Materials and textures are what change your model from being gray to brilliant. You can add color, make things glow, become transparent like glass or make them look like brick, grass, stone, metal, fabric, wallpaper, etc. There’s a lot to cover in this chapter so let’s get started.

**Basic Material Settings**

You must **always** add a material before you can add a texture. To add a material, first select the object you want to work with. Then go to the **Materials** panel in the **Properties** window. Then click the **“New”** button (unless you are working with the initial cube—*that has a material on it by default*). You will see more options open up. The material block is used to change some of the physical properties of the object in how it looks. If you plan on using just straight color and no texture, this is where you set the object’s color. The panels can float around so they may not be in this order, but here is what you see with all panels collapsed:

- **Add a new material or duplicate the one currently selected**
- **Change the material name here**
- **How to display the material:**
  - **Surface:** Normal mode
  - **Wire:** Render as a wireframe
  - **Volume:** Useful for smoke simulations
  - **Halo:** Gives vertices a glow
- **Different ways to display the sample**
  - **Diffuse:** The actual color of the object settings
  - **Shading:** Control self-emitting light and ambient lighting effects
  - **Subsurface Scattering:** Effects for final rendering
  - **Strands:** Used for hair and grass effects
  - **Shadow:** Setting related to how the object casts and receives shadows
  - **Specular:** Controls the objects glossiness settings
  - **Mirror-Transparency:** Raytrace settings will be discussed in a later chapter
  - **Options:** A few settings related to the world and rendering

This is just an overview of the basic material panels. On the next page, we will highlight some of the important panels we will be using at this time.

**RoboDude Asks: How can I see all the panels on the screen?**

It may be impossible to see all of the panels at once, but you can scale the by pressing the “+” and “-” keys on the number pad and pan with the mouse wheel.
Material Panels:

Here are some of the basic material panels and settings:

**Diffuse:**
Diffuse is actually the color that is given off by the object. If you want the object to be red, set it here. You will also see settings for the way the material is calculated (default-Lambert) and the intensity slider. The Ramp button will allow diversity of color.

By clicking on the color sample in diffuse (or in any other block dealing with a color), the color wheel will pop up. You can set the color using the wheel and light/dark slider, setting in manually using RGB, HSV, or Hex numbers. You'll also see an eyedropper for picking a color elsewhere.

**Specular:**
Specular settings control the glossiness of the object (is it flat or shiny?) You will see a color sample, calculation model and ramp as in Diffuse. The color sample indicates the color reflected back (usually kept white). Intensity controls the amount of glossiness while the hardness slider controls the hardness and softness of the glow. Check the sample as you change these settings to see how it changes appearance.

**Shading:**
If you want something to glow, even in low light, adjust the Emit slider. Ambient light allows the object to also react as if indirect light were hitting it. There are also a few other shading settings here as well.

**Transparency:**
For now, we will only look at using the “Z Transparency” option (Raytrace has it’s own chapter). After checking the Transparency box and “Z Transparency” selected, you can control how transparent an object is using the Alpha slider.

**SubSurface Scattering:**
Is used to improve rendering for materials where light enters the material and leaves through another point (like skin).

**Strands:**
Strands are used to represent hair or grass when used with particle systems (discussed in a later chapter). With strand settings, you can control the root and tip width of the strand.

**Shadow:**
There are times when you do not want an object to be able to cast a shadow and times when it doesn’t receive shadows properly from objects with transparent materials or ray-tracing features. Those options are controlled in this panel.
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Transparency Using Z-Transparency:

The easiest way to make something transparent in Blender while still maintaining a fast render speed is to use the Z-Transparency feature and controlling the Alpha setting. In the Material panel, turn on Transparency and select Z-Transparency, then slide the Alpha control down. Press the F12 button to render an image. If you need features like distortion (refraction), then you will need to use Raytrace Transparent. Refraction is the effect you get like looking through a magnifying glass or a crystal. Avoid using Ray features at this time. They are discussed in a later chapter.

