Cameras:

By default, your scene already has one camera and that is usually all you need, but on occasion you may wish to add more cameras. You add more cameras by hitting “Shift-A”, like creating all other objects discussed up until now. To change which camera is active, you need to select that camera and press “Ctrl” and number pad “0”. This changes the active camera.

Like all other objects in Blender, you can adjust the camera settings as well. With the camera selected, click on the Camera button. Here are some of the settings options you have:

**Perspective/Orthographic/Panoramic** - Used to set the camera from showing a true-life perspective view to an orthographic view. Panoramic can give a 360 degree view in Cycles only.

**Lens (Focal)** - Set-up a lens length much like a real camera. 35mm is a good, safe setting, but wide and tight angle setting work for different needs.

**Shift** - Pushes the view left, right, up, down from actual camera view, without changing perspective.

**Clipping** - Start and End - How close and how far an object can get to the camera and still be seen. In very large scenes, this needs to be set higher or things “disappear” from view.

**Camera** - Used to set a specific make of camera for your scene. You can select a specific camera or set your own.

**DOF** (Depth-of-field) - Used with nodes to blur foreground and background objects. This will be discussed in the “Working with Nodes” chapter.

**Display Settings**:

- **Limits** - Draws a line in the scene to help you visualize the camera’s range.
- **Size** - How big to draw the camera on the screen. You can also control size with scale.
- **Show Mist** - Used to give you a visual display of how far the camera sees if using Mist (discussed in Chapter 5).
- **Name** - With all objects, the name of the object or camera can be displayed on the screen, but this will display the name in the camera view.
- **Passepartout** - Shades the area on the screen outside of the camera’s view. You can control the darkness of the shaded area with the **Alpha** slider.
- **Title Safe Areas** - Displays a dashed box to help with placement of objects and text.
Chapter 7- Lighting & Cameras

Using Nodes for Camera Effects:
Up to this point, we have only used nodes for Cycles materials, but node can be used with the internal renderer for camera effects as well.

Depth-of-Field- Internal Renderer:
A great node feature is creating Depth-of-Field effects. Just like a camera shot using a low F-stop setting that creates blur behind and in front of what the camera is focused on, we can create in Blender. This process is for the Internal Render Engine.

To start this scene, I’ve created a grid of cubes. The camera is tracked to an Empty, placed directly on the center cube.

Notice everything is in focus above. We want to blur the foreground and background.

With the camera selected, go to the Camera’s Object Data panel to set a few things.

You have 2 ways to set the Depth of Field. You can select an Object for the camera to target (great for animation) or you can set a Distance. In order to see the actual target point on the screen, turn on “Limits” in the Display panel. The target point will display on the dashed line. All of this can be animated, much like you would see done professionally. This will be discussed in a later chapter.

It’s now time to work on the nodes.

In the Node Editor screen configuration, enable nodes by checking the “Use Nodes” button, also set for “Compositing Nodes”. If you would like to render in the background, enable “Backdrop” as well.
Delete the line connecting the Render Layers and Composite panels. We are now going to add 2 nodes. Add a “Map Value” node from the Vector node set and a “Defocus” node from the Filter node set. If you would like to render in the backdrop, add a “Viewer” node from the Output node set.

Set the nodes up as displayed below and match settings:

The “Map Value” panel is used to adjust the pixels related to distance from camera and connects to the “Z” on the Render Layer panel and Defocus panel. The image Out/Ins connect as shown. Adjust the F-stop to a low number. Like a camera, a low fStop means little is in focus beyond the target. A larger number will give a larger focus range. Max Blur sets the amount of blurring while a high Samples setting will give you a better quality image. Experimenting with these settings will give you different results.
Chapter 7- Lighting & Cameras

Depth-of-Field- Cycles Renderer:
Using depth-of-field is actually easier in Cycles than in the internal renderer. You can use simple DOF in the Camera properties panel and not even enter the Node Editor window.

First, set the Cycles Render engine in the top bar, select the Camera, and go to the Camera properties panel. You will notice a few more options in the DOF panel than you have using the internal render engine. Set the Focus target or Distance as before, Lower the F-stop setting for blur (about 1.0), and set the Size of the Aperture Radius to about 0.2. This should give you a good blur effect. Adjust the numbers as needed.

Other Camera Node Effects:
These node effects work with both the internal renderer and the Cycles renderer.

To the right is a basic rendered view without any special nodes applied. On the next page, you will some sample node settings applied that can alter the output:
Black and White output using an RGB to BW Convertor Node. Inverted output using an Invert Color Node.

Inverted output using an Invert Color Node.

Camera lens output using a Lens Distortion Distort Node.

The possibilities are limitless using nodes. Search for some creative tutorials using nodes on the web.

Using the Chroma Key (Green Screen Effect):
Blender can be used for video composite work and motion tracking (combining 3D elements with real video), like you see in professional blockbuster films and advertising. Motion tracking and video editing are handled in later chapters, but we will discuss setting up nodes for chroma key composites now. Chroma key composite work basically involves video taping a subject in front of a colored screen (typically green), and then replace the green color with some other graphic or movie. Weather forecasters use the chroma key feature to project weather maps behind them during news reports.

