3. Ensure that the depth of the second camera is 0. Set the X and Y property of the view port to (.75, .75) and set both the W and the H values to **.2**.

4. Run the scene. Notice that the second camera appears in the upper-right corner of the screen (see Figure 5.7). Experiment with the different view port settings to get the camera to appear in the different corners.

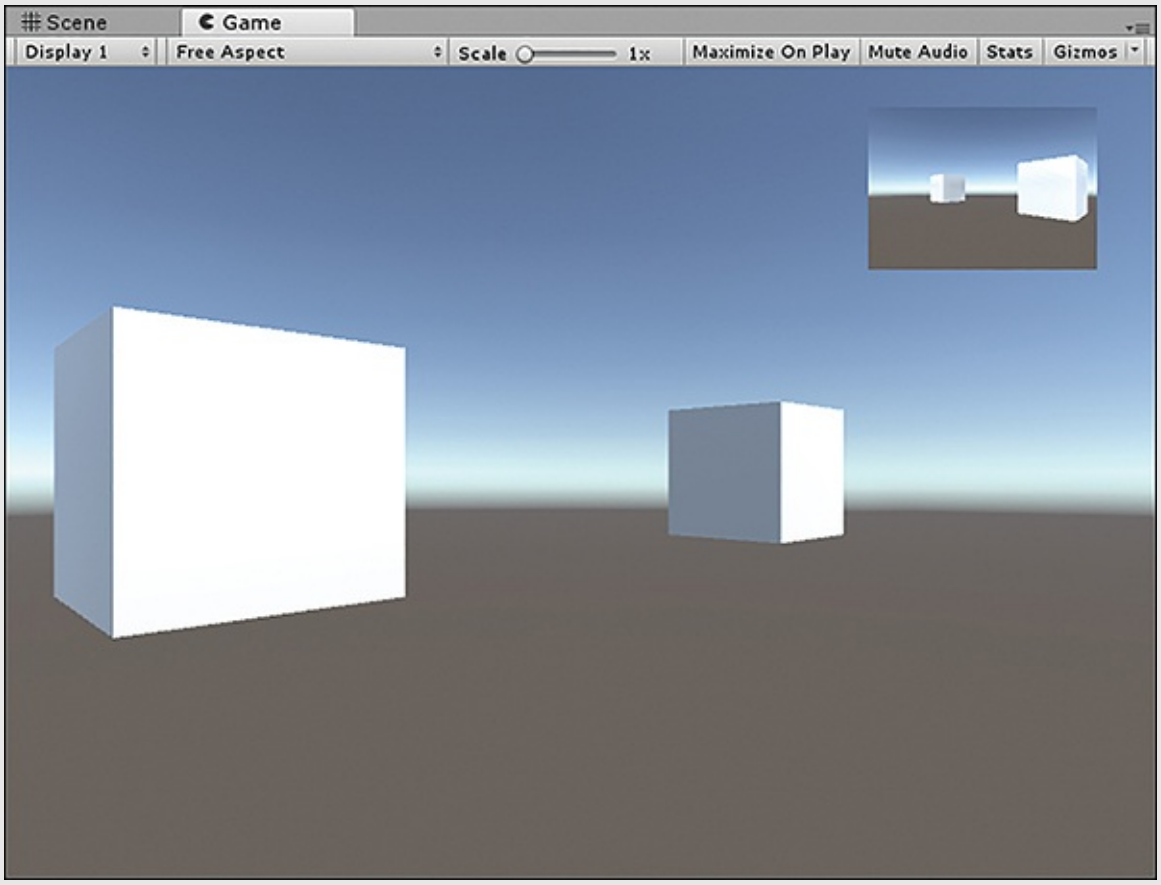

FIGURE 5.7
The picture-in-picture effect.

