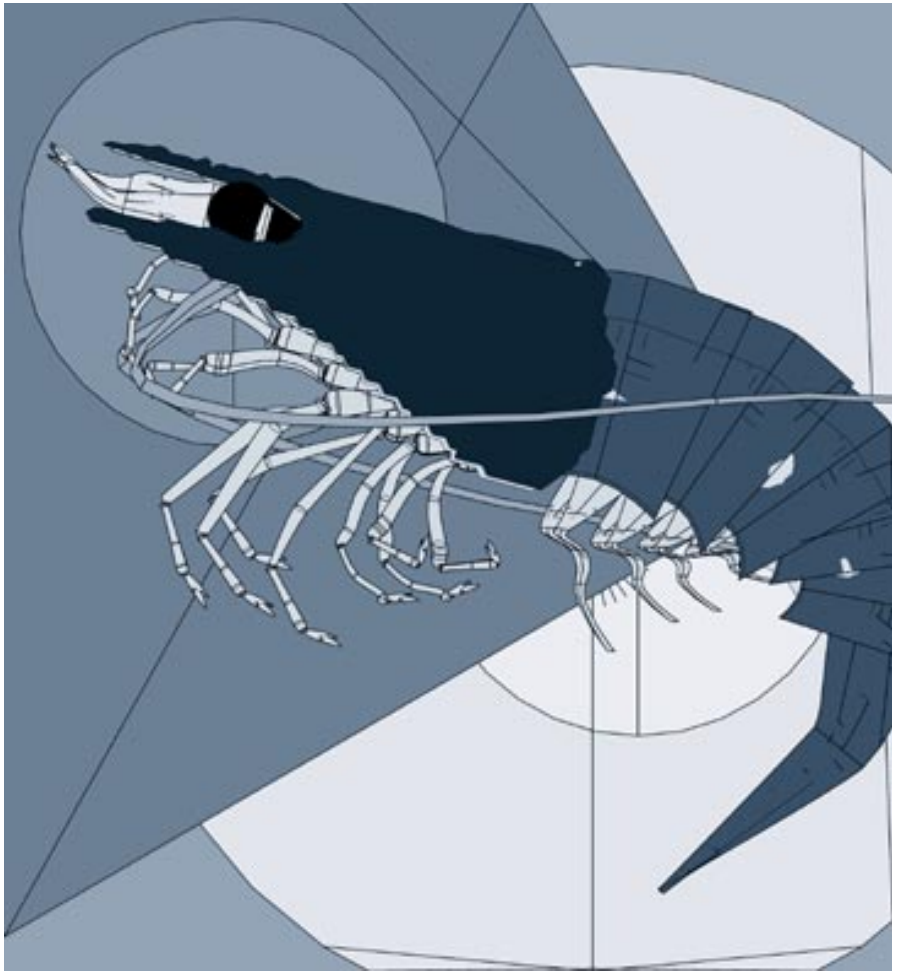

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Rendering

About Rendering

Rendering is the process of capturing a view of your three-dimensional scene and saving it as a 2D image. An image has to be rendered before you can print it or open it in an image editing or page-layout program.

Ray Dream's rendering process can create photo-realistic images because it considers all of the objects in a scene simultaneously and calculates not just forms, color, and texture, but the interaction of lights and surfaces within the scene.

Since your scene exists in three dimensional space you can take any number of renderings of it—from different angles and even with different lighting conditions. If you created an object in a 2D drawing program and wanted to look at it from another side, you would have to

redraw the object. In Ray Dream Studio 5, you simply move the camera to another view and re-render the scene.

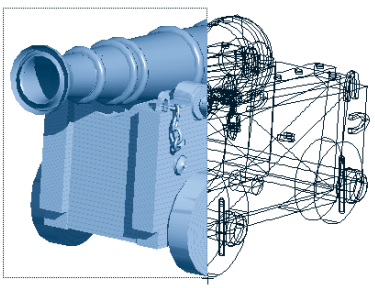
A rendering is a separate file and is stored on disk in a different format. Ray Dream Studio lets you save renderings in many popular image formats: PICT and EPS (Macintosh only), Windows Bitmap (BMP), TIFF, Adobe PhotoShop, and others. You can print your renderings, open them in an image-editing program, or place them into virtually any application.

The G-Buffer is a special feature of Ray Dream Studio 5 that allows you to include special information in data channels that are saved with the rendered image. These channels can be manipulated in an image editing program to create special effects.

The Rendering Procedure

When you've built a scene, set lights, and chosen a viewpoint, you are ready for rendering. You'll probably render your scene several times—the first couple of renderings will be low resolution proofs, so you can check your work.

You can also use the **Render Preview** tool to marquee an area of your scene and ray trace it directly in the **Perspective** window.



Use the Render Area tool to see how areas of object will appear rendered.

At each proof stage, you may want to change your Rendering Settings, depending on the image aspects you want to check. For example, if you just want to look at the objects, you might use the Draft Z-Buffer. Or if you're concerned only with shading and shadows, you might turn off the other ray-tracing options, like reflections and transparency, which add to rendering time.

Then, after correcting anything that didn't turn out as expected, you can generate the final, high resolution rendering.

An Overview

Before you produce a rendered image, you'll need to complete the following steps:

1. Arrange the objects in the scene. Refer to "Arranging Objects" on page 223 and "Building a Scene" on page 251 for additional information. Apply shaders to give the objects interesting surfaces. Refer to "Shading Objects" on page 181 for more on shading.

2. In the **Perspective** window, add lights to illuminate the scene. Refer to "Setting Lights" on page 271.

3. Set your rendering options using the tabs in **Scene Settings** window. Options include a choice of renderers, rendered image size, file format, and post-render filters for special effects. These features are described later in this chapter.

4. Display the production frame and adjust the position and settings of the camera to frame the view of the scene you want rendered. Refer to "Framing Your Scene" on page 361.

5. Adjust Ambient Light, Background, and Atmospheric settings. See "Ambient Light" on page 271 for setting ambient

light. See "Backgrounds and Backdrops" on page 345 for background and atmosphere.

Note: These options do not apply to the Natural Media renderer.

6. Once you have verified that all settings are correct, you can start the rendering with one of the **Render** commands.

Setting up to Render

Ray Dream Studio offers a number of options and settings for controlling rendering. To get the rendering results you want, you'll need to make several choices and adjustments.

Your choices will be based on your expectations—whether you're creating a draft rendering to check the objects, rendering final artwork, or rendering an animation.

Rendering Preferences for Individual Objects

Each object has two preferences that instruct the ray tracer (and Adaptive renderer) how to deal with it. These preferences concern reflection and refraction, and you'll only need to change them if you want the renderer to deal with a particular object differently.

To set an object's rendering preferences:

1. Select an object.
2. Display the **Properties palette: Rendering tab**.
3. Use the **Reflection Feature** pop-up to set whether or not this object is reflective—**No Reflections** or **Ray-traced Reflections**.
4. If this object does show reflections, set the **Reflection Feature controls: Maximum depth** value to limit the number of ray reflections.

   If two reflective surfaces face each other, the rays would bounce back and forth between them indefinitely. The Maximum depth value sets the number of bounces before the renderer stops.
5. Use the **Refraction Feature** pop-up to set whether or not this object is refractive—**No Refractions** or **Ray-traced Refractions**.
6. If this object does refract, set the **Refraction Feature controls: Maximum depth value** to limit the number of refractions.

