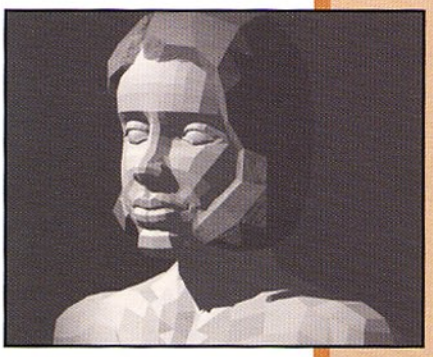
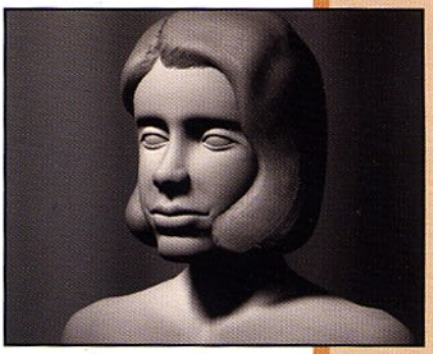
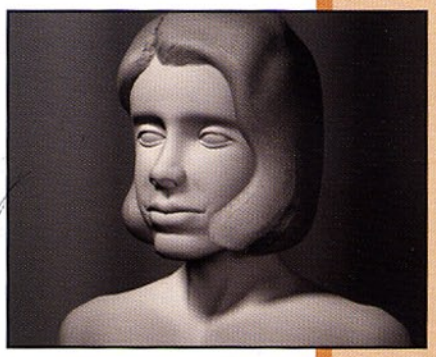
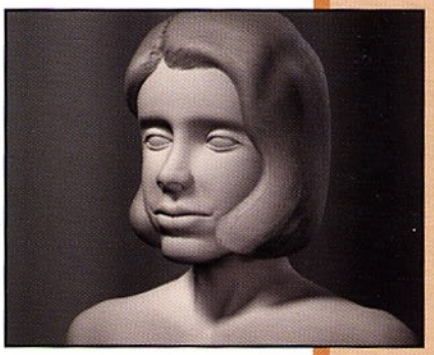
CHAPTER 3









THREE-POINT LIGHTING

ONE OF THE MOST POPULAR and attractive ways to illuminate any subject is with a classic Hollywood lighting scheme called *three-point lighting*. Three-point lighting is a design that makes it easy to "model" your subject with light, to convey its full three-dimensional form through your rendered image. Variations on three-point lighting can cast a favorable light on anything from a small prop to a movie star. Learning to use the three points as described in this chapter will give you an understanding of major roles that lights can play in almost any lighting design.

3.1 MODELING WITH LIGHT

Before discussing the specific decisions and light positions that create three-point lighting, it is important to understand the underlying issues and goals that have made three-point lighting such a popular framework for cinematic lighting design.

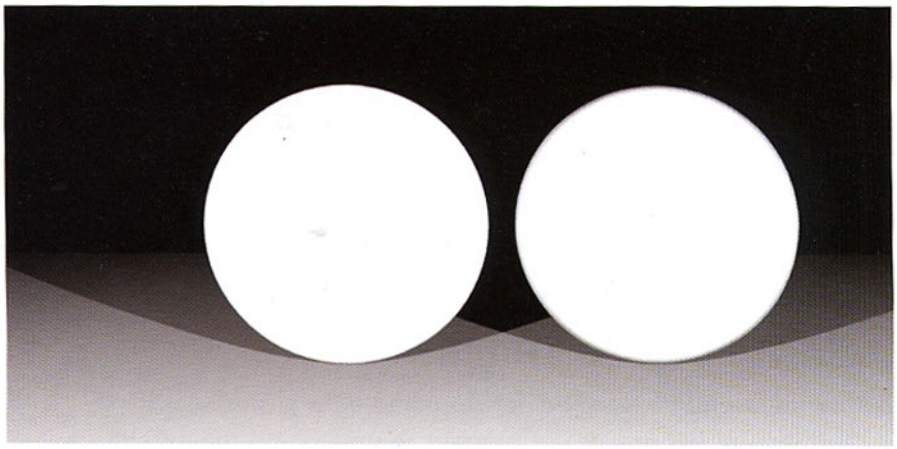
Beginners sometimes think that a subject is well lit just because it is brightly lit, and that all it takes is enough light to make the entire subject visible. In reality, even when a subject is brightly lit, important aspects of its form will not be visible without effective shading from different angles. Figure 3.1 is certainly bright enough, for example, but the shading is not adequate to reveal the three-dimensional forms of the models.

One of the main goals of three-point lighting is *modeling with light*. To model with light is to illuminate a subject so that your two-dimensional output shows the subject's full three-dimensional form.

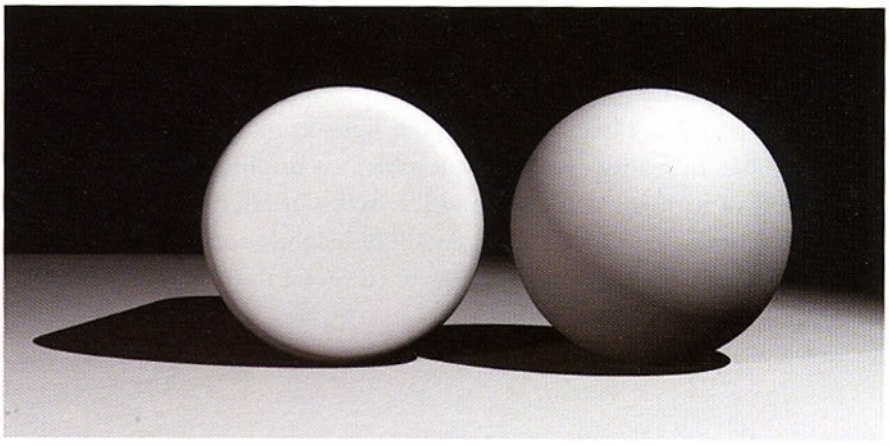
Figure 3.2 shows the same objects as Figure 3.1, but they are better modeled with light. You can see that one surface is a sphere, and the other is the flat end of a cylinder. Your audience would have missed this distinction in Figure 3.1.

Most scenes are not as extreme as Figure 3.1, but the figure makes the point that overly uniform lighting can flatten a subject, hiding the actual curvature and modeling. This kind of "flattened" look is sometimes seen in a photograph taken with a camera's built-in flash, or in video news coverage where a light is mounted directly on top of the camera.

Figure 3.2 has more variation of shades used in lighting the subjects. Light that is brighter on one side, with dimmer light from other angles, can prevent flat, uniform lighting and can add the shading needed to model with light. For the best modeling, study the shading on your surfaces and make sure that there are no overly flat, uniform areas.



3.1 No modeling is visible in these forms.



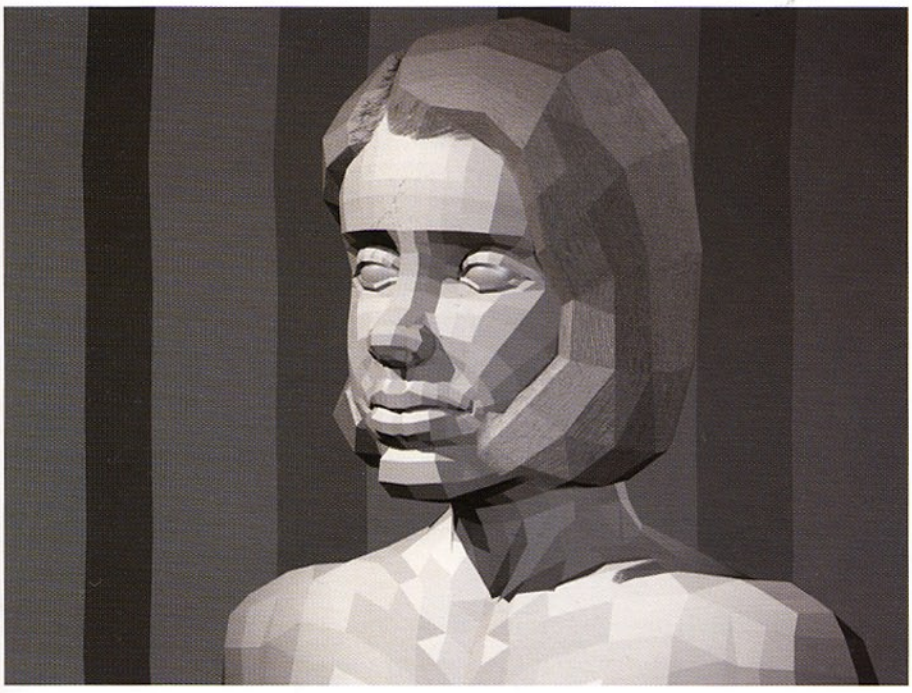
3.2 The new lighting reveals the forms.

