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## Section 4 – Color

### Using Color in 3D Art

#### Selecting Colors When Working on the Computer:

Remember that it was mentioned earlier that a better method for selecting color other than using simple common names is needed? Fortunately, on the computer there are several ways to select colors that represent the same hue on any computer.

The system color selectors on the PC and Mac may be presented differently but they function similarly. Almost all color palettes in software programs have a different look. Fortunately, regardless of the specific platform of a program, specifying colors is relatively easy and accurate. Almost any color you can imagine can be specified using either RGB (Red, Green, Blue) or HSV (Hue, Saturation, Value) settings in a program color selector. In Autodesk® 3ds Max® software, the Color Selector gives you both choices. Figure 01



Figure 01

2

Specifying any color using the numeric settings produces an identical color on another computer.

Using color in 3D programs is more complicated than using color in 2D programs. Not only do you have the color native to the objects you use in your scene but you have scene lighting to deal with. Light completely changes the appearance of objects already in a scene. The figure shows a 3D color wheel with the primary, secondary, and tertiary colors represented and illuminated by a white omni light. Figure 02

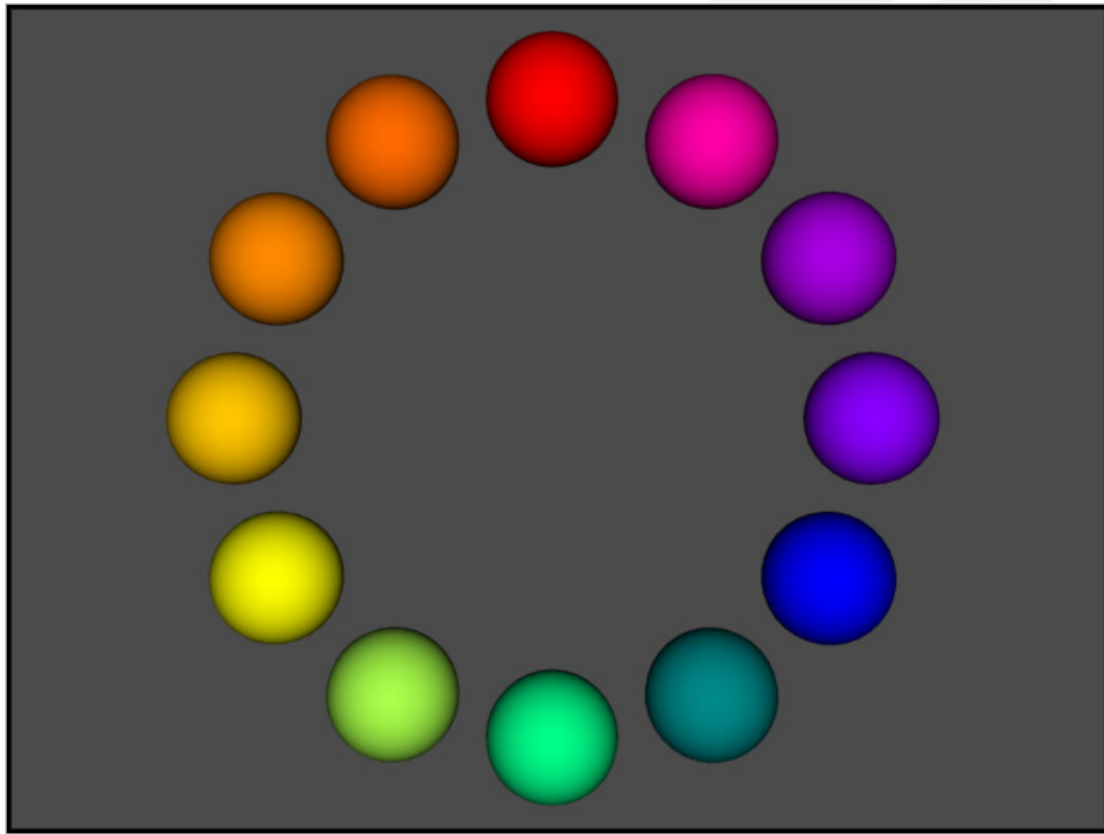


Figure 02

3

The following images show the same color wheel with the color of the light source changed to red, yellow, blue, violet, green, and orange. Notice the dramatic changes that altering the color of the light produces to the object colors. Figures 03-08

Figure 03 shows the color wheel illuminated by a red light.

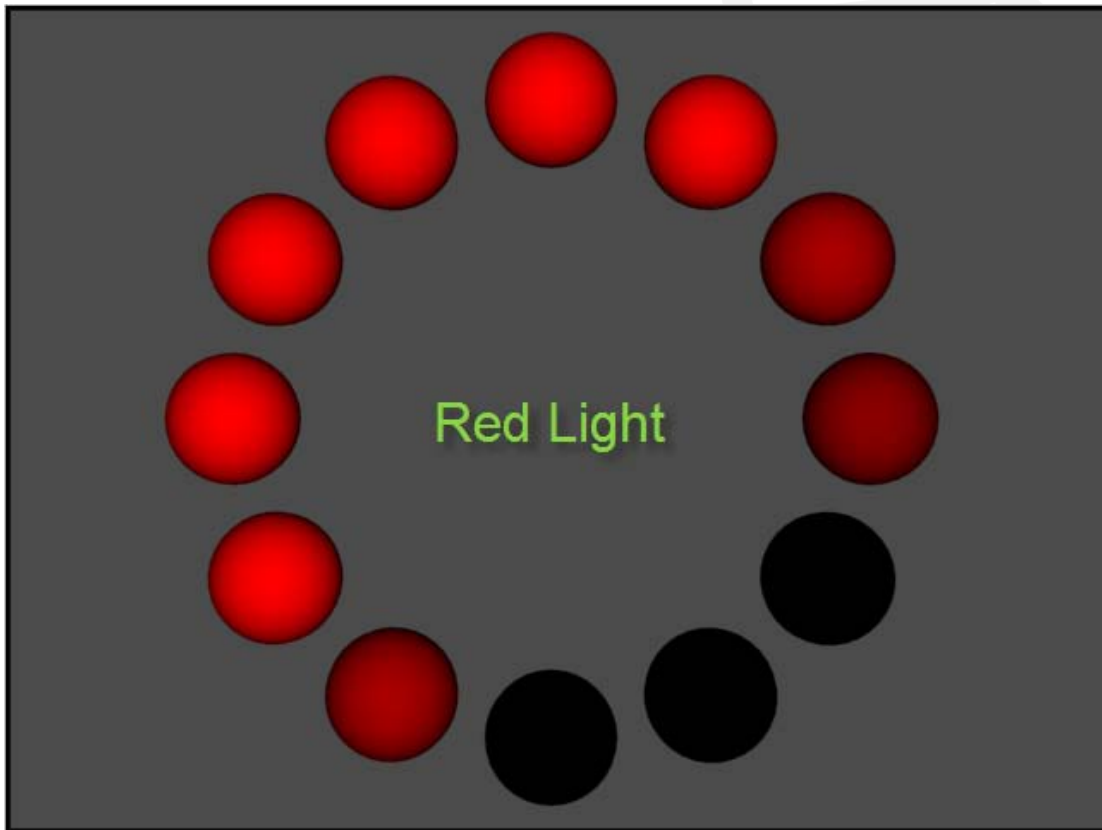


Figure 03

4

Figure 04 shows the color wheel illuminated by a yellow light.

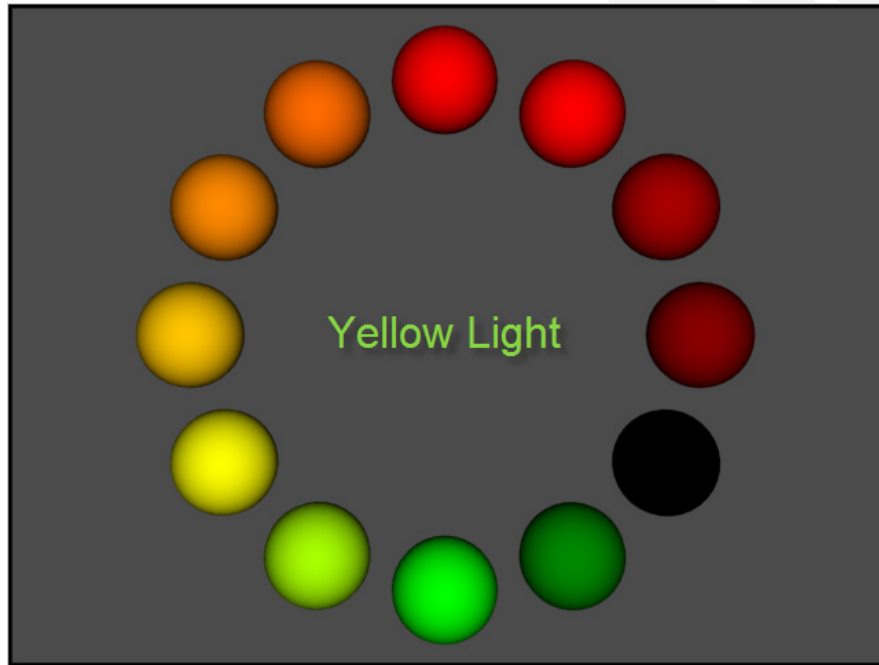


Figure 04

Figure 05 shows the color wheel illuminated by a blue light.

