
PART 1 — RENDER OVERVIEW

Creating visually pleasing imagery and photo-realistic representations of 3D worlds is the ultimate goal of the rendering process. Maya's rendering environment provides what sometimes may seem like an overwhelming amount of choices, and it may be difficult to get the look you want at first. That's why Part 1 of this tutorial spells out the basics. Getting comfortable with Maya's rendering interface is the first step.

If you are familiar with Maya's rendering interface, skip Part 1 and move onto Part 2 — Using Render View/IPR... *page 13*.

- Maya's Hypershade provides various options and methods with which you can interactively tweak the visual elements of your scene.
- Using Maya's **IPR** (Interactive Photorealistic Rendering) and **Render View** provides instant feedback as you tweak scene elements such as texture placement, lighting, or special effects.

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Before you start:

This tutorial requires Maya scene files. To download the tutorial files, please visit the Taste of Maya web site at www.aliaswavefront.com/tasteofmaya.

Starting Maya:

Double-click the **Maya 3.0 Evaluation** icon on the desktop, or from **Start > Programs > Maya 3.0 Evaluation > Maya**.

In Maya:

Once the tutorial files have been installed, set the current project to access the Maya scene files. To set the current project from within Maya:

- Select **File > Project > Set** and navigate to the directory where you installed the Maya scene files.
 - Select the directory **Maya_tutorial_data** and press **OK**.
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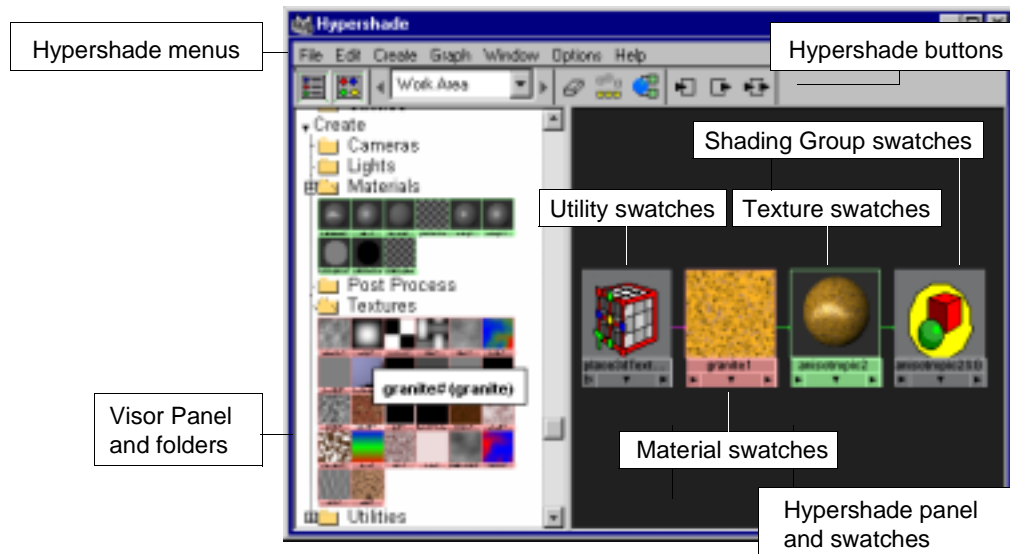
Accessing the scene files

To test what you will learn in this lesson, load **pipeSystem.ma**: This is the scene file you start with. It contains several layers of objects that compose a subterranean tunnel.

See *Part 2 — Using Render View/IPR* for more information about these layers and details about how to adjust the rendering aspects of the scene.

Rendering user interface

<p>Hypershade/Visor</p>	<p>Maya's Hypershade/Visor provides access to every element (or node) in the scene. You can assign materials (sometimes called <i>shaders</i>) and textures to selected objects, or create and place lights and special effects in a scene simply by clicking their related swatches.</p>
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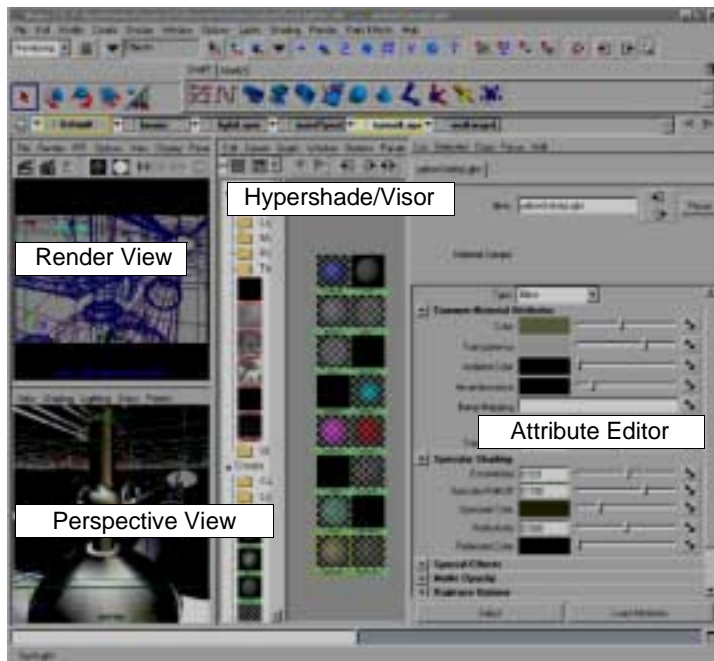