   If multiple refractive objects align, the rays would bend from one to the next, through all objects. This would take an exceedingly long time to render and wouldn't contribute to image quality. The Maximum depth value sets the number of refractions before the renderer stops.

Render Preferences

You can select certain rendering options as defaults so they will be set in every new scene.

To set rendering default preferences:

1. Choose **File menu▸ Preferences**.
2. Choose **Render Features** from the main pop-up.
3. Use the pop-ups to choose default settings for **Shadows**, **Reflections** and **Transparency**.

Scene Settings

The **Scene Settings** window provides four tabs for controlling rendering: **Renderer**, **Effects**, **Filters** and **Output**.

After you have made all of your selections in this dialog, click **OK** to save these settings with your scene.

To display the Scene settings window:

Choose **Windows menu▸ Scene Settings** for *filename*. Where *filename* is the name of your scene.

The following sections describe the features of the **Renderer**, **Effects**, **Filters** and **Output** tabs.

Renderers

Ray Dream Studio offers four rendering engines to choose from: **Adaptive**, **Draft Z-Buffer**, **Ray Tracer** and **Natural Media**. Each has an advantage when you're looking for a particular result.

- The Draft Z-Buffer is an excellent choice for fast proofing. The quality it produces is similar to that of Better Preview mode in the **Perspective** window.
- The Ray Tracer calculates the effects of light rays from your light sources as they encounter the objects in your scene. Ray tracing shows most of the "real world" lighting effects, including transparency, shadow, reflection, and bump maps.
- The Adaptive renderer adapts the rendering method for different regions of the scene. It uses ray tracing where it's required for bump maps, reflections, shadows, etc. And it switches to an accelerated A-Buffer renderer for other regions. The Adaptive renderer produces anti-aliased edges on objects.
- The Natural-Media renderer, based on technology licensed from ThinkFish Productions Inc., produces interesting, stylistic renderings of the scene. In general, the renderings produced by the Natural Media renderer have a more hand-drawn style than typical 3D images.

To choose the renderer you want to use:

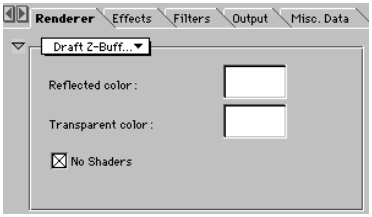
1. Display the **Scene Settings window: Renderer tab**.
2. Choose the renderer you want from the pop-up.

   The panel updates to show the options for this rendering engine.

To set Draft Z-Buffer options:

1. Click on the **Reflected color** chip to select the reflection color.

   The reflected color appears in all areas that would show reflections in ray tracing.



Use the Draft Z Buffer to create fast renderings of your scene.

2. Click on the **Transparent color** chip to select a transparency color.

   The Transparent color appears in all areas that would show transparency in ray tracing.

3. Enable the **No shaders** option if you want to see the objects without their applied shaders. A solid-colored approximation of the object is used instead, which greatly reduces rendering time.

To set Adaptive renderer options:

1. Enable the **Shadows** option to render shadows.
2. Enable the **Reflections** option to render reflections on reflective surfaces.

3. Enable the **Bump** option to render bump effects on objects.

4. Enable the **Transparency** option to render transparent objects.

5. Enable the **Refracted transparency** option to render refraction effects through transparent objects.

6. Enable the **Light through transparency** option to render lighting effects through transparent objects.

7. Click a radio button to choose the level of **Anti-aliasing** you want—**None**, **Edges** or **Better**. **Edges** anti-aliases the edges of objects only. **Better** anti-aliases the entire image.

8. Adjust the **Silhouette Quality** slider to set the accuracy for the edges of objects.

Note: Increasing **Silhouette Quality** increases RAM requirements.

9. Adjust the **Maximum Ray Depth** slider to set a limit on the number of interactions allowed for rays that reflect or refract.

Note: You can limit ray depth for individual objects. For details, refer to "Rendering Preferences for Individual Objects" on page 341.

To set Ray Tracer options:

1. Enable the **Shadows** option to render shadows.

2. Enable the **Reflections** option to render reflections on reflective surfaces.

3. Enable the **Bump** option to render bump effects on objects.

4. Enable the **Transparency** option to render transparent objects.

5. Enable the **Refracted transparency** option to render refraction effects through transparent objects.

Reflectiveness, transparency, refraction and bump are shader characteristics. You'll apply shaders to develop these effects on particular objects. refer to Appendix 10, "Shading Objects".

6. Enable the **Light through transparency** option to render lighting effects through transparent objects.

7. Click a radio button to choose the level of **Adaptive Oversampling** you want—**None**, **Fast** or **Better**.

   Adaptive oversampling renders at a higher resolution, then resamples the picture to produce a smoother, anti-aliased image.

8. Adjust the **Silhouette Quality** slider to set the accuracy for the edges of objects.

Note: Increasing **Silhouette Quality** increases rendering time and RAM requirements.

9. Adjust the **Maximum Ray Depth** slider to set a limit on the number of interactions allowed for rays that reflect or refract.

Note: You can limit ray depth for individual objects. For details, refer to "Rendering Preferences for Individual Objects" on page 341.

The Natural-Media Renderer

The Natural-Media renderer uses the LiveStyles technology from ThinkFish Productions Inc. Ray Dream includes several LiveStyles for you to choose from. You can find out more about LiveStyles and purchase additional LiveStyles from ThinkFish at http:\\www.thinkfish.com

To set Natural Media renderer options:

1. Use the pop-up to choose the rendering style you want.

2. Adjust the sliders and set your other options to control the effect.

3. When you've changed object position or geometry in the scene, click the **Update Geometry** button.

   Ray Dream Studio rebuilds the preview with the new scene data.

Miscellaneous Renderer Settings

The **Scene Settings window: Renderer tab: Miscellaneous** control has two advanced options.

- Enable the **Enable SMP** option if you have a multi-processor computer and you want to use multi-processing for rendering.

  If your computer has only one processor, this option is not available.

- Enable the **Enable Field Rendering** option if you are rendering an animation for video and you want to render the interlaced fields separately.

Note: If you use field rendering, you should choose 60 fps (NTSC) for the rendering frame rate.

Render Effects

Ray Dream Studio 5 provides some environment options to help complete the appearance of your scene in renderings. These options include **Ambient Light**, **Atmospheres**, **Backgrounds** and **Backdrops**.

For setting ambient light, refer to "Ambient Light" on page 271.

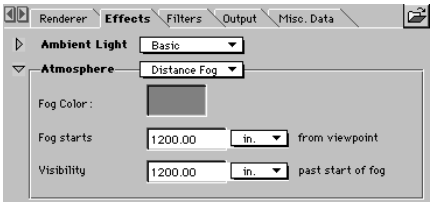
Atmosphere

Ray Dream Studio 5 offers two types of fog effects: **Distance Fog** and **Cloudy Fog**.

- **Distance Fog** produces an effect like a haze, which is more apparent across greater distances. This fog has uniform density.
- **Cloudy Fog** produces an effect that simulates the irregular "clumping" of clouds.

Atmospheric effects are only visible in the final rendered image.

To use the Distance Fog:



You can use the Distance Fog to add depth to your rendered scene.