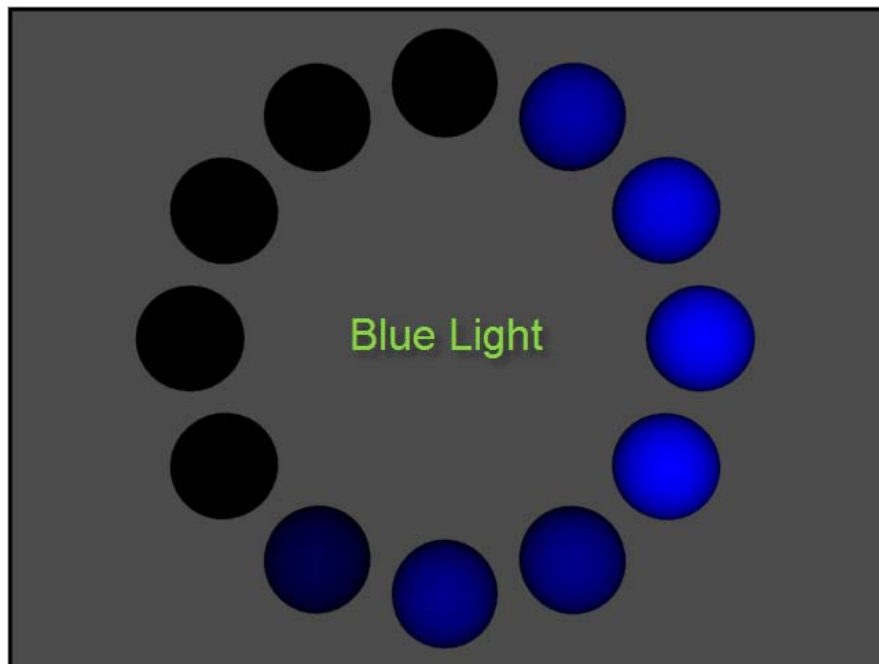


Figure 05

5

Figure 06 shows the color wheel illuminated by a violet light.

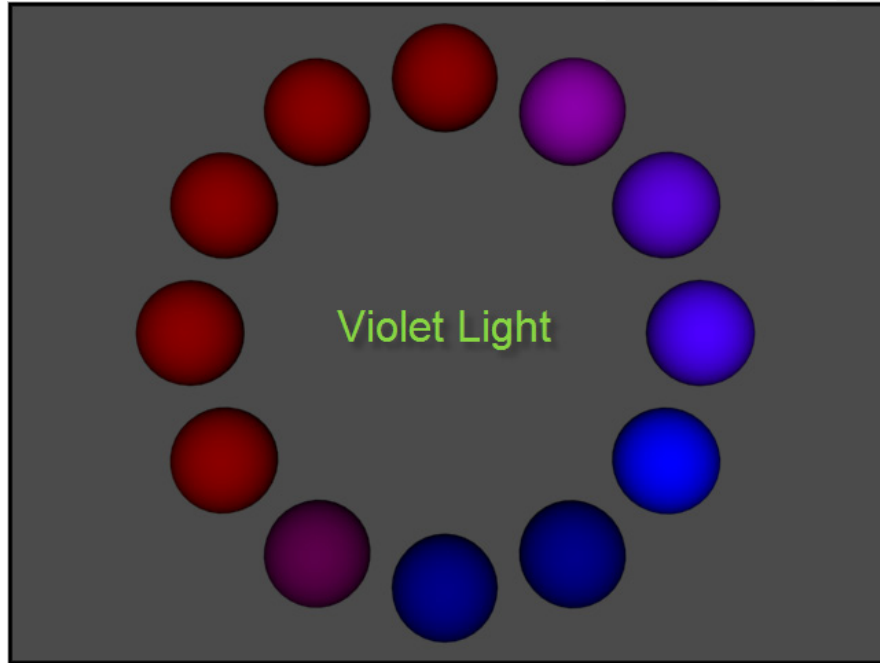


Figure 06

Figure 07 shows the color wheel illuminated by a green light.

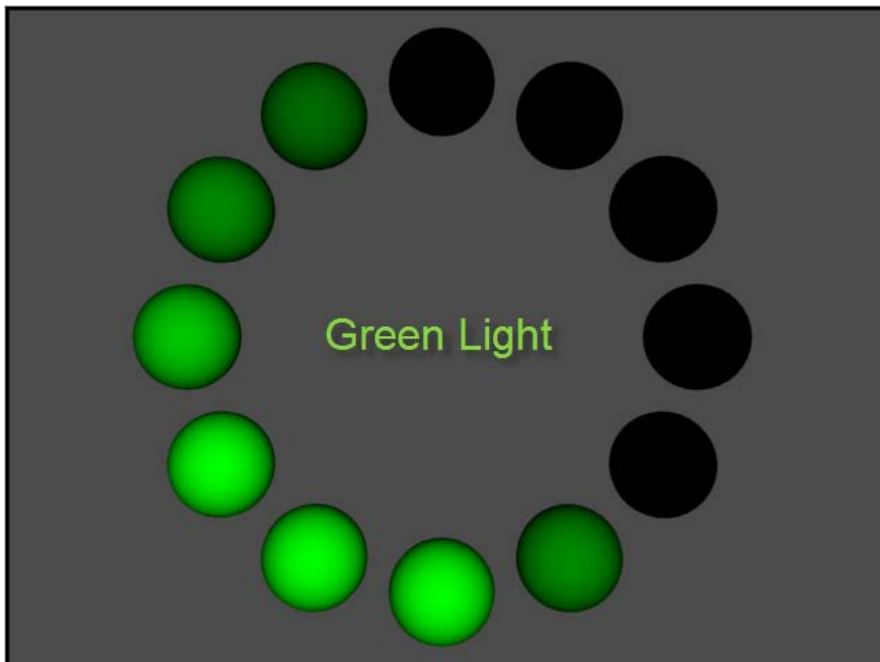


Figure 07

6

Figure o8 shows the color wheel illuminated by an orange light.

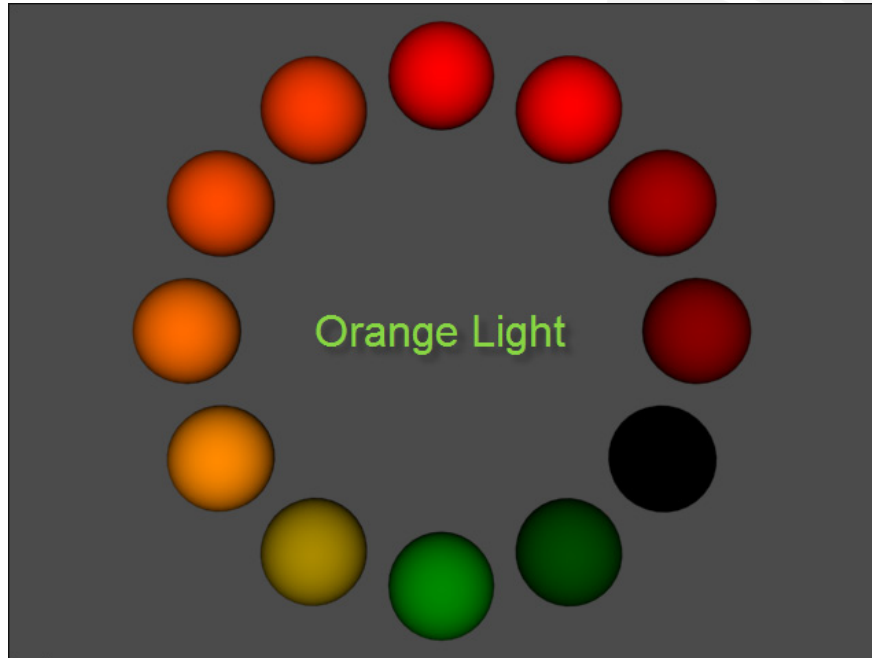


Figure o8

## Color Harmonies

If you are new to color and not sure what to do when starting a new scene, there are standard color harmonies that you may find as useful starting points. If you are brave, you can use all the colors on the color wheel, but you will find getting a harmonious image difficult. Listed in no particular order are the most common color harmonies.