<p>Attribute Editor</p>	<p>Hypershade provides direct access to the Attribute Editor for a selected node. From this powerful editor, you can change a node's attributes by entering exact values and moving sliders. You can customize textures and colors as well as map special attributes to objects.</p>
<p>Attribute Spreadsheet</p>	<p>To change (most) multiple attributes for several nodes, use the Attribute Spreadsheet.</p>
<p>Camera Views</p>	<p>If desired, you can interactively adjust the scene in the Camera Views (top, front, right, perspective).</p>
<p>Render View/ IPR</p>	<p>Any adjustments you make can instantly display in both the views (displays <i>hardware</i> rendered results) and in the Render View/ IPR window (displays <i>software</i> rendered results).</p>

Creating a window layout for rendering

Because you consistently access various windows when setting up a scene, it is strongly recommended that you create specific layouts to suit your needs.

This sample layout displays the **perspective view**, **Attribute Editor**, **Render View**, and **Hypershade/Visor** all in one panel:



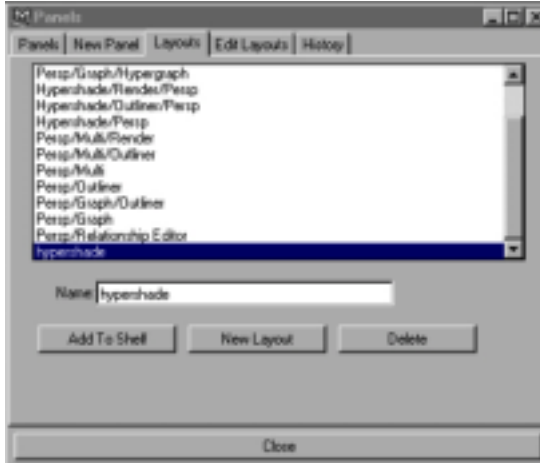
Tips

- Try to avoid detached or floating windows that can get in the way and slow you down.
- Once a layout is in place, you can quickly jump from one configuration to another by selecting a Shelf button or hotkey. See *Customize the default UI* next to find out how to create a Shelf button.
- Maya also provides pre-made layouts accessible from any view's Panel menu (**Panels > Saved Layouts**).

The following steps show you how to create this layout which works well with IPR and rendering in general.

Customize the default UI

- 1 Select **Window > Settings/preferences > Panels** from the main menu bar.
- 2 In the **Panels** window, click the **Layouts** tab.



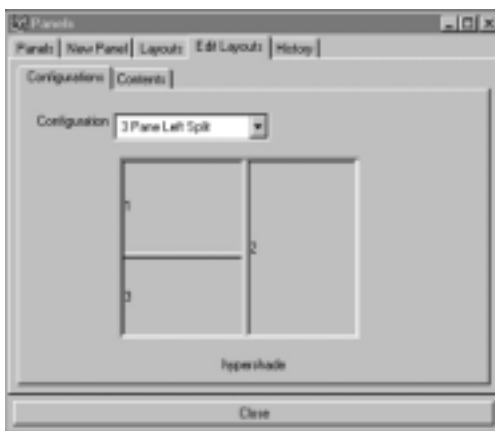
Selected Layouts tab in Panels window

- 3 Press the **New Layout** button.
- 4 In the **Name** box, rename the new layout **Hypershade/Render** and press **Enter** to validate.
- 5 Press the **Add to Shelf** button.

Tip

If you want to delete a shelf item, **MMB-drag** it to the trash can icon on the right side of the shelf bar.

- 6 Now select the **Edit Layouts** tab and choose **3 Pane Left Split** from the **Configuration** pull-down menu.



Edit Layouts tab selected in Panels window

7 Select the **Contents** tab in the **Edit Layouts** section and set the following:

- **Panel 1- Render View**
- **Panel 2 - Hypershade**
- **Panel 3 - Persp Panel**

Now when you select the shelf button, the layout changes to this configuration. You may want to create several layouts using this method.