1. Display the **Scene Settings** window. Choose **Windows menu▸ Scene Settings** for filename.

2. Display the **Scene Settings: Effects tab**.

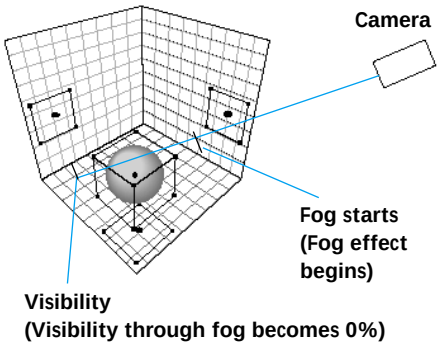
3. Choose **Atmosphere pop-up: Distance Fog**.

   Ray Dream Studio displays the **Distance Fog** controls.

4. Click the **Fog Color** chip to set its color. Ray Dream Studio opens the system color picker so you can choose a color.

5. Enter the **Fog Starts** distance.

This is the distance from the camera where the fog begins.



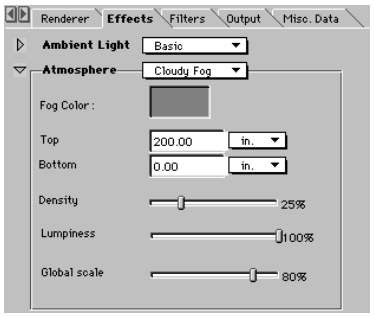
Distance fog range is set in relation to the position of the camera.

6 Enter the **visibility** distance.

This is the distance beyond the start of the fog where it becomes so thick that visibility becomes zero.

The results of these settings will be visible in the final rendering. You may return to these settings, make changes, and render again.

To use Cloudy Fog:



Use Cloudy Fog to create clumps of clouds in your scene.

1 Display the **Scene Settings** window. Choose **Windows menu▸ Scene Settings** for *filename*. Where *filename* is the name of your scene.

2 Display the **Scene Settings: Effects tab**.

3 Choose **Atmosphere pop-up: Cloudy Fog**.

4 Click the **Fog Color** chip to set its color. Ray Dream Studio opens the system color picker so you can choose a color.

5 Enter values for **Top** and **Bottom**.

These values define the vertical range (along the Z axis), where fog appears. When you're setting this option keep in mind that altitude Z=0 runs through the center of the **Working Box** when the **Working Box** is in its default position.

6 Set the **Density** slider.

Density determines fog thickness.

7 Set the **Lumpiness** slider.

Lumpiness determines how much the fog clumps together.

8 Set the **Global Scale** slider.

Global Scale determines the spacing between the wisps of fog.

The results of these settings will be visible in the final rendering or when you render an area with the Render Preview tool. You can return to these settings, make changes, and render again.

Backgrounds and Backdrops

When you render your scene, regions where there are no objects are considered background areas. By default, these areas appear white in the renderings. Ray Dream Studio offers two features for filling in the space between objects—background and backdrop.

Background

The background gives you control over the scene environment. The background is sometimes called an environment map.

During rendering, the background is projected on the inside surface of a giant sphere that surrounds your scene. Any region of a rendering not occupied by an object will show the background. The background is also the environment reflected by reflective objects.

Note: See the next section on the backdrop for another method of filling areas not occupied by objects.

You may choose the type of background you want: **Image**, **movie**, **color**, or **bi-gradient**. The background is only visible in your final image.

An isometric camera cannot record a Background. If you are using an isometric camera for your final rendering, you must use a Backdrop instead.

To use a Reflected Background:

1. Display the **Scene Settings** window. Choose **Windows menu▸ Scene Settings** for *filename*. Where *filename* is the name of your scene.
2. Display the **Scene Settings: Effects tab**.
3. Choose the type of background you want from the **Background** pop-up.

None creates no background in the scene. The background areas appear white in the final rendered image.

Bi-gradient creates a paired gradation for the background. This is an easy way to create a sky and horizon. Bi-gradient controls are covered in "Bi-Gradient Controls" on page 347.

Map uses a bit-mapped image file as the background. This is the best choice when you want specific imagery in reflections. How to load an image as a map and map controls are covered in "Map Controls" on page 348.

Color sets a solid color as the background. Open the controls and click the color chip to choose a color.

Formula creates a color pattern from a formula. You can devise your own formula to create a new pattern. For more information on **Formula** controls, refer to "Formula Controls" on page 347.

Movie uses a sequence of images in the background. This option only makes sense when you are creating an animation. How to load a movie and movie controls are covered in "Movie Controls" on page 349.

Backdrop

The backdrop is a 2D image placed behind your scene. The backdrop appears in regions of the rendering where there are no objects.

The backdrop does not appear in reflections or interact with the lighting.

You might want to use both a backdrop and a background. In this case, Ray Dream Studio uses the background for the reflection environment and places the backdrop behind the objects.

To use a backdrop:

1. Display the **Scene Settings** window. Choose **Windows menu▸ Scene Settings** for filename.
2. Display the **Scene Settings: Effects tab**.
3. Choose the type of backdrop you want from the **Backdrop** pop-up.

   None creates no backdrop in the scene.

   Bi-Gradient creates a paired gradation for the backdrop. **Bi-Gradient** controls are covered later in this chapter.

   Map uses a bit-mapped image file as the backdrop. This is the best choice when you want specific imagery behind your

objects. How to load an image as a map and map controls are covered later in this chapter.

Color sets a solid color as the backdrop. Open the controls and click the color chip to choose a color.

Formula creates a color pattern from a formula. You can devise your own formula to create a new pattern. For more information on **Formula** controls, refer to "Formula Controls" on page 347.

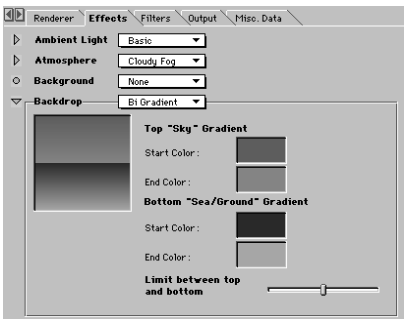
Movie uses a sequence of images in the Backdrop. This option only makes sense when you are creating an animation. How to load a movie and movie controls are covered later in this chapter.

Bi-Gradient Controls

To use a bi-gradient for the background or backdrop:

1. Choose **Bi-Gradient** from the pop-up where you want to use it—**Background** or **Backdrop**.

2. Click the **plus**/**arrow** icon to display the **Bi-Gradient** controls.



Use the Bi-Gradient controls to set up a simple two color backdrop.

3. Select colors for the **Top** ("Sky") and **Bottom** ("Sea/Ground") **Start** and **End** colors.

   Click the color chip and use the system color picker to select a color.

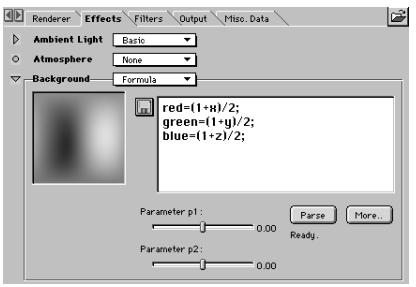
4. Adjust the **Limit between top and bottom** slider to control the height of the horizon.

Formula Controls

To select a formula for the background or backdrop:

1. Choose **Formula** from the pop-up where you want to use it—**Background** or **Backdrop**.

2. Click the **plus**/**arrow** icon to display the **Formula** controls.



The Formula controls let you create a backdrop mathematically.

