

Realistic Lighting - Summary and Essentials

Without light you see nothing. With light you can reveal the unknown, command attention and evoke a variety of emotions and sensations. Having a basic understanding of lighting can make the process of communicating through visual images a more rewarding experience and provide a foundation on which to build your own personal style and technique.

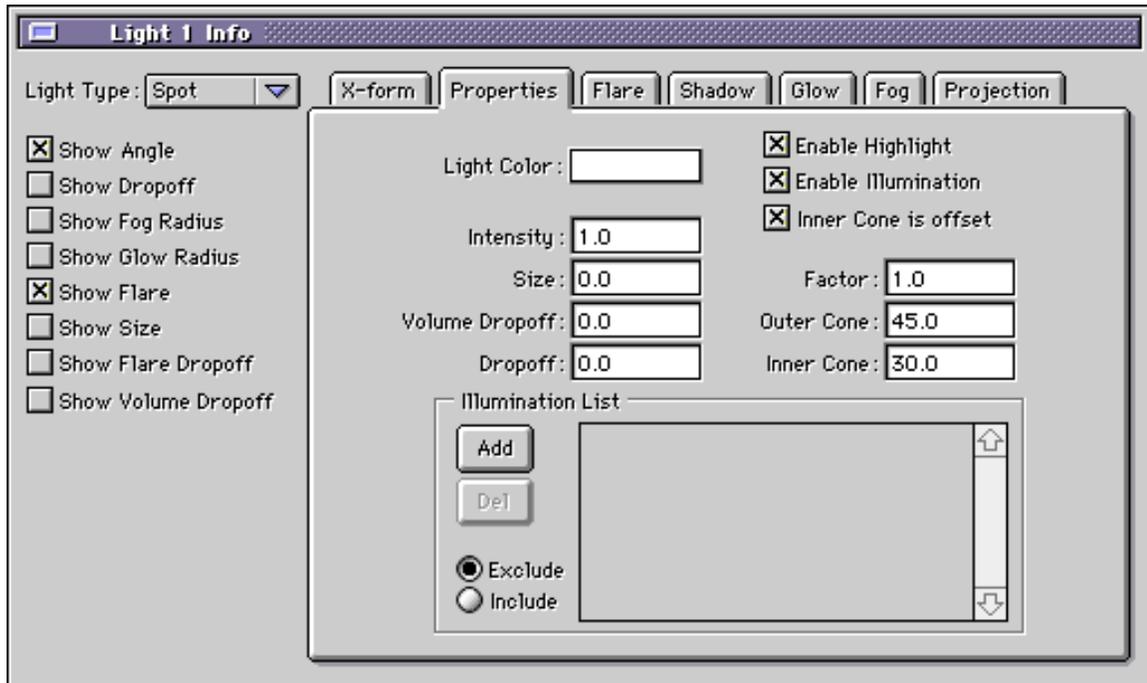
The methods and ideas presented here are not new - fine artists, photographers, performing artists and film makers draw on the same time honored principles. What follows is my version of this process presented with supporting images and Electric Image related commentary.

As with any given situation there is usually more than one way to get things done. It is recommended that these examples are seen as one way to achieve a particular effect. Through experimentation you will find the results that work best for you and your work.

The Controls

Let's first take a look at the Lighting Controls in EI. This is very similar in layout to the other controls in that it packs a large amount of information and control into a small space. You can easily access certain key features of the light through a series of rider tabs labeled: transformation, properties, flare, shadow, glow, fog and projection. With this tutorial we will only cover the properties and shadow sections.

