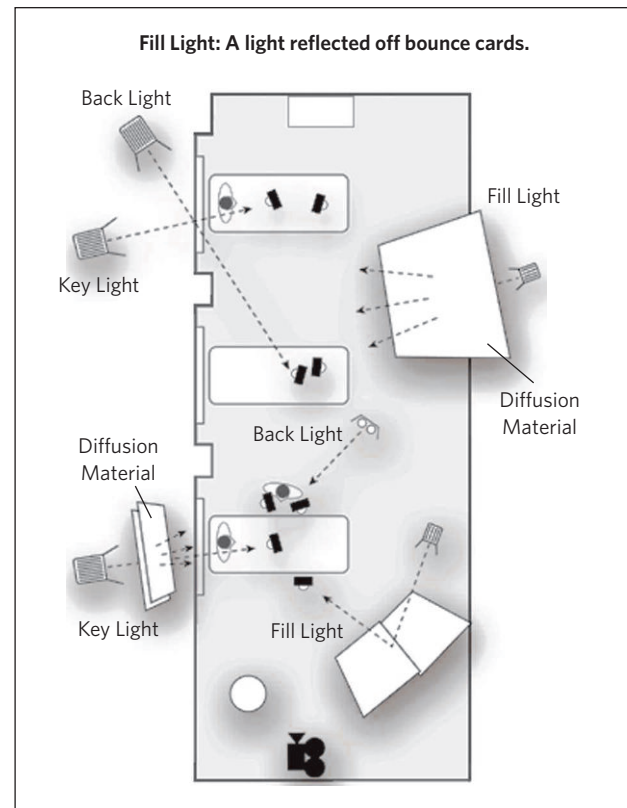
Following are more useful strategies for controlling light:

- Use **lights** to fill shadow areas.

- Filter sunlight with **diffusion.** Diffusion material such as silk or grid cloth can be stretched over a frame and mounted on stands to cast a diffused light over the entire frame. This softens shadows and reduces contrast.

- Use silvered **reflector boards** or white cards to bounce diffused sunlight into the shadows. Alternately, the hard surface of a reflector or mirror can be used to throw a powerful shaft of sunlight into shaded areas.

- Use black material as **negative fill** to create shadows and modeling on subjects otherwise washed out by flat sunlight. This technique is also useful in overcast light to create interest in an otherwise flat, even light.

LIGHT SOURCES

Some of the lights commonly used on motion picture sets are:

PAR (Tungsten and HMI)—Available in various beam spreads from narrow to wide, they allow for selective, controlled subject lighting.

Light Banks—PAR lights mounted in multi-unit configurations, usually from 6-light up to 36-light, light large areas with diffusion—a large soft source.

Beam Projectors—These produce a narrow parallel beam of light that creates a shaft of light and results in sharp shadows.

Ellipsoidal Focus Spots—Popularly referred to by brand name, e.g. Leko or Source Four, these produce a narrow bright beam with a long throw. Ellipsoidal Focus Spots are used as selective lighting to project gobo patterns on backgrounds, shafts of light, and hard shadows. These are most commonly used in theatrical lighting.

LEDs—Mounted in banks, often near the camera, LEDs provide low power, cool light that's used for soft fill.

Tungsten, HMI, and **fluorescent** refer to lamp types. **Open face** and **fresnel** refer to types of fixtures that hold lamps. PAR lights are very efficient because they use parabolic reflectors. Open face tungsten lights are quartz halogen units without a lens; they are brighter, but harder to control than units with lenses. Open face tungsten lights are primarily used for bouncing and through diffusion.

Barn doors on the light sources control the width of the light. They're used to prevent unwanted shadows or to create shadows where we do want them. They offer greater control in the "flood" position of the lighting unit. Flags, dots, and cookies in a variety of shapes and sizes are used to create shadow patterns. Gelatin filters, or gels, are mounted in front of lights and used to adjust color.

"KLMS [KODAK Look Manager System] was great. I could try out various stocks, look at the grain structure, and see how they handled colors. I also experimented with various filtration packages to see how they reacted to the hard sunlight and deep darkness of Florida. Coming from Seattle, I found the difference between light and shadow almost unbelievable. We knew we would need film's latitude to capture that distinctive look, and the Super 16 format fit with our budget and the need to move quickly and with a small crew."

—*Benjamin Kasulke, Cinematographer*