Lighting Techniques & 3 Point Light

Art of lighting

Ultimately, lighting is about controlling and shaping light and shadows, reflections, refractions, and even color-whether you do it on a computer or on a film set. This kind of control requires an understanding of how light works, the aesthetic art of lighting, and techniques for lighting. This knowledge helps you develop your eye so that you can look with understanding at your image, clearly see it, and know what needs to be done. By looking and learning as much as you can about color and lighting, you can decide which information to use to create your lighting design-be it naturalistic or stylized in a myriad of ways.

Though the tools may differ, the principles involved in creating good lighting for computer graphics are used on film sets, as well. When referring to settings in a 3D package, most other 3D packages have settings for these same attributes, although their interfaces may be different.

Looking and Learning

For a computer graphics (CG) artist, understanding how light works in the natural world is important, because not only will you be called upon to produce naturalistic-looking imagery, but sometimes you will be asked to combine live-action footage and computer-generated imagery. Also, like a cartoonist who understands form and anatomy, if you want to stylize your lighting design, you need to understand which lighting attributes and qualities to work with. So, look at the world around you and study it

Shadows-

In lighting, darkness is just as important as light. This darkness can be caused by the absence of light (shade) or by an object blocking the light (shadow).

Shadows and Composition

How the shadows fall in any scene you are lighting contributes to the composition as well as the mood. Most often, to create the shadow design composition, you want only the key light (that is, the primary light source) casting the shadows. But there will be times when, in the interest of true realism, you will want every CG light in a scene that represents a practical real light to cast a shadow. For example, you may want all of the CG lights representing table lamps in a living room to cast shadows so that as your character walks by them, the shadows change.

Shadows and Time of Day
Shadows are one big indicator of the time of day. Shadows late in the afternoon when the sun is low on the horizon are longer and softer versus the shadows at high noon, when the sun is directly overhead. At noon, shadows are shorter and sharper. That is one reason noon sunlight is referred to as hard, and late afternoon light is soft. Experiment with shadows by holding any light source lower, and then higher-directly over an object-and watch how the quality of the shadows changes.

Moving Shadows and Light Patterns
Moving shadows can help add to a sense of restlessness, danger, or suspense. Think of someone tossing in bed with shadows falling over him or her or shadows indicating an otherwise-unseen presence. You can break up the throw of a light using various devices. You've probably noticed the stripes of light coming in through Venetian blinds, for example. Walking at night, I often wonder at the dappled light and leaf shadows on the pavement caused by the street lamp light shining through the trees.

Key Light

Outdoors, the main source of light is the sun. Its rays come down to earth from one direction. You can think of the sun as the key light, because it is the dominant light outdoors. You can think of any light that is the dominant light in a scene as a key light, although a key light is generally used to highlight and add dimension to the main subject in a scene. The key light is generally the first light you set up, and it is part of the commonly used three-point lighting set up. It is the light that really sets the mood of a scene.

The key light in a scene can be animated, or it can constantly change as your character moves. Sometimes, you might want your character to be moving in and out of the light to add a sense of distance and depth or drama to your scene. Other times, you may want your character to be in the light at all times, so that nothing he or she is doing is lost. In a scene, the key light can be constantly changing, as for example when your character moves from under one street lamp to under another.

Reflected and Absorbed Light

Subjects can be lit by direct illumination from a light source as well as from reflected light. One of the most important things to understand about light is that some of it is reflected off of or absorbed by every surface it hits. In life, light can be reflected off one surface, then hit and bounce off of another surface again and again. Outdoors, the light from the sun creates a lot of bounce light.
Besides adding to the general brightness and illumination of a scene, this reflected light creates highlights, spectral and diffuse light, as well as reflections such as you see when you look in the mirror. This reflected light also has a lot to do with the colors you see and color bleed.
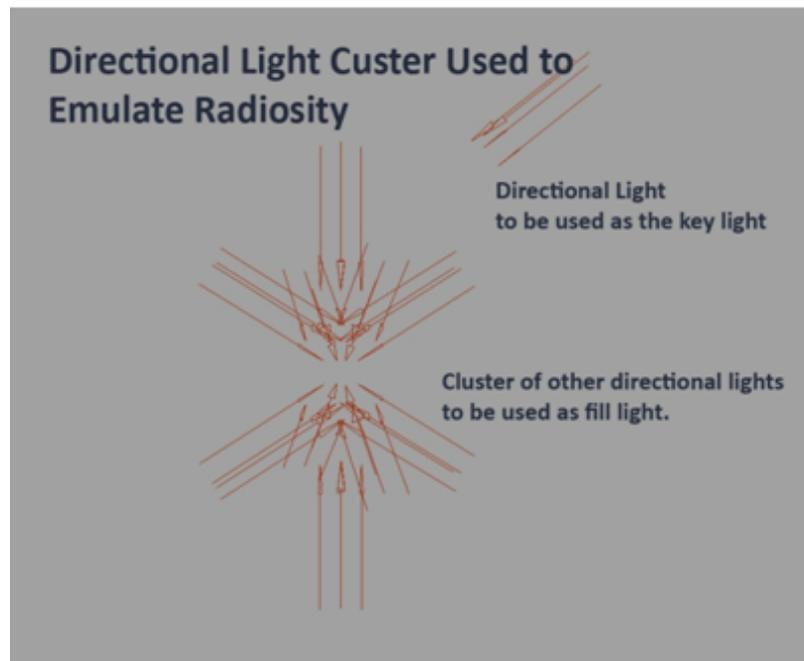
Quality