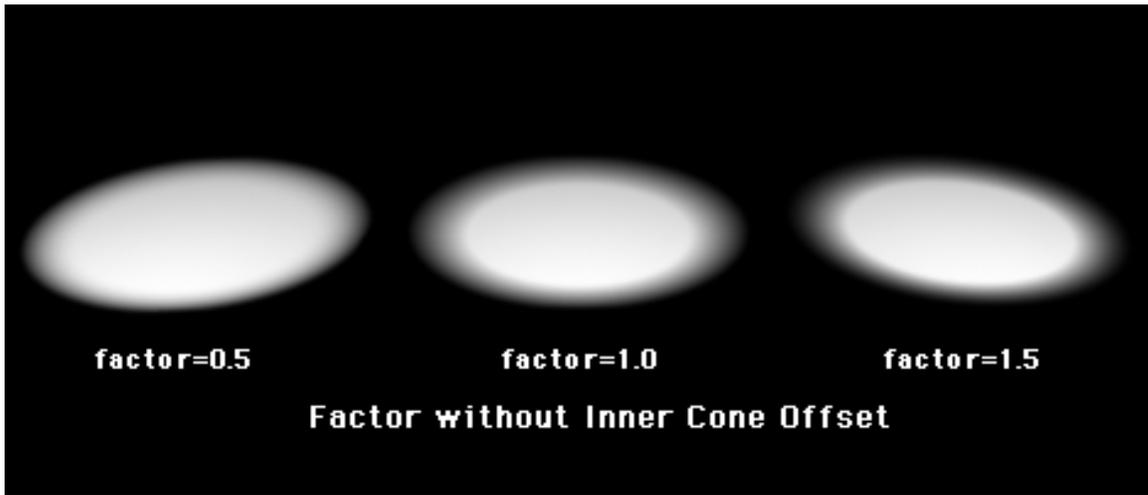
When first confronted by the Light Info window you should first take a moment to click through all the tabs to see what is here and how it is organized.



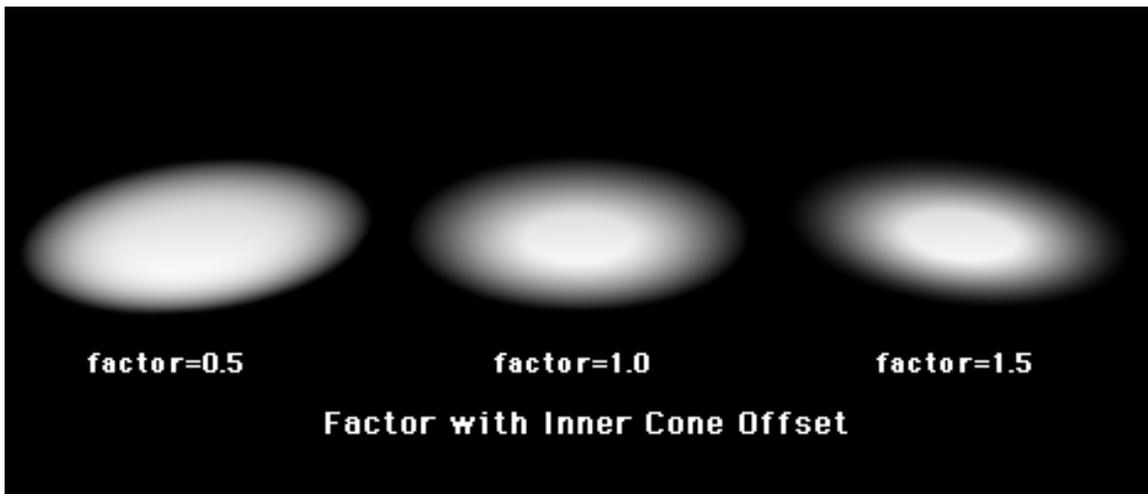
Looking at the properties tab one can see that there are controls for:

- Light Color (click the color chip to bring up the color picker)
- Values for Intensity (how bright the light is), Size (for lens flare effects only)
- Volume Dropoff (Adjusts falloff of glow lights)
- Dropoff (how far the light is cast)
- Check boxes for Enable Highlight (does the light produce a highlight)
- Enable Illumination (does it cast light - using combinations of lights that have disabled highlights or illumination properties allows you to control how the lighting looks)
- Inner Cone is offset (creates a softer transition from inner and outer cone angles of spotlights).

With the figure above there are three other values that are only available when the light type is set to "spot". They are Factor, Inner Cone and Outer Cone. Factor is a little complex to explain so here are two images that should make sense of what happens when you use different factor values.



Here are three spot lights with different factor settings - there is no inner cone offset in this case. You can see how the lower factor value produces a smoother transition and how there is a sharper demarcation between inner and outer cones at the higher factor values. The useful range of input is 0.5 to 1.5.