3. If the current formula uses the **Parameter** sliders, you can adjust them to change the formula result.

4. To load a new formula, click the disk icon.

   Use the **Open** dialog to locate and open an appropriate formula. You can find sample formulas in the **Ray Dream Studio CD: Samples: Formulas** folder.

The formulas for a Background or Backdrop differ. Remember the Background is projected onto a sphere, so it uses a 3D system. The Backdrop is rectangular, so it uses a 2D system.

5. If you want to edit the formula or create your own, click **More** to open the **Formula Editor**.

   Ray Dream Studio uses the **Formula Editor** in several places. Use of the editor is common, but the type of formula you're creating determines the valid input and output variables. Refer to the *Using Formulas in Ray Dream Studio 5 PDF* for details on using the **Formula Editor**.

   Formula editing becomes technical quickly. You can learn a lot by loading the sample files.

6. When you're done with the **Formula Editor**, click **OK**.

7. To save a formula, press on the disk icon and choose **Save As** from the pop-up.

8. Use the **Save** dialog to name the file and select a disk location.

Map Controls

The tools and methods for using a map are the same for the background or backdrop.

Ideally, images for the background should have an aspect ratio of 2:1 (twice as wide as they are tall).

Images for the backdrop should have the same aspect ratio as the final rendering and be equal or greater in resolution. You can set the final rendering image size in the **Scene Settings window: Output tab: Image Size** control.

To select a map for the background or backdrop:

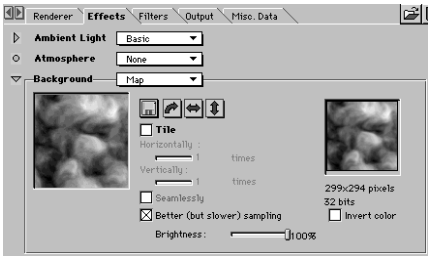
1. Choose **Map** from the pop-up where you want to use it—**Background** or **Backdrop**.

2. Click the **plus/arrow** icon to display the **Map** controls.

3. Click the disk icon. Ray Dream Studio displays the **Open** dialog.

4. Locate and open a bitmapped image file.

   When you've opened an image, a preview appears in the left panel.



The Map controls let you use an imported image as backdrop.

5. You can click the directional buttons to change the image's orientation.

6. You can reduce the image's brightness with the **Brightness** slider.

7. Enable the **Better (but slower) sampling** option to get cleaner results in your rendering.

8. Enable the **Invert Color** option if you want to invert the image's colors.

9. If you want the image to repeat, enable the **Tile** option. The tiled image appears in the right preview.

10. Use the **Horizontally** and **Vertically** sliders to set the number of tiles in each direction.

11. Enable the **Seamlessly** option to tile the image without visible seams between tiles. Ray Dream flips adjacent tiles vertically and/or horizontally as necessary to avoid seams.

You can apply a filter to the map. For more information, refer to Chapter 18, "Post Production."

Movie Controls

To select a movie for the background or backdrop:

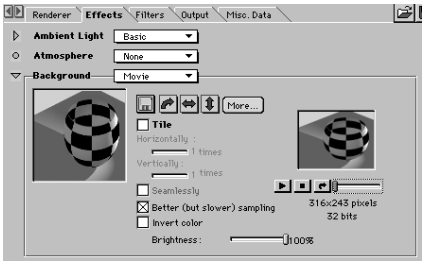
1. Choose **Movie** from the pop-up where you want to use it—**Background** or **Backdrop**.

2. Click the **plus**/**arrow** icon to display the **Movie** controls.

3. Click the disk icon. Ray Dream Studio displays the **Open** dialog.

4. Locate and open a movie file.

When you've opened a movie, a preview appears in the left panel, and a preview player appears in the right.



Use the Movie Controls to import a movie as a backdrop.

5. You can click the directional buttons to change the movie's orientation.

6. You can reduce the image's brightness with the **Brightness** slider.

7. Enable the **Better (but slower) sampling** option to get cleaner results in your rendering.

8. Enable the **Invert color** option if you want to invert the movie's colors.

9. If you want the movie to be tiled, enable the **Tile** option. The tiled movie appears in the right preview.

10. Use the **Horizontally** and **Vertically** sliders to set the number of tiles in each direction.

11. Enable the **Seamlessly** option tile the image without visible seams between tiles. Ray Dream flips adjacent tiles vertically and/or horizontally as necessary to avoid seams.

12. You can get more information on this movie by clicking More.

    Ray Dream Studio opens a window that provides technical information and a larger movie preview player.

Use the Movie Time Selection dialog to review additional information about your movie.

Render Filters

The render filters create special effects in the image after it has been rendered. Actually, they're post-render filters.

The filters include lens effects that simulate the results obtained from photographic cameras and special lighting effects.

To apply a render filter:

1. Display the **Windows menu▸ Scene Settings window: Filters tab**.
2. Click the **Plus** button.

Ray Dream Studio displays a dialog with a list of the available post-render filters.

3. Select the filter you want to apply. Click **OK**.
4. In the **Filters tab**, set the options for the filter.

The options for each filter are described in the next section.

The Visible Light and Lens Effect filters can be enabled or disabled on a light-by-light basis. So you can turn the filters on/off for specific lights.

To apply a render filter on a light-by-light basis:

1. Display the **Windows menu▸ Properties palette: Miscellaneous tab**.
2. Click the **Plus** button.

Ray Dream Studio displays a dialog with a list of the available post-render filters.

3. Select either **VL LIght Control** or **PLP Light Control** and click **OK**.
   - Use **VL Light Control** enable/disable the Visible Light render filters: LIght Cone and Light Sphere.
   - Use **PLP Light Control** to enable/ disable the Lens Effect render filters: Depth of Field, Lens Flare, CrossScreen, Glow, Nebula, Pulsator, Stars, VariCross.
4. In the **Miscellaneous tab**, use the popup to enable or disable the effect.

Note: Although you can enable/disable filters on a light-by-light basis, the settings you specify for the render filter are global for any given scene. All lights for which a given filter is enabled will use the same settings.

Animating Filters

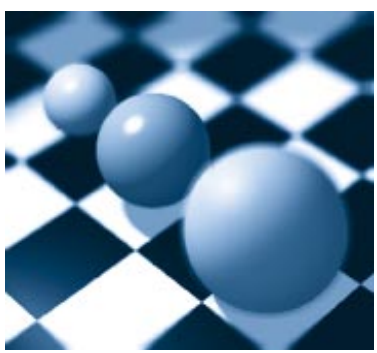
All of the filters have settings that you can change to create key events. The results of animating filters can be dramatic. For example, by animating the Depth of Field filter, you can have the camera focus on the foreground, then gradually move its focus to a background object over the course of the animation.

To do this, you need to set the Depth of Field focus (on the foreground) in the first frame, then move later in time and set the Depth of Field focus (on the background) to create a key event. You can change the tweener to modify the focus transition—have it accelerate, for example.

All of the effects can be animated in this way. Most of them have several settings you can animate.

Depth of Field

The Depth Of Field filter simulates the lens of a real life camera. The Depth Of Field filter post-process-es the rendered picture by blurring the objects according to their distance from the rendering camera.



Depth of Field filter simulates the type blur you'd see on objects that are not in focus.