Z-Transparent material

Halo Settings

By using Halos on objects, you are basically only making the vertices visible when rendered. Halo effects give you a star-like image on every vertex. Sometimes, it adds a nice effect to take a plane and delete all vertices except for one. This one vertex can be used like a shooting star or a “Tinkerbell” effect in an animation. Tie it to a particle effect (discussed in a later chapter) and you can produce some interesting results. When you press the “Halo” button in the material panel, here are your options:

- Turn ON Halo
- Halo glow only
- Rings only
- Lines only
- Star only
- Rings, Lines and Star
- Halo Transparency
- Halo Color and Hardness
- Check to add rings, count and color
- Check to add lines, count and color
- Check to add stars and tips
- Flare adds additional rings and effects
- Flare adds additional rings and effects
- Flare adds additional rings and effects
- Flare adds additional rings and effects

Halos can also be animated to give a variety of effects. Animation basics are discussed in a later chapter. There are also other options with halos not discussed. Halos are also used to control the size and appearance of particles in smoke and fire effects. These will also be discussed in a later chapter. Feel free to experiment!
It’s now time to add some color and water to your project. Open your “Landscape Scene” model that you created in the Basic Editing chapter. Render a picture with “F12” and it should look something like this:

Lots of gray… In this exercise, we are just planning to experiment with material colors and settings. We will also add a plane to the scene to act as the water. In the next activity, we will add some texture to it.

With the landscape plane selected, go to the Material Buttons and select “New”. It is good to get into the habit of naming your materials. By default, it will be “Material”, probably with some zeros and numbers after it. Create an appropriate name. The name block may be small on your screen.

Under “Diffuse”, click on the color swatch to open the Color Wheel and select a shade of green. You can select a shade of green 2 ways- by using the RGB sliders at the bottom of the panel or by moving the dot in the wheel, then adjusting the brightness with the white-to-black slider on the side. I know this doesn’t look too realistic at this point, but we will apply a nice soil/grass texture in the next exercise. For now, you’re just working with material basics.

Since ground usually isn’t glossy, Take the “Intensity” slider down to 0 (or almost 0) in the “Specular” panel. I would leave the color white here.
Now that you've adjusted the color and glossiness in the materials panel, Press “F12” to render a new image.

Looks better than gray, but still needs more work. We will apply a texture to the mesh in the next exercise. Remember that you always need to place a material on an object before you can add a texture. For future reference, if we were planning to apply an image (picture) as a texture, you would not need to adjust the color. However, you would still need to adjust specularity as needed.

We're now ready to add some water to our scene. For this we need to add a Plane from the Top View (#7) (Shift-"A"- Add- Mesh- Plane)

After adding the plane, Scale the plane to about the size of your ground.

Switch to the Front View (#1) and move the plane to a location somewhere between the top and bottom of your landscape rise. Press F12 to render an image and check for appearance. Make sure that you do not see the edge of the plane in camera view.
Now it’s time to add a new material to the water plane exactly as we did for the landscape. Add a new material, name the material and adjust the Diffuse color wheel for a shade of blue. Keep the Specular up for this material since water should have a gloss.

Finally, render a picture using “F12”. Your screen should now look similar to the one below. A green landscape with blue water.

** Call the instructor when finished**
Basic Textures Settings

After you create a material and would like to add some kind of texture to the object (i.e. brick, carpet, wood grain, etc), you then click on the Texture button beside the Material button. After you click the “New” button, you have some choices in the texture buttons. First, you need to decide if you wish to use one of Blender’s preloaded texture generators or provide your own image as a texture. Blender is capable of using almost any image file type whether created in a paint program or is a photographic image. JPEG images are most common. Blender can even place a movie on an object as a material! This is a good effect if you want to add animation within your animation.

Here's what you see in the texture panel:

- **Texture Channels:** You can add multiple textures to an object. For example, let’s say you want a marble texture on an object, but also want to add a roughness to the surface. You would add a texture for both effects.

- **Texture Name:** Like materials, it’s a good idea to name your textures. In this area, you can also add “+” and delete “−” materials.

- **Texture Type:** Choose between built-in texture generators for wood, marble, stucci, etc or select an image or movie.

- **Mapping:** Setting that control how the texture is mapped onto the object. Also control the size and offset of the texture on the object.

- **Influence:** Settings that control appearance such as brightness, transparency, glossiness and roughness. S are also effected by the Material setting. Materials and textures work together.