8 Press **Close**.

Tip

Using the layout in the example, the **Outliner** can only be a floating window. If that limits your screen space, try using one of these methods:

- Create a *hotkey* that can raise and lower the Outliner.
 - Create layouts for Hypershade that replace the perspective view by the Outliner.
 - Create a layout that includes all four windows.
-

Previewing render results in Render View/IPR

Preview render results by test rendering a scene in the **Render View**, or interactively change scene elements and test render using **IPR**.

Render View window

The Render View (**Window > Rendering Editors > Render View**) displays the rendered results of the scene. You can test render a single frame to see exactly what a batch or sequenced render might look like.

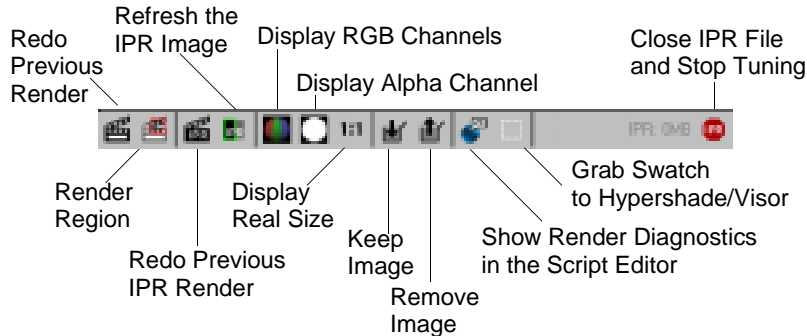
The Render View menu bar contains pull-down menus, which you can also access using the **RMB** while the cursor is in the window. Use the icons to quickly access the functions you most often use.

Render View icons

You can use the icons at the top left of the Status Line in the main window,

or

use the icons at the top of Render View to perform various operations.



Setting up to test render

Hardware texturing (rendering in a modeling view) lets you see how textures, lights, and objects look before you preview the render in Render View. The following lists offers a typical procedure you can take to set up a scene before you render in Render View.

To set up before previewing in Render View:

- 1 Click to make the perspective view active and select **Shading > Smooth Shade All** and **Shading > Hardware Texturing** from the view panel's menu bar (or press 6).
- 2 Select **Lighting > Use All Lights** from the view's menu bar.
- 3 Place lights in the scene. (The rendered result does not display in Render View unless there are lights in the scene.)

Tip

If you are new to Maya, the best light to start with is the Directional Light (**Create > Lights > Directional Light**).

- To interactively adjust the lighting before you preview, use Maya's transform tools in the view (**Move, Scale, Rotate**).
- To see an accurate preview result (even though it may take a little longer), adjust the **Resolution** and **Anti-aliasing** attributes in the **Render Globals** window. See *Part 2 — Using Render View/IPR* for details about setting these attributes.

To preview the render in Render View:

- 1 Click to focus in the view (or camera) you want to render.
- 2 From the Render View, select **Render > Redo Previous Render**, or click the **Render into a new Render View window** icon at the top-right of the main window's Status Line.
- 3 If you want to render another view, select **Render > Render** in Render View and choose the view you want to render from the pull-down menu.

Tip

Click the **Redo Previous Render** icon on Render View's tool bar if you want to re-render the same view.

The entire Render View window initializes and begin rendering in blocks.

4 Press the **1:1** button to view the image at the **Real Size**, or actual resolution.

Note

If you scale the Render View window to a size other than the actual Render Globals resolution, the image may appear aliased or jagged.

5 To render a region in Render View, marquee-drag (**LMB-drag**) a box around the part of the scene you want to render and select **Render > Render Region**.

Tip

Use **Render Region** when you test raytraced rendered effects and other rendering elements not viewable in **IPR**.

Improving the Render View quality

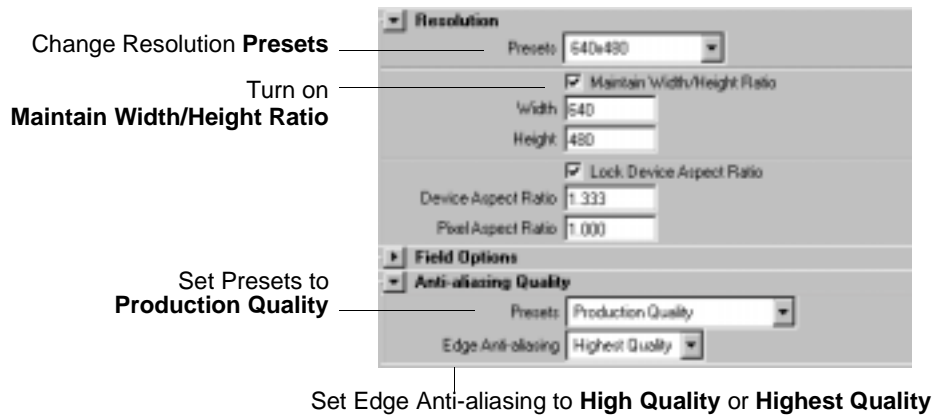
The following shows a default rendered image in Render View. Notice the quality of the result. Sometimes this can happen when you zoom in (**Alt-middle-left mouse button**) to get a better view and do not select the **1:1 (Display Real Size)** icon in Render View's status line.