Layers

It can often be difficult to organize the many objects in a project and in a scene. Sometimes you want items to be viewable by only certain cameras or illuminated by only certain lights. Sometimes you want collisions to occur only between certain types of objects. Unity allows you to organize by using layers. Layers are groupings of similar objects that can be treated a certain way. By

Layers are groupings of similar objects that can be treated a certain way. By default, there are 8 built-in layers and 24 layers for the user to define.

CAUTION

Layer Overload!

Adding layers can be a great way to achieve complex behaviors without doing a lot of work. A word of warning, though: Do not create layers for items unless you need to. Too often, people arbitrarily create layers when adding objects to a scene with the thinking that they might need them later. This approach can lead to an organizational nightmare as you try to remember what each layer is for and what it does. In short, add layers when you need them. Don't try to use layers just because you can.

Working with Layers

Every game objects starts in the Default layer. That is, the object has no specific layer to belong to, so it is lumped in with everything else. You can easily add an object to a layer in the Inspector view. With the object selected, click the **Layer** drop-down in the Inspector and choose a new layer for the object to be a part of (see Figure 5.8). By default, there are five layers to choose from: Default, TransparentFX, Ignore Raycast, Water, and UI. You can safely ignore most of these for now because they are not very useful to you at this point.

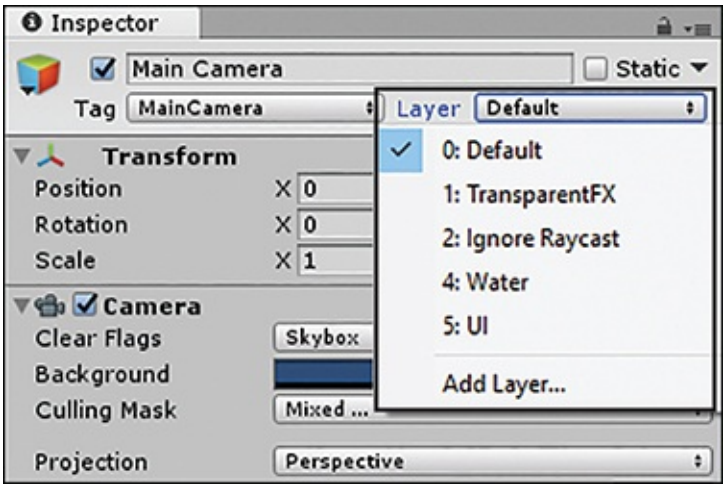

FIGURE 5.8
The Layer drop-down menu.

Although the current built-in layers aren't exactly useful to you, you can easily add new layers. You add layers in the Tags & Layers Manager, which you can

add new layers. You add layers in the Tags & Layers Manager, which you can open in three different ways:

- With an object selected, click the **Layer** drop-down and select **Add Layer** (refer to Figure 5.8).
- In the menu at the top of the editor, click **Edit > Project Settings > Tags and Layers**.
- Click the **Layers** selector in the scene toolbar and choose **Edit Layers** (see Figure 5.9).

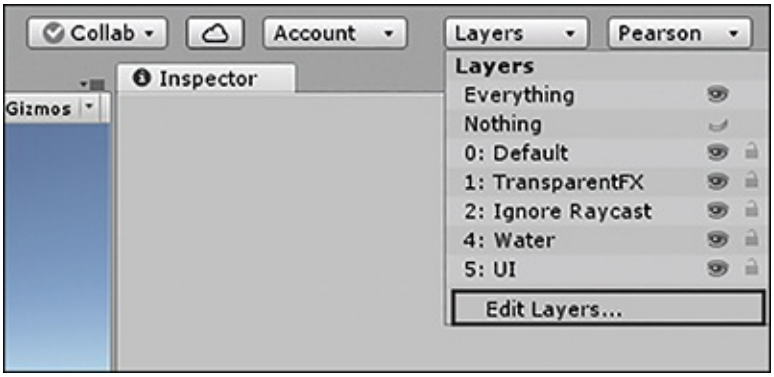

FIGURE 5.9
The Layers selector in the scene toolbar.