The quality of light-whether it is hard or soft-is important in lighting, contributing to the mood of a scene. It is easier to control whether a light is hard or soft on a computer than on a live set.

Hard Light

The sun is obviously our largest light source, but because of its great distance away, by the time the light rays reach us on a clear, unclouded day, they are virtually parallel, making it a hard light source. Parallel rays (or close to parallel rays) are a characteristic of hard lighting.

Hard light creates crisp, dark, and harsh-edged shadows, emphasizing angles and edges. Hard light is good for showing contrast and giving dimension to a subject, a landscape, or an object. It's also good for showing form and volume. Hard lighting can show texture very well, as in leather or an engraving, and it's good for lighting night scenes, where you want dark, hard-edged shadows. On set, hard light can come from a point source, such as a naked light bulb or a focused spotlight or a small, focused source such as a Fresnel lens.

In a 3D program, a good hard light source might be a light that starts from a single point, such as a point light or a spotlight with the penumbra set to 0. Hard light has no soft falloff. A directional light, which is the closest light to the sun in most 3D programs, also provides a good hard light source. Like the sun, the directional light sends down parallel rays of light at the same angle over the entire scene

Soft Light

The term *soft light* refers to a light that wraps around objects and creates shadows with soft edges or (ideally) no shadows. The rays of a soft light are less parallel to the illuminated object than the rays of a hard light, illuminating an object from multiple directions, so a soft shadow or no shadow at all results. A soft light is a flattering light for a portrait, lessening the contrast of wrinkles on a face. It reduces texture and smoothes an object's surface. The danger of soft lighting is that it can leave the subject a bit dimensionless
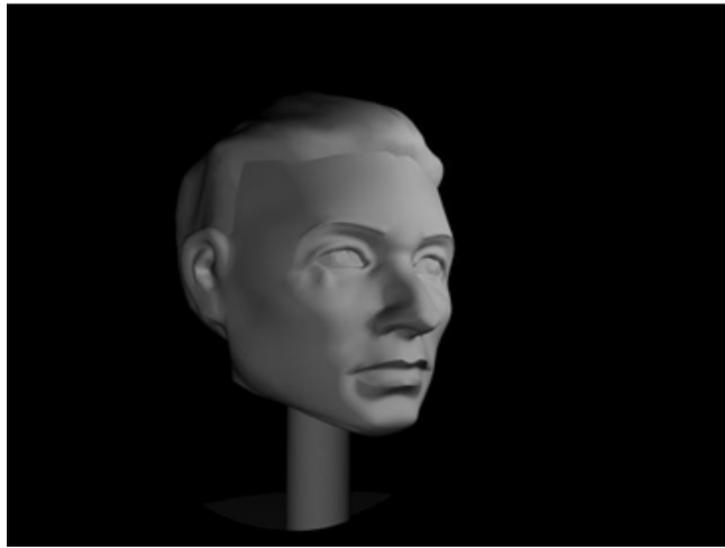
A good soft light is an area light. In an area light, the light is not emitting just from a single point but from many points, thus spreading the light out. Area lights come in many shapes, and you can change their sizes. A bigger area light will emit light from a larger area. You can even make a spotlight into a soft light by increasing its penumbra and turning off its shadows. You can also make lights softer by turning off their shadow casting. A global illumination system or radiosity can produce soft lighting

Fill Light

You've set up your key light, but now you decide that you want to add more light to the scene. The first light typically added is called the *fill light*. Fill light is generally a soft light that doesn't cast shadows. The fill light adds light to the scene, softening the light from the key light by lowering the contrast of the dark to light areas. Often, a fill light is set up lower than and opposite to the key light, on the other side of the camera axis, pointing toward the object to be illuminated. Fill lights are usually low, as they are often emulating the reflected light that would be coming off the floor. You can use bounce light to add to the fill light.Generally, when you are lighting a realistic or naturalistic scene, you do not want any totally black areas in the scene. In life, there are rarely any areas of complete black: Some light has bounced in. Fill light can help provide this light. Even when I am lighting a night scene, I try to add some light so that no area is totally black.