Your first step is to film or obtain a video of the subject in front of a green screen (or other color not in the scene) and the image or video you plan to put behind your subject. For this example, we are using a video of a well known person in front a green screen and video of the Pennsylvania capital fountain for the backdrop. For best results, the films should be the same size and frame rate to match your output settings. Use a video converter to correct differences.
Chapter 7- Lighting & Cameras

Now, you will need to set up the nodes as shown below in the Node Editor:

You are using two “Movie Clip” nodes from the Input node group, a “Keying” node from the Matte node group, and a “Mix” node from the Color node group. The Mix output will go to a Composite node and a Viewer node. Enable the Backdrop rendering so you can see your adjustments in the background. Connect the nodes as shown above. The difficult part of this set up is adjusting the Keying settings so the green is removed, but none of the desired image. You may have trouble with shadows and glow depending on the quality of the video used.

Creating an output video will be discussed in Chapter 24: Video Sequence Editing.
Lighting Types and Settings

When you create a scene in Blender, you start with a few basic elements that will include a camera, but may or may not include a light. Remember that what the camera sees is what will render out as a picture or movie depending on what you tell the program you want as a final output. To get a simple rendered view, press the “F12” key. If the picture is black, you do not have a lamp or the lamp settings or placement is incorrect. To exit the render window, press the “Esc” key.

In most cases, you will need more than one lamp in order to properly illuminate your scene. Most scenes usually require 3-4 lamps. Be careful not to use too many lamps! The different types of lamps available for you to use are as follows:

- **Point**: Basic Blender Lamp—shines all directions.
- **Sun**: Provides even angle of light, regardless of placement from objects.
- **Spot**: Shines a direct angle of light.
- **Hemi**: A wider light, much like area lights.
- **Area**: Provides large area lighting (like a classroom). Can be scaled.

In traditional Blender rendering, only spotlights are able to cast shadows. However, with Ray-tracing (discussed in a later chapter) all lamps can cast shadows.

Lamp Settings:

To create a lamp, position the 3D cursor in a desired location and press “Shift-A” and select Lamp, then type. The lamp will be placed on the screen. You now have several options to select. With the lamp selected, click the Lamp button to bring up the adjusting options. Here’s what you see:

- **Lamp Type**: Can be changed any time. You will get different options depending on the lamp selected.
- **General Settings**: This is where you select the color of the lamp, it’s energy (brightness), the distance it shines, and a few other options.
- **Shadow Options**: Shadow style, color and quality. Ray-shadow will be discussed in a later chapter.

These are your basic settings. Sun and Spot give you some different options. The Sun can actually be used to simulate sky and atmosphere variations. The spotlight will be discussed on the next page.

RoboDude Says: Instead of adding too many lights, experiment with the Energy and Distance settings first. In a large scene, the default distance setting may not light the entire scene!
Chapter 7- Lighting & Cameras

Spotlight Settings:

Spotlights are unique in that you can simulate a foggy scene with them and cast shadows in the traditional Blender program. Ray-tracing (discussed in a later chapter) can cast shadows for all lamp types, but because of the more complex rendering calculations that need to be performed, renders much slower. If you watch professionally made animations on T.V., you will see that ray-tracing with reflections is not always used because of the rendering time. It is only used when needed. You can do the same thing. Again, we will focus on using the Buffer Shadow settings. Ray-trace shadows will be discussed later. Here are your spotlight settings:

Shadow Type: Buffer is the old style and fastest.
Shadow Color: Adjusts the color of the shadow.
Buffer Type: By holding your mouse over these buttons, it will tell you the benefit of each style (i.e. Deep supports transparency and better filtering, but slower).
Filter and Sample: These settings can be used to refine your results, but could add to your render times.
Clip Start and End: Gives a range for calculating shadows. Represented by a line down through lamp. Keep this line as short as possible to give the best shadowing. New to this release is the Autoclip options to set these for you.
Spot Shape: Set the Angle Size, Blend (edge softness), and Shape (round or square). You can also give it a haze with the Halo settings and intensity.

RoboDude Asks: Why can't I see my shadows or why do they look bad? If you have shadows, but look bad, try a larger Clip Start number to shorten up the area of calculation or adjust the Sample Buffers Size and Samples. If you don’t see any shadows at all, you might need to go to the Render buttons and turn on Shadows under Shading.

Different lights can be used to get different effects. As mentioned before, try not to add too many lights to your scene. It is better to keep it down to 3-4 and play with their locations and setting, rather than flood the scene in light. Think of it in terms of real lighting situations.
Indirect Lighting

In Cycles, you would use an emission shader to make an object emit light, but in order to achieve this effect in the internal render engine, you will need to use indirect lighting. Indirect light is light that bounces off other objects, like real life. There has always been an *Emit* option in the Blender material settings so an object could glow, even when light wasn't hitting it, but it could never light up things around it. It now can. First, let's set up the material with the *Emit* feature on. For the scene below, I have removed all lamps and the default *World* from the scene. The only reason why the cube glows in the render is due to the *Emit* setting. The plane that it is resting on is not illuminated.

