Chapter One

Illuminating Light: How Light Works in Photography

After changes upon changes we are more or less the same.
Lyric from "the Boxer" by Simon & Garfunkel

Once upon a time, photographers concentrated on which lens offered the most lines of resolution and the best contrast. They debated which film had the tightest grain with the highest speed. There were discussions of the developer that produced the greatest number of zones and the paper/chemistry combination that reproduced the most tones. Which format was superior? Was it 8 x 10, 5 x 7, or 4 x 5? When portability was the issue, did you pack the medium format or the 35mm? What camera system had the best optics? Which one was the most durable? Whose shutter was more accurate? And what about films?

Fujichrome, Kodachrome, Ektachrome, Vericolor, Fujicolor, Agfa, GAF, Ilford, Fuji, Kodak, 3M, Konica . . . (the list goes on and on) were all hot topics of conversation on Saturday mornings at the local professional camera store.

A very short time ago (or a long time ago in computer years) the digital imaging thunderstorm burst through; lightning flashed and rained down upon photographers. Some of us got wet. Some saw the light, and the topics shifted. Tips and techniques for using Adobe Photoshop were shared. New acronyms and terminology popped into the language of photography—RAM, ROM, CCD, LCD, RGB, HSB, LAB, DPI, PPI, PSD, JPG, CMOS, Macs, PCs, megapixels, megabytes, gigabytes, dye-sub printers, ink sets, inkjet printers, substrates . . . (as you can imagine or have already experienced, this list, too, goes on and on)—and became subjects for heated debates in coffee houses and Internet chat rooms around the world. Everyone was now so concerned with recording and reproducing light that lighting itself had been left in the dark.

Light, Writing, Vision

The word photography means *light writing*. That makes *light* literally the first word in photography. It is also the first word in Photoshop. Doesn't it seem slightly odd that most photographers concentrate on the *writing* part and pay little, if any, attention at all to the light? It's important for a book on photography (Photoshop and postproduction aside) to pay the appropriate homage to photography's first word and in the process shed some light on *light*.

Okay, I know you are thinking, "I already know all of this stuff." That's fine. Let me ask you one question and if you get it right, you can skip this chapter.

"Do you feel lucky?"

Oops. Wrong movie.

The question is, "As you get closer to a light, does it become harsher or softer?"

Desperately Seeking Soft Light

Figure 1.1 is a close-up of Laura without any makeup (1.1). The "Sunny" image is lit with harsh light as indicated by the very sharp-edged cast by her nose. Skin texture is revealed. Note the two beauty marks above her left eyebrow, the pores, and the very fine hairs on her forehead. Also notice the specular highlights (mirror images of the light source) on the left side, tip, and bridge of her nose caused by naturally occurring skin oils. Compare these light quality clues with the "Overcast" photograph. The only difference is the light source has been diffused (spread out into two dimensions) so that it is huge when compared to the size of the subject. The soft light quality minimizes the skin textures and oils by spreading out the shadow edge. Soft light makes textures almost disappear. Add makeup, and the retouching becomes a whole lot easier.

1.1

No, I'm not going to tell you now. If you're curious, read on. . . .

Defined by the *Merriam-Webster Unabridged Dictionary,* light is *something that makes vision possible.* How cool is that? Light makes vision *and photography* possible. Let's explore those possibilities. This chapter begins by looking at some of the properties of light and how to use them. Then it moves into how to measure light in a way that can be used to accurately render a subject digitally. (Deep-Dark-Never-Before-Revealed-Secret—this stuff works great with film, too, even though film is now officially an alternative process.)

Note

Soft light makes skin creamy, eyes liquid, and fabrics flowing. Women *love* soft light.

Understanding Quality Versus Quantity

First, let's talk quality. One of the most difficult concepts to understand about lighting is the difference between quantities and qualities of light. Much of this confusion comes from thinking that bright light is harsh light. Bright light isn't necessarily harsh. And yet it can be. One of the most important principles of how light behaves is that *the larger the light source is in relation to the subject, the softer the quality of light.* That means that the closer the subject gets to the light source, the softer the quality of the light on the subject. (In other words, the source of light becomes larger in relation to the size of the subject as the subject gets *closer* to the light.)

At first this concept seems to make absolutely no sense at all. The light gets harsher, not softer, we say to ourselves. ("Look at how bright the light is!") Ah-hah!

What really happens is that as the subject moves closer to the light source, the light becomes both *brighter* and softer simultaneously. The actual problem is that almost every description of the quality of light is confused with the quantity instead. The harsher/softer description is really a quantity/quality issue. As the subject moves closer to the light source, the light in fact becomes brighter (quantity), while becoming softer (quality). The key to the harsher/softer question is the edge of the shadow cast by the subject.