In the Tags & Layers Manager, click to the right of one of the user layers to give it a name. Figure 5.10 illustrates this process, showing two new layers being added. (They were added for this figure, and you won't have them unless you add them yourself.)

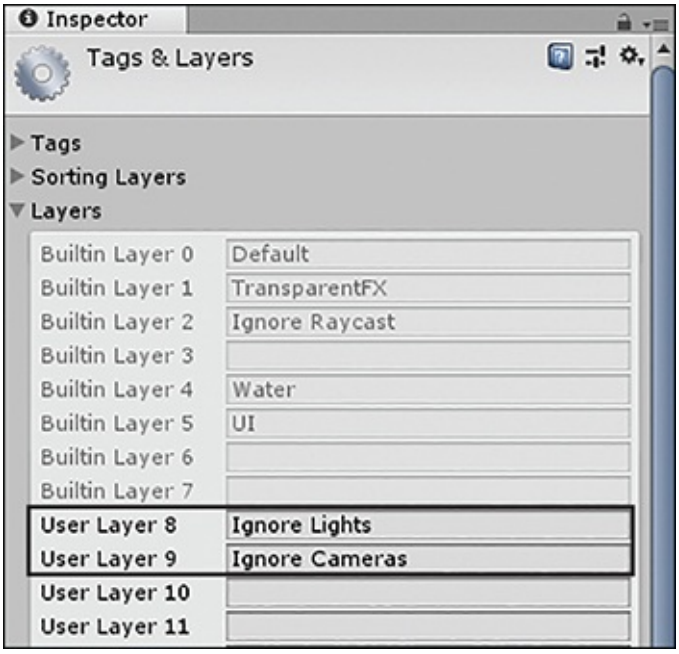

FIGURE 5.10
Adding new layers to the Tags & Layers Manager.

Using Layers

There are many uses for layers. The usefulness of layers is limited only by what you can think to do with them. This section covers four common uses.

One common use of layers is to hide them from the Scene view. By clicking the Layers selector in the Scene view toolbar (refer to Figure 5.9), you can choose which layers appear in the Scene view and which don't. By default, the scene is set up to show everything.

TIP

Invisible Scene Items

One common mistake is accidentally changing what layers are visible in the Scene view. If you are not familiar with the ability to make layers invisible, this can be quite confusing. Just note that if at any time items are not appearing in the Scene view when they should, you should check the Layers selector to ensure that it is set to show everything.

A second way to use layers is to exclude objects from being illuminated by light. This is useful if you are making a custom user interface, making a shadowing

system, or using a complex lighting system. To prevent a layer from being illuminated by a light, select the light and then, in the Inspector view, click the **Culling Mask** property and deselect any layers that you want ignored (see Figure 5.11).