This is what Blender could do in older versions. In order to turn on indirect lighting, I need to add a *World* back into the scene. I set the Horizon and Zenith colors to black for added effect. In the *World* settings, check the box for *Indirect Lighting*. Find the panel labeled *Gather* and turn on *Approximate*. Check and open the panel. You will see a *Factor* (influence) slider and Bounces, which will control how many times the light bounces. A rendered scene now shows reflection on the floor plane and a sphere sitting beside the cube, invisible before indirect lighting was applied.
Internal Renderer: What is a lighthouse scene without a light shining out through the fog? Open your “Lighthouse Scene” and place the 3D cursor directly in the middle of the lighthouse where the spotlight should shine. Use your 3 principle views (#1,3,7) to place the cursor in a good location (the light can always be moved later). After the cursor is located, check to see if you are in the front view (#1) and add a Spot Lamp (Shift”A”-Add-Lamp-Spot). Rotate the lamp as necessary so it is pointed across your scene and not directly at the camera.

After the lamp is added, go to the Lamp buttons and make sure it is set to Buffer Shadow. Adjust the Energy to about 1.2. In the Spot Shape panel, adjust the Size slider to about 10. This will give you a narrow beam that is about 10 degrees wide. Also turn on the Halo button. Render an image. Fine tune the spot light with Distance and Energy setting and the Halo Intensity slider.

Your final rendering should look something like the image below. Looks good, but something is missing. There should be something in the middle of the lighthouse emitting that light. We’ll do something simple, but effective for that next.
Now it’s time to add something in the middle of that lighthouse. Basically, we’re going to add a mesh with a single vertex and place a Halo Material on it.

Start by making sure the 3D cursor is still in the middle of the lighthouse top. If it isn’t, an easy way to get it there is to select the spotlight and hit “Shift-S” and select the option “Cursor to Selected”. This is a great command to use and use often. In the top view, add a plane. Enter Edit Mode (tab) and delete all but one vertex. Move that remaining vertex to the center of the lighthouse. After you move the one vertex, exit Edit Mode (tab).

Now go to the Materials buttons and Add a new material. Press the Halo button. Here, you will see some Halo settings. Adjust the Halo Size (try 1.0 or more), turn on Rings and Star, and try adding more Rings and Stars. You may want to try adjusting the Hardness and Add sliders.

Your end result should look something like this with a ring and star in the center of the lighthouse. You may need to darken your world setting a bit to get the best effect.

**Call the instructor when finished**
**Challenge Task - Cycles Scene & Blur**

**Cycles Renderer:** For this challenge activity, you will be adding an environment and lamp to your lighthouse scene in Cycles, similar to the previous activity.

First, add a misty world to your scene. Refer back to pages 6-7 and 6-7 to add a mist. Try for something like this:

Adjust the color and mist density to your desired results. Our ultimate goal is a “dark and stormy night”, so we need to make some lighting adjustments and add the spotlight.

Your first step with lighting is to adjust your current overhead lamp down for a sunset-type effect. Remember that the Cycles lamp setting in under the Materials panel as an emission shader. You will also want to go back to the World properties panel and turn down the **Strength** of the sky texture for a darker appearance.

Select the lamp and set the strength in the Materials panel. Render and adjust until you have the desired effects.
It’s now time to add the spotlight. There is no easy way to simulate the halo from the cone in Cycles at the time of this writing, but there are several ways to simulate the effect. Here is the easiest method found online:

We will simulate the spotlight with a mesh Cone. Create a cone from the Add-Mesh menu, enter Edit mode, and shape the cone to look like the spotlight used in the previous pages.

Add the following material nodes to the cone as shown to the right. You will need to adjust the Emission Strength to get a desired effect. The Volume Scatter node creates a mist effect within the cone.

You will also need to add an object, like a sphere or cylinder to simulate the lamp in the lighthouse. Use an Emission shader on this.

You should now have a result similar to the one shown below:

** Call the instructor when finished**
Chapter 7 Reflection

Chapter 7 Reflection and Wrap-up:

Lights, Camera, Not Quite Action!

This chapter’s focus was on setting up lights and cameras in your scene. The action part is coming up soon when we discuss animation techniques. Take some time to reflect on your experiences by answering these questions:

1. Look back at the camera settings found on page 7-1. Many of the features that can be done with real cameras can be simulated using these settings in a virtual world. What happens to a scene when you decrease the focal length? Research the internet to find out where shorter lens lengths can be useful (called a wide-angle lens). Explain your results.

2. Another feature of real cameras is aperture and is represented by the F-stop number. Research how the aperture works on a camera and why it is useful. Explain your results.

3. Explain a situation where it would be useful to use depth-of-field where the foreground and background will be out of focus.

4. After completing this chapter, what was your greatest challenge and learning experience and why? Explain.