One way to study the shading of your subject is to imagine your subject defined by different *planes*. Planes are just portions of the surface with their own angles, and you can imagine flat planes existing even as a part of curved, organic forms. Figure 3.3 shows a human head rendered with distinct planes rather than smooth shading. (Even before the advent of computer graphics and polygon meshes, illustrators talked about the "planes of the face" as a way to break down the forms that need to be shaded—building an object out of polygons only makes the analogy more convenient.)

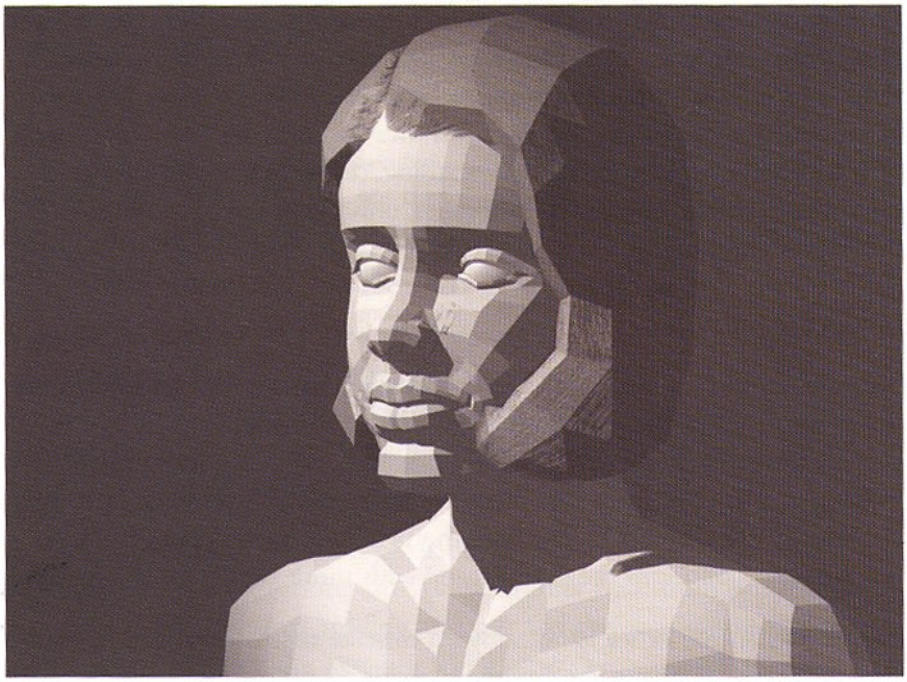
To model a surface with light, different values have to be assigned to the different planes of the surface. In Figure 3.3, each plane of the face is given a different shade by the lighting design, with the illumination varying as you look from one plane to the next. As you move on to the left side of the subject's face, where the brightest light doesn't reach, a second light continues the shading and adds more variety to the surface.

Figure 3.4, on the other hand, shows a mistake that is common in computer graphics. It uses a flat "ambient" shade to fill in the unlit areas. This creates regions of uniform shading on the parts of the head not illuminated by the main light. In the areas such as the neck, you can't see any difference between adjacent planes of the head, meaning that they are not modeled with light.

In areas where the shading doesn't vary, where moving from one plane to another doesn't move you into a different tone of illumination, you



3.3 The planes of the face are each illuminated with different tones.



3.4 In the ambient-lit area, the planes are not distinct.

NOTE

Refer to Chapter 2, "Lighting Workflow," for a more complete explanation of why adding a uniform global ambience hurts your lighting.

will not see all the "modeling" that could be shown in a shaded form. Avoid the flat, dead spaces of ambience, or uniform lighting, and use lights to shade your subject with varied gradients.

Three-point lighting, as described in the following sections, is a reliable approach to modeling your subject with light. In setting up a three-point lighting design, keep the goal of modeling with light in mind with each adjustment, and look at the modeling indicated in each test rendering.

3.2 The Three Points

The three "points" in three-point lighting are actually three "roles" that light can play in a scene, each serving a specific purpose:

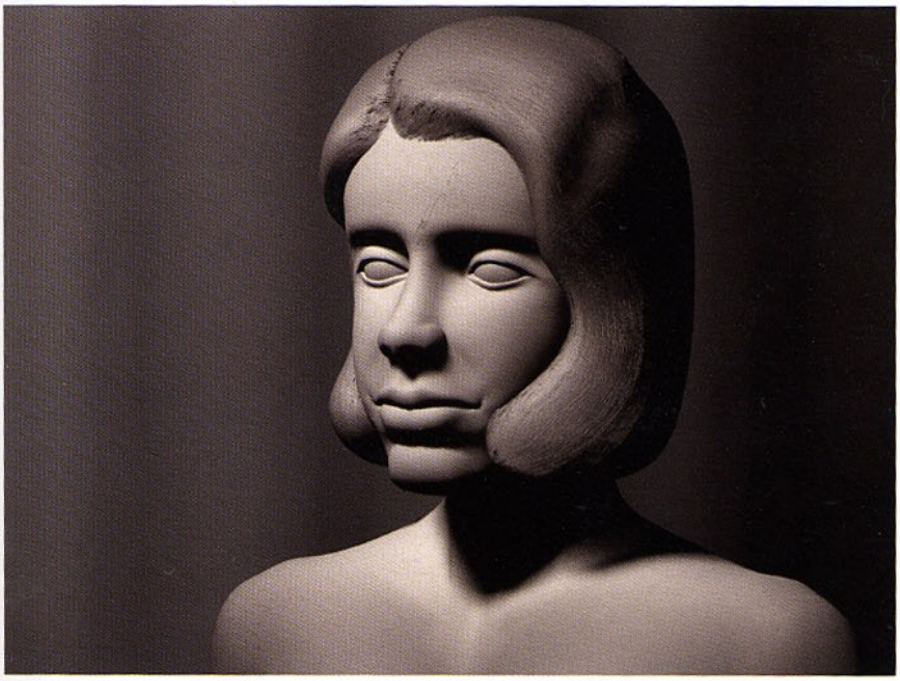
- **Key light.** This light creates the subject's main illumination and defines the dominant angle of the lighting. The key light is usually brighter than any other light illuminating the subject and is usually the light that casts the darkest, most visible shadows in your scene.
- **Fill light.** This light softens and extends the illumination provided by the key light and makes more of the subject visible. The fill light can simulate the effect of reflected light or of secondary light sources in the scene.
- **Backlight.** This light creates a "defining edge" to help visually separate the subject from the background. The backlight can glint

off the subject's hair (backlights are sometimes called "hair lights" for this reason) and add a defining edge to show where the subject ends and the background begins.

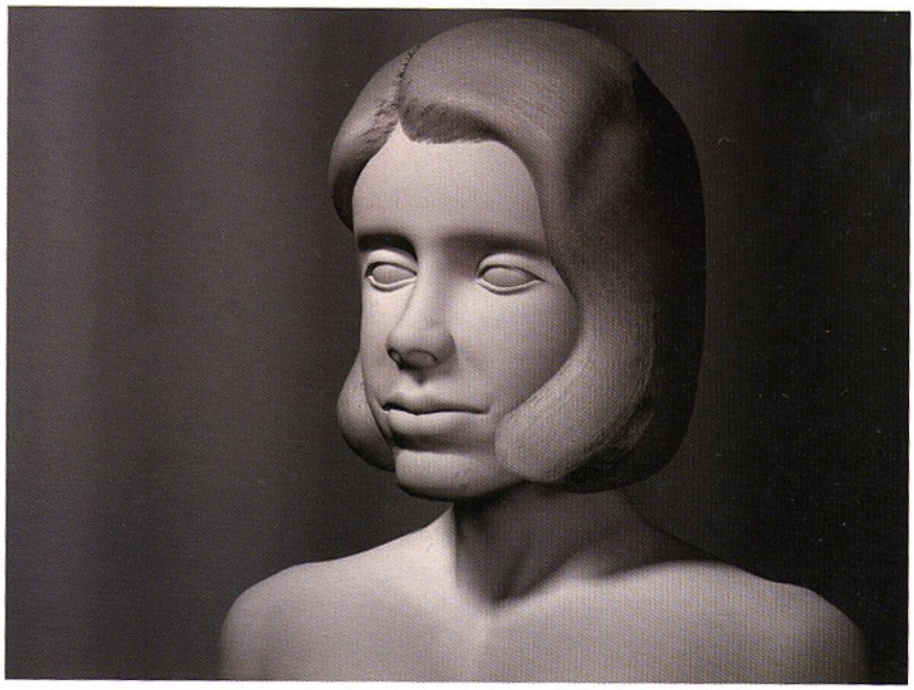
In reading these definitions, don't confuse "backlight" with "background" light. A backlight is not designed to illuminate the background, only to create a defining edge around the rim of your subject. None of the three points discussed so far need to light your set—they are usually used to light your main subject, such as a character or product, and other lights can be used to light the environment around it.