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### Analogous:

This harmony consists of those colors located next to each other on a color wheel. Figure 09, 09a



Figure 09

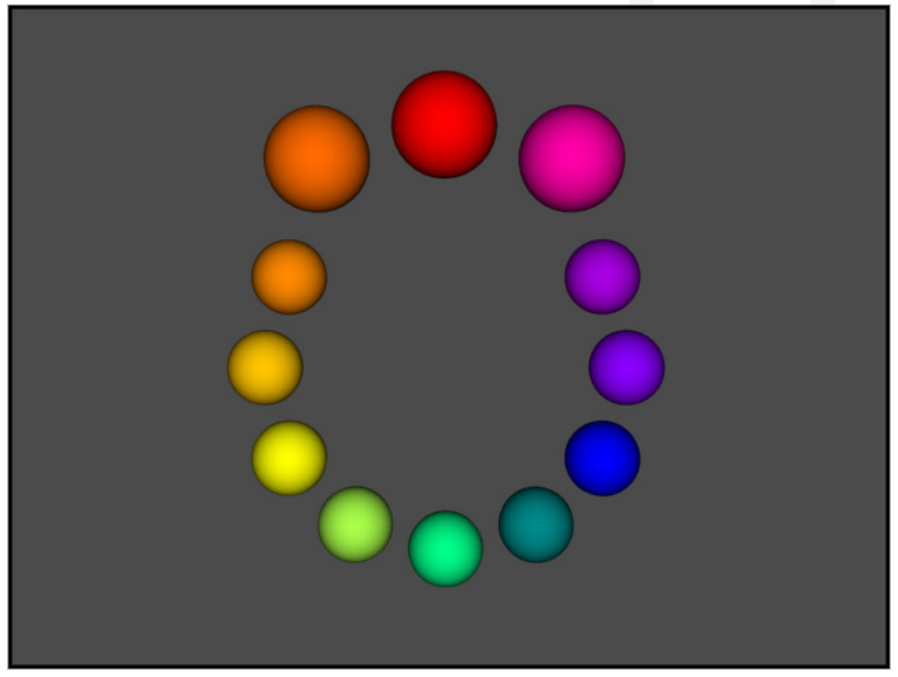


Figure 09a

#### Analogous with Complement:

The same as the above harmony with the addition of a complement color located on the opposite side of the color wheel. Figure 10 and 10a



Figure 10



Figure 10a

### Complementary:

This color harmony is based on colors that are opposite on the color wheel. Figure 11 and 11a

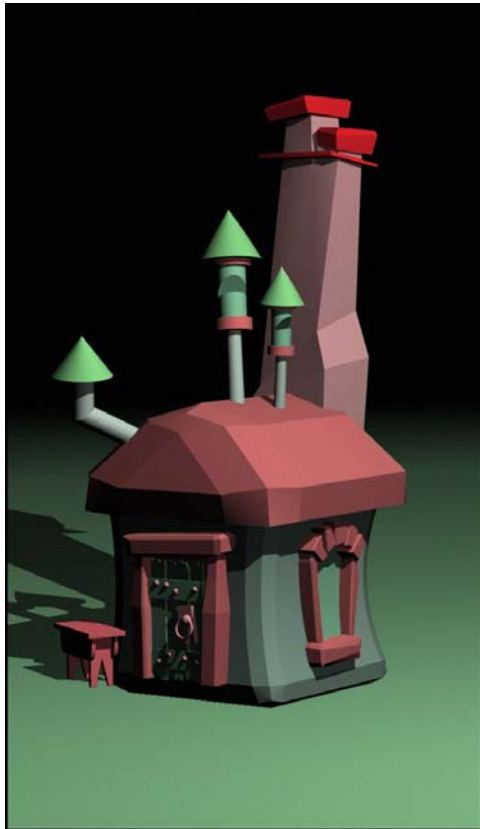


Figure 11

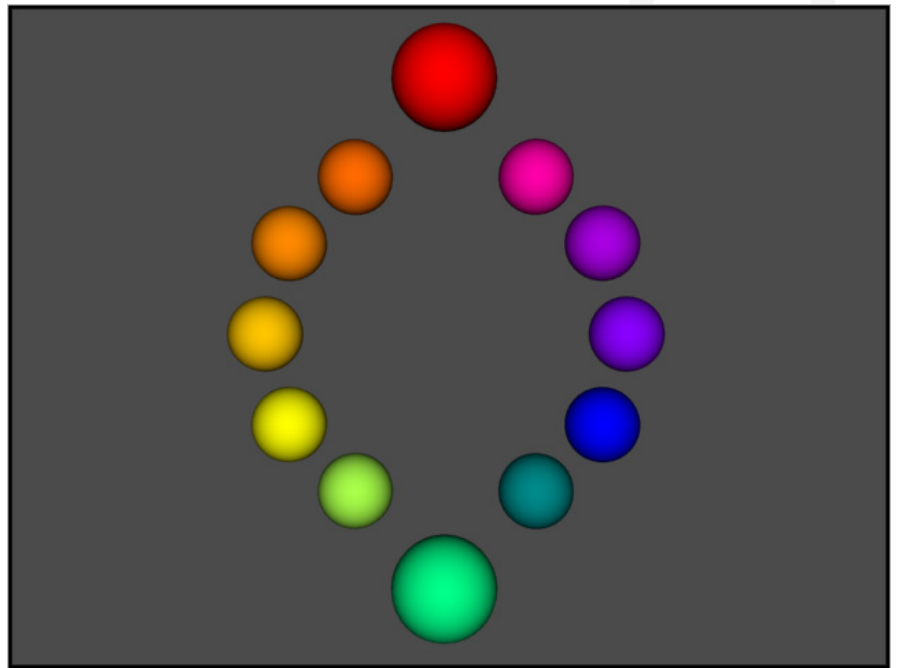


Figure 11a

**Split Complement:**

Similar to complementary harmony except that colors immediately to either side of the complement are used.  
Figure 12 and 12a

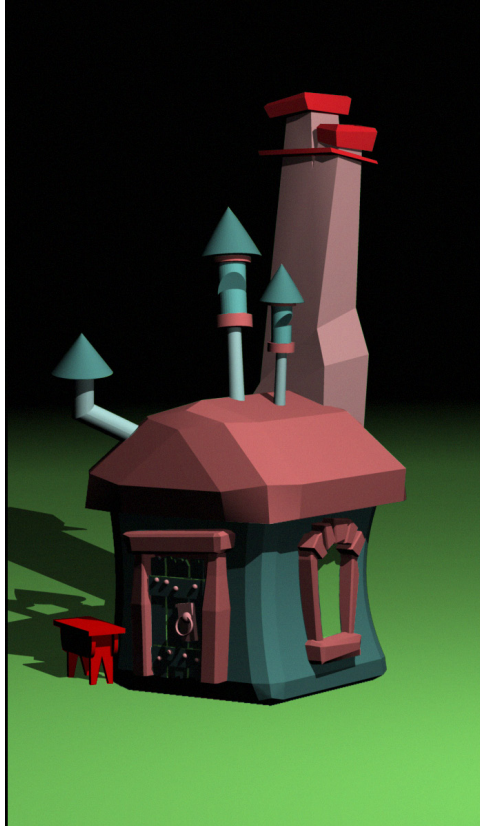


Figure 12

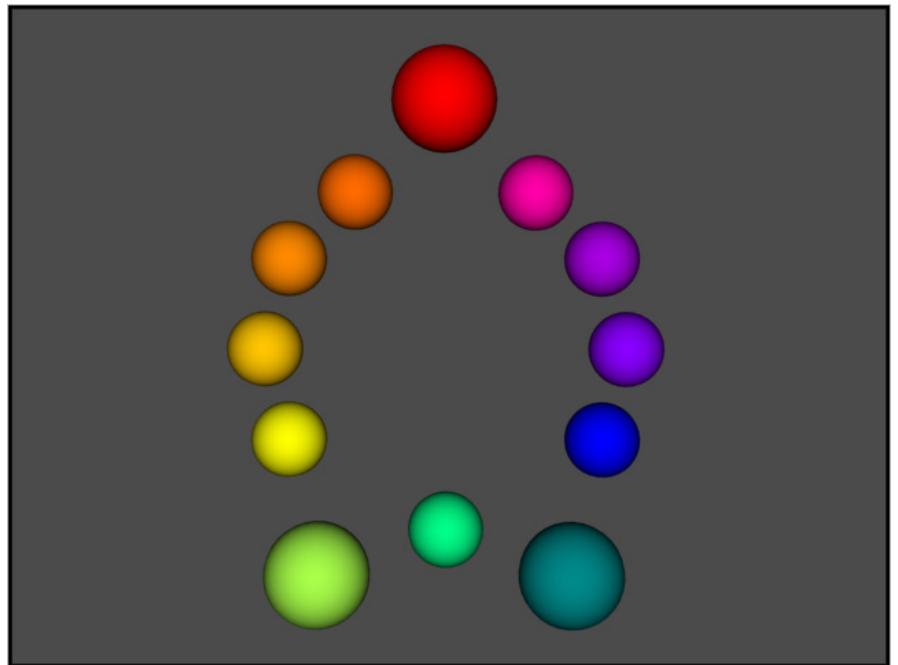


Figure 12a

### Triad Color Harmony:

One of the most difficult color harmonies to master. Colors are selected from three equidistant points on the color wheel. Figure 13 and 13a