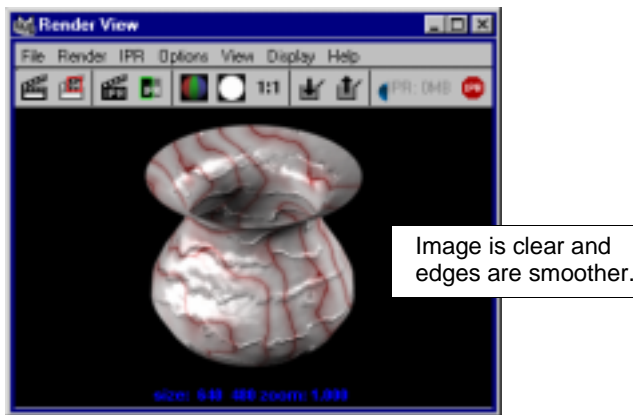
To improve the Render View quality:

When you're ready to see an accurate result of the rendered scene:

- 1 Open the **Global Attributes** window (**Window > Render Globals**) and change the following settings to your liking. Remember—the higher the quality the slower the render time.



- 2 Press the **Redo Previous Render** icon in Render View.



Tips

- When you set Render Globals attributes, even if you zoom in or out, the results are still quite accurate.
- If you place a **Resolution Gate** around the objects you want to render, only those results display in Render View.

IPR rendering

Rendering in IPR is very similar to rendering in Render View with one important difference. In addition to creating an IPR render file, IPR creates an image called a “Deep Raster” image, which contains more information than just the pixel color and matte information.

Deep Raster technology keeps track of the information that creates the pixel color, including lighting, shadows, and material definitions. When you adjust a related node, such as a light or material, only the value for that node is re-computed instead of the entire scene. This speeds up the rendering edit process and enables the “interactive” portion of IPR.

IPR advantages

Use IPR when you spend too much time testing and waiting for feedback. IPR improves on these and other time-consuming activities:

- Material attribute tweaking
- Texture placement, Color balancing, and filtering settings
- Lighting, including:
 - Placement
 - Intensity and Fall-off
 - Fog Density and Color
 - Shadow Color and Intensity
 - Light Glow and Lens Flare
- Reflection Map tweaking
- Shader to lighting and texture interactions
- 2D and 3D texture attribute tweaking

IPR limitations

For most tasks that involve repeated tweaking and rendering, IPR speeds up the process. However, there are some options that have not yet made it into IPR.

- Raytraced shadows, refraction, and reflections do not display in IPR.
- Volumetric particle rendering attributes do not update in IPR, but surface shading can be adjusted and tuned on a stand-in geometric object.
- Displacement maps, Depth of Field, and 3D motion blur do not display in the IPR deep raster-based image.

Tuning with IPR

After you establish the scene using the hardware rendered display for texture placement and rough lighting, use IPR as the next tuning tool. The following gives you a general idea of how to IPR render. Later on, you actually work with a Maya scene.

To tune the test render with IPR:

- 1 Position the perspective camera to frame the scene.
- 2 In Render View, select **IPR > IPR Render > Current(persp)**.

The entire Render View initializes and begins rendering in blocks. This creates the *deep raster* image in the **iprimages** directory of the current Maya project.

Important Note

A deep raster image can be quite large. A typical image file size for a 720 x 486 (D1) resolution IPR image can be between 45 and 100meg. Make sure you have suitable disk space and real memory. If you have limited system resources, you may want to consider working with smaller resolutions.

- 3 When the IPR render is done, Maya prompts you to select a region to begin tuning. Marquee-select a region to tune (**LMB-drag-select**).

The region you select updates. This portion of the deep raster is loaded into RAM and CACHED for quick system access. The size of the region you select determines how much system overhead is required.

- 4 In **Hypershade/Visor**, select the light or material you want to edit. The **Attribute Editor** updates to display the attributes associated with the selected item. Adjust these attributes while watching the IPR region update.
- 5 Select **Render** from the Render View window to test-render the image.

Tip

To **stop** a test render in Render View, press the **Esc** key at any time.

- Load only the object layers you edit to speed up the render.
- Choose IPR tuning options selectively. For example, if you do not plan to work on shadows or special effects like glows, make sure to turn these options off. You can globally set and control options in the **IPR** section of the **Render Globals** window, or from the Render View's **IPR pull-down** menu.
- Work at the lowest possible resolution that produces adequate feedback.