For a quick preview of the three points, Figures 3.5, 3.6, and 3.7 show the points being added one at a time around a 3D head. Figure 3.5 is lit with only a key light. The key light illuminates a portion of the subject, but the opposite side still falls into darkness. In Figure 3.6, a fill light is added on the opposite side of the subject, continuing the shading over the whole surface. In Figure 3.7, a backlight has been added, producing a defining edge around the character. This small rim of light is all that needs to be lit by a backlight to separate the subject from the background.

Three-point lighting is actually a flexible set of principles that can be changed and adapted into a wide range of lighting designs. No single "recipe" for a successful lighting treatment will suit every shot. Each time you apply three-point lighting, you need to make variations and decisions specific to your scene. The following sections discuss how to choose positions and settings for your key light, fill light, and backlight.



3.5 The key light adds the dominant light to the subject.



3.6 The fill light continues the shading around the model.

3.7 The backlight creates a defining rim to separate the subject from the background.

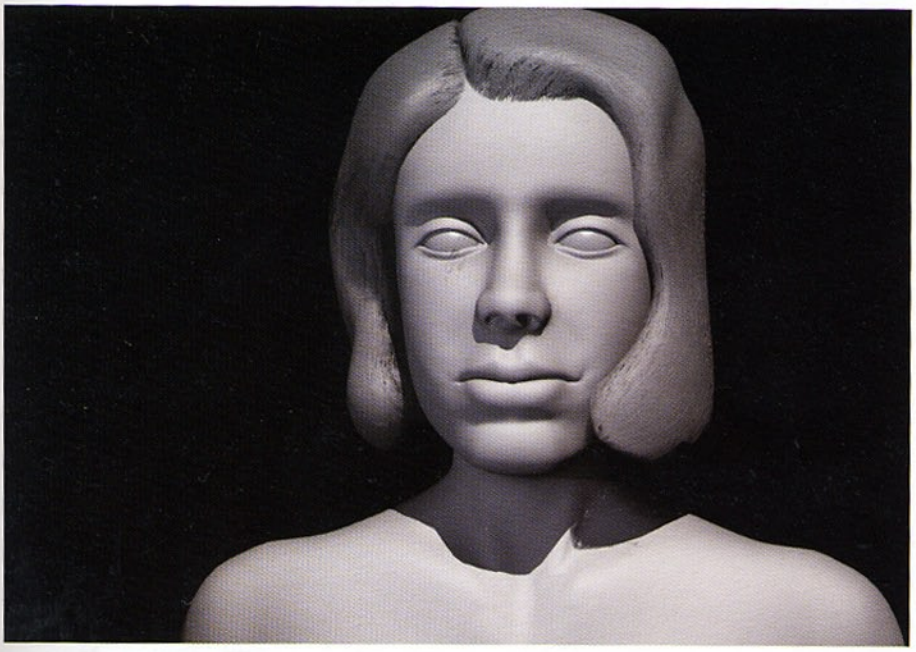
3.3 KEY LIGHT

Every three-point lighting scheme has a key light. As the main, brightest light in the scene, the key also establishes the dominant angle for the illumination of your subject. Choosing an angle for your key light is one of the most important decisions in lighting your subject.

Lighting angles described in this chapter are relative to the position of the camera. Three-point lighting works best when you set up your shot and camera angle first, before positioning your lights. If you later change your mind and decide to shoot your scene from a completely different angle, the lighting would also have to change. Viewing your scene from the point-of-view of your camera, you can add and adjust your key light.

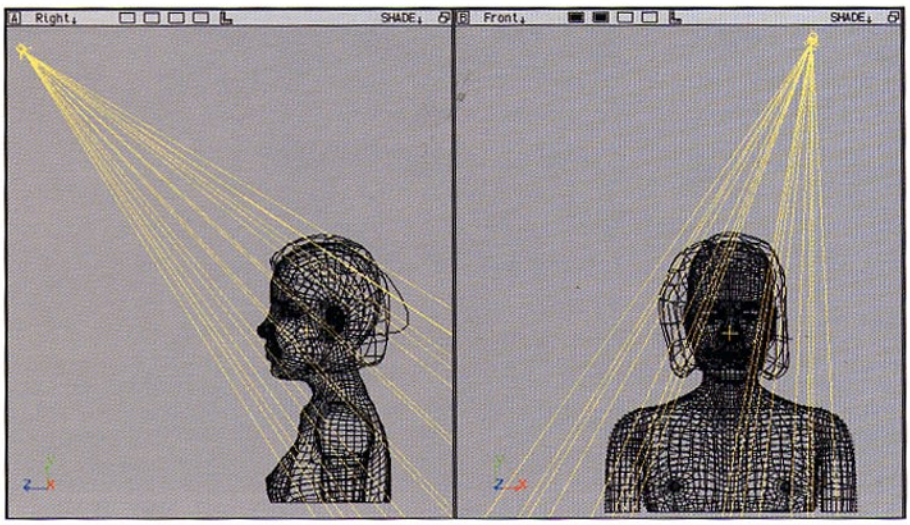
Putting the key light too close to the camera angle can flatten the form, as shown in Figure 3.1. But moving the key too far to the left or right can be harsh and distracting in its own way, and might not fully illuminate the face.

Think of a character's nose as a sun dial, and watch which way its shadow points. If it points downward toward some part of the mouth, as in Figure 3.8, this is a normal way of seeing a person. Viewers are used to seeing people in environments with overhead light. To aim the shadow in this expected way, the key was positioned above and to one side of the subject, as shown in Figure 3.9.



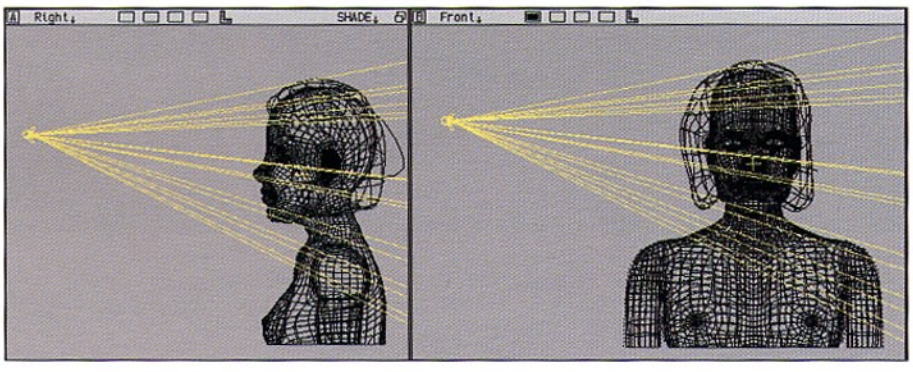
3.8 The nose shadow points toward a part of the mouth in the most normal lighting.

If the nose shadow shoots off sideways, bisecting the cheek, as in Figure 3.10, this is less flattering and sometimes makes the lighting a distracting element in the scene. This can happen when the key light is positioned too far to one side, as shown in Figure 3.11.



3.9 A common key light position is over the subject and at least a little off center.

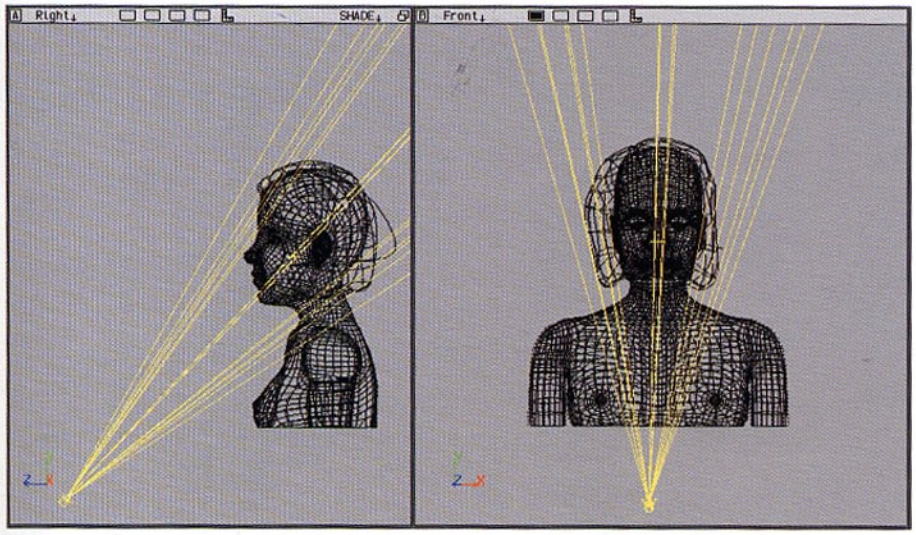
3.10 The nose shadow telegraphs the sideways angle of the lighting.