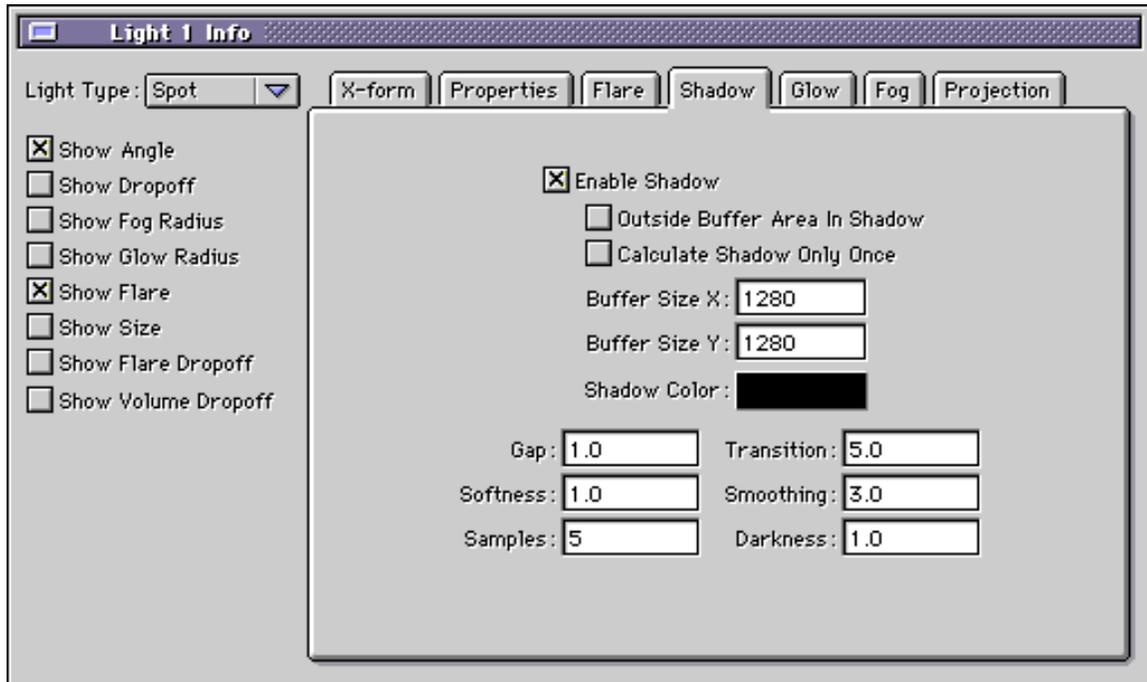


Here are three spot lights with different factor settings - this time the “Inner cone is offset” has been enabled for all three lights. You can see how enabling the offset decreases the size of the inner cone. You can see how the lower factor value produces a smoother transition and how there is a sharper demarcation between inner and outer cones at the higher factor values. Again the useful range of input is 0.5 to 1.5.

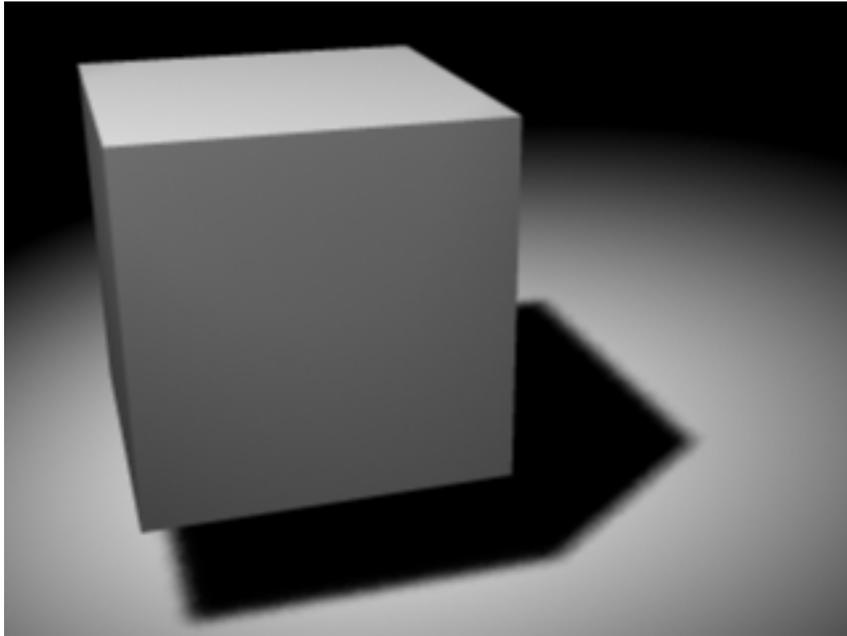
Inner Cone sets the angle of full illumination on a spot light and Outer Cone sets the angle for limit of illumination (angle beyond which the light does not illuminate).