Rendered result at low resolution

Improving the IPR quality

You cannot use **Display Real Size** to zoom into the view or resize the Render View window when IPR rendering. If you do, the results are not good.

To correct this:

- 1 Zoom in or out of the camera view for which you are performing an IPR render.
- 2 Select **IPR Render Globals** from the IPR menu in Render View.
- 3 Set the attributes to give you the results you need.

Not only can you set the attributes specific to IPR rendering (**IPR Options**), you can also adjust the **Resolution** and **Anti-aliasing Quality** for the scene.

CONCLUSION

Hopefully you feel a little more comfortable with Maya's rendering workflow and are ready to move on to Part 2 where you will learn how to adjust several node attributes to get the rendered result you want.

PART 2 — USING RENDER VIEW/IPR

Using Maya's **IPR** (Interactive Photorealistic Rendering) and **Render View** provides instant feedback as you tweak scene elements such as texture placement, lighting, or special effects.

In Part 2 of this tutorial:

- IPR example... *page 14*
- Render quality settings... *page 16*
- Displaying accurate render results... *page 16*
- Anti-aliasing... *page 17*
- Render resolution... *page 18*
- Render the finished view... *page 23*



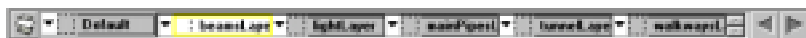
Scene files

pipeSystem.ma: This is the scene file you start with. It contains several layers of objects that compose a subterranean tunnel.

Layers

The elements used to compose **pipeSystem.ma** have been organized into layers.

- To display the layers, access the layer bar: **Display > UI Elements > Layer Bar**.
- To turn the visibility of each layer on or off, press the **RMB** on the layer button and select **Visible**.



Layers in pipeSystem.ma

Tunnel layer: The base geometry for the tunnel system which was constructed from NURBS cylinders.

Pipes layer: The pipes that run through the tunnel.

Walkway layer: This layer is composed of *instanced geometry* which are objects that have been duplicated with the instancing option set to on. Instanced geometry lets you create a base object that, when duplicated, acts as a reference. Any edits made to this base object are mirrored in the instanced copies. The walkway was created using this method, using as few objects as possible.

Light layer: Contains the lights in the scene: point, directional, and spot lights. Lighting gives the objects volume and a sense of weight.

IPR example

This scene file uses a typical setup. Your goal is to maneuver the camera around the scene, frame interesting angles, then render them. The objects are textured and the lights are roughly set up. Feel free to experiment with the textures and lighting to create your own images.



Close-up of pipes and lights



Wide view of pipes and tunnel

Open pipeSystem.ma scene file

- 1 Start Maya, then select **File > Open Scene**.
- 2 Select **pipeSystem.ma**.
- 3 Press **Open**. This file contains several objects and groups of objects:
 - tunnelGroup
 - pipesGroup
 - lightsGroup
 - walkwayGroup
 - instancedWalkwayGroup
- 4 Open the **Outliner** to view these object groups, as well as lighting and camera objects.
- 5 In the Outliner, **LMB** on the **+** sign to the left of the object name to open the nested objects (these objects may also be parents of other objects).

The **tunnel** objects have been texture mapped. To see the textures in the views:

- Press **5** for shaded display.
- Press **6** for texture-shaded.
- Press **7** for textures with lighting in the perspective view.

Note

Because these textures are very dark, you may not see much in texture mode at this point.

Important

If your system does not allow you to tumble the scene quickly, you should either restrict your viewing to wireframe, or hide some of the layers. When all layers are displayed in shaded modes, most systems without adequate graphics memory will not tumble freely.

Render quality settings

The **pipeSystem.mb** scene file renders at **Preview Quality**. When you test render this scene, notice various artifacts, such as edge-aliasing and low resolution light fog shadows.

The **pipeSystemFinish.mb** scene file's **Render Global** settings and light attributes are adjusted to create a high resolution image, called **Production Quality**. This file takes longer to test render because of the higher texture sampling and edge anti-aliasing settings.