3.11 The key light from the side creates the sideways nose shadow.

An extremely unnatural effect occurs when the key light is positioned low, aiming upward at the subject, as in Figure 3.12. At a summer camp, you may have tried aiming a flashlight upward and holding it directly under your face. This can be a terrific technique when telling ghost stories. You can turn an ordinary person into a frightening, ghostly apparition, just by positioning your key light as shown in Figure 3.13. Unless the source of the light is visible in the scene—for example, if the character is standing over a fire or holding a lantern—low-angle light can make the audience notice something very unusual about the lighting. Be selective in using this effect.

3.12 Low-angle lighting is sometimes called "Light from Hell."

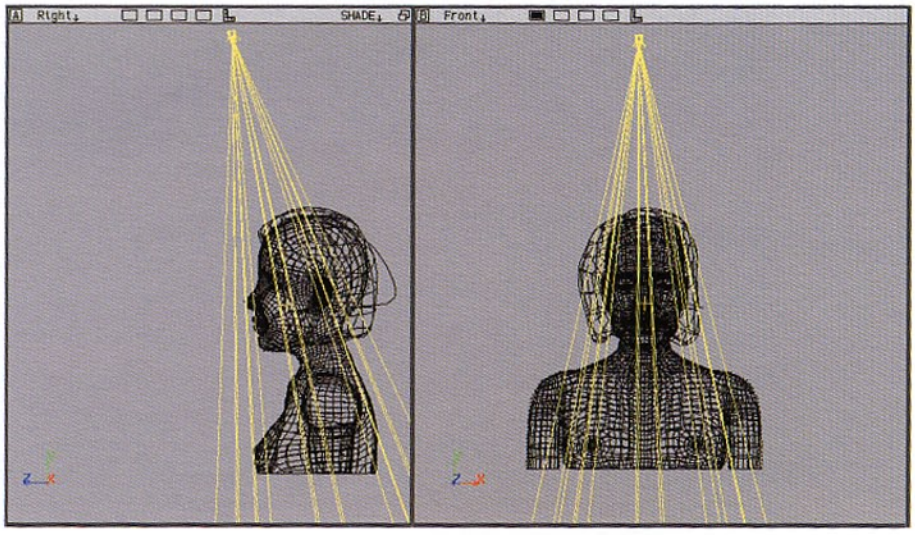


3.13 The key light from below creates unnatural lighting.

Raising the key light too high above your subject can create dark shadows within the eye sockets, hiding her eyes in shadow, as shown in Figure 3.14. With the key light angle in Figure 3.15, even if the eyes were made visible by fill light, the "raccoon eyes" look could still be noticeable, and is not very attractive.

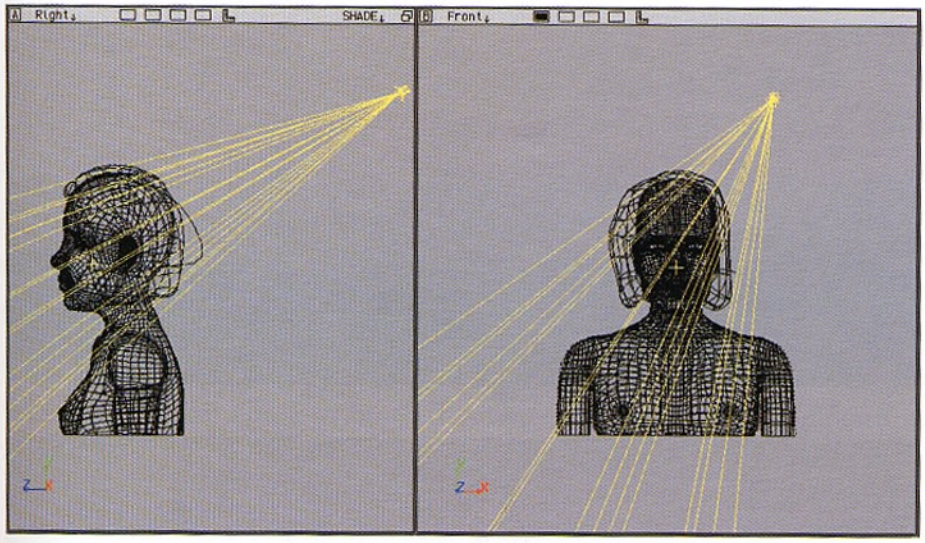
Positioning the key light all the way behind your subject could put your subject into silhouette, as shown in Figure 3.16, and cast shadows down toward the camera. This departure from standard three-point lighting places the key light behind the subject, as shown in Figure 3.17. Even though the key light is in a position that normally would be used for a

3.14 The "raccoon eyes" look comes from very high-angle lighting.



3.15 The key light is positioned at an unnaturally high angle above the head.

3.16 An upstage key can cast a character into profile.



3.17 The key light is positioned behind the head.

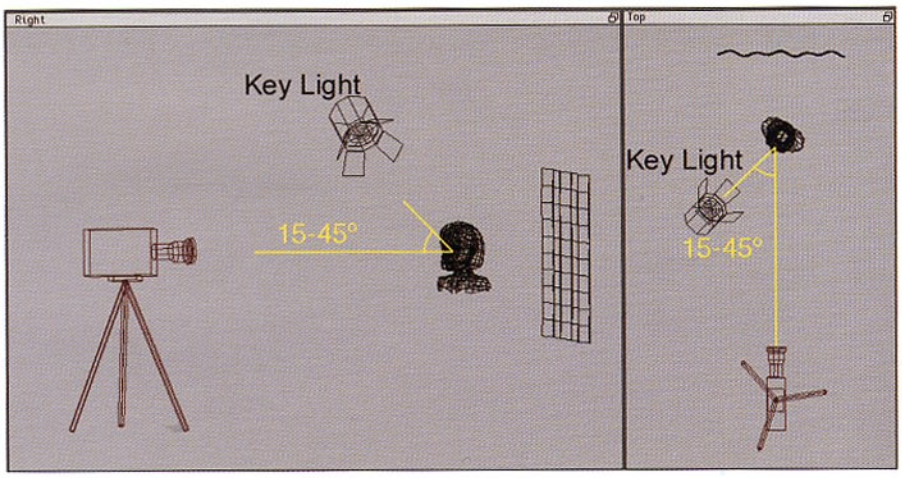
backlight, it can be called an "upstage key." This can be a very dramatic effect. Remember, however, that lighting effects can sometimes be distracting in a story or can compete with the character's performance for the audience's attention.

Of all possible choices, positioning the key about 15 to 45 degrees to the side (left or right) of the camera, and about 15 to 45 degrees above the camera, seems to be a "happy medium" for most standard three-point lighting setups, and is a useful starting point in lighting many scenes. When trying for a "normal" lighting setup, you can usually stay within the range of angles shown in Figure 3.18.

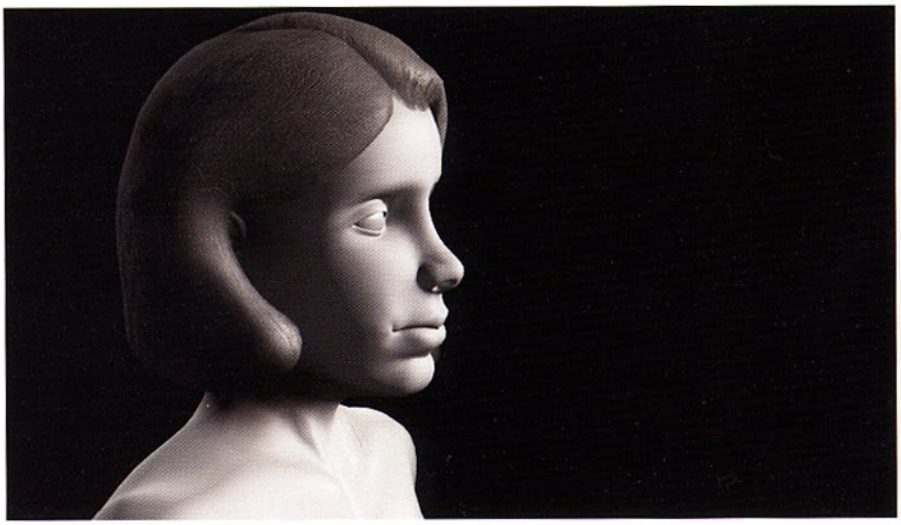
One exception to these guidelines is that when shooting a character in profile, you may want to rotate your key and fill lights so that the character's face is fully lit, as shown in Figure 3.19.