Figure 13

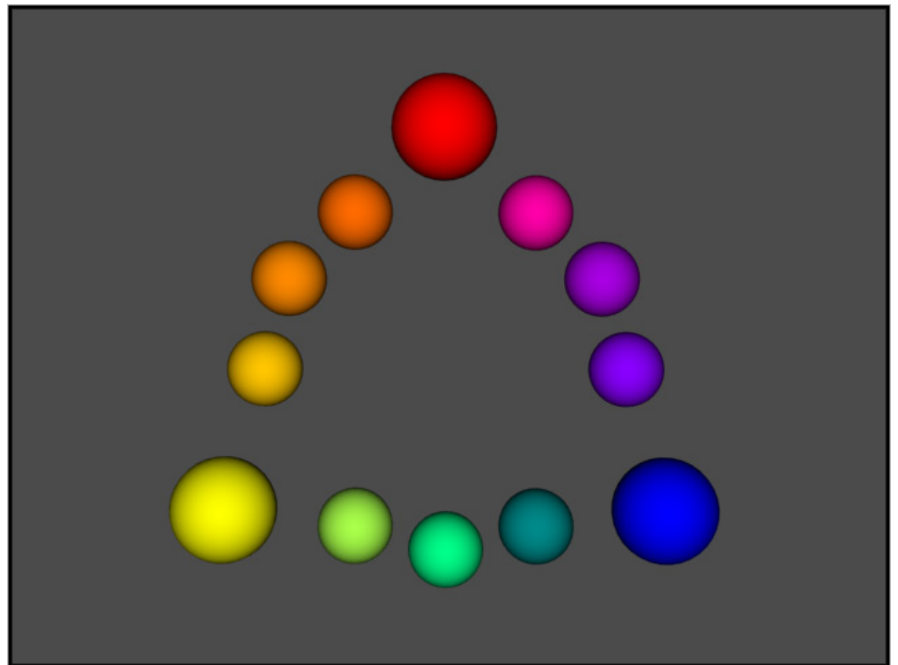


Figure 13a

### Square Color Harmony:

Colors are selected from four equidistant points around the color wheel. Figure 14 and 14a



Figure 14

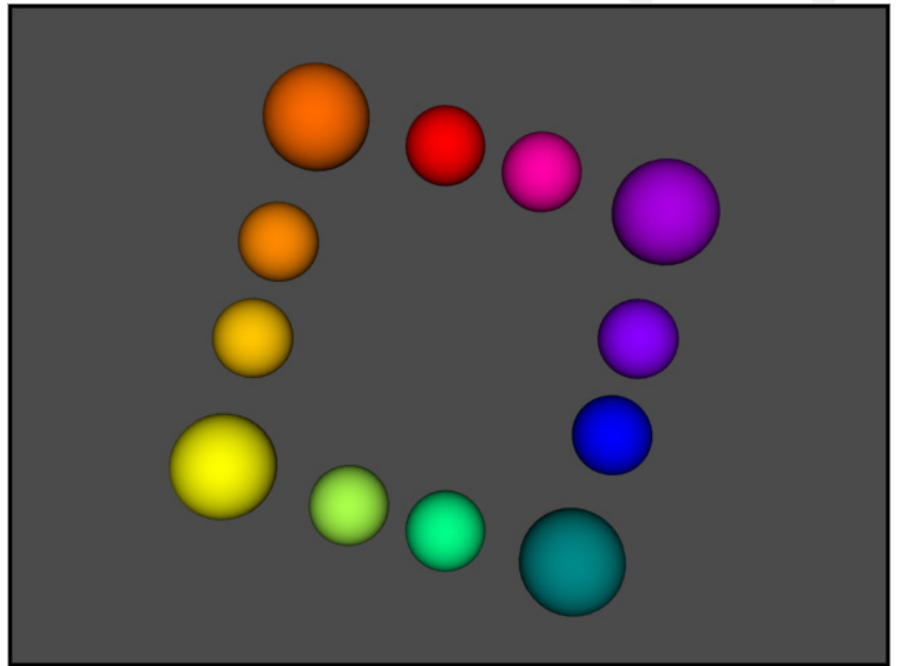


Figure 14a

### Rectangle Color Harmony:

Similar to the square harmony with two of the four colors shifted around one space in the same direction on the color wheel. Figure 15 and 15a



Figure 15

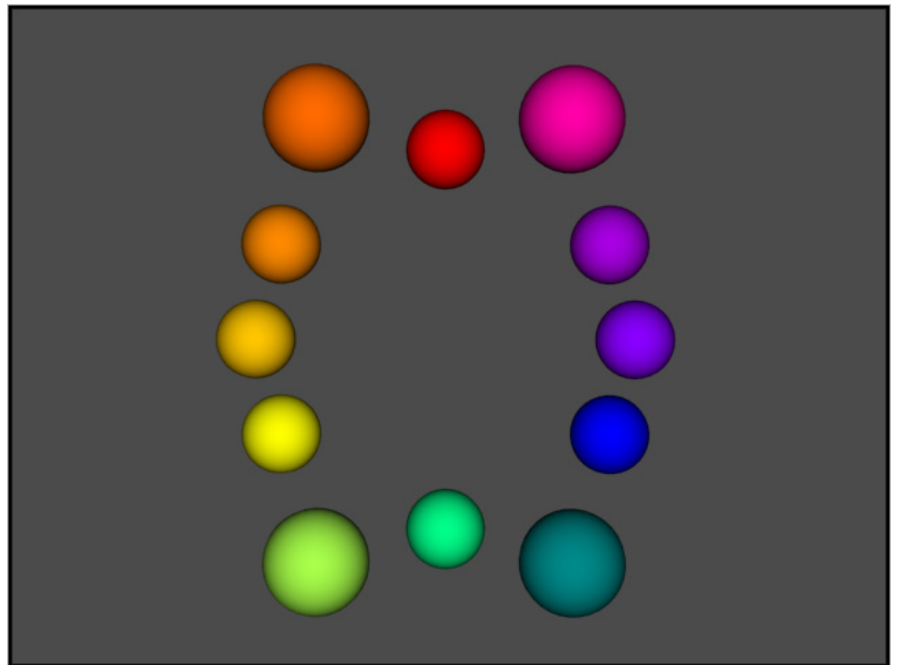


Figure 15a

### Hexad Color Harmony:

Colors are selected from six evenly-spaced points around the color wheel. Figure 16 and 16a



Figure 16

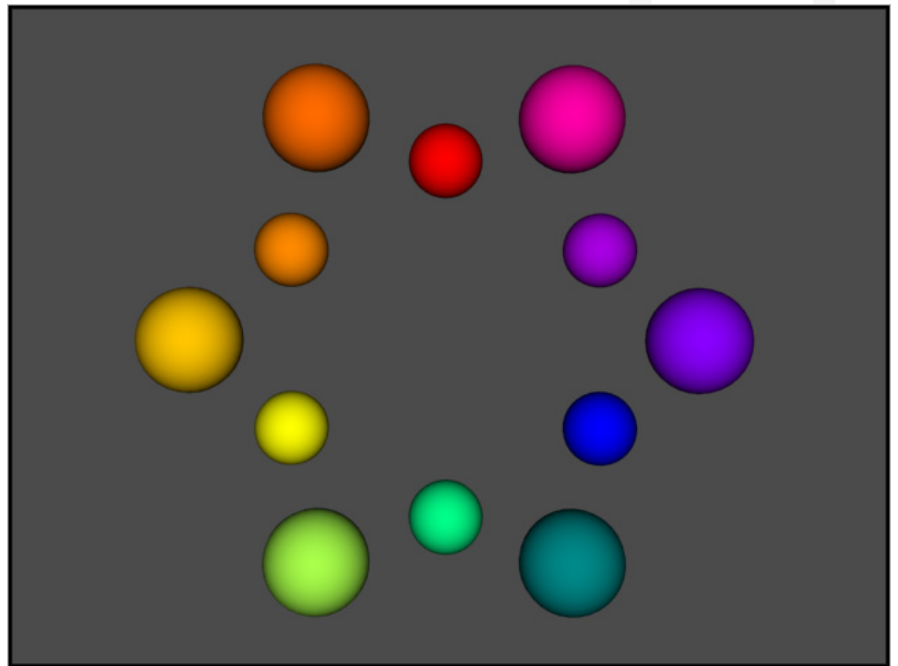


Figure 16a

### Monochromatic:

One color is selected and various values of that color are used to create the image. Figure 17 and 17a