Depth of Field is a post-render filter. It does not change the rendering camera itself.

Note: Normally, every object appears in focus regardless of its distance from the camera.

You can also select or design your own lens to change the depth of field range from macrophoto to telephoto.

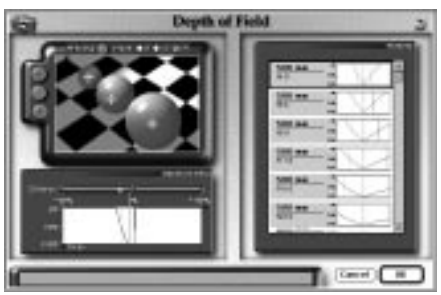
To set Depth of Field options:

1. Click one of the radio buttons to chose the preview quality:

   x1 high quality (slower)

   x2 normal quality

   x4 low quality (faster)



Use the Depth of Field controls to set the focus object and the range of the effect.

2. Click **Preview** to generate a preview of your scene.

   This takes a few moments.

3. Click the red cross button to select the tool for setting the plane of focus.

4. Click in the preview on the object that you want to be in focus.

   Ray Dream Studio puts a red cross on the point where you click and sets this distance as the plane of focus.

5. Set the range for the depth of field. You have three options to do this:

   - By using the blue and green crosses and clicking in the preview
   - By dragging sliders on the blue and green **Distance** sliders on the graph
   - By choosing a preset

To use the click tools:

1. Click the green cross button to select the tool for setting the foreground out-of-focus plane.

2. Click in the preview on the foreground object that you want to be 50% out-of-focus.

Note: You cannot select a foreground object that is behind the in-focus object.

   Ray Dream Studio puts a green cross on the point where you click, sets this distance as the plane of 50% out-of-focus, and updates the Depth Of Field curve.

3. Click the blue cross button to select the tool for setting the background out-of-focus plane.

4. Click in the preview on the background object that you want to be 50% out-of-focus.

Note: You cannot select a background object that is in front of the in-focus object.

   Ray Dream Studio puts a blue cross on the point where you click, and sets this distance as the plane of 50% out-of-focus, and updates the Depth Of Field curve.

To use the Distance sliders:

Note: You must set the plane of focus with the red cross when using the sliders.

1. Drag the blue slider on the **Distance** bar to set the distance of the 50% out-of-focus background plane.

   If you want background objects to stay in focus, move the blue slider all the way to the right.

2. Drag the green slider on the **Distance** bar to set the distance of the 50% out-of-focus foreground plane.

If you want foreground objects to stay in focus, move the green slider all the way to the left.

To use a Depth of Field preset:

You must set the plane of focus with the red cross when using a preset curve.

1. On the right side of the panel, click the graph describing the **Depth of Field** you want.
2. Use the scroll bar to view more choices.

Dots Per Inch (DPI) and Depth Of Field

In natural photography, depth of field is closely connected to film resolution and size. The smaller the film the more the out-of-focus objects are blurred. The Depth Of Field filter works the same way: if you increase the size of the rendered picture the depth of field effect will appear weaker. Keep this in mind when working with your small previews.

To give you control over the strength of the effect, the **Depth Of Field** filter uses the DPI settings as the film resolution. When increasing DPI the picture size and film resolution are increased, hence the depth of field effect remains the same.

Example:

1. Render a preview at 216 x 144 pixels and 72 dpi with the Depth of Field filter applied.
2. When you are satisfied with the preview, render your final image at full resolution (for example: 600 x 400). You have two options:

Option 1:
In the **Image Size** control of the **Scene Settings window: Output tab**, change the render size directly by typing 600 and 400.

The image is now 600 x 400 at 72 dpi. The Depth Of Field filter renders the image as if you have increased the size of your film and you get a weaker blur.

Option 2:
In the **Image Size** control of the **Scene Settings window: Output tab**, change the dpi to 200. The picture is also at 600 x 400, but this time at a resolution of 200 dpi.

The **Depth Of Field** filter renders the image as if you have increased the resolution of your film. The result is the same blur in your final image that you saw in the preview.

Note: To achieve realistic results use 72 dpi. For the opposite effect (to render very blurry images) increase the dpi while maintaining image size.

Note: You can get a stronger depth of field effect by increasing the dpi and decreasing the picture size by the same amount. For example, if you want an effect that is twice your current effect, halve the picture width and height and double the dpi.

Lens Flare

Lens flares are reflections of a strong light source on the various components of the lens. Flare color and size depend on the kind of glass and shape of each lens component.

Lens Flare simulates the reflections produced by a very strong light source.

The Lens Flare filter lets you add lens flares to one or more light source in your final rendered image, according to their respective positions, colors and intensities.

To get a lens flare effect, a light source must be visible to the rendering camera The light source must be within the production frame and not hidden behind or inside another object—even if it is a transparent object. A spot light must be aiming toward the rendering camera to produce a lens flare. (The camera must be within the light cone.)

To set Lens Flare options:

1. Apply the **Lens Flare** filter.

   See "To apply a render filter:" on page 350 for instructions on applying filters. The Lens Flare controls appear on the **Scene Settings window: Filters tab**.

2. You have two options for previewing the lens flare effect. To switch between preview modes, click the radio button for the mode you want.

   Display selected lens flare shows an arbitrary light source on a black background to create the lens flare.

   You can drag in the preview to change the relationship between the light source and lens. This doesn't effect your final lens flare effect.

   Show preview uses a rendered preview of your scene. You must first generate a preview to use this option.

Note: If you're rendering with a white background, you won't see the result of the lens fare effect. Select a dark color for the background.

Use the Lens Flare Controls to set the light source attributes.

3. If you want to generate a preview of your scene, click one of the radio buttons to chose the preview quality: **x1** (high quality (slower)), **x2** (normal quality) or **x4** (low quality (faster)).

- Click the **Preview** button to generate a preview of your scene.

  This takes a few moments.

4. On the right side of the panel, click the image describing the lens flare you want.

5. Drag the **Intensity** slider to change lens flare strength.

The Lens Flare effect uses three parameters to render the effect: **Light source color**, **Light source intensity** and **Lens Flare intensity**.

To get brighter Lens Flares use brighter light sources. It also helps to lower the ambient light and use darker backdrops.

Glow

Glow simulates a photographic filter by adding a glow around every visible light source. The effect of the glow depends on the light's position, color and intensity.

The light source must be visible from the camera to produce a glow. It must be within the production frame and not hidden behind or inside an object.

Glow created a visible glow around light sources.

To set Glow options:

1. Apply the **Glow** filter.

See "To apply a render filter:" on page 350 for instructions on applying filters. The Glow controls appear on the **Scene Settings window: Filters tab**.

2. Adjust the **Glow Size** slider to change the diameter of the glow.

3. Adjust the **Glow Intensity** slider to change the strength of the glow.

Nebula

The Nebula filter adds multicolored streaks around every visible light source.

The light source must be visible from the camera to produce a nebula effect. It must be within the production frame and not hidden behind or inside an object.

Use the Nebula filter to simulate the light streaks produced by a bright light pointed at the camera.

To set Nebula options:

1. Apply the **Nebula** filter.

   See "To apply a render filter:" on page 350 for instructions on applying filters. The **Nebula** controls appear on the **Scene Settings window: Filters tab**.