In animated productions, you have to anticipate the movements of characters with your lighting. It is a good idea to test render different frames from any animated shot, including tests of the lighting at any "extreme" poses of the head. When a character turns and looks sideways, you might want to check that you have adequate light to define the profile.

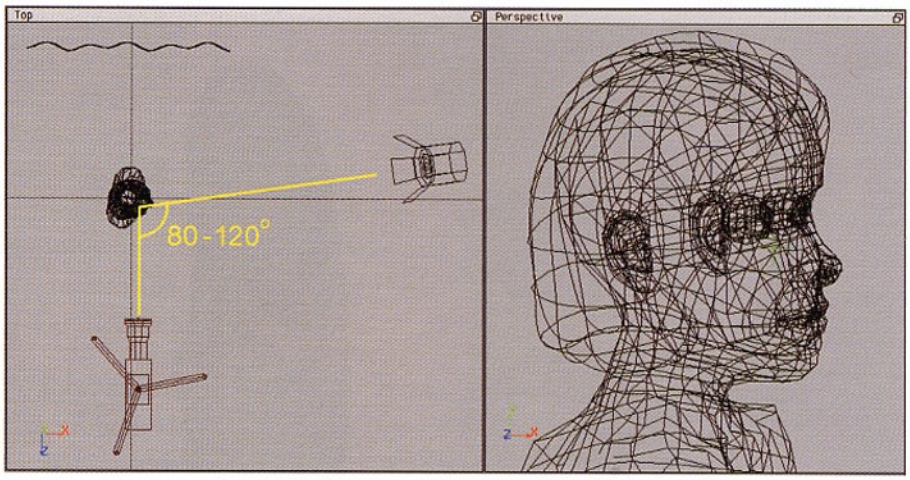
Ordinarily, moving the key light more than 100 degrees away from the camera angle would make it function more as a backlight or rim light. In a profile shot or in an animated shot in which a character turns into profile, however, you can position the key light to keep the character's face in the light, as shown in Figure 3.20.



3.18 Typical key light angles are relative to the camera angle.



3.19 The key light can be moved to face a character in profile.



3.20 The key light can move much farther from the camera angle to light a profile shot.

Your actual lighting should be influenced both by the angles that best light your subject and also by the apparent light sources in your scene. Within a normal range, a specific lighting angle can be chosen to match the environment around the character. Outdoors, the time of day might suggest an angle for the light from the sun and sky. Indoors, a lamp or a window might light a room, and you would want the key light to appear to come from the same general direction. The angles suggested in this section are general guidelines that should not override your own judgment of what seems appropriate to your scene.

3.4 Fill Light

In real life, some situations "provide their own" fill light, because illumination from the key light is reflected by other surfaces in the scene, adding additional illumination to the subject. By taking advantage of this in photography—and sometimes in live-action film and video—terrific results can often be achieved using just one light to light a scene. If it reflects off other surfaces, a single source can provide all the direct and indirect illumination needed for some live-action shots. In a standard scanline renderer or raytracer, without radiosity, this "indirect" illumination is not calculated. A renderer that does not calculate any indirect illumination can produce a scene such as Figure 3.21, in which the brightly lit wall on the right side does not appear to bounce any light back onto the subject.

To achieve the same illumination in computer graphics, you may need to add a dim fill light at a generally opposite angle from the key, to simulate reflected light. Figure 3.22 has an added fill light to roughly simulate indirect illumination in the scene.

NOTE

To learn about indirect illumination, types of renderers, radiosity, and simulating radiosity, see Chapter 9, "Materials and Rendering Algorithms."

3.21 A subject without indirect illumination or fill light falls off into unnatural blackness.

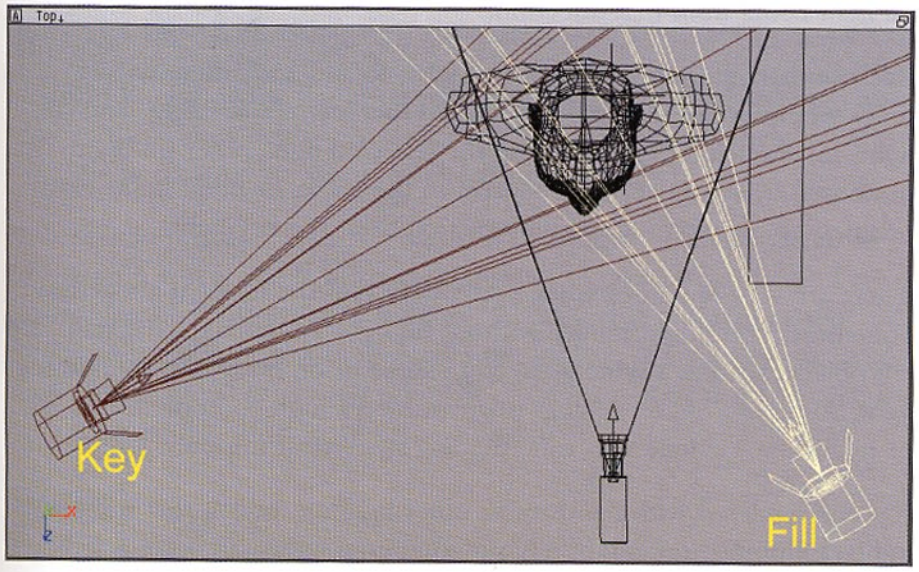
3.22 This use of fill light simulates indirect illumination.

The fill light in the case of Figure 3.22 is just a dim spotlight added on the other side of the subject, as shown in Figure 3.23. For the most true-to-life results, you would position the fill light behind the wall that is being brightly lit, to simulate light bouncing directly off the brightest spot of the wall. The direction of your fill light does not have to be precise or numeric, however; sometimes the key and fill are both more useful when cheated toward the front of the subject.

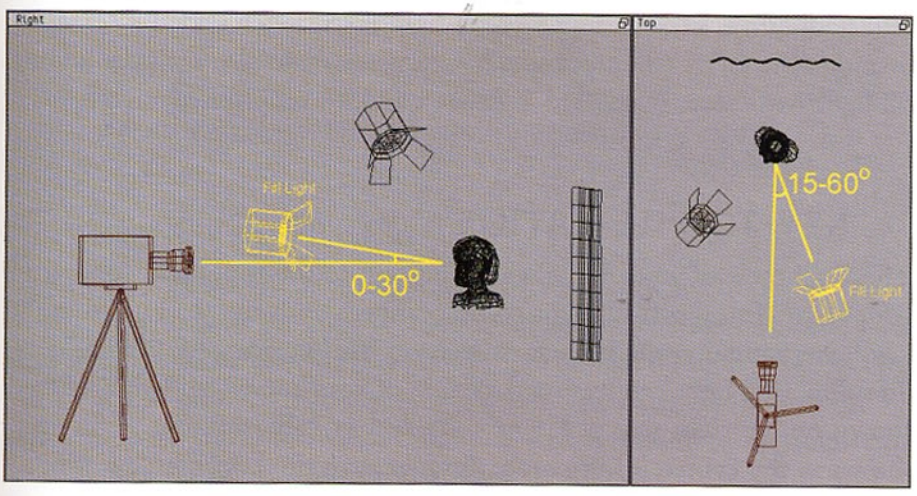
A fill light is usually most useful when placed at a generally opposite angle from the key. If the key comes from the upper left of the frame, for example, the fill should generally come from a lower angle, to the

right. Instead of putting the light all the way to the opposite side, however, you may achieve better results if you move the fill light closer to the camera angle, so that the areas lit by the key and fill overlap. Making the areas lit by the key light and the fill light overlap guarantees that you will have continuous shading across the entire surface. Figure 3.24 shows a good "normal" range of fill light angles, with the fill coming from only slightly above the camera angle, but somewhere between 15 and 60 degrees to the left or right of the camera angle. These are very loose, general guidelines.

A good rule of thumb is that, while your key light is above your subject, the fill light should be lower than the key. The heights can range from a position just below the key, down to the level of the subject's head. If the fill light were actually lower than the subject's head, on a side of the subject lit primarily by the fill light, the subject would be receiving



3.23 This fill light loosely approximates the direction of the side wall.



3.24 A fill light comes from a generally opposite direction.

unflattering low-angle light. The logic behind this convention is that, although most key light sources are overhead, such as the sky, sun, and ceiling fixtures, the secondary (fill) illumination often comes from light reflected off the ground or walls, or from dimmer light sources such as table lamps.