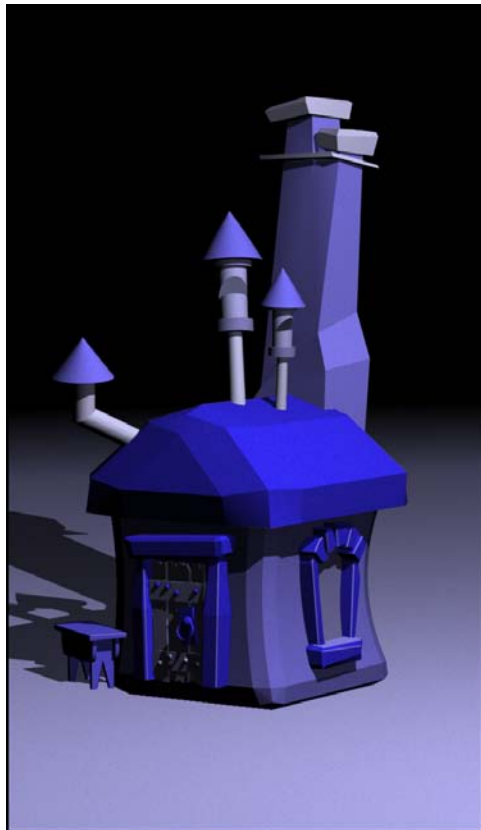


Figure 17

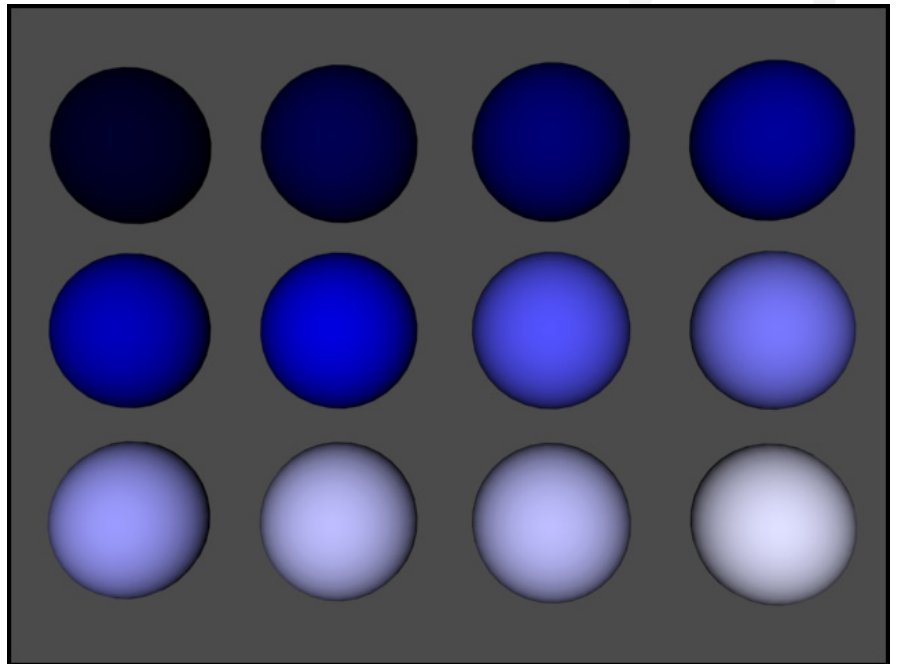


Figure 17a

Color is a subject that can be daunting for an artist and can take years to master. The preceding information about color just begins to scratch the surface of the possible influences and application that color can have on your work. The few color harmonies listed here are provided as a starting place for you, the artist, and will provide an infinite variety of color combinations to produce work that is not only pleasing to look at but will carry whatever emotional message you are trying to convey.

### Hints for Using Color

Here are a few tips that may help you manage your color. While not considered color theory, these tips built on good color harmony will help you manage color while you are learning all of the possibilities.

1. Do not use colors at full strength all over the image. Reserve colors of strongest intensity for the focal point and center of interest. Color at full strength all over an image will either bore or confuse the audience.
2. Decide who the audience is and choose colors accordingly. Be aware of gender, age, cultural, and education level preferences.
3. If a color scheme is predominately one color, or a family of colors, make sure that a complimentary color is used somewhere in the composition. A good spot for a complementary color is near the center of interest.
4. If there are large fields of flat color, break it up using “noise.” Large expanses of flat colors are visually boring.
5. Establish your color scheme early and stick to it. An established color scheme will keep you from nitpicking individual elements and fracturing the color harmony.
6. To make a color look brighter, place its complement next to it.
7. Warm colors advance, cool colors recede.
8. Pure blue should be avoided for text, thin lines, and small shapes.
9. Colors change in appearance as the ambient light level changes.
10. Colors change in appearance as the color of light changes.
11. It is difficult to focus on edges created by color changes alone.
12. Avoid red and green at the edge of large images.

### Additional Tips from Chevreul

Chevreul was a French chemist in the nineteenth century who made many color discoveries. At the most basic, he described how hue, value, and intensity of colors change depending on their neighboring colors.

1. Light colors appear more arresting against black or dark colors.
2. All colors appear more conspicuous against white or light colors.
3. When dark colors are set against light colors, they look darker than they would against colors of similar value.
4. When two colors are placed next to each other, each tints its neighbor with its own complement. For example, complementary colors viewed side-by-side seem more intense than if they are viewed separately.
5. Dark hues on a dark ground not complementary will seem weaker than if seen on a dark complementary ground.
6. Light hues on a light ground not complementary will seem weaker than if seen on a light complementary color.
7. When a bright color is used against a dull color, the contrast will be stronger when the latter is complementary.
8. A bright color against a dull color of the same hue will appear duller than if viewed against a dull complementary color.
9. Light colors on light grounds can be greatly strengthened if bound by narrow bands of black or dark complementary colors.
10. Dark colors on dark grounds can be greatly strengthened if bound by narrow bands of white or light complementary colors.

People must be able to see what you are doing and to be able to understand what you are saying. It is important that artists understand the basic elements and principles of design with value and color being the two most critical if they are going to clearly communicate their ideas.

To learn what color can do for you, as well as the challenges presented by color different color harmonies and themes, you add colors to the alien landscapes you created in the last section. While the landscapes should already make sense visually and show an understanding of good design, it is when color is added that they will really take on a visual life of their own.

To give your image more life, you add materials to each object in the scene. Materials are how you describe of what substance an object appears to be made. Currently, the renderings of your landscapes should be visually understandable, but because they are simple black and white images, you are unable to tell of what material an

object is made. Materials enable you to describe the composition of an object. In this exercise, you use the Material Editor to assign colors to every object in your scene. Color alone will not describe the visual properties of an object. There are many variables that go into creating a material that looks like its counterpart in the real world. Materials that are created to imitate natural materials may include settings for color, opacity, surface texture, how reflective or shiny an object appears, and many more. This exercise concentrates mainly on color and is a good foundation for later work with more complicated materials.

To add colors to your scenes you use the Material Editor in Autodesk 3ds Max.

To access the Material Editor, click the Material Editor button or press the M key. Figure 18

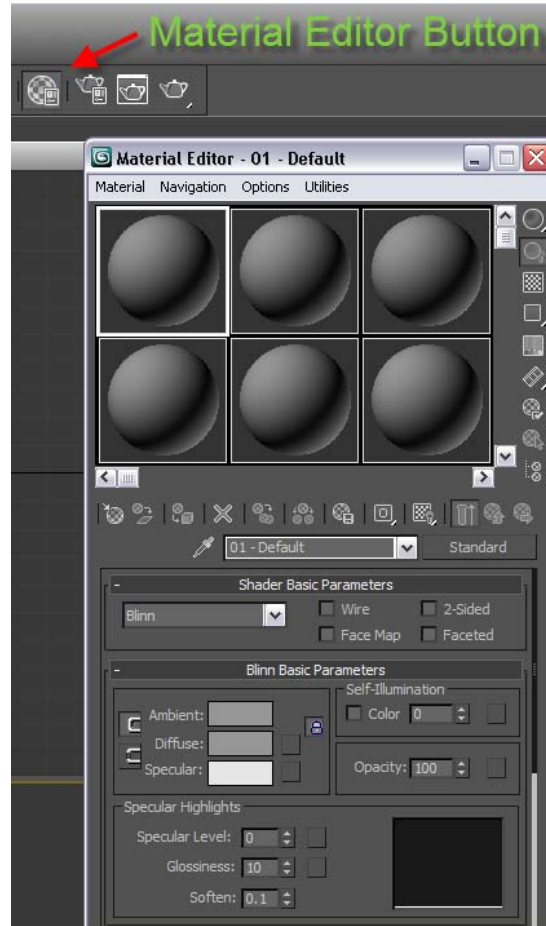


Figure 18

The Material Editor is displayed. Depending on your screen size, you may see more or less than is shown in the image.

There are six material preview windows currently showing six gray spheres along with a several buttons and settings. These gray spheres are where you preview the colors that you add to your scene.

The main areas of the Material Editor that you are concerned with for this exercise are:

- Shader Basic Parameters rollout, where you select the basic type of shader to use.
- Basic Parameters rollout.

First, you select the standard material. There are eight different options. The one that is default when the Material Editor is opened is the Blinn shader. This will be fine for what you need. Check boxes for the Blinn shader are:

- Wire will render the material as a wireframe.
- 2-Sided renders the back side of the object's surface.
- Face Map applies a texture on each face of an object.
- Faceted removes smoothing when the scene is rendered.