Here is an everyday way to think of this concept. On a bright, clear, and cloudless sunny day the light source is the sun. The sun is 864,000 miles in diameter, give or take a mile or two. It is also 8.32 light minutes away from the camera and our subject. The sun is a high-intensity light source about the size of a thumbnail held arm's length from the eye. In relationship to the subject, the sun is a very small light source indeed. It's bright, too. For example, in this figure our model, Laura, is lit by the sun (1.2). A shadow is cast on the wall behind her. Is it harsh or soft? Well of course we know it's harsh. Bright sunlight is harsh light. That is a true statement. We've heard this all of our photographic lives. So how do we know it's true? The answer lies in the distinct, hard edge that demarks the dark shadow from the rest of the wall. The sharp edge of this transition is the visual clue that the light is harsh. This demarcation is called the *shadow edge transition*. A very short transition from highlight to shadow denotes harsh light.

1.2

The cause of confusion is the word *bright*. The more accurate statement is *"On a clear day sunlight is harsh light."* Bright is a quantity term. Harsh is a quality term. During an eclipse the sunlight becomes very dim. Yet the shadows don't change. The contrast does. You find out more on contrast later in this chapter.

Continuing the example, look at Laura after clouds roll in front of the sun, making the sky overcast (1.3). Two things happen: The light source becomes larger in relationship to the subject, and the clouds diffuse (spread over a larger area) the light, so the quality of light becomes much softer. The quantity of light is reduced two ways: by the density of the cloud cover and by the spreading of light over a larger area dimensionally (the whole sky). Check it out. The shadow edge transition of the cast shadow on the wall widens over a much greater distance indicating a softer quality of light. Shadows cast on a very overcast day can be nonexistent because the light source is so incredibly large when compared to the size of the subject.

Make Up!

Most women, even those who choose not to wear makeup on a daily basis, understand that it is a great help if not a necessity when being photographed. They welcome the makeup artist with open arms and often hugs. Men on the other hand, especially those who are not used to being photographed, might feel intimidated by the prospect of wearing it. It helps to assure them that unless they tell someone they have makeup on, no one will notice. They might hear comments of how good they look that day. And no one will ever say "(insert man's name here), I just love your makeup!"

I have found that the soft brushes used to apply a light amount of powder knock down the shine on male skin by dulling its surface efficiency (shininess caused by oily skin). There is a great added benefit. It also calms them down quite a bit. Most men have *never* had a makeup brush run over their face! After making the first series of exposures, bring your male clients to the makeup counter and powder them down. They really have no clue about how good a makeup brush feels. (If you are a male and reading this, put this book down right now and have someone—women usually have these things—run one of these brushes over your face; close your eyes first. You'll know immediately what I'm referring to. And ladies, if you haven't powdered your guy, what are you waiting for? You don't even have to add powder. Just brush lightly over his face. You know the drill!) Now you know why this is great for those uptight "real-men-don't-wear-makeup-types" before shooting, er . . . photographing them.

1.3

Note

Harsh light is ideal for revealing textures because of the sharp shadow edge transition that defines it visually. It is good for revealing weaves of fabric, strands of hair, and the makeup of a surface. Skin is a surface, too. Seeing texture in a woman's skin is not a good thing. (Texture in skin means wrinkles, lines, and pores.) Women *really* don't love harsh light.

The sun is the *origin of light* in each example. On clear days it is both the origin and the source of light. On overcast days the cloud cover becomes the source of light. The sun remains the *origin* of light. A sharp shadow edge transition defines the light quality as *harsh*. A wide shadow edge transition defines the light quality as *soft*.

Shedding Some Light on Light

Another concept that confuses what we think light is doing and what it actually is doing is *contrast*. Contrast is the difference between a highlight and a shadow measured in f/stops. Contrast is concerned with the quantities of light and its relative brightness and not its quality. High-contrast situations are often considered to have harsh light even when the shadow edge transitions are wide, indicating soft light. In order to lower the contrast of a scene, light is added to the shadows. Lowering the contrast does not change the quality (harshness/softness) of light, only the relative brightness within the image.

Note

Harsh light that is low in contrast is a compromise that reveals textures in fabrics without revealing too many flaws in skin, especially when a makeup artist is involved in enhancing the skin's natural beauty.