Key to Fill

You may have heard the terms *key-to-fill* ratio or *low key* and high key lighting. A key-to-fill ratio is just a measure of the brightness of your key light to that of your fill light. If your key light is 3 times as bright as your fill light, that's a 3:1 ratio. The expression *high key lighting* or *low key lighting* refers to the amount of fill light in your scene.

**Using Lights to Set Up Moods**

In a bright and happy scene-a comedy, say-you would be well served by high key lighting. A brightly lit scene with low contrast can create a safe feeling, as nothing is completely hidden in shadow. The mood

is calm and tranquil; no danger lurks. In contrast, a lot of cool florescent light can make a scene seem sterile. Cool-temperature high key lighting could be good for creating a scene in a drug store or laundromat, for example.

With high key lighting, because of the lessening of contrast, a scene can look a bit flatter. To give volume to an object or scene, you want that contrast of dark to light. A night scene is a good example of low key lighting. Low key lighting is also used in a film noir lighting style-a popular film genre and lighting/cinematography style developed in the 1940s and 1950s in American films. It speaks of danger and suspense with a touch of evil. In a film noir lighting style, darkness and shadows predominate: There would be very deep black shadows and light falling exactly where you want it to, with very little light spill. On the other end of the low key lighting spectrum, consider a romantic dinner scene: Soft, flickering candlelight can be sentimental or romantic. Candles would also work in a church scene.

Back Light

A third type of light commonly used in a three-point lighting setup is the back light, sometimes referred to as a *rim light* (see Figure 9). When the sun is lower in the sky, its rays can put rim lighting around people and objects out in the landscape, separating them from the background. Back lighting is a device you might want to try out in your lighting to help emphasize a figure or object. Often, you set up a back light to illuminate a subject this way. If there is already enough contrast between your character and the background, you might not want to use a backlight to rim and define your character's edges.
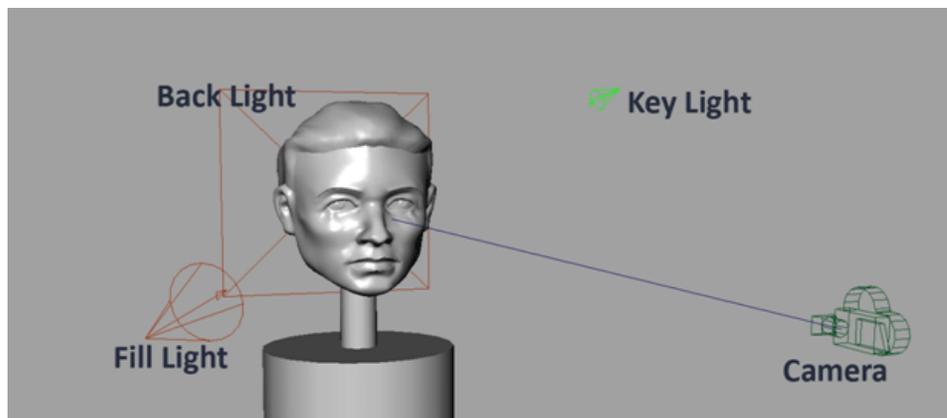
A typical three-point lighting setup

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

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

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

A portrait with three-point lighting: a 300 watt key light, a 150 watt back light, and fill light from a bounce board

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

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

The *back light* (a.k.a. the *rim*, *hair*, or *shoulder* light) shines on the subject from behind, often (but not necessarily) to one side or the other. It gives the subject a rim of light, serving to separate the subject from the background and highlighting contours.