- **Many textures use a secondary color in their generation. That is also controlled in this panel.**

RoboDude Says:

You can’t add a texture unless you’ve already added a material. Material and Texture properties work together!
Blender's Built-In Textures:

Let's say you want to use one of Blender's built-in textures (under the "Type" option). For now, we just want to look at Clouds, Stucci, Magic, Marble and Wood. These can produce some interesting effects with a little practice. When you select one, setting options will open for that effect. Each texture has different tools available to work with, but some similarities are present in most:

Most of Blender’s texture options deal with turbulence and noise (randomness of the pattern). The wood texture also has some features dealing with the pattern of the wood grain (bands and rings). After you place the texture, you still need to go back to the Materials Buttons to fine tune the look on your object. The Stucci texture involves a little more work and will be discussed later in this chapter.

Many textures have a Noise Basis for different texture effects.
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For an example of how to work with a texture, we will apply a wood texture to a cube. We'll start with a basic cube that has a material applied to it. Since wood is usually various shades of brown, we'll make the **Diffuse** color brown. We'll also take **Specular Intensity** down a bit.

We'll now go over to the texture buttons and add a new texture. Make the texture type “Wood”. In the wood texture panel you will see some different ways to represent the wood grain. “Sine-Saw-Tri” will give you a different stripe while “Bands-Rings-Band Noise-Ring Noise” will give you a different pattern. For my example, I will select “Ring Noise” and hit “F12” to render a picture.

If you look at your render, you should see your wood grain, but you have a secondary color that needs to be corrected! To fix this, scroll down through your texture panels to find the color swatch to change this to a better color. I will choose a darker brown.

You can also adjust the **Size (X,Y,Z)** of the texture and the **Noise Basis** for more effects. Feel free to experiment with the various other settings.

The Stucci Texture:

The Stucci texture provides interesting effect on the surface of your object. In the Texture Buttons, select it as you do for any of the other texture generators and adjust the settings. In the Stucci panel, I will adjust the size to 0.15. Next, go down to the **Influence** panel and turn on “Nor” under Geometry for normal. Adjusting the “Nor” slider to adjust the amount of the effect. Play with the setting to get a bumpy effect. Turning the size setting way down can also give you a grainy effect.

Below are some samples of different **Noise Basis** patterns.
Using Images and Movies as Textures

The basic texture generators are nice, but not complete. Most of the time you need to place textures like grass, brick, metal, fabrics and such into your model. **Anything that can be saved as a JPEG image can be used as a texture in Blender.** Most other image type files can be used as well (png, targa, TIFF, bmp). If you want to put a picture of your face on an object- you can! Movie files can also be placed on an object as a material. To use a JPEG as a texture, add a Material as before, go to the Texture buttons and select the “**Image or Movie**” option under “**Type**”. When you select this, here is what you see for options:

- **Texture Type:** Changed to “Image or Movie”
- **Preview Window:** Can be set to display Texture or Material or Both
- **Colors Panel:** An image can be adjusted if colors are not quite what you want (i.e. a wood grain that you may want more red in it)
- **Mapping Panel:** Textures can be projected **Flat, Cube, Tube, or Sphere** onto an object. Important block! Here, you can also adjust the offset and size of an image on your object.
- **Image Panel:** This is actually where you open the image or movie you wish to use for your texture. If you don’t see thumbnails of your images, you can change the window’s viewing type (see page 1-4 for details).
- **Image Sampling Panel:** Make adjustments to your image such as Alpha (transparent images). For example, you have a tree image made in a graphics program with a transparent background. Set alpha here to remove that background.
- **Image Mapping Panel:** If you would like to have the texture repeat (i.e. a brick pattern where you need to use the image several times on a surface), set it here. You also have mirror options in case the image you’re using doesn’t appear seamless.

**RoboDude Asks:** I’ve worked with all these settings, but the texture still won’t map correctly- what’s wrong? Textures can be affected by rotation and scaling of objects. Try pressing **Ctrl-"A"** to reset scale and rotation.
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For an example of using images, here is a cube and sphere rendered using a brick image. You will notice that, by default, the image is mapped onto the top and stretched down the sides of the object. This is called “Flat” mapping. This can be adjusted in the “Mapping” panel. Your other options are shown below:

![Mapped Cube](image1)
![Mapped Tube](image2)
![Mapped Sphere](image3)

**RoboDude Asks: Why can’t I find any images to use with Blender?**
Blender does not come with any images installed with the program, only the built-in texture generators. You will need to supply your own images. There are many texture libraries available on the internet or you can create your own.