Compare these two images of Laura (1.4). The left image is sunlit with no fill. The right image is the same exposure with a reflector positioned to bounce some of the sunlight back into the right side of the photograph. The added light brightens the shadow (and the highlights) *lowering* the contrast of the shadow in comparison to her skin. Look at the shadow edge. It is the same in both photographs. It's still a short transition. The quality of light is still harsh; the only difference is lower contrast. More detail is visible in the shadow. Compare the backgrounds. The one on the right that has light reflecting into it has a lighter background. The fill is not enough to change the exposure; it is enough to add a bit more life to the image. Controlling contrast is important especially when photographs are reproduced on web printing presses where shadows can load up with ink (dot gain) and lose detail.

Note

Today's incident meters are all handheld. They come in two varieties: ambient and flashmeters. My advice is always buy the flashmeter even though it costs more. At some point you will want to meter electronic flash.
Flashmeters read both the light in an environment (ambient or existing) and electronic flash. An investment in a high-quality incident meter that can also read flash will last for many years. I have switched to Sekonic flashmeters. I have a Minolta Flashmeter IV that is fifteen years old. That's a great service life and return on investment!

1.4

One more concept to go: Light either hits a subject or bounces off of it. It is considered to be either incident or reflective depending on where it is in relation to eye, capture device (sensor chip), or film. *Incident* light falls onto the subject. *Reflective* light bounces off of the subject and is on its way to the camera or the eye.

Incident Light Meters

Incident light meters measure the light before it gets to the subject. An incident meter measures light that has not been influenced by the qualities of a subject. These qualities can include color, shape, and tonal efficiency of the surface. Because incident meters see only the quantity of light hitting the subject, they report an exposure that represents the true tone of the subject in a photograph. This is called the *diffused value*. The diffused value is the proper exposure for a photograph. The diffused value is the aperture (f/stop) and shutter speed set on the camera.

Reflective Meters

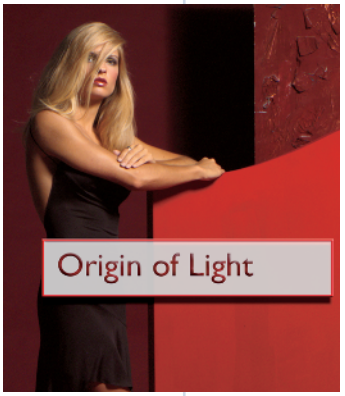
Reflective meters, like the ones built into cameras, measure the light after it has bounced off of the subject. Reflective meters measure the relative brightness in f/stops (contrast) between the highlights and the shadows. These readings determine contrast within a photograph. Contrast is subjective. It is one of the creative controls a photographer can use to establish mood or drama. Harsh and soft light qualities can be represented in situations of high, medium, or relatively low contrast.

Photoshop's Eyedropper and Color Sampler measuring tools display reflective data in the Info palette. You can use them to measure the relative brightness between areas in an image. The advantage of using these tools is that they are much more accurate than a light meter. They read the actual reflectivity of objects in the captured image. In the traditional capture world it would be like using a densitometer to read reflectivity from developed photographs as they are made in the field—impossible with film, simple with a digital camera, laptop, and, of course, Photoshop! Remember that in photography, accuracy rules!

Lighting: "Great Photoshop Starts with Great Photography"

Three things are of concern when lighting a subject for photography: the quality of the light, the exposure for the diffused value, and the relative brightness between the highlight and shadow areas. These considerations are important because their interplay defines the quality of the image artistically and how well the image will reproduce on the printed page, on a photographic or inkjet print, or on the Web. Paying attention to these considerations can greatly reduce time-intensive postproduction services.

Photographs can have many quantities and qualities of light at the same time. Quantities of light are relative to each other. They are measured in relationship to the chosen exposure for the image. For the following fashion shot, I discuss how I set up the lighting and which incident controls I chose and why. I then discuss setting the diffused value—the exposure—with both an incident meter and a GretagMacbeth ColorChecker chart. One thing that might surprise you is how little time is actually spent working with the camera.



1.5

Laura Phillips from Elite Model Management/Atlanta is the model for this shoot. I start the session with one light on Laura. The origin of light in this case is a 22-inch "beauty dish" placed at a 45-degree angle above and to the right of the camera. This figure shows the effect of a single light (1.5). An incident meter in the scene reads the light falling on the subject (1.6). The diffused value is f/16. Examine the shadow edge transitions—they are short. The light on Laura is harsh. The aperture setting on the camera's lens for this image is f/16. The shutter speed for all the photographs in this section is 1/125 of a second.

As with light meters, lighting controls are either reflective or incident. *Reflective controls* deal with light after it has hit the subject and is on its way to the imager. Filters for color correction or soft focus and vignetters are reflective controls. They are mostly used with film.

1.6

Incident controls are devices that come between the origin of light and the subject. They do their work on the light before it strikes the subject. Diffusion panels, scrims, flags, and cookies are examples of incident lighting controls. I use each one of these controls in the shoot.