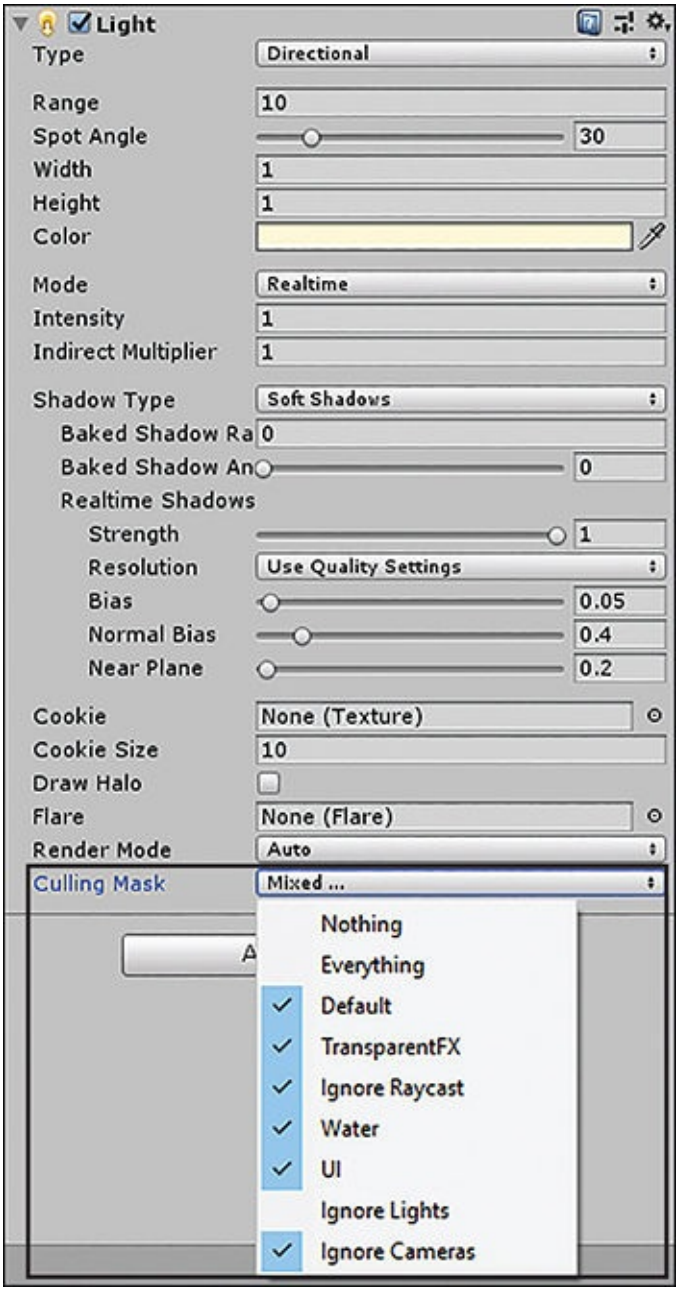

FIGURE 5.11
The Culling Mask property.

The third thing you can use layers for is to tell Unity which physics objects interact with each other. You can choose this in **Edit > Project Settings >**

Physics and look for the Layer Collision Matrix (see Figure 5.12).