Shadows

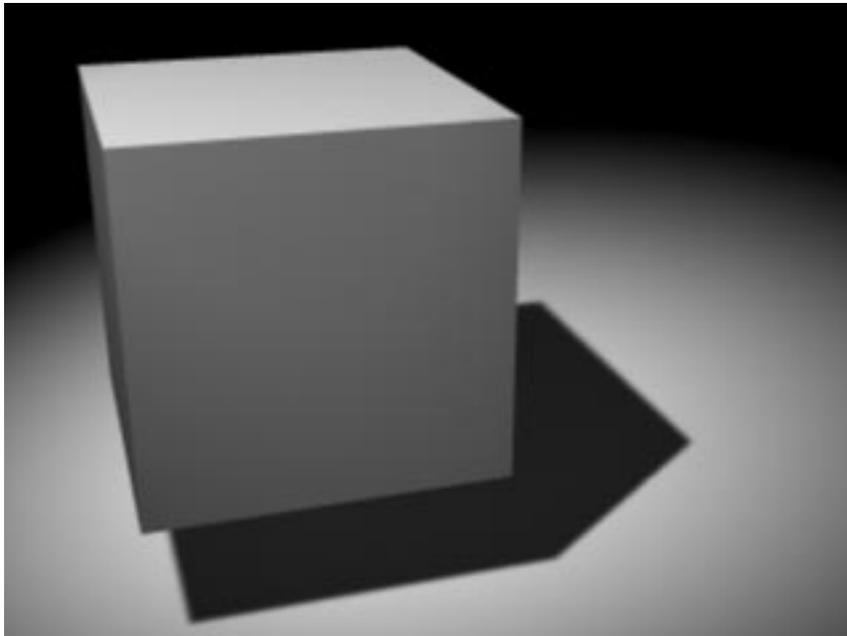
There are some finer points to understand about how EI makes shadows. The shadow controls offer a number of settings which can be used to create very realistic shadows in EI. A quick rundown of the specific settings reveals that you can:



- Enable or disable shadows for a particular light.
- Set the region outside the shadow buffer to be in shadow.
- Set the shadow to calculate once (useful in animations where the light and objects with shadows cast by that light does not move).
- Buffer Size values in pixels for both X and Y - this determines the amount of RAM required to generate a shadow and affects the quality of the shadow.
- Shadow Color chip - click the chip to change the color of the shadow (more on shy you'd do that later).
- Gap - how far apart geometry can be before a shadow is calculated (in EI units).
- Softness - applies noise to the shadow map effectively softening it.
- Samples - higher values sharpen and improve shadow quality.
- Transition applies a fade in from where the shadow starts. Essentially this a gradient controlling the shadow's opacity from its origin to the surface where it is being cast..
- Smoothing applies a blur to the shadow map creating the appearance of a diffuse light source.
- Darkness - controls the overall opacity of the shadow (value of 1.0 = 100% opacity).



Here is a sample of EI's default shadow settings - there is some granularity to the edge of the shadow - note that the default is also 100% opaque.



Here is a sample of EI's shadow where the samples have been increased to a value of 10 - thus improving the quality of the shadow's edge. In this example the opacity has been set to 80%.