All of the check boxes should be clear (no check marks). You are concerned with the Diffuse box on the Blinn Basic Parameters rollout. This is where the basic color of a material is set. Figure 19

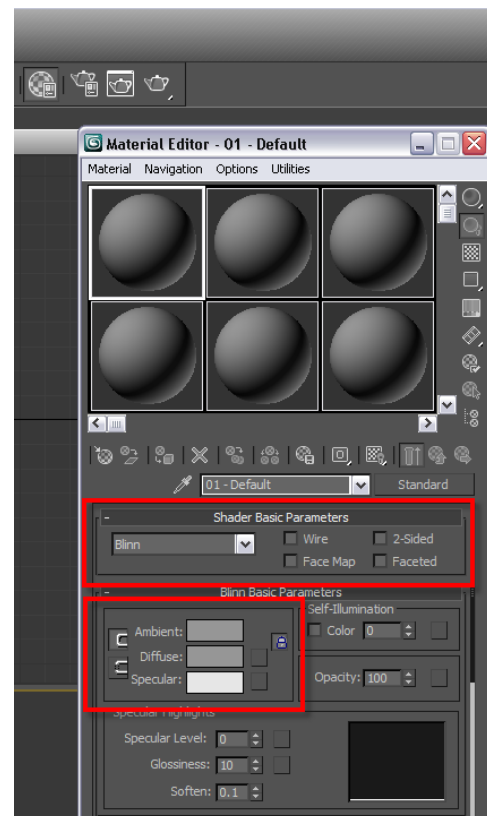


Figure 19

To begin adding color to the landscape:

- First, you decide on one of the color harmonies described. In the example, a split complementary color harmony is used with violet, yellow-orange, and yellow-green.
- Click the upper left sphere to make it the active material. It is highlighted by a white outline around the sphere's box.
- Click the Diffuse button in the Blinn Basic Parameters rollout. The Color Selector displays. Notice that it prompts Diffuse Color, so you know what you are applying a selected color.
- Select a color. The first sphere updates.
- Click OK. Figure 20

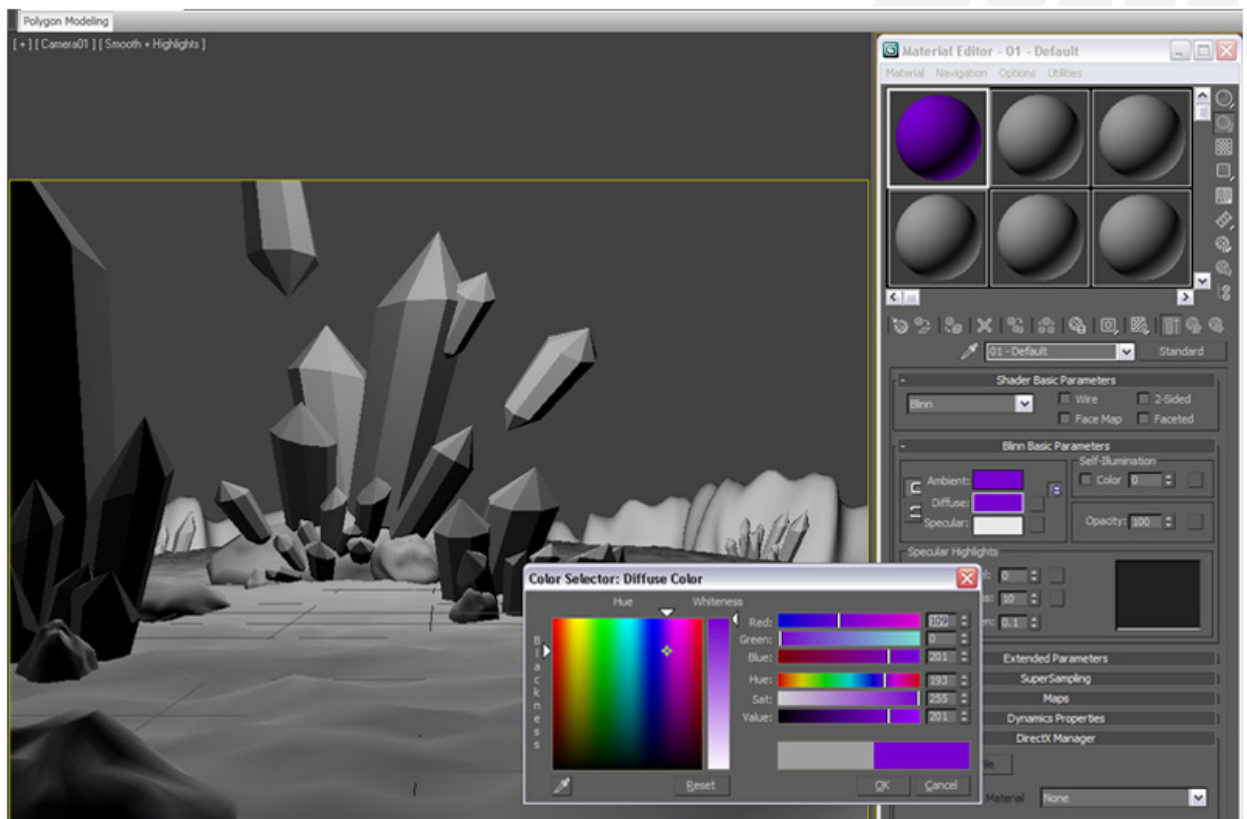


Figure 20

If you want the material to be shiny, raise the Specular level and Glossiness using the up/down arrows next to each or by entering a numeric value in each box. The Highlight Graph updates along with the Material preview.

- In the Material Editor, name your new material.
- You then add it to the Material Library so it can be reused by clicking the Put to Library button. Figure 21.

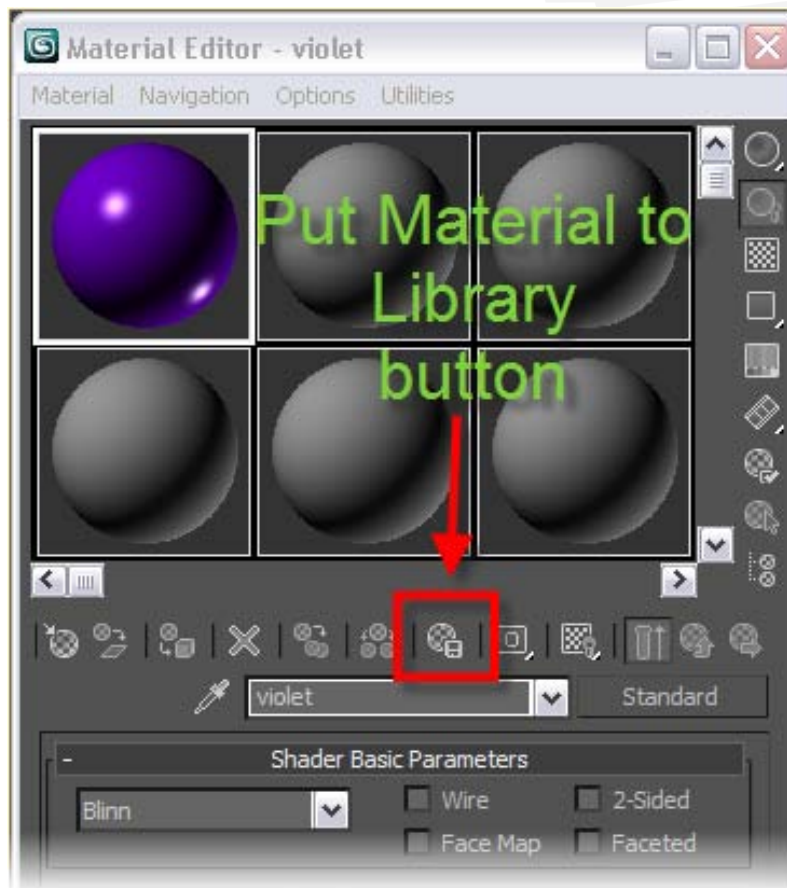


Figure 21

Your new material added to a material library.