2. Drag the 1st radius to set the streak's starting radius.

3. Drag the 2nd radius to set the streak's ending radius.

4. Drag the **Angle** slider to rotate the streaks around the light source center.

5. Use the **Branch number** pop-up to choose the number of streaks.

6. Enable the **Thick** option to makes the streaks thicker.

7. Drag the **Intensity** slider to set the streak intensity.

Note: You'll need to render on a dark background to see the effect.

Pulsator

Pulsator adds dotted streaks around every visible light source.

Use the Pulsator filter to simulate the dotted streaks of light produced by a flashing light.

The light source must be visible from the camera to produce a pulsator effect. It must be within the production frame and not hidden behind or inside an object.

To set Pulsator options:

1. Apply the **Pulsator** filter.

   See "To apply a render filter:" on page 350 for instructions on applying filters. The Pulsator controls appear on the **Scene Settings window: Filters tab**.

2. Drag the **Thickness** slider to set the streak thicker.

3. Drag the **Size** slider to set the streak radius.

4. Drag the **Angle** slider to rotate the streaks around the light source center.

5. Drag the **Intensity** slider to set the streak intensity.

Note: You'll need to render on a dark background to see the effect.

Stars

Stars adds a star around every visible light source.

Use the star filter to add starry streaks around objects.

The light source must be visible from the camera to produce a stars effect. It must be within the production frame and not hidden behind or inside an object.

To set Stars options:

1. Apply the **Stars** filter.

   See "To apply a render filter:" on page 350 for instructions on applying filters. The Stars controls appear on the **Scene Settings window: Filters tab**.

2. Drag the **Thickness** slider to set the star thicker.

3. Drag the **Size** slider to set the star radius.

4. Drag the **Angle** slider to rotate the stars around the light source center.

5. Use the **Branch number** pop-up to choose the number of rays.

6. Enable the **Diffraction** option to split the stars into rainbow colors.

7. Drag the **Intensity** slider to set the star intensity.

Note: You'll need to render on a dark background to see the effect.

VariCross

The VariCross filter adds two streaks around every visible light source.

Use the VariCross filter to simulate the light streaks produced by distant bright lights.

The light source must be visible from the camera to produce a varicross effect. It must be within the production frame and not hidden behind or inside an object.

To set VariCross options:

1. Apply the **VariCross** filter.

   See "To apply a render filter:" on page 350 for instructions on applying filters. The VariCross controls appear on the **Scene Settings window: Filters tab**.

2. Drag the **Thickness** slider to set the streak thicker.

3. Drag the **Size** slider to set the streak radius.

4. Drag the **1st Angle** slider to rotate the first streak around the light source center.

5. Drag the **2nd Angle** slider to rotate the second streak around the light source center.

6. Enable the **Diffraction** option to split the streaks into rainbow colors.

7. Drag the **Intensity** slider to set the streak intensity.

Note: You'll need to render on a dark background to see the effect.

CrossScreen

The CrossScreen filter adds a glow and large branches to every visible light source.

Use the CrossScreen filter to simulate the light effect produced by stars.

The light source must be visible from the camera to produce an effect. It must be within the production frame and not hidden behind or inside an object.

To set CrossScreen options:

1. Apply the **CrossScreen** filter.

   See "To apply a render filter:" on page 350 for instructions on applying filters. The CrossScreen controls appear on the **Scene Settings window: Filters tab**.

2. Adjust the **Glow Size** slider to change the diameter of the glow.

3. Drag the **Star Size** slider to set the star radius.

4. Drag the **Angle** slider to rotate the stars around the light source center.

5. Drag the **Branch** number slider to set the number of rays.

6. Drag the **Intensity** slider to set the effect intensity.

3D Light Cone

The 3D Light Cone simulates the interaction between light from a Spot light and smoke, fog, and dust.

The 3D Light Cone effect post-processes the rendered picture to adding visible light beams from Spot lights. The visible light beams accurately describe the half angle of each Spot light in the scene.

Use the 3D Light Cone filter to produce visible cones of light in your scene.

Note: In the natural world, light rays are visible when the atmosphere contains small particles of dust or vapor which diffuse light.

About the Warnings

Some of the **3D Light Cone** options lead require more memory and extend rendering time.

The warning box at the bottom left of the panel tells you when the current settings demand a large amount of memory and require more rendering time.

The bottom right box indicates the amount of RAM required to render the scene with the current settings.

To set 3D Light Cone options:

1. Apply the **3D Light Cone** filter.

   See "To apply a render filter:" on page 350 for instructions on applying filters. The 3D Light Cone controls appear on the **Scene Settings window: Filters tab**.

2. To change the color of the fog, click on the color chip at the left of the Fog panel.

   Ray Dream Studio opens the system color picker so you can choose a color.

Note: The color of the visible light cone results from the interaction of the light's color and the fog color. Yellow light in a white fog produces a yellowish light cone. In a blue fog, yellow light produces a green cone.

3. Drag the **Intensity** slider to change the strength of the light cone effect. The range is from 25% to 200%.

4. Enter a value in the **Range** entry box to set the length of the light cones.

   The **Range** describes the number of inches before the light cone fades out.

5. Enable the **Use gel** option if you want to use any gel on the lights in the light cone effect.

   Use this option only if you've applied gels to your Spot lights.

6. Drag the **Gel Buffer Size** slider to set the quality of the gel effect in the light cone.

   Move the slider to the right to increase quality of the gel in the light cone.

   Caution: To render textured light rays, the filter pre-processes and stores buffers for each Spot light in your scene. High buffer values produce better results, but can be costly in rendering time and memory requirements. Don't try values higher than 200 unless you have a powerful computer and are working on high resolution pictures. Always start with a small value.

7. Enable the **Add Turbulence** option if you want swirls in the fog medium.

8. Drag the **Turbulence size** slider to set the mean size, in inches, of the wreath of smoke. This slider ranges from 0.01 inches to 489 inches.

9. Drag the **Turbulence lumpiness** slider to set the contrast level in the wreath of smoke.

10. Drag the **Turbulence sampling** slider to set the number of samples per pixel.

    The typical value is 10. Don't change this value unless you are working on high resolution pictures (over 1024 x 1024). High sampling values significantly slow down the rendering.

11. Enable the **Animated** option if you want the fog medium to move (change over time).

    This option slows down the rendering. Use it only when doing animations.

12. Enable the **3D Shadow** option if you want objects in the light cone to cast shadows in the fog.

13. Drag the **Shadow Buffer Size** slider to set the quality of the 3D shadow effect in the light cone.

Caution: 3D Shadows is a powerful but costly effect. The filter must pre-process and store buffers for each Spot light in your scene. High values can are costly in

rendering time and memory requirements. Do not try values higher than 200 unless you have a powerful computer and you are working on high resolution pictures. Always start with a small value.

Note: You'll need to render on a dark background to see the visible light cones.

3D Light Sphere

The 3D Light Sphere simulates the interaction between light from a Bulb light and smoke, fog, and dust.

3D Light Sphere filter post-processes the rendered picture by adding a light sphere around each Bulb light.

Use the 3D light Sphere to add a ball of light in your scene.

About the Warnings

Some of the **3D Light Sphere** options lead require more memory and extend rendering time.

The warning box at the bottom left of the panel tells you when the current settings demand a large amount of memory and require more rendering time.

The bottom right box indicates the amount of RAM required to render the scene with the current settings.