Basic Lighting

It is important to first take a look at EI's default lighting settings and to see what simple, yet effective steps can be taken to easily enhance and lend realism to your project's lighting. Each of the following figures will address a new step in the procedure and will explain why.

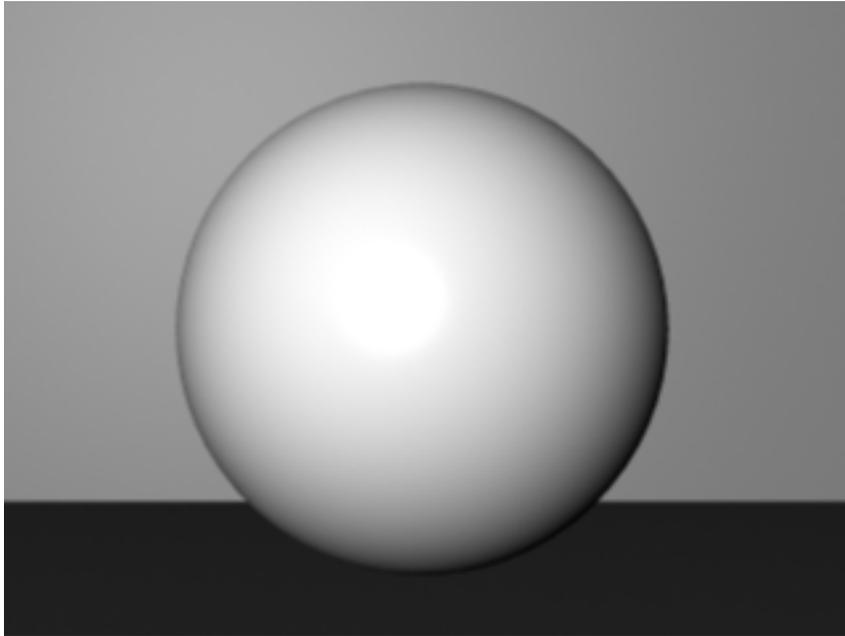


figure 1

Figure 1 shows a simple scene in Electric Image. In this case the lighting setup is the default that is provided by EI when you first create a new project. It has one radial light (also known as a “point” light in other circles). the default settings are effective only in that they allow you to see the objects in your scene . There are no shadows and the image has a rather “flat” feel.

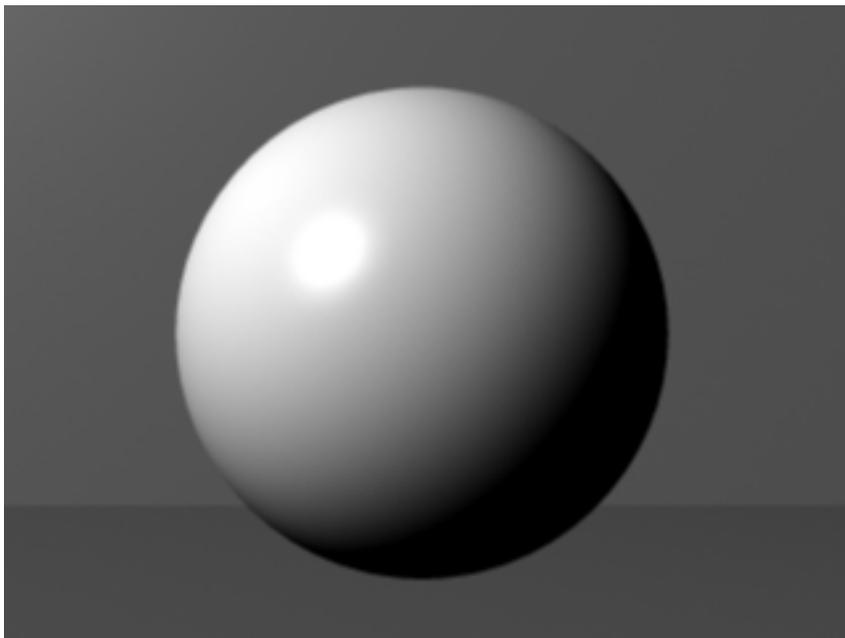


figure 2

Figure 2 is the same scene, but in this case the light has been moved to a “classic” location - above and left of the viewer's POV (point of view). The actual coordinates of the light are (xyz -100, 100, -100) This is a good place to put the light if you are looking to

emphasize the volume or shape of an object. Because there are no shadows to help “ground” it there is very little mass to the object and it feels as if it is floating in space.