Displaying accurate render results

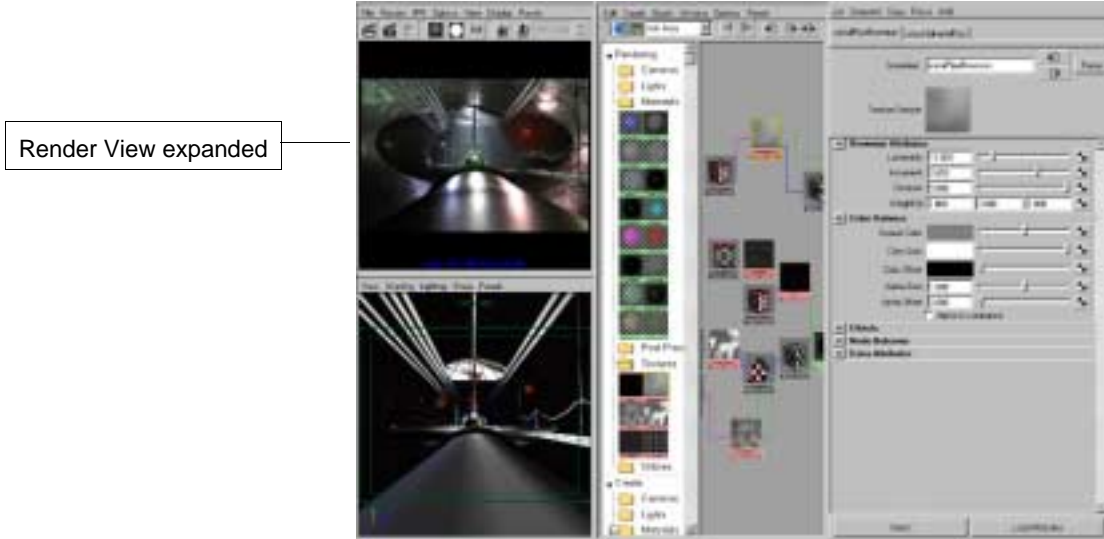
Display the rendered image at a **1 to 1** display resolution by pressing the **1:1** button in **Render View**.

Note

If you view a rendered image at a scale other than 1 to 1, artifacts display. This can make an otherwise good looking image look aliased and chunky.

Expand the Render View window:

- 1 **LMB-click** in the **Render View** window, then press the space bar to expand the window to full view.
- 2 Press the **1:1** button to scale the image to actual rendered resolution.



OPTIMIZING THE RENDERED RESULT

Anti-aliasing

Before you begin tuning with IPR, you may want to review the **Render Globals** settings, the most important of which is the *Anti-Aliasing* level.

Set the Anti-alias level

- 1 Select **Window > Render Globals**.
- 2 In the Anti-aliasing section of the Render Globals window, set **Anti-Aliasing** to **Preview Quality**. When close to testing the final result, turn the quality up to **Production Quality**.

These settings are already adjusted in the **pipeSystem.mb** file. You can re-adjust them to suit your pace and the performance of your system.

Depth Map Fog Shadows

Fog Shadow Samples are located in the **Shadows > Depth Map Shadows** section of the Attribute Editor for the light casting shadows.

Tip

Depth Map Fog Shadows can greatly increase rendering time.

Set Depth Map Shadows

- 1 In the Outliner, select each of the spot lights in the scene that cast **depthmap** shadows and have a **light fog** attached. You may need to **RMB** in the Outliner to turn on **Show Shapes**.

The following—**domeLightShape**, **northSpotShape**, and **southSpotShape**—are located under the **lightingGroup** node in the Outliner.

- 2 Adjust the **Fog Shadow Samples** attribute in the Attribute Editor to obtain a smooth look. When turned down to **15** or so, chunkier-looking fog shadows result, but the render time is faster. When ready for a finished render, turn this value up to about **70**.

Note

- You can adjust the attributes for each light in its associated Attribute Editor.
 - If you select multiple objects at one time, their associated attributes display in the Attribute Editors one-by-one. To quickly edit most multiple selected items, use the **Channel Box** or the **Attribute Spreadsheet** (**Window > General Editors > Attribute Spreadsheet**).
-

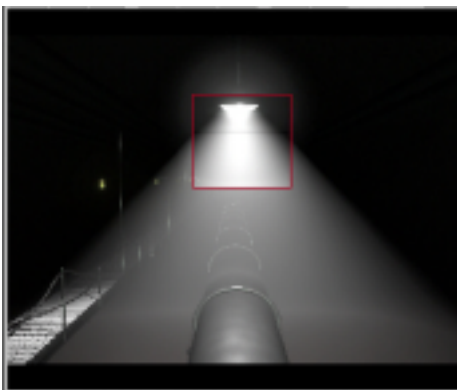
Render resolution

When rendering in Render View or IPR, its best to work at the smallest resolution yet maintain a clear enough view while working. In this scene file, the resolution is set to **720x486** or **Digital Video CCIR601**. Try the following to test render at other resolutions.

Test render at other resolutions

In **Render View**, select **Options > Test Resolutions > 50% Globals**.

The test rendering resolution for Render View and IPR is now 1/2 the current pixel **Resolution** value set in the Render Globals window. This value is adequate when working with most items in the **pipeSystem.mb** scene.



Light Fog on northSpot

Tune the Light Fog for the northSpot light

An overhead shaft at the tunnels' junction contains a spot light named **domeLight**. Light fog has been attached to this spotlight, plus it can cast depth map shadows.