An unnatural degree of symmetry is a problem in computer graphics in general and is something to watch out for in positioning your fill light. Just as you don't want your scene as a whole to look too symmetrical, don't put your fill light in a position that is exactly mirror reflected over the camera axis from your key.

Fill lights are not only positioned to simulate reflected light. The position and direction of a fill light may be influenced by any secondary light sources visible in a scene. If there is some apparent light source, such as a desk lamp, that could motivate your fill light, try to make your fill light come from that direction.

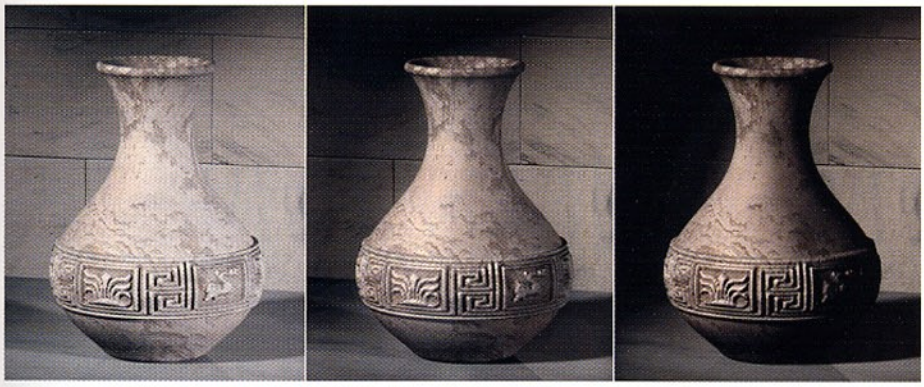
Because there are several different reasons to add a fill, there will be times when several fill lights are needed in a scene. You might have fill lights for simulating or enhancing the reflected light, other fill lights motivated by secondary light sources in the scene, or other lights just broadening or softening the illumination from the key light.

There are very few cases when you would skip the fill light altogether. Sometimes you might render without fill light when raytracing transparent objects, such as a wine glass, that can be lit on both sides by one key light. Some stylized renderings might use very high contrast and no fill, or might use a simple two-tone shading style requiring only a key light.

A scene rendered with radiosity, or other lighting models that support indirect illumination, might rely on computer-simulated bounce lighting rather than a fill light. Even in live-action productions, where naturally reflected light is present, however, fill light is still often added to extend or modify it. Even when using radiosity, you should also consider adding fill lights whenever needed to soften, extend, or modify reflected light.

3.5 Key-to-Fill Ratios

The brightness of your fill light is important to the tones and contrast in your scene. Too much fill light could compete with the shading from the key light, flattening the subject, as seen on the left side of Figure 3.25. Too dim a fill light can leave a dark side of your model undefined, as shown on the right side of Figure 3.25. A reasonable amount of fill light, shown in the center, is noticeably dimmer than the key light, but still bright enough to fully light the subject.



3.25 Three different key-to-fill ratios are tested on the same scene.

The difference between the brightness of your key light and the brightness of the fill light is called the *key-to-fill ratio*. When your key light is twice as bright as your fill light, for example, it is a 2:1 key-to-fill ratio. In Figure 3.25, the left side uses a very low 1.5:1 key-to-fill ratio, the middle uses a moderate 4:1 key-to-fill ratio, and the right uses a very high 24:1 key-to-fill ratio.

In plain English, what the key-to-fill ratio measures is the level of contrast in the scene's lighting. You want to know how much brighter the brightly lit parts of the scene will be than the dimly lit parts.

It is the illumination at the subject that is being compared by your key-to-fill ratio, not at the light sources. Be sure to take into account any *attenuation* (also known as "decay" or "falloff") that will reduce the brightness of a light before it reaches the subject. If a light has decayed to half its original brightness where it illuminates your main subject, for example, use half of its brightness setting in your key-to-fill ratio.

NOTE

A warning is required about two confusing terms. You will sometimes hear the phrases *high-key* or *low-key* used in reference to an environment's lighting. These terms might sound as if they are describing the opposite of their actual meaning. High-key refers to a bright environment, with a lot of fill light, and therefore a low key-to-fill ratio. Low-key means a dark-looking environment, without much fill light, and therefore a high key-to-fill ratio.

3.5.1 Low Key-to-Fill Ratios

Figure 3.26 uses a low key-to-fill ratio of about 3:1. Even though the key light represents the sun, you can imagine that the light-colored table and walls could be providing a high proportion of fill light by reflecting much of the sunlight that illuminates them. The extra fill light in the scene helps to simulate reflected light, as well as adding to the impression that the leaves are somewhat translucent.

3.26 "Still Life with Spider Plant," by Jeremy A. Engleman, was rendered with a low key-to-fill ratio.

Here are some situations in which you would expect to see a greater proportion of fill light, and might choose to use a low key-to-fill ratio:

- Interiors with white or highly reflective surfaces, such as a kitchen or bathroom, would naturally have a low key-to-fill ratio, because of the amount of reflected light created in that kind of room in real life. After adding even one bright light to such an environment, you expect the illumination to be reflected onto almost every surface, and it could look unnatural to have any completely dark shadows in the room.
- Cloudy, overcast, or snowy days block the direct sun, and also provide more scattered or reflected light from different sides of the sky. If a typical outdoor scene uses the sun as a key light and the sky as the main source of fill, the dimmer sun and brighter sky can lead to a very low key-to-fill ratio in those weather conditions.
- Some productions, such as a comedy or children's program, use consistently low key-to-fill ratios, such as 2:1 to 4:1, to maintain a bright, cheerful mood. Enough fill light is added to illuminate every corner of the characters and the sets, and even the shadows are not very dark.
- A lower key-to-fill ratio is preferred in designing images for output to television than might be used for print or film. Conventional televisions cannot display as full a range of tones as can be projected on film. Lighting for television requires more fill light in some areas just to make the areas bright enough to be visible.

Be careful when your key-to-fill ratio drops much below 2:1. If your fill lights are bright enough to rival or overpower your key light, there

might not be enough variation in tone to shade your subjects and model with light. Before you add too much fill light to any scene, stop and think if you are really happy with the key light's position and settings. When your key light is not working for you, it is better to go back and fix it than to get trapped masking the problem with unnecessary fill levels. If you don't like the main shading and shadows from your key light, you should fix your key light; don't waste time adding more and more fill to hide the key light's effect.

If you are using several fill lights, keep track of the total brightness as they add up, to make sure they don't accidentally add up to more illumination than your key light. If two fill lights both illuminate the same planes of your subject, add together the brightness of both to calculate the proportion of fill light. If a fill light overlaps with the key light, also add the fill's illumination to the key's side of the ratio. With overlapping lights taken into account, your key-to-fill ratio can be expressed as "key + fill : fill + fill."

3.5.2 High Key-to-Fill Ratios

Higher key-to-fill ratios, such as 8:1 or more, can create a dramatic look for darker, more shadowy scenes with a lot of contrast between bright and dark. The starkness of falling off to black on one side of a character's face may be appropriate for some environments—such as Figure 3.27, which was set in a moving subway train. High key-to-fill ratios can sometimes create dramatic images with a lot of visual impact.

3.27 A high key-to-fill ratio can look dramatic or moody.

The impression of a "dark scene" in a movie does not have to come from an underexposed piece of film, but more often can come from a high key-to-fill ratio. When you want to create a "dark scene," the scene can still show some well-lit detail in selected, controlled areas, to show the important elements in the scene in sufficient light. You can take advantage of the full range of brightness available in your palette and use a high key-to-fill ratio, making some areas of the scene well lit and other areas much darker.

You can actually build a greater sense of darkness through contrast than through underexposure. Careful control over your illumination is the secret to lighting a dark scene, not just making everything dim and murky. The shadows fall off into blackness in Figure 3.28, for example, with very little fill light. This creates the impression of a dark scene even though some areas of the scene are brightly lit.

When you light a scene with very little fill light, make sure that any important actions or parts of a character's performance are still visible in the key light. If it is important that the audience see something, even if other parts of the scene are murky, make sure that the important detail or area is lit well enough to see.

Some situations in which you would expect less fill light, and might choose to use a high key-to-fill ratio, include the following:

- Night scenes frequently have high key-to-fill ratios. At night, you will still have a key light coming from the moon or an artificial light source, but there is no natural source of fill light from the sky.
- Scenes in horror movies, or dramatic and suspenseful scenes frequently benefit from a high key-to-fill ratio. Using less fill light means that more of the scene is hidden in darkness, which is frequently useful in building suspense. A film genre called *film noir* was known for this look.
- Work rendered for film can show a greater range of brightness than work rendered for video. A key-to-fill ratio of 8:1 is already a fairly high-contrast, dramatic-looking scene for television; in film, however, a more stark shot might use 16:1 or higher, when appropriate.