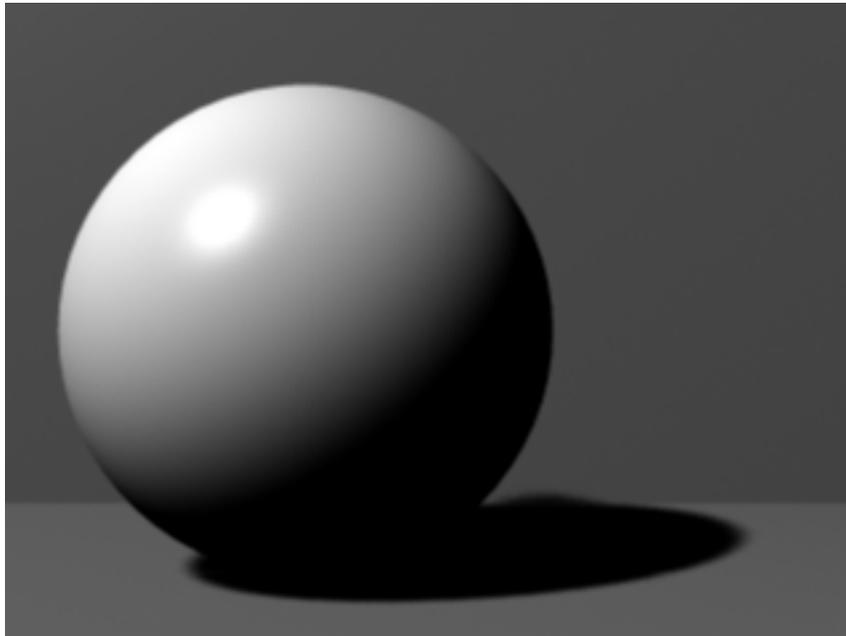


figure 3

Figure 3 has the same elements as the scene above. In this case the POV has been shifted to the right in order to accommodate the shadow which is now being cast by the object. The shadow helps to ground the object, but because it is the default shadow setting at 100% opacity (value of 1.0 in EI) the object loses some of its volume and definition in the shadowed area.

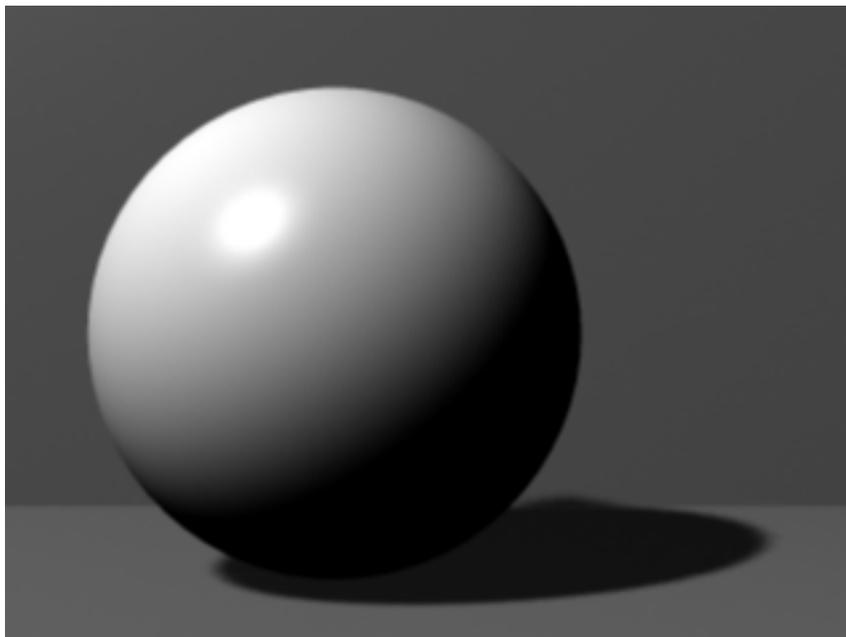


figure 4

Figure 4 is very similar to figure 3. The difference here is that the shadow's opacity has been reduced to 80% (value of 0.8 in EI). This maintains the object's position on the ground but improves its sense of shape and volume by allowing you to see the whole of the object.