To set 3D Light Sphere options:

1. Apply the **3D Light Sphere** filter.

   See "To apply a render filter:" on page 350 for instructions on applying filters. The 3D Light Sphere controls appear on the **Scene Settings window: Filters tab**.

2. To change the color of the fog, click on the color chip at the left of the Fog panel.

   Ray Dream Studio opens the system color picker so you can choose a color.

Note: The color of the visible light sphere results from the interaction of the light's color and the fog color. Yellow light in a white fog produces a yellowish light sphere. In a blue fog, yellow light produces a green sphere.

3. Drag the **Intensity** slider to change the strength of the light sphere effect. The range is from 25% to 200%.

4. Enter a value in the **Range** entry box to set the radius of the light sphere.

   The **Range** describes the number of inches before the light sphere fades out.

5. Enable the **Add Turbulence** option if you want swirls in the fog medium.

6. Drag the **Turbulence size** slider to set the mean size, in inches, of the wreath of smoke. This slider ranges from 0.01 inches to 489 inches.

7. Drag the **Turbulence lumpiness** slider to set the contrast level in the wreath of smoke.

8. Drag the **Turbulence sampling** slider to set the number of samples per pixel.

   The typical value is 10. Don't change this value unless you are working on high resolution pictures (over 1024 x 1024). High sampling values significantly slow down the rendering.

9. Enable the **Animated** option if you want the fog medium to move (change over time).

   This option slows down the rendering. Use it only when doing animations.

Aura

Aura let you render true glowing objects with an outside aura. The light emitted from the glowing objects can interact with fog or turbulent smoke.

Use the Aura filter to create glowing objects.

Aura automatically detects which objects have a glow shader, letting you create impressive effects like laser beams, neon signs and LEDs.

Aura uses the shader glow channel to know which object are glowing and which are not. Only objects that have some degree of luminance in the glow channel receive an aura.

To identify which objects should have an aura:

1. Select an object that should have an aura.
2. Display the **Current Shader Editor palette: Glow tab**.
3. Set the glow color.

   Higher luminance values result in a brighter glow and, therefore, a stronger aura.
4. Repeat steps 1 through 3 for each object that should have an aura.

To set Aura options:

1. To change the color of the aura, click on the color chip at the left of the Aura panel.

   Ray Dream Studio opens the system color picker so you can choose a color.

Note: The color of the final aura effect results from the interaction of the object's glow color and the aura color.

2. Enable the **Test Z** option if you want Ray Dream Studio to check the depth of the different objects in the scene before applying the aura effect.

   When Test Z is off, the Aura might produce an unexpected result when the aura object is partially obscured by a non-aura object.

   For example, you set up two spheres—one in the foreground without glow and the second with glow behind the first. With Test Z off, the Aura around the background sphere may cover a part of the foreground sphere. With Test Z on, the Aura filter knows which object is in front, and the foreground sphere will correctly obscure the background aura.
3. Drag the **Intensity** slider to change the strength of the aura effect.
4. Drag the **Range** slider to set the radius of the aura.

   The **Range** describes the number of inches before the aura fades out.
5. Enable the **Add Turbulence** option if you want swirls in the aura medium (smoke wreaths).
6. Drag the **Turbulence size** slider to set the mean size, in inches, of the wreath of smoke. This slider ranges from 0.01 inches to 489 inches.
7. Drag the **Turbulence lumpiness** slider to set the contrast level in the wreath of smoke.
8. Drag the **Turbulence sampling** slider to set the number of samples per pixel.

   Leave this value at the default unless you are working on high resolution pictures (over 1024 x 1024). High sampling values significantly slow down the rendering.
9. Enable the **Animated** option if you want the medium to move (change over time).

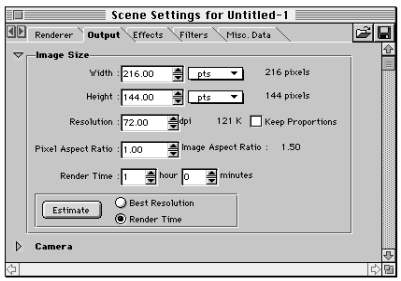
This option slows down the rendering. Use it only when doing animations.

Output

The **Scene Settings window: Output tab** provides a set of controls for the images the renderer creates.

Image Size Controls

The **Image Size** controls lets you describe the dimensions and resolution of the image to be rendered.



The image size controls let you specify the size and resolution of the final rendered image.

The resolution of a device, such as a monitor, printer, scanner, or image setter, is described as the number of pixels it can create for each inch of image area: pixels (or dots) per inch (ppi or dpi).

For example, the screen of an Apple color monitor has 72 dots per inch (dpi). Each dot is a pixel, so an image that is 72 x 72 pixels would be one inch square on the screen of that monitor. VGA monitors have slightly higher resolutions. Many color printers are capable of 300 dpi, and some image setters can produce more than 2500 dpi.

This discrepancy in device resolution creates a slight problem—pixels are different sizes on different devices, so an image displays or prints at a different size on devices of different resolution. For example, the 72 x 72 image that appears one inch square on the screen would be less than one-quarter inch when printed on a 300 dpi printer. (72 pixels drawn at 300 dots per inch: 72/300=0.24 inches.)

The solution is to set the rendering parameters according to the size of the image you want from a particular output device.

To set the image size and resolution:

1. In the **Width** and **Height** entry boxes of the **Rendering Settings** dialog, enter the dimensions you want for the picture.

   Set the size according to your final output. You can use the pop-ups to the right to choose the units.

2. In the **Resolution** entry box, enter the resolution (dots per inch) of the expected output device.

A six-inch square image at 600 dpi may occupy as much as 100 MB on disk! (The size varies depending on file format and image content.)

3. Enable the **Keep Proportions** option if you want to keep the same aspect ratio (ratio of width-to-height) when you change either the width or height.

To check how long this rendering will take:

1. Set image dimensions and resolution as described above.

2. Click **Estimate**.

   In a moment, the Render time display shows approximately how long rendering will take at the current settings.

To limit rendering time:

If time is more important than quality, you can give Ray Dream Studio a time limit and ask for the best rendering in that time frame. This would be a good choice, for example, if you wanted the rendering done by the time you got back from lunch.

1. In the **Render Time** entry boxes, enter the amount of time you want Ray Dream Studio to work on the rendering.
2. Click **Estimate**.

   In a moment, the Resolution (and number of pixels in each dimension) changes to the best resolution possible in the time allotted settings. You can now start the rendering to get this result.

Framing Your Scene

The image dimensions are closely related to the production frame, which specifies the area of the scene (as seen by the camera) that's rendered in the final artwork. You can think of the production frame as the camera's view finder.

After setting the image size in the Image Size panel of the **Render Settings** dialog, turn on the Production Frame display and check the framing of your scene.

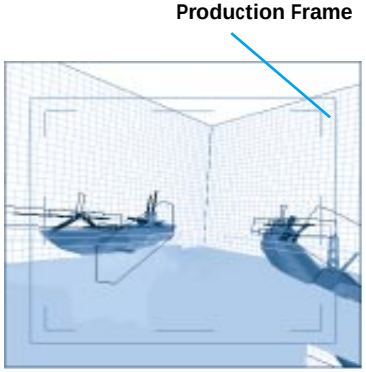
To display the Production Frame:

Choose **View menu▸ Production Frame**.