Back light or rim light is different from a kick in that a kick (or *kicker*) contributes to a portion of the shading on the visible surface of the subject, while a rim light only creates a thin outline around the subject without necessarily hitting the front (visible) surface of the subject at all.
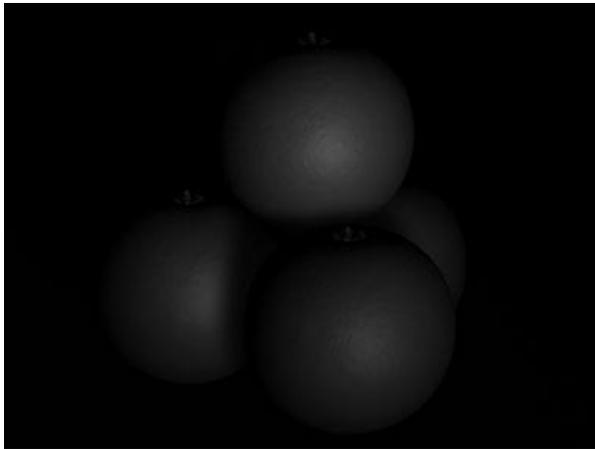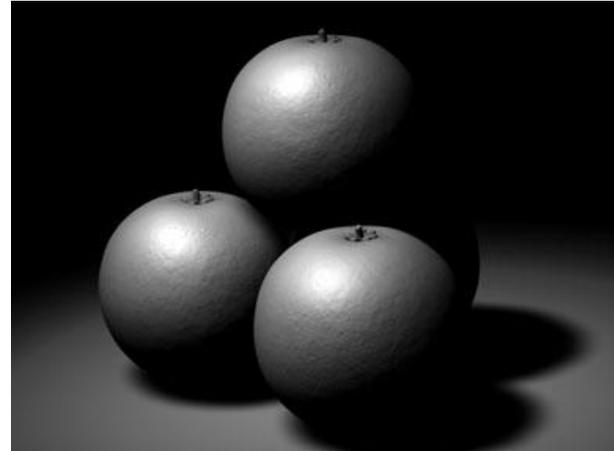
Three-Point Lighting in Theatre

A three point system in theatre can be used in a variety of ways to help set a mood of the character. By having bright key light, but minimal fill and back light, this will give the effect of anger, whereas if the scene is very brightly lit with little shadow on the actor, this can make the scene look very happy.

The Key Light

A single key light

By placing the key light above and to the left we can see the volume of the oranges (i.e. that they're spherical). We can also see that they are on the floor by the shadows cast and that they are stacked on top of each other. However the image is lacking detail in the shadow regions and is a bit brutal. In order to fix this we need to add another light to the right of the oranges to add some illumination to those darkened areas. This light is called the FILL LIGHT. Let's look at what this light contributes to the scene.

The Fill Light

The job of the fill light is to illuminate those areas of the image which are in shadow when the key light is placed. It should be pretty obvious therefore that the fill light is placed after and in relation to the key light. As the job of the fill is only to allow us to see a little more detail it should not be as intense as the key light. Look at this example; the key light is about 2-3 times brighter than the fill. Let's take a look at how the key and fill light work together.

Key and Fill

Key and fill light

The image now looks a lot better than it did with just a key light. The image has more depth and detail. It is neither too dark, nor too washed out. However there is something more we can add. The right side of the oranges are getting a little lost against the background. In order to counteract this we can add a RIM LIGHT.
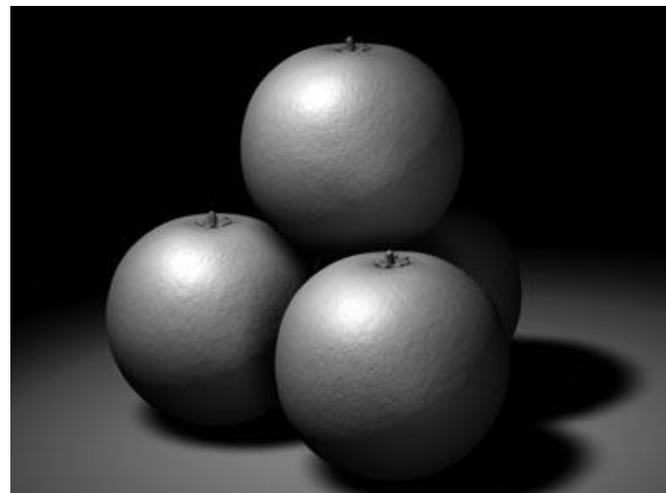
The Rim Light

The rim light

The rim light is placed behind the objects being illuminated and is angled so that the light glances off the surface of the object at the narrowest angle. The intensity of this light is often quite high, often brighter than the key. Due to its intensity and placement it creates a line of bright light around the object and in doing so lifts the object away from the background. The rim light is principally used to ensure that a dark object does not blend in with a dark background. OK now the lighting is complete let's examine the finished result.