Don't assume that bolder and more attention-grabbing lighting will always be better lighting, or that half-lit characters are always a more "artistic" choice. Many productions benefit more from lighting that subliminally enhances a scene than from lighting that calls attention to itself and distracts the audience from the story.

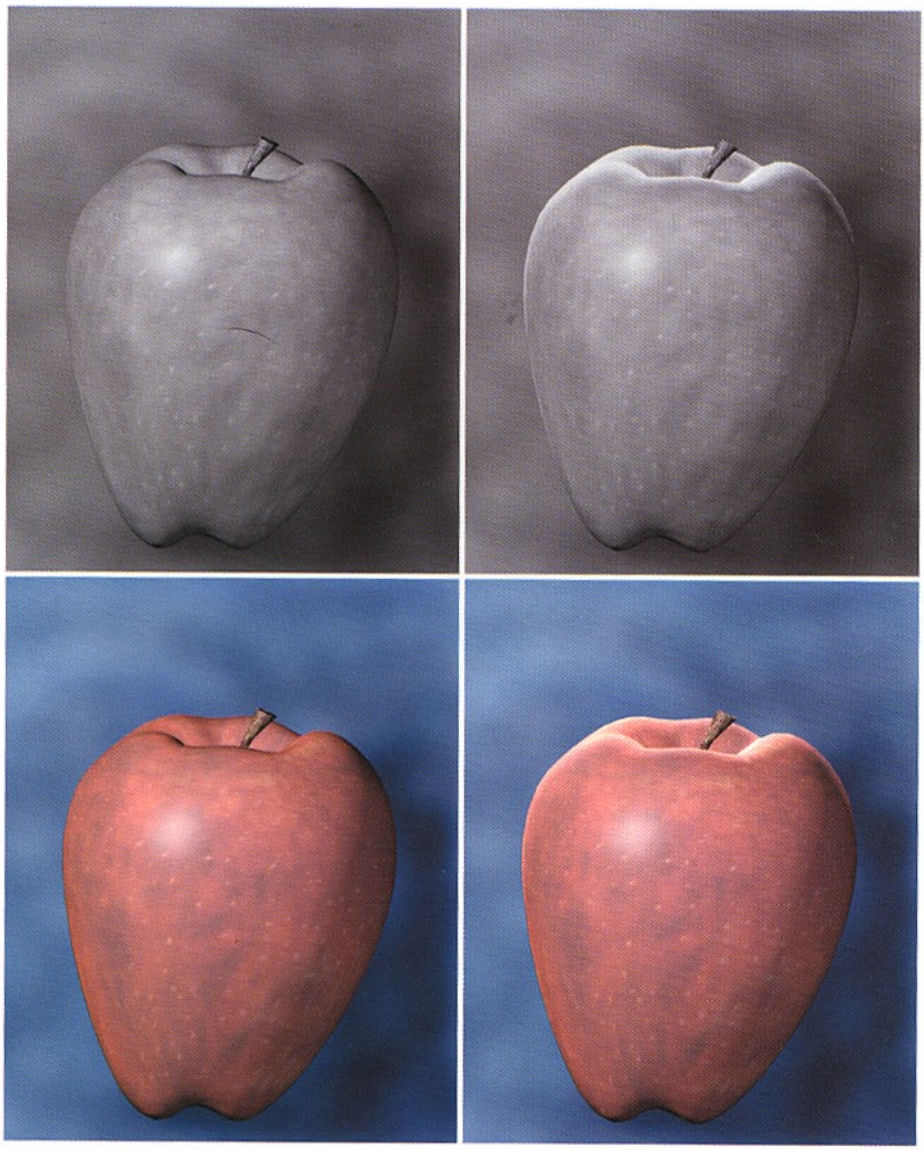
3.28 The high key-to-fill ratio means high contrast between shadow areas and bright areas.

High key-to-fill ratios can also make your key light look harder, when there is less fill to soften its falloff. Especially in computer graphics, harsh lighting treatments can sometimes look unnatural.

3.6 BACKLIGHT

Backlight is a convention inherited from black-and-white cinematography. Lack of color forces photographers and cinematographers working in black-and-white to accomplish even more with lighting than is necessary in color, and backlight is a terrific tool for visually separating a gray actor from the gray wall behind him. In color, backlight is still useful, especially in cases of dark-haired subjects against a dark background. Backlight is not used quite as frequently in color, however, and is considered more of an optional, stylistic device. Figure 3.29 shows the same scene without backlight and with it, and shows that the difference is greater when viewed in black and white.

You should think before adding backlight to every scene. Often there is already enough contrast between the subject and the background, so you might not need an extra defining edge from a backlight. In some scenes, a bright light behind the character might not seem plausible. Whether extra backlight will be "cheated" into a scene is a decision that depends on the visual style of the production and on the importance of the distinction between the foreground and the background.

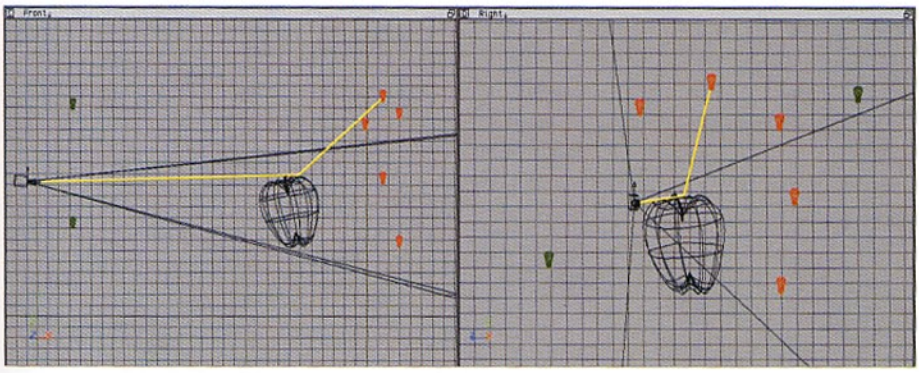


3.29 A black-and-white subject can merge into a background (top left) until it is better defined with backlight (top right). In color, the subject is easier to distinguish without backlight (lower left), and backlight adds less to the rendering when used (lower right).

3.6.1 Rendering Backlight

Backlight can sometimes be challenging to simulate in computer graphics. To render Figure 3.29 with a noticeable rim of light wrapping around the subject, multiple backlights were used, as shown in Figure 3.30. All the light positions are relative to your camera angle, positioned, and test rendered so that they illuminate the visible edge of the subject. Be sure to test render your scene from the final camera angle when setting up backlight.

It is okay for your backlight to be very bright. Sometimes it can even be brighter than the key. Because it is behind the subject, only highlighting the edge of the visible surface, the backlight does not compete with the shading of the key light.

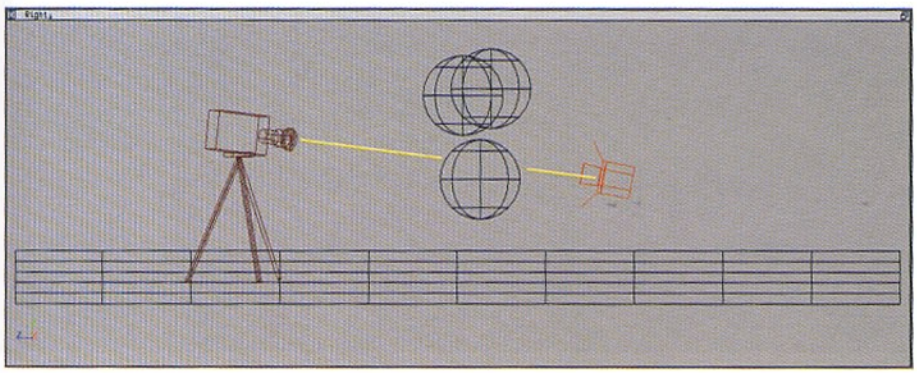


3.30 Multiple backlights are sometimes needed to create a rim that wraps around the subject.

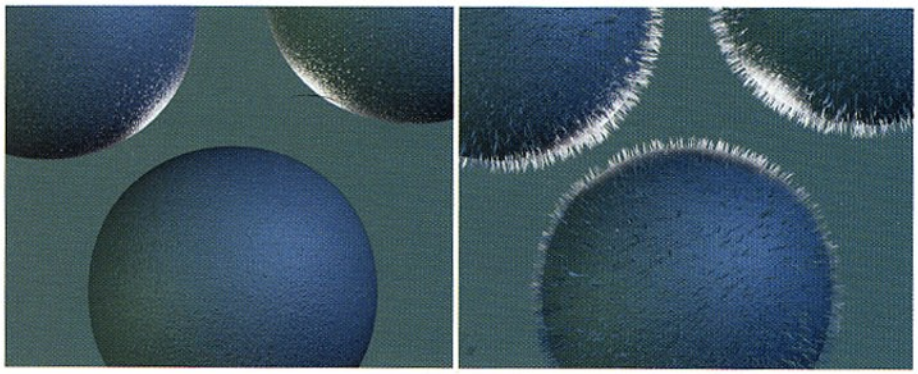
In some situations, the effect of backlight can be diminished or completely hidden in computer graphics, when light from the same angle would have been more effective in real cinematography. To compensate, you may need to make your backlight proportionately brighter or to adjust the subject's shading and the light's position. You need to be especially careful if you have a backlight positioned directly opposite the camera (behind the subject, for example) as in Figure 3.31.