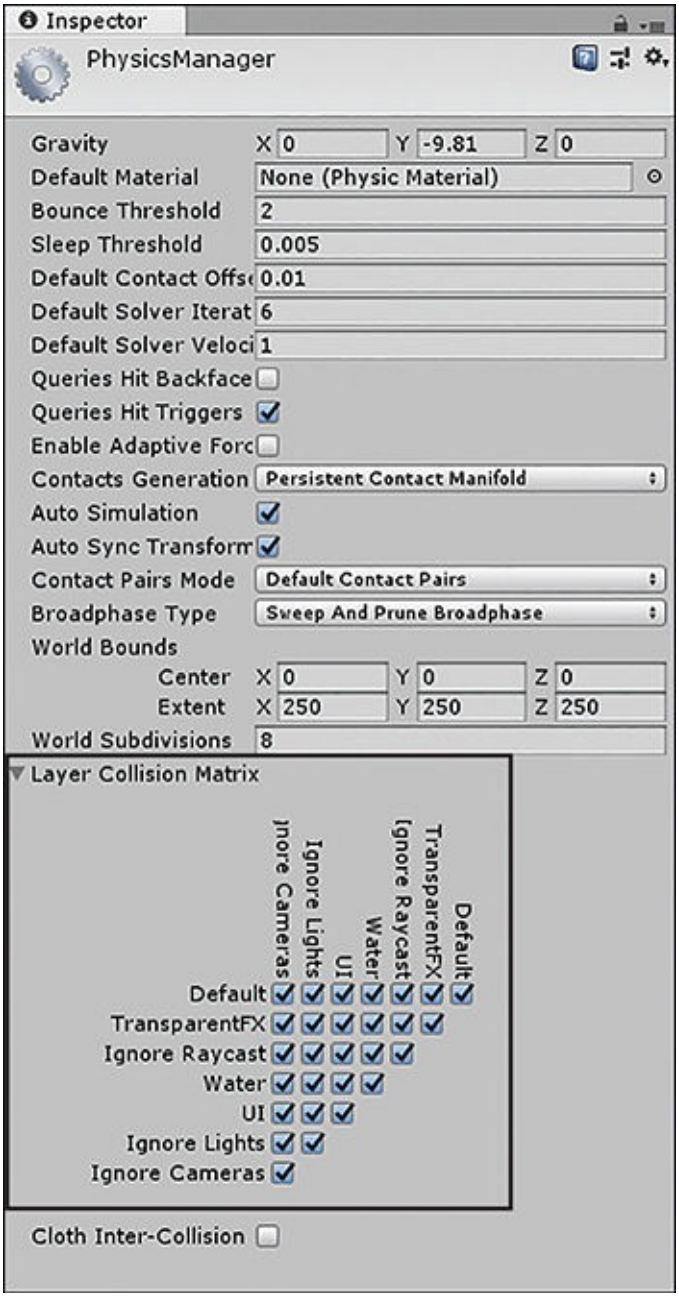

FIGURE 5.12
The Layer Collision Matrix.

The last thing to know about layers is that you can use them to determine what a camera can and cannot see. This is useful if you want to build a custom visual effect using multiple cameras for a single viewer. Just as previously described, to ignore layers, simply click the **Culling Mask** drop-down on the camera

component and deselect anything you don’t want to appear.

TRY IT YOURSELF

Ignoring Lights and Cameras

Follow these steps to briefly work with layers for both lights and cameras:

1. Create a new project or scene. Add two cubes to the scene and position them at (2, 1, -5) and (2, 1, -5).
2. Enter the Tags & Layers Manager using any of the three methods listed earlier and add two new layers: **Ignore Lights** and **Ignore Cameras** (refer to Figure 5.10).
3. Select one of the cubes and add it to the Ignore Lights layer. Select the other cube and add it to the Ignore Cameras layer.
4. Select the Directional Light in the scene, and in its Culling Mask property, deselect the **Ignore Lights** layer. Notice that now only one of the cubes is illuminated. The other one has been ignored because of its layer.
5. Select the Main Camera and remove the **Ignore Cameras** layer from its Culling Mask property. Run the scene and notice that only one nonilluminated cube appears. The other one has been ignored by the camera.

Summary

In this hour, you’ve learned about lights and cameras. You have worked with the different types of lights. You have also learned to add cookies and halos to the lights in a scene. This hour you have also learned all about the basics of cameras and about adding multiple cameras to create split-screen and picture-in-picture effects. You wrapped up the hour by learning about layers in Unity.

Q&A

Q. I noticed this lesson skipped lightmapping. Is it important to learn?

A. Lightmapping is a useful technique for optimizing the lighting of a scene.

It’s slightly more advanced, and you don’t need to know how to use it to make your scenes look great.

Q. How do I know if I want a perspective camera or an orthographic camera?

A. As mentioned in this hour, a general rule of thumb is that you want perspective cameras for 3D games or effects and orthographic cameras for 2D games and effects.

Workshop

Take some time to work through the questions here to ensure that you have a firm grasp of the material.

Quiz

1. If you want to illuminate an entire scene with one light, which type should you use?
2. How many cameras can be added to a scene?
3. How many user-defined layers can you have?
4. What property determines which layers are ignored by lights and cameras?

Answers

1. A directional light is the only light that is applied evenly to an entire scene.
2. You can have as many as you want.
3. 24
4. Culling Mask property

Exercise

In this exercise, you have a chance to work with multiple cameras and lights. You have a bit of leeway in the construction of this exercise, so feel free to be creative:

1. Create a new scene or project. Delete the directional light. Add a sphere to the scene and place it at (0, 0, 0).
2. Add four point lights to your scene. Place them at (-4, 0, 0), (4, 0, 0), (0, 0,

-4), and (0, 0, 4). Give each of them its own color. Set the ranges and intensities to create the visual effect on the sphere that you want.