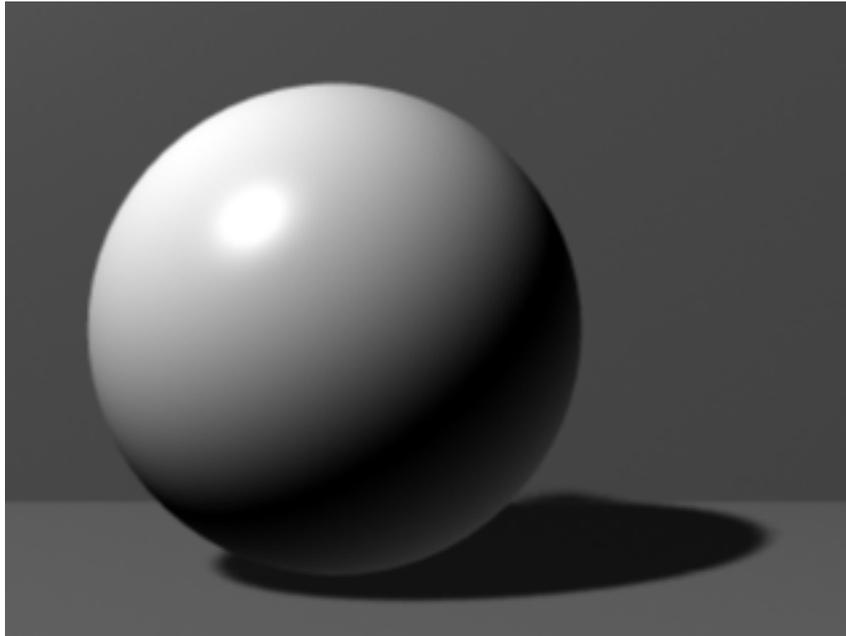


figure 5

Figure 5 completes this demonstration by adding a second light that is directly opposite to the first. Its coordinates are at (xyz 100, -100, 100). This second light gives the illusion of light being reflected from the floor back onto the object. By disabling the highlight for the second light and lowering its intensity to 30% (value of 0.3 in EI) it has the soft quality that one might experience with light bouncing off of grey construction paper. If one wanted to simulate a more reflective material you could increase the intensity of the second light.

Lighting and Mood

The next important thing to realize about lighting is that it not only lends weight, mass and realism to an image, but it can quickly establish a mood, emotion or environmental quality. The following series of images illustrate this point by using the same element - the trusty EI teapot - with the same POV and four very different lighting treatments.



figure 6

Figure 6 starts this exercise with our favorite teapot pleasantly lit in the same manner as the sphere in figure 5 above. By changing the POV the spout is in an area of intense light and shadow. An area of high contrast. The use of contrast is very effective in directing the viewers attention to a particular region. This works well with both digital artwork and more traditional methods. For example you can see this technique used in the famous illustrations by N.C. Wyeth (jacket covers for *Treasure Island*, *Kidnapped*, etc...)



figure 7

Figure 7 uses the exact same POV as figure 6, but with very different lighting. the mood established is more mysterious and nocturnal. Is it a teapot by the side of the road? Or is it in a darkened room and the door has just been opened? In any case there are two lights in this scene. The main light is shining on the teapot from the left rear of the scene - raking across the teapot casting an elongated shadow on the ground plane. Placed directly opposite it is a dim highlight-disabled fill light which gives definition and volume to the teapot from our POV.



figure 8

In figure 8 we see the same POV as before. This time though we are throwing a strong spot light onto the teapot and casting an abrupt shadow onto the back wall and ground planes. One can almost hear someone saying “OK Mr. Teapot, where’s you hide the money?” As in figure 6 there are areas of strong contrast which direct the viewers attention to the pot and it spout. There are still only two lights in this scene - set opposite each other as in the previous projects.



figure 9

Figure 9 is the teapot of mystery. The POV is roughly the same as the previous shots. With a number of small spot lights picking out bits and pieces of the teapot it becomes more mysterious and its sense of scale and placement becomes altered. In fact if one were to add some small buildings to the scene and some tiny helicopters flying about it might be that this is in fact a **HUGE MONSTER** teapot on the rampage through downtown Tokyo.