There are a number of ways to apply the new material to an object in the scene. The easiest way is to click the Material Preview window, and then drag and drop the new material onto an object. If the object is selected in the scene, you can click Assign Material to Selection. Figure 22

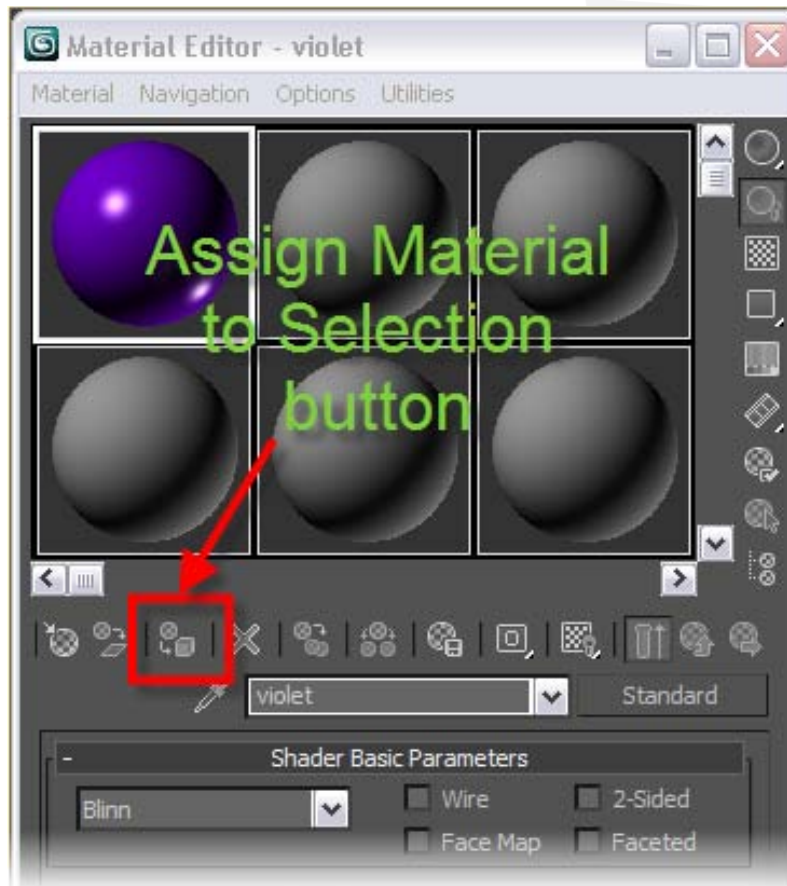


Figure 22

Continue to create Materials based on colors within the chosen color harmony. Add them to the Material Library, and apply them to the objects in the scene.

- To see all the materials that have been created, click the Get Material button. The Map/Material Browser opens.
- On the Browse From menu, select Mtl Library.
- To see a thumbnail representation of the new material, click either View Small Icons or View Large Icons. All of the materials you have created are shown. Figure 23

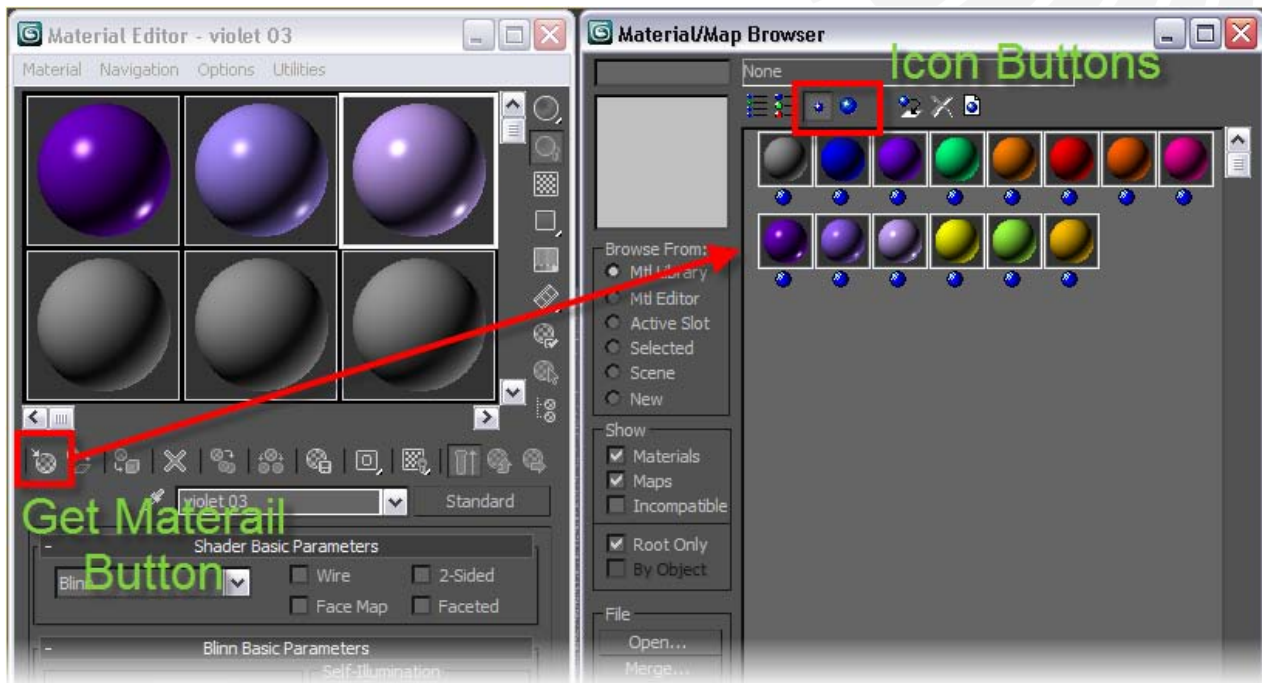


Figure 23

Continue to add the new color materials to the loaded scene. Figure 24

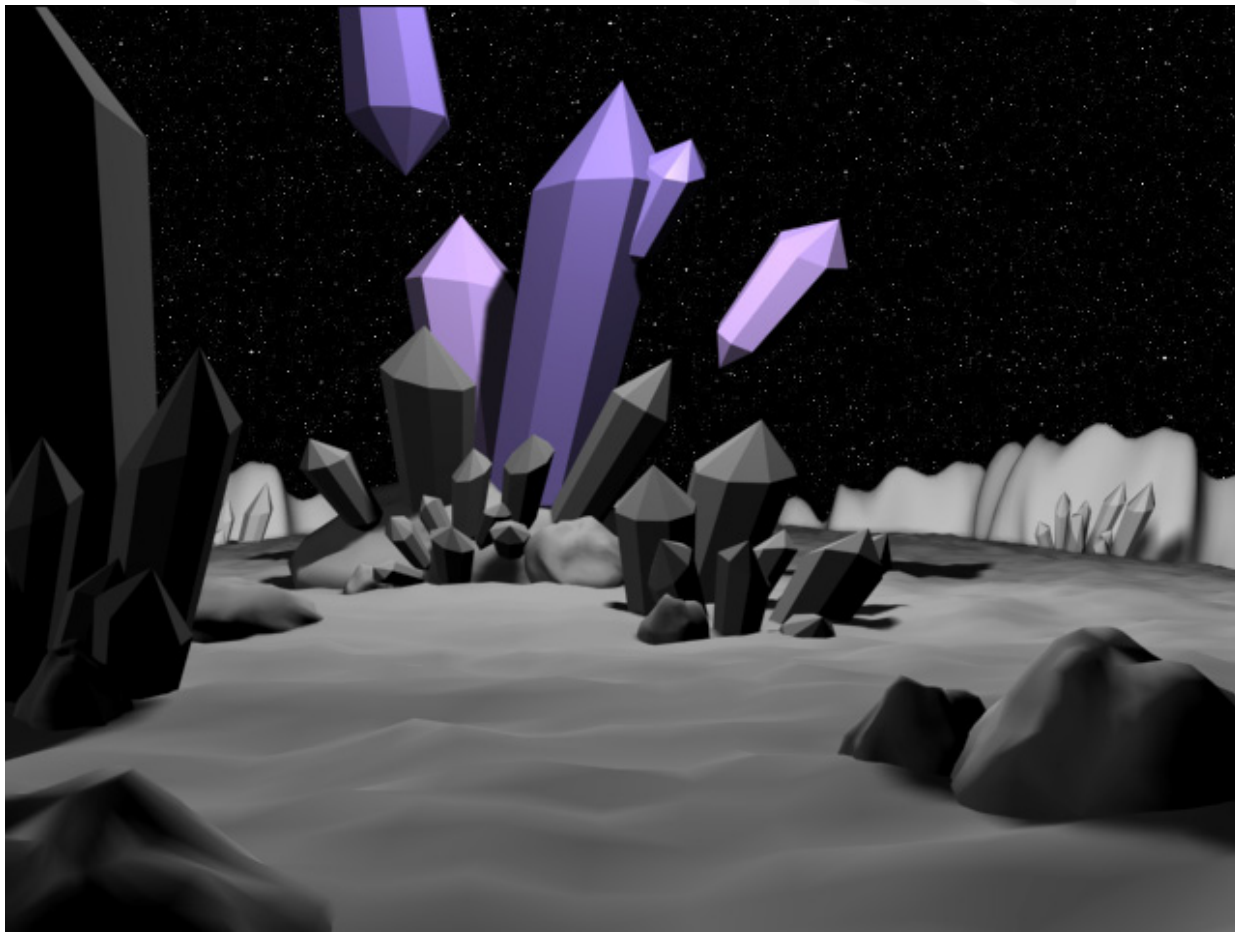


Figure 24

When all the objects in the scene are colored you are finished. If you want a background that is something other than black, you can easily add an image that will render in place of the pitch black: To do this:

- Click Rendering > Environment. The Environment and Effects window displays. Figure 25