3. Delete the Main Camera from your scene (by right-clicking **Main Camera** and selecting **Delete**). Add four cameras to the scene. Disable the audio listener on three of them. Position them at (2, 0, 0), (-2, 0, 0), (0, 0, 2), and (0, 0, -2). Rotate each of them about the y axis until it is facing the sphere.
4. Change the view port settings on the four cameras so that you achieve a split-screen effect with all four cameras. You should have a camera displaying in each corner of the screen taking up one-quarter of the screen's size (see Figure 5.13). This step is left for you to complete. If you get stuck, look for the completed version of this exercise in the Hour 5 book assets.

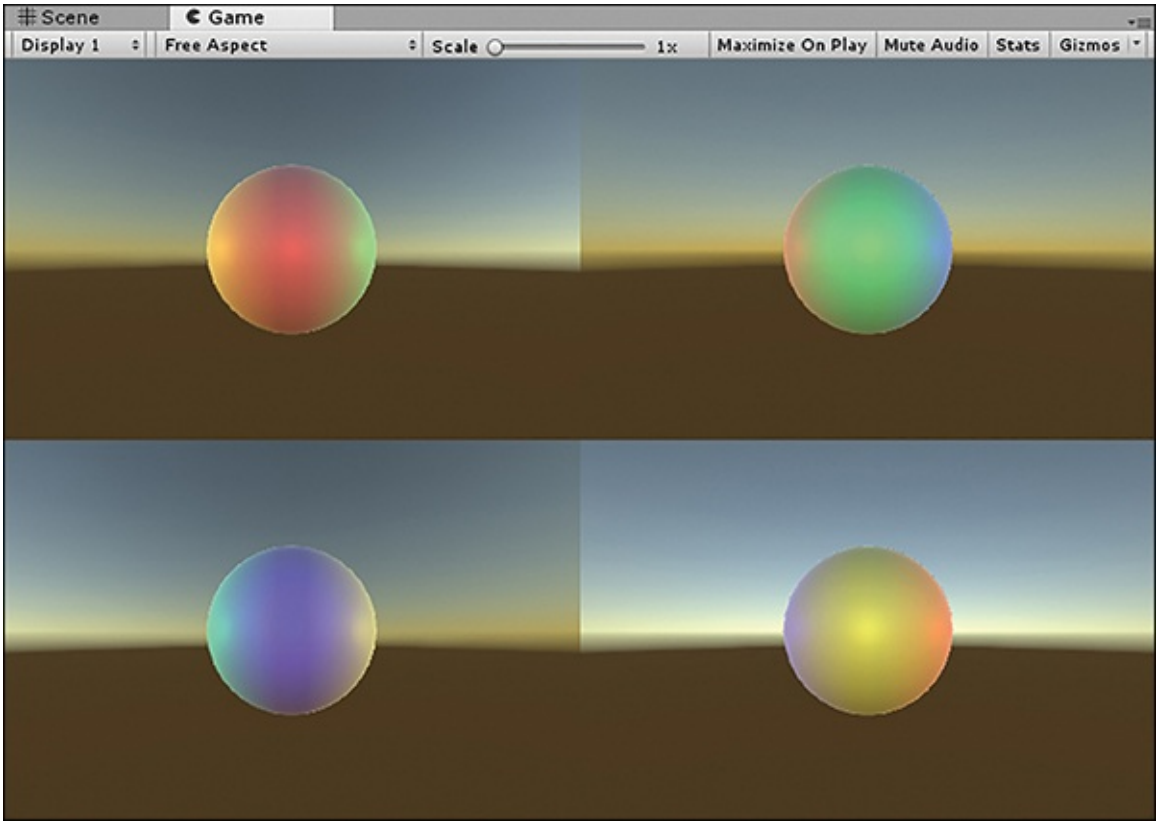

FIGURE 5.13
The completed exercise.