Light Color and Environment

So by now it should be clear that you can do a lot with just a couple of lights in Electric Image. Where you place the lights can do a lot of work for you in telling your story. What needs to be addressed next is what role does color play with lighting. You might not realize it, but natural sun light is not white light. It's actually slightly yellow. Sure, sure - it's yellow light, so now what? Well, did you know that the shadow that a light casts is the complimentary color of the light itself? This means that if the sun's light is yellow then the shadows cast by objects on a sunny day are very slightly purple! So this means that for a given color of light, its shadow will always be that color's compliment. Here is a color wheel to show how this works.



figure 10

Figure 10 is the color wheel is made up of primary colors (red, blue, and yellow) and tertiary colors (orange, green, and purple). The compliment of any color on the color wheel is the color which is opposite it. So green compliments red, blue compliments orange, purple compliments yellow and so on. (All this to figure out how to have proper shadows, eh?) Well it's important - because once you know all this you can dial up a light color, set the shadow and the image will "feel" like it is from a particular environment! Examples of this would be the like the one from above where daylight is yellow-ish with slightly purple shadows.

Incandescent light is very yellow-orange so the shadows would be blue-purple. Fluorescent light is very cool bluish so its shadows would be warmish orange. Summer daylight has a warmer "feel" than the cold cool winter light. You've got your afternoon light, sunset light, light beer, and sodium light. All these different qualities of light achieve this by having a particular color.

So back to the mighty teapot to show what these colored lights can do...



figure 11

Figure 11 shows the tea pot at high noon. The strong main light has a hint of yellow added to it (about 5%) and the shadow has a distinct purple shade to it. The back light is also slightly purple.



figure 12

Figure 12 shows the early morning light on the tea pot. The warm yellow light and the cool purple shadow help to reinforce the sense of time and environment. The lights are the same as many of the other examples - only the color of the lights and shadow have been changed.



figure 13

Here in figure 13 we've put the tea pot out on the curb under a sodium street light. Notice that the shadow color has been changed to be greenish (the compliment of the reddish light) and the under light that represents the reflected light is orange in color. As far as the preciseness of these values - well - I have been guessing and picking colors that "feel" right. Try some of your own and see how it works. Just remember that this is a place where less is more in most cases - a little color goes a long way!

It all comes together

It all comes together when you use the above mentioned techniques and combine them into a complex scene with interesting models and textures. The following image does just that.



This greenhouse image is a contrast of environments and qualities - the cold wintry look outside and the lush verdant interior. There are four lights in this project - one which casts a shadow from the exterior of the scene and one for each interior wall to mimic the of “natural” light. The lighting in this scene has a thin and cold quality to it. This is because the main light’s color is 100% white and the back lighting is cool blue or plain white in color. Another contrast is the play between the spiky pointed plants and the rounded landscape features. This is an image where making it “feel right” was more important than say - perfectly matching the perspective of the exterior scene to the EI scene (it is very close though) and boosting or diminishing the three back lights to create the right balance of light on the interior surfaces.

Overall this scene took about four hours to create - the palm trees were generated with Tree Pro from Onyx and the background image was generated in Bryce. The bromeliad plant was made by modeling only one leaf. This was texture mapped in EI and a number of copies were made. By changing the rotation and scale an entire plant was made - copy this eight times and rotate each slightly for that “natural” feel and you’ve got a garden! The other elements in the scene were quickly created in Form*Z and then imported into EI.

Take a look at the project file to see the specific settings that were used and feel free to make changes of your own. Make the light a little yellowed and use a slight purple and a light green for the fill to warm up the scene. Make a new summer scene to stick behind it. What would you do to make it seem as if it were on top of a high-rise in the afternoon? Under water in the tropics? Or the North Atlantic Ocean? Have fun and enjoy!