I place a *diffusion panel* made of translucent sailcloth fabric stretched on a Chimera 42 x 72-inch frame in front of the origin of light and move it closer to Laura. The shadow edge becomes wider and the light quality softens (1.7). The panel spreads the light two-dimensionally over a 21-square-foot area making the source much, much larger in relation to the size of her face (about half of a square foot). The panel is now the *source* of light and the beauty dish on the flash head is the *origin* of light.

1.7

The diffusion panel also lowers the amount of light reaching Laura. Whenever I modify the origin of light, I take a new incident reading. The diffused value is now f/8.0.4, or almost one and a half stops darker than the harsh light exposure. I set the new exposure on the camera, allowing an additional stop and a half of light to reach the sensor. The light panel reduces the amount of light reaching Laura by one and a half f/stops. The exposure doesn't change even if I move the panel closer to or farther away from the model.

The background areas become brighter because the exposure is now one and a half stops more than before. Laura remains the same in both examples because I adjusted the exposure to compensate for the diffusion panel. The ColorChecker in both images shows the same reflected brightness. These Photoshop readings are considered reflected because they show the relative brightness of the black and white patches on the card.

Note

The aperture controls the light made with flash in photographs. A burst of light from an electronic flash travels at the speed of light. Shutters are not fast enough to control the amount of flash recorded at the camera.

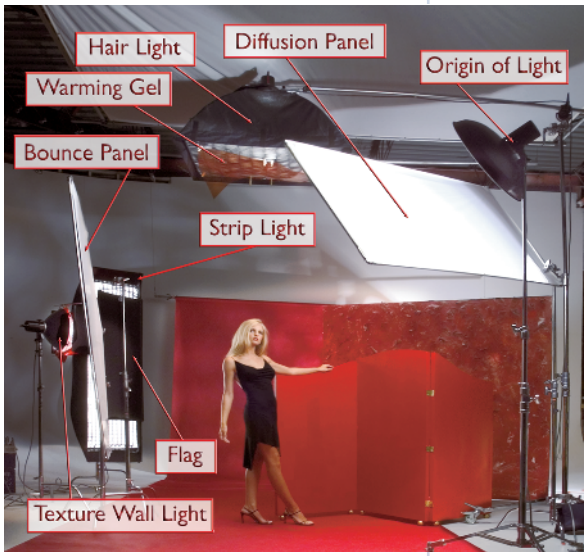
The exposure as read from the ColorChecker shows that Laura will record with detail in her skin and hair (R, G, B: 249) and in her black dress (R, G, B: 49) (1.8). The shadows under the wrinkles around her waist read in the low 20s.

The names and placement of the lights and incident controls used in this lesson are shown in this figure (1.9). I've labeled the effect of each one on the corresponding photograph illustrating the building of the lighting. The flag in front of the strip light blocks its light from hitting the lens and causing flare.

Decimals and Thirds

Modern incident and reflective light meters provide readings that are accurate to one-tenth of a stop. This causes confusion because some f/stops have decimal points in their names. By popular convention, a light meter reading of 5.6.3 means f/5.6 and three-tenths (roughly 1/3) of an f/stop, which is equivalent to f/6.3 (f/5.6 plus 1/3 of an f/stop) on your camera. The reading on the soft light image (Figure 1.8) reads f/8.4, telling the photographer that the correct exposure is f/8.0 and between a third and a half. Depending on personal preference, photographers round the tenth of a stop in this instance either up to a half f/9.5 (very slightly underexposed) or down to a third f/9.0 (very slightly overexposed). It is important to use tonal references such as a GretagMacbeth ColorChecker Chart or a ColorChecker Gray Scale card used in the examples in this chapter.

1.8



1.9

I use an incident control to lower the contrast by adding light to Laura's shadows. The bounce panel is a Chimera 42 x 72-inch frame covered with a white reflector panel, which I place to the side opposite the source of light (the diffusion panel). Light bounces into the shadows on her hair and arm (1.10). Now details in these areas open up becoming more visible. Notice that her back is beginning to separate from the background. Notice, too, that even though the contrast is lower, the shadow edge transition did not change. The brightness or darkness of shadow areas is subjective. You can raise contrast for a moody and dramatic look or lower it for a more open feeling.

1.10

Why Thirds?

Densitometry is the science of charting how much light causes an increase of the amount of silver retained on a negative after the film is developed. An f/stop of density measured from a black-and-white film negative has a logarithmic value of .3. A density change of .1 is the equivalent of one-third of an f/stop. In Photoshop, an opacity change of 13 points is, by general rule, a third of a stop (above 25) and is subject to what amounts to reciprocity in bright highlights (above 249) where more and more light is needed to drive the numbers up to 255.