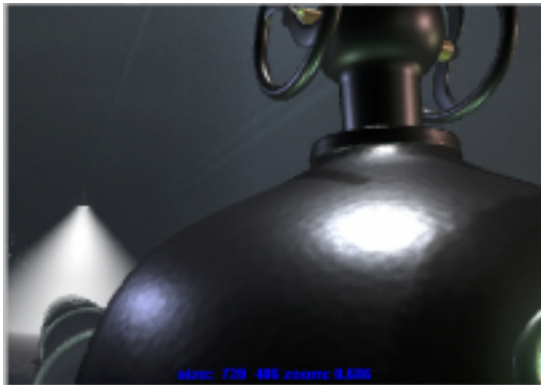
The **North** and **South** tunnels also contain these same spotlights placed mid-tunnel (named **northSpot**, **southSpot**).

- 1 Select the **northSpot** object in the **Outliner** or Hypershade's **Visor**.
- 2 Press **f** to frame the light. Pull the camera back to frame the spotlight with enough room to see the extent of the cone of light.
- 3 From the Layer Bar (**Display > UI Elements > Layer Bar**), hide the **walkway** layer. **RMB** the Layer button to turn visibility off.
- 4 Render an IPR image (**Window > Rendering Editors > Render View > IPR Render > persp**).
- 5 **LMB** drag a region to tune that includes some of the light fog.
- 6 In Hypershade/Visor, **LMB-click** the Lights folder icon to access its directory, then **LMB-select** the **northSpot** icon if it is not already selected.

In the Attribute Editor, open the **Light Fog** section under **Light Effects** and adjust these attributes. Notice the IPR image updates in the Render View.

You can also traverse the **Light Fog** attribute to the **lightFog** node by clicking the Connection Arrow Button at the right side of the attribute.

- 7 Adjust the northSpot's Intensity and the **Dropoff** to see how these attributes affect the light fog.
- 8 Select the **lightFog** tab at the top of the Attribute Editor and adjust the **Fog Color** and **Intensity**. Watch the results in the Render View.



Close-up of pipe shading

Tune the pipes shader

The pipes in this scene are shaded by the **Blinn** material. Blinn provides a realistic-looking metallic surface because it has specular highlight that you can control.

A texture is applied to provide bump and specular highlight. Since the Blinn material has been added, it can be considered a *Shader*.

- 1 Position the camera close to the central pipe so that you can see the effect of tuning the shader.
- 2 **Hide** the **walkway** and tunnel layers in the Layer Bar (**Display > UI Elements > Layer Bar**).
- 3 **Render** an IPR image.
- 4 **LMB-drag** a region to tune that includes pipes.
- 5 Select the **metalBumpPipe** material in Hypershade/Visor. To do this, in Visor's **Rendering** section, **LMB-click** the **Materials** folder and:
 - **LMB-select** the **metalBumpPipe** material.
 - **MMB-drag** the **metalBumpPipe** material from Visor to the Hypershade panel.Press the **Show Up and DownStream Connections** button at the top-right of Hypershade/Visor to display the nodes related to the shader you selected.
- 6 In the Attribute Editor, begin adjusting the **metalBumpPipe** shader's attributes.
 - Adjust the **Diffuse** attribute.
 - Notice the effect on the highlight when you change the **Eccentricity** attribute. Try changing the both the **Specular Rolloff** and Eccentricity.
 - A 3D texture controls the **Specular Color** attribute.
- 7 In Hypershade, double-click the **bump3d** node and adjust the **Bump Depth** attribute in the Attribute Editor to display clearer, more defined bumps, or smoother, subtler bumps.

A 3D Brownian procedural texture is attached to the **metalBumpPipe**.

This texture is connected to the **Bump Mapping** attribute as well as the **Specular Color** attribute. Using this simple trick, the Specular highlight follows the bump.

When you adjust the **metalPipeBrownian** texture, you also adjust both bump and specular properties.



Warning Light's shader glow and corner light lens flare

Tune the Warning Light Glow

By applying a little incandescence and a little glow to a material, you can create glowing surfaces. The walkway safety lights and the windows on the vertical pipe have this glow.