Let’s say I want to use the “Cube” mapping, but the bricks are too large. I can control this in the “Image Mapping” panel under the “Repeat” option. The image I used tiles well, but if it does not you can press the Mirror- X and Y buttons.

Remember that the Material and Texture panels work together. The bricks look good, but a bit too glossy and flat. You can make adjustments to Specular in Materials (glossiness) and add a “Normal” to the brick texture in the Texture panel under the “Influence” panel. This will simulate depth and add a nice effect to the brick.

**Movies as Textures:**

You load a movie just as you would load an image, except that you have a few other options. You can control which frames of the movie to use, when it starts (offset) and if the movie cycles through your animation. This can be a great option for animated backgrounds, and motion on objects. Remember that all movie formats may not be supported.
Displacement Mapping

Displacement Mapping is using a texture effect to deform the mesh. Basically, you can make a cube, sphere, etc. look wrinkled or deformed without having to move vertices around to do it. To start, create a cube or sphere. If you start with a cube, go into Edit Mode (tab) and select all vertices, press the Subdivide button a few times in the Tool Shelf. Displacement works off of vertices so if you don’t have it subdivided a few times, you won’t get a good effect. Next, put a material and a texture on the object. I used the Cloud texture in Blender. Here’s what we have by pressing F12:

Nothing that we haven’t already experienced in this chapter so far. Now, go to the “Influence” panel and find the “Displacement” button to turn on Displacement and adjust the slider. Re-render (F12). Displacement basically works by pushing vertices with the varying colors in the texture. This is also controllable.

For our next test, I will create a simple image in a graphics program using only simple gray, white and black shapes. Gray is considered the base color.

Here are the effects of the image on the object mapped with the Cube wrap. Notice that the white shape was pushed out while the black shapes went in. The quality of the cuts and extrudes is determined by the subdivision (vertices) on the mesh.

To the right, the shape has been subdivided a few more times for a better edge. While Normal gives the illusion of depth, Displacement will actually deform, but it makes the shape more complicated and slower to render.
Let’s start by adding textures to your lighthouse. Open your “Lighthouse” model, switch to a front view (#1), and enter Edit mode (tab). Make sure you are in wireframe view (“Z” key). Deselect all vertices using the “A” key (remember- deselected vertices are pink, selected vertices are yellow). Zoom in on the top portion of your lighthouse.

Begin by box selecting (“B” key) the top of the lighthouse (roof only) as shown. We will separate these vertices from the rest of the mesh, making it easier to apply a different material and texture to that part of the lighthouse. Press the “P” key to partition (separate) and choose the “Selected” option. The top of the lighthouse is now a separate mesh.

Now select all the vertices that form the walkway with the box selection and separate them using “P”.

Lastly, select all the vertices that form the lighted area of the lighthouse and separate them using “P”.

Exit edit mode (tab) and zoom out to see the entire lighthouse. The base of the lighthouse should be selected. Go to the Material buttons. Select “New” and name the material LH Base. Change the Specular Intensity setting down to 0.1. This will keep the gloss down. We do not need to set a color in the RGB sliders since we will be applying an image texture to the mesh. Just to check our results so far, Press F12 for a render.

If you notice any strange effects when rendering, it is the result of separating the mesh. Try entering Edit Mode, select all vertices and use the “Recalculate” Normals, or “Remove Doubles” options in the Tool Shelf. The may even be the possibility that you have a double mesh.
Now it's time to add a stone image in the texture buttons. You will need to find a texture to use. You can search the internet for free stone textures, look through the Blender websites, or go to [http://www.cdschools.org/cdhs/site/default.asp](http://www.cdschools.org/cdhs/site/default.asp) and look under “Academics” and “Drafting and Design Technology” for a compiled zip file. Once you have some saved images, go to the Texture buttons and select the Image or Movie option. Hit “Open” in the Image panel and find a texture you would like to use. Hit F12 to render an image:

Looks a bit distorted. The texture is being mapped Flat by default which means it is being mapped to the top plane and stretched down the sides. To fix this, go to the Mapping panel and change the Projection from “Flat” to “Tube”. Render another picture and you should see an improvement.