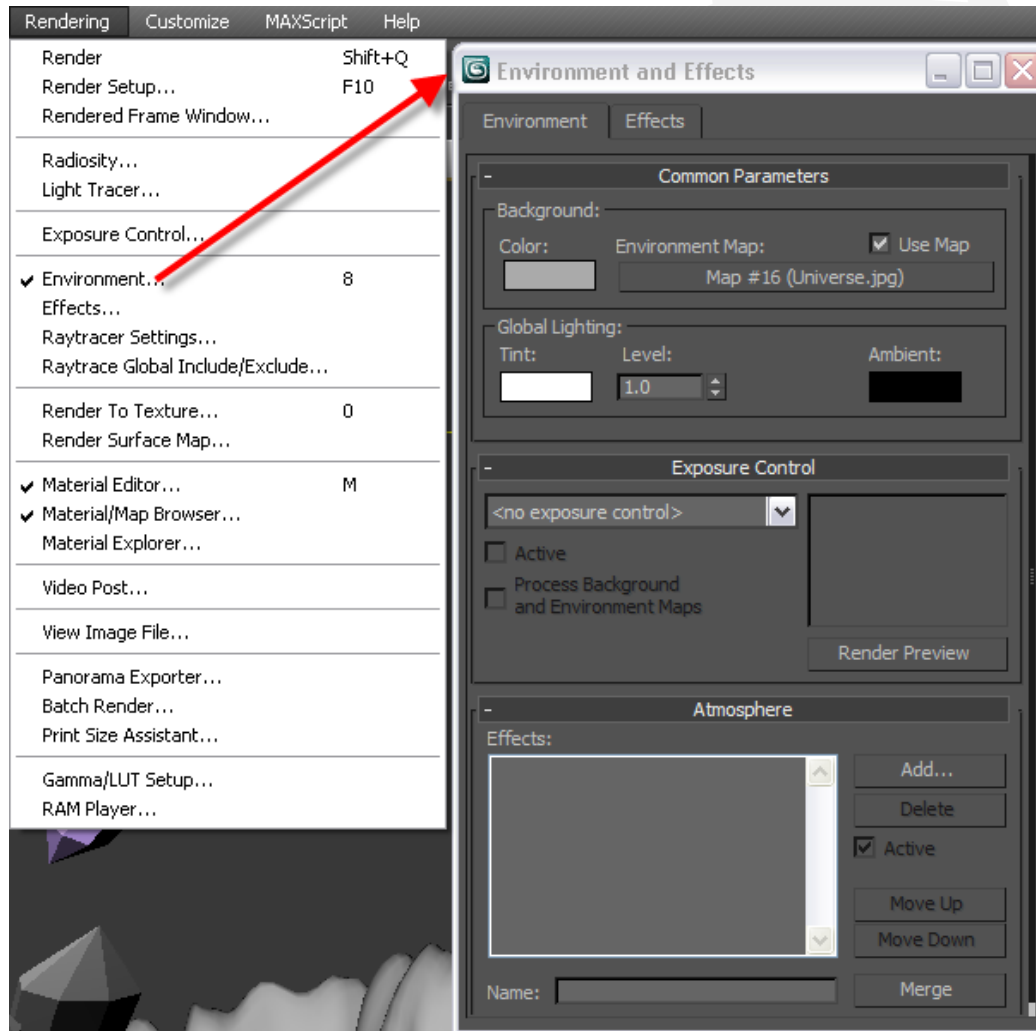


Figure 25

- In the Background rollout, select Use Map to the right of Environment Map.
- Click the Map button. Figure 26

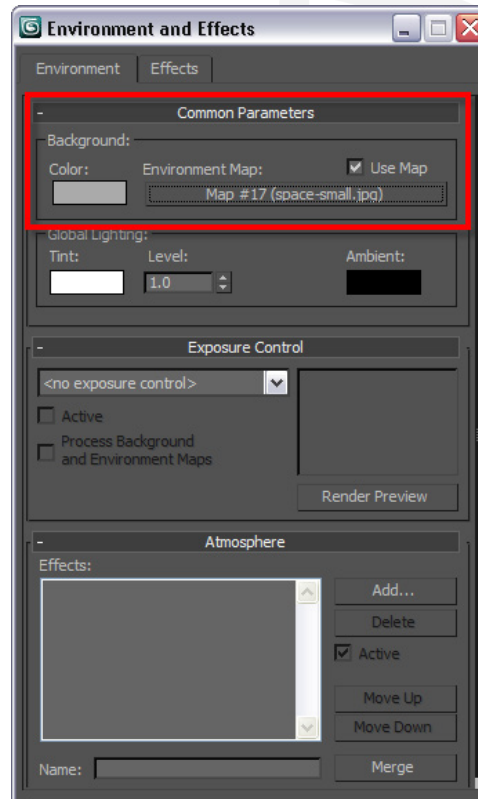


Figure 26

- The Material/Map Browser displays. Double-click Bitmap. Figure 27

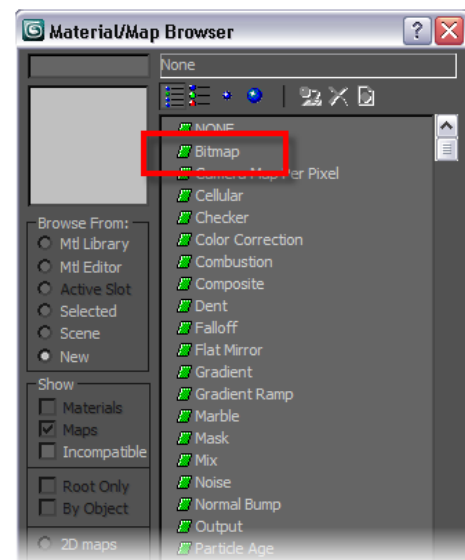


Figure 27

The Select Bitmap Image File dialog box opens.

- Navigate to the image you want to use. Click Open. Figure 28

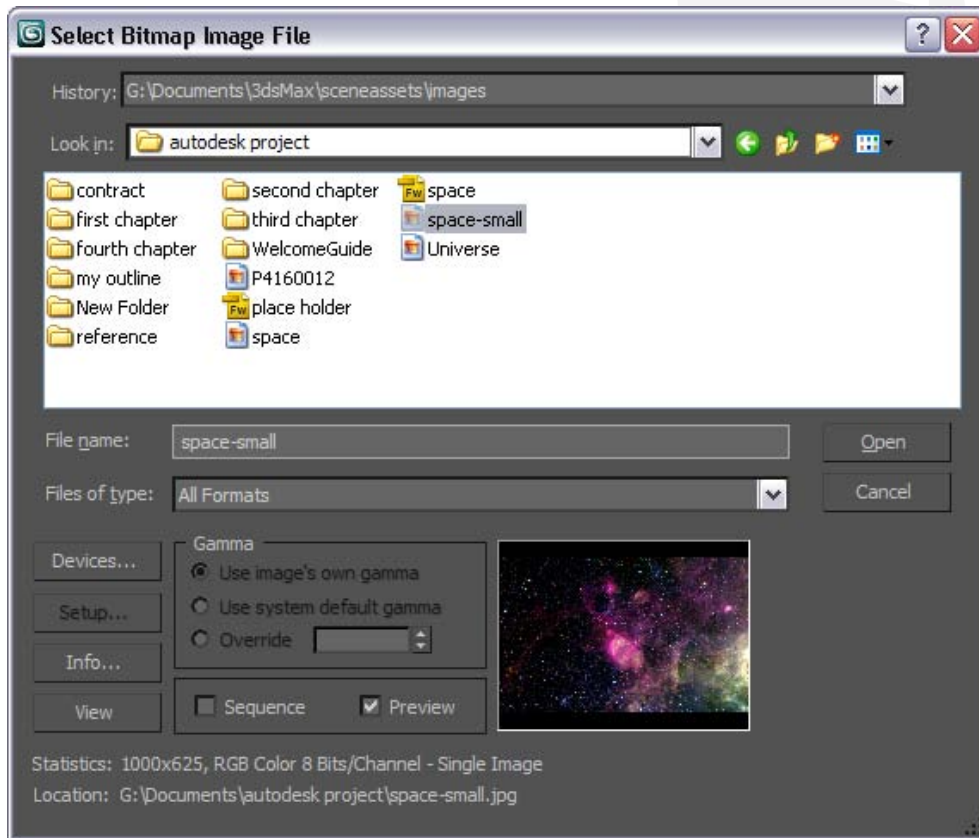


Figure 28

The image selected now renders in the background of the scene. Make sure that you select an image that has a color scheme consistent with your image.

When all materials are applied, you should have a full color scene. Figure 29 is the example scene with a split complementary color harmony used for the materials.



Figure 29

When you have finished applying colors to one scene and rendered an image, evaluate the result and decide if there is anything you can do better to improve the coloring.

Apply a different color scheme to the two additional scenes you created in the last section.

## What You Learned

In this section, you looked more closely at one of the most important elements of design, color. You learned to:

- Describe the three fundamental properties of color.
- Distinguish the secondary characteristics of color through examples.
- Explain some of the standard color harmonies.
- Apply a few different methods of using color in your images.

Color is a subject that you can never learn enough about. It is hoped that this brief introduction and exercises using color encourages you to continue learning more about the possibilities available to you as an artist.