- 1 In the **Outliner**, open the **Pipes Group**, and select the **warningLight** group.
- 2 Press **f** to frame the current selection in the camera view, then position the camera to frame the warning lights and part of the pipes.
- 3 From the **Layer Bar (Display > UI Elements > Layer Bar)**, **RMB** the Layer button and turn the visibility off to hide the **walkway** and **tunnel** layers.
- 4 IPR render this view.
- 5 Select a tuning region around one of the warning lights.
- 6 Select the **yellowWarningLight** material, and:
 - In Hypershade/Visor, **LMB-click** the Materials folder icon in the Rendering section of **Visor**.
 - **LMB-select** the **yellowWarningLight** material.
 - **MMB-drag** the **yellowWarningLight** material from Visor to the Hypershade panel.
- 7 Adjust the attributes on this Blinn material. and notice the updates in IPR, especially:
 - the interaction between the Specular Color and Glow intensity
 - the role Incandescence plays in the glow

All these attributes are all inter-related and require tweaking to find the right combination. Its hard to imagine trying to juggle these attribute settings without the interactive feedback IPR provides.

Change the following and watch IPR update the changes:

- Try negative and positive values for the Eccentricity.
- Adjust the Glow Intensity (under the Special Effects section of the material's Attribute Editor).
- Change the Color of the material.

Tune the Lens Flare on the corner PointLight

The blue corner safety light has an associated Lens Flare. Adjust these attributes while watching the IPR render results.

- 1 In the Outliner, select the **cornerPointBlue** light, and press **f** to center the camera's center of interest on this object.
- 2 Position the camera back from this light to ensure the lens flare is caught by the camera.
- 3 Render an IPR image.
- 4 Adjust the attributes listed under the **cornerPointBlueShape** tab of the Attribute Editor.
- 5 The **Light Glow** attribute (in the Light Effects section) has a connected node called **opticalFX1**. Press the box at the right of the Light Glow attribute to access this node's attributes.
- 6 The **opticalFX1** node contains several attributes associated with Lens Flare, Halo, and Glow. Experiment with these values and watch the IPR results.

Note

Because the **Halo Type** pull-down menu is set to **None**, a halo effect does not display on this light and the attributes associated with Halo have no effect.

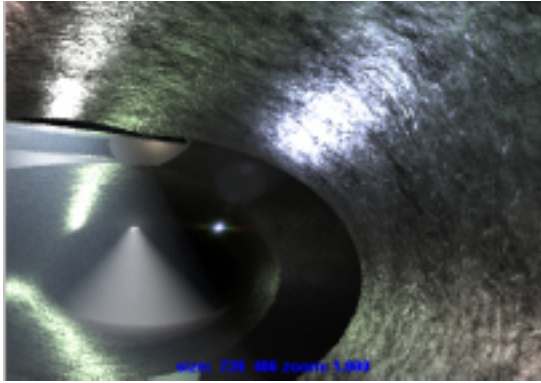
Tune the Tunnel Highlight

- 1 In the Layer Bar, turn the visibility on for **tunnel**.

Using the same workflow, select and tune the **tunnelWallBlinn** material. This material is connected to the tunnel surfaces and contains more interesting texture and material applications.

To achieve the look of a bumpy slimy surface, several techniques are used for this shader. For instance, the way in which this surface treats specularity defines most of its appearance.

- 2 For the **tunnelWallBlinn** material, render in IPR, then adjust the specular attributes for **Eccentricity** and **Specular Roll Off**.
- 3 Adjust the **Bump** through several points:
 - for the **tunnelStencil** node, adjust the **Mask** attribute
 - for the **tunnelBump** node, adjust the **Bump Depth**
- 4 For the **tunnelBrownian** node, adjust the **Specular Color** from **Color Balance > Color Gain**.



IPR view of tunnel highlight, pipes and walkways hidden



Finished render of all elements

Render the finished view

Now that you have tuned some of the scene, use Render into Render View to render the scene (check to see how the IPR edits stand up to the final render).

- You may want to tweak the attributes in the **Render Globals** window to increase the **Anti-aliasing level**.
- Turn the **Fog Shadow Samples** attributes on the lights that cast shadows back up to about **80** to produce smooth **depth map** fog shadows.
- You can also open the **pipeSystemFinish.mb** file which shows pre-adjusted **Production Quality** settings.

Test rendering in Maya using two methods

In summation, both these methods have strengths and weaknesses, but together they provide accurate and fast feedback on the final look of the rendered scene.

- **Render into Render View:** Test-renders the selected camera regions after each tweak. When test-rendering a Ray Traced scene, use this method to see how reflections, raytraced shadows, and refractions display, and to test 3D motion blur.
- **IPR:** Renders an IPR deep raster file and provides fast interactive updates for each attribute or interactive adjustment. Use this method when tweaking materials, lights, depth map shadows, shader glow, lighting glows, and optical fx-like lens flare as well as 2D motion blur.

CONCLUSION

The fastest part of a renderer is how quickly you can make a decision about the scene. Regardless of the power available to perform the final render, waiting to see the results of a complex and interdependent shader or lighting setup can be frustrating. By viewing the adjustment in almost real-time, there are fewer test renders, especially when you are just getting started. This greatly increases a project's turn-around and quality tests up-front.