The image should now wrap around the lighthouse nicely, but the stones may be a bit large. The image may also look a bit flat. It would be nice to simulate some depth to that stone texture.

To change the image size, find the X and Y Repeat buttons in the Image Mapping panel. Change them from 1 to a higher number. For this example, we used 5 for each, but depending on the texture you used, it may be different. If your image shows a bad line at the seams, try clicking the Mirror buttons by each repeat setting. This will mirror the image to minimize repeats.

In order to simulate depth to the stone, add a “Normal” to the stone texture in Textures under the “Influence” panel. This will simulate depth and add a nice effect to the stone. Some texture will work better with this than others due to color contrast. Render another image to check your results.

Continue doing this for all parts of your lighthouse to get the look you wish. You can also use straight materials on some parts. Our next step is to cut some windows in the top of the lighthouse. Feel free to try some of Blender's built-in texture generators.
Here's the final result of my texturing. I decided to go with a straight color of red for the light area and a stucci texture on the walkway to simulate stone/concrete. Since the lighthouse will be toward the back of our final scene, it doesn't need to be “photo realistic”.

It's now time to cut some windows to let the light shine out. We will do this easily by deleting faces in edit mode.

First, select the tube mesh and enter edit mode (tab). Change from selecting vertices to faces. (see page 3-5 if you forget). You'll also want to switch from wireframe view to solid shading (“Z” key) and hit the button to limit selection to visible. You will need to select every 3 faces and delete “faces”. You will leave 1 face (as the post between the windows), and delete the next 3 faces. Continue all the way around. Since there are 32 divisions, it should work out perfectly all the way around.

With the faces deleted, exit Edit mode and render a picture with F12. Your lighthouse should look something like the picture below.

Now that we're done texturing and editing the lighthouse, it's time to join the meshes back together. In Object Mode, select all the meshes by RMB (right-mouse-button) clicking on them while holding down the Shift key. Hit Ctrl-J and confirm the operation. The lighthouse should once again be a single mesh. You should also have a final rendered view, fully textured! After joining your meshes, you now have one mesh with multiple materials and can see them listed in the material panel. You may need to go back and adjust them after joining, but should not need much.
Now it’s time to save the “Lighthouse” file and bring up the “Landscape Scene”. It’s now time to find a nice grass/dirt texture to use on our ground and repeat the same process we used for the lighthouse. Since we already have a material from the previous lesson, we can use it. Take Specular Intensity down since it shouldn’t be shiny. Add a new texture and load an image of your choice. Use the X and Y repeat setting as needed and apply Normal to show depth. You may want to keep this image Mapped Flat. Here’s the final result with a grass/dirt image that repeats well:

Let’s work on the water now. Select the plane representing the water. Again, use the material we previously created. Keep Specular Intensity high since water is glossy. We will be using Blender’s built in cloud texture type instead of an image for this one. Go to the Texture buttons and add a Cloud texture. If you render a picture, you will see the original blue and the pink color. Go back to the Texture buttons and change the secondary color in the Influence panel to a slightly different shade of blue/gray.

Remember that our goal is to have a stormy night so pick colors that would reflect that type of scene. Adjust both colors (Material Diffuse color and texture color) for the best effect. Adjust the Normal setting to show waves and render an image to check.
The results look pretty good. To get higher waves, remember to adjust the Normal setting. You can also try to experiment with different “Noise Basis” options to get a desired look for your waves. Some will look better than others.

Remember that Blender has the ability to use multiple textures on one object. Select the next texture channel under the current one and add a new texture to this channel. For the Texture Type, select Sticci. This additional channel will add another level of detail to the waves. As before, select a Noise Basis and adjust the Normal setting and colors to get a desired result.

The scene to the right required adjusting the material color and settings on both texture channels. Adjust the size, type, texture color, and normals to get a good balance.

That’s it for now. We will come back in a later chapter and animate the waves. Remember to SAVE!

**Call the instructor when finished**