In real life, a bright light directly behind a person is still visible as a glowing edge around the person's hair, skin, and clothing. This is because real skin, hair, and clothing tend to be surrounded by a layer of translucent fuzz. The fuzz layer is made of tiny translucent hairs, fibers, and other particles that can catch and diffuse light and seem to glow when lit brightly from behind. Even nonhuman subjects can be covered with dust, liquid, or other thin layers that respond better to backlight than a conventionally shaded surface in 3D graphics.

When the backlight is directly behind an object in your 3D scene, it often has no visible effect on the way that object renders. On the left side of Figure 3.32, for example, the lower ball does not appear to receive any illumination from the bright light that is directly behind it. On the right side of Figure 3.32, a fuzz layer is roughly simulated with translucent fur from a fur shader. Adding fur to all your objects is slow,



3.31 A light positioned directly behind a subject can be more effective in live action than in computer graphics.



3.32 Most 3D objects will hide a light placed directly behind them (left), unless a translucent layer is added (right).

difficult, and often impractical; and most 3D scenes that need backlight will not have a realistic fuzz layer on each object.

To avoid blocking the backlight completely, it is safer to move the backlight higher up and toward the camera, as seen in Figure 3.33, so that it is not completely behind your subject.

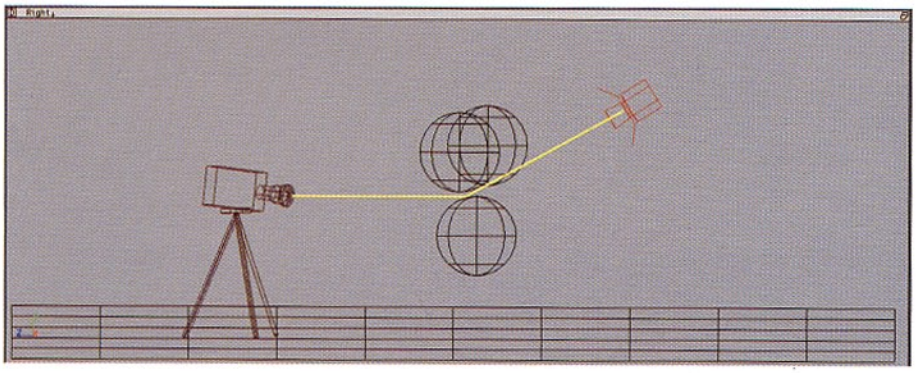
NOTE

See Chapter 9, "Materials and Rendering Algorithms," for more information about highlights, specularity, and shading models.

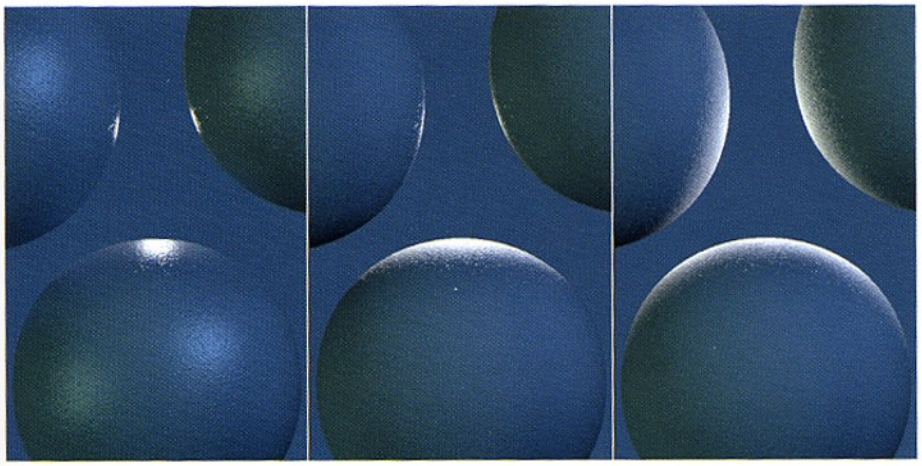
If you want backlight to trace around the edge of a curved surface, not just create one hotspot at a point on the edge, it helps to create your backlight with diffuse, not specular, illumination. Reducing the specular brightness of the subject's material can help extend the defining edge, as shown in Figure 3.34. Blinn shading can sometimes work better than Phong at diffusing a backlit highlight, if you have a choice of shading models.

If a single backlight does not give you a long enough rim of light, you sometimes need to use several backlights in a row behind your subject. To produce the image on the right side of Figure 3.34, three backlights were used, as shown in Figure 3.35.

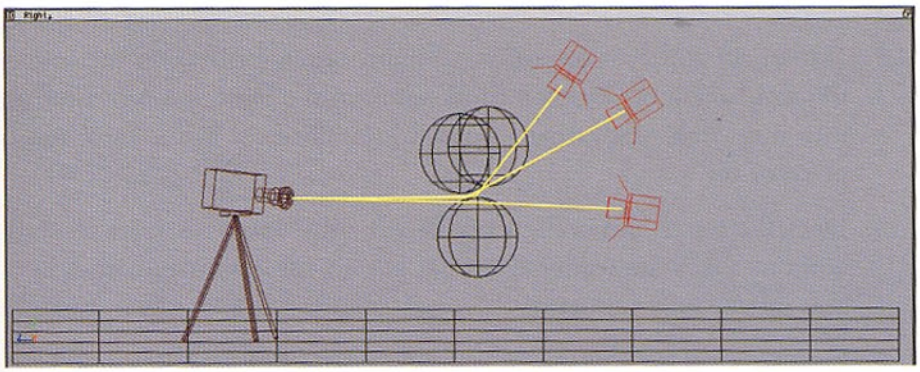
Using a row of lights as a backlight is a pragmatic variation on three-point lighting. Adjustments such as this are sometimes necessary to solve problems and achieve the results you want.



3.33 Moving a backlight higher and toward the camera can make a bolder defining rim.



3.34 Tight specular highlights (left) don't make as effective a defining rim as diffuse shading (center) and using multiple backlights (right).



3.35 Multiple backlights extend the illuminated rim.

There is no fixed recipe for three-point lighting, only a series of options and decisions. None of the specifications or suggestions in this chapter should limit or discourage your own experiments and departures from the norm. Hopefully, the concepts behind three-point lighting should raise your awareness of some of the issues and concerns in lighting a subject, so that you can better devise your own lighting schemes for your own scenes.

3.7 SUMMARY

This chapter introduced a number of important concepts that you will need to know as you read the rest of the book or do any other work with lighting:

- Three-point lighting is generally used to solve a common problem: how to fully represent a three-dimensional form with a two-dimensional image. Producing shading that solves this problem is sometimes called "modeling with light."

- In a well-lit scene, every light exists for a purpose. Three of the possible purposes for a light are to serve as a key light, fill light, or backlight.
- Like all rules in art, the conventions of three-point lighting are flexible guidelines, ready for you to exploit and manipulate.

3.8 EXERCISES

Watch a movie on video so that you can freeze it at a few specific scenes. For each paused scene, see whether you can answer these questions:

1. Where is the key light? Fill light? Is any backlight used?
2. Is there an apparent (or assumed) light source motivating the key, fill, and backlight? Do you think some of the light was "cheated" into the scene—light that wouldn't logically exist in the time and place of the story?
3. Does the scene have a high key-to-fill ratio? How does the level of contrast affect the scene? Does the key-to-fill ratio make sense in that scene's environment?
4. Find a shot with a character standing in front of a background or in front of another character. Is the lighting in the foreground different from the lighting in the background? Does the lighting help to separate the foreground from the background in any way?