1.11

Laura's blond hair has very little life and it merges with the background. I add a Chimera medium soft box fitted with a fabric grid and a warming gel directly overhead. This separates her hair, shoulders, and arms from the background. The grid minimizes spill on the background. The warming gel (Rosco 3407) puts a golden glow in her hair and warms the color on her arms (1.11).

After firing this light independently of the other lights and measuring it with a reflective meter pointing at her hair, I then adjust the power of the light until it is about half a stop brighter than the diffused value.

Laura's back and dress still get lost in the background. A large Chimera strip light with a grid adds a beautiful highlight that separates them nicely. A reflective reading of the highlight is again about a half stop brighter than the diffused value (1.12).

Contrast and Seeing

Controlling the quality of light and constraining it to a range that the camera can record and, even more important, to one a printer can reproduce is what lighting is all about. One of the biggest problems with recording images is that digital chips (CCD, CMOS) and film have limited contrast ranges they can capture. Our eyes are limited to about the same range except that we have brains. When we look at a high-contrast situation, our eyes "see" an image. What really happens is that first we view the bright areas, and the brain remembers the details in the highlights. Then the iris of the eye instantly opens wider to see into the dark areas while the brain remembers the bright ones and integrates them into a single picture we refer to as *sight* or *vision*. Capture media has no brain. It can record a limited contrast range. Contrast must be controlled to allow the subject to be photographed with recordable detail in the highlights and shadows.

The last goal of the lighting scheme is to bring up the illumination on the background elements. They consist of a texture wall on the right and red background paper that runs from above the set down to and then along the floor. I aim a light with a 16-inch reflector with a red Rosco #25 gel at the wall. Barndoors keep the light from spilling anywhere but the wall (1.13). The red background paper is still very dark so I place a bare bulb head behind the texture wall. It shines through a four-foot square panel with leaf-shaped holes cut in it. This incident control is called a *cucoloris* or *cookie*. It breaks up the light into the pattern on the background paper (1.14).

Lighting the background is very important especially when the fashions to be photographed are sheer and flowing. The background must have enough brightness to silhouette her shape through the fabric. If it doesn't,

1.12

1.13

1.14

1.15

the garment will appear to be opaque even though it's sheer (1.15).

After the scene is lit, the photography starts. Shoot until you are sure you have the image you want. Then experiment. Exploring your photographic creativity takes nothing but some time. This is the time to play, experiment, and explore. Put on music, turn on a fan, invite your model to participate and contribute to the session. The results will more often than not exceed your original ideas. When the session is working there is an energy that flows through everyone involved. When the photographer feels this energy it is a rush. The excitement shows in the final images.

In the next chapter I introduce digital photography's back story—bit depth, image quality, color correction by the numbers, and more.

Tip

When a diffusion panel is introduced to a lighting set, it affects the color of the light. Be sure to shoot a ColorChecker again so that you can neutralize the color shift from the panel as I did in these examples.

Lighting Terms and Definitions

Courtesy of Dean Collins

Ambience: Light existing in the surrounding or pervading environment.

Contrast: The difference in f/stops between the highlights and the shadows. Contrast that is too high produces a photograph that has loss of detail in the highlights and/or the shadows. Adding light to the shadows reduces contrast.

Diffused value (or highlight): Represents the true brightness or tone of an object. You use the diffused value to set the exposure for a photograph on the camera.

Diffusion: A method of making an origin of light larger by spreading light two-dimensionally (height and width).

Gobo: An incident lighting control that goes between the light source and the subject used to block light.

Incident control: Modifies the origins of light before light strikes a subject to be recorded. This includes the choice of light, tungsten or electronic flash, the number of lights and their output, as well as diffusion panels, gobos, and so on.

Incident metering: Determines the amount of light striking an object. The reading of an incident meter aimed at the predominant light source indicates proper exposure for the diffused value.

Origin of light: The point from which light energy begins (such as electronic flash, flood light, sun, and so on).

Reflective metering: Determines the amount of the light reflecting off of an object. This type of metering is used to establish the difference in contrast (brightness) between two objects or areas in a photograph (such as the subject and background).

Shadow edge transition: The area of transition between a diffused value (highlight) and a shadow. A transition that covers a small area results in a hard shadow edge. A harsh quality (from a small light source) of light is defined by a short shadow edge transition. One that covers a large area indicates a soft shadow edge. The quality of light from a large shadow edge transition is described as soft. This indicates a large light source.

Source of light: A two-dimensional surface that illuminates an object.