The production frame appears as a colored rectangle (green, by default) in the **Perspective** window.

The rectangle's dimensions are determined by the width and height settings in the Image Size panel.

The area of the scene the frame encloses represents the area of your rendering. You can think of the rectangle as "defining the print area" of your scene.



The Production Frame defines the area of the Perspective window will be used to produce the rendered image.

To move the Production Frame:

1. Choose the **Selection** tool.
2. Click on the outer rectangle to select it.

   You'll notice "handles" appear on each corner and side.
3. Move the cursor inside the frame and drag it where you want it.

Note: To change the viewpoint of your scene, you'll need to work with the camera. For information om moving the camera, refer to Chapter 14, "Setting Lights & Cameras."

To resize the Production Frame:

1. Choose the **Selection** tool.
2. Click on the outer rectangle to select it.

   You'll notice "handles" appear on each corner and side.
3. Drag a corner handle to resize in two dimensions. Hold down the **Shift** key while you drag to constrain proportions (maintain the aspect ratio).
4. Drag a side handle to resize in one dimension.

When you resize the production frame, Ray Dream Studio updates the height and width values in the **Scene Settings window: Image Size** controls. The resolution (dpi) stays the same.

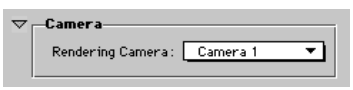
Note: The camera position does not change when you move or adjust the Production Frame. What you are doing is cropping the camera's view.

The **Zoom** tool and the scroll bars change the display in the **Perspective** window—not the camera view. If you can't see all of the production frame, use the scroll bars and/or Zoom tool (to zoom out) until you do.

Camera

If you use one of the **Render** commands, by default you'll be rendering from the current camera.

To render from some other camera or if you are going to use the Batch Queue, you can identify which camera to use.



The Camera controls let you specify a camera to use for the rendering.

To select the camera to render from:

1. Display the **Scene Settings window: Output tab: Camera** controls.
2. Use the **Rendering Camera** pop-up to choose the camera you want to render from. The pop-up lists all cameras in your scene.
3. Save your scene.

Note: If you want to render one scene several times from different cameras, use the Batch Queue. This feature is described in "Using the Batch Queue" on page 368.

File Name

The **File Name** controls let you set the name and disk location for rendered files.

To set a file name for rendering this scene:

1. Display the **Scene Settings window: Output tab: File Name** controls.
2. Click the **In Named File** radio button.
3. Click **Set**.

   Ray Dream Studio displays a dialog that lets you enter a name for renderings from this scene and choose a disk location.
4. When you've finished with the dialog, click **Save**.

   Ray Dream Studio displays the disk location and name to the right of the **Set** button.

Use the file name controls to choose between a default file name and a specific name.

File Format

The **File Format** controls let you choose the type of file saved to disk and set options for it. The **File Format** controls also let you specify the frame range and rate for rendering animations.

To set file format options for rendering the current frame:

1. Display the **Scene Settings window: Output tab: File Format** controls.
2. If necessary, click the radio button for **Current Frame** (still image).

Movies have additional settings and considerations. See the next section For information on choosing movie file formats, refer to "Choosing Compression Settings" on page 363.

3. Choose the file format you want from the pop-up.

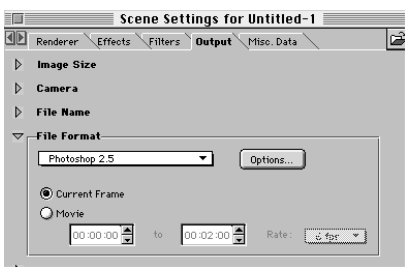
   Windows Bitmap, PICT (Macintosh), TIFF, EPSF (Macintosh), GIF, JPEG, Painter RIFF, Targa (Windows), Corel Photo Paint, and Adobe PhotoShop.

   You may have other formats added as PhotoShop compatible plug-ins.

4. Click **Options**.

   Ray Dream Studio displays a dialog that lets you set features for this file format.

5. When you're finished setting options, close the options dialog.



Use the File Format controls to select a specific format for the final rendered image.

To choose a movie file format:

1. Click the radio button for **Movie** (animation).

2. Choose the movie file format you want from the pop-up.

   Movie formats include QuickTime Movie (Macintosh), AVI Movie (Windows), and a variety of sequenced image formats.

   The "Movie" formats (QuickTime and AVI) generate a single file that includes all of the frames.

   The "sequenced" formats generate a single file for each frame. The files are numbered 000, 001, 002, and so forth, to keep them in sequence. Sequenced files are often used for transferring the animation to other programs, such as Adobe Premiere™

3. Set the start and end points of the render range. For more information on the render range, "The Render Range" on page 303.

4. Choose a frame rate from the **Rate** pop-up.

5. Click **Options**.

   Ray Dream Studio displays a dialog that lets you set features for this file format.

Choosing Compression Settings

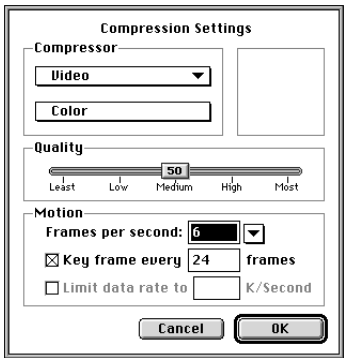
Rendering animation requires significant amount of hard disk space. If you have disk space limitations, you will want to compress the movie that you render. If you have plenty of disk space, you may want to render without compression. This way you won't invest rendering time only to find out that you used too much compression. You can then re-open the movie file in Ray Dream Studio and save it with compression.

The software compression and decompression algorithms (called codecs) that you can select in the **Compression Settings** dialog are provided with QuickTime (Macintosh) or AVI (Windows). Codecs compress data when you render an animation and decompress the data when you play the movie. Any Macintosh or Windows system with QuickTime or AVI software can play back a compressed movie.

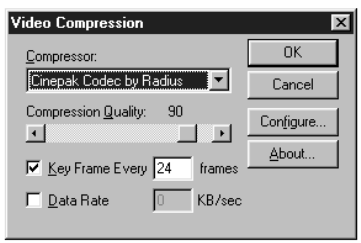
If you are using hardware for MPEG compression, see the instructions that accompanied your board for a description of available compression options.

To select a movie compression option:

1. Click **Options** n the Scene **Settings window: Output tab: File Format** controls. The **Compression Settings** dialog appears.



On Macintosh you can set compression options for Quicktime movies.



In Windows you set compression options for AVI movies.

2. Select one of the compressor options from the **Compressor** pop-up.

Note: Your actual compression may vary, depending on the version of QuickTime or Video for Windows you have installed. For additional information refer to your Apple or Microsoft documentation.

Macintosh Compression Options

- ***None***. This is a lossless form of compression with a 2 to 1 (or less) compression ratio. This codec converts an image's pixel depth from 32-bit to 24-bit image format with no loss in quality by combining the alpha channel byte. None is a good option for raw animation if you have plenty of hard disk space. You may want to use this as an intermediate step if you plan to edit your animation in Adobe Premiere because Premiere re-compresses the movie (you should avoid compressing twice). None is better for reachieving when the highest image quality is important.
- ***Animation***. This codec works best for 8-bit animation and computer-generated screen images (as opposed to videotape images). It's often used for 3D animation. The image quality (especially at higher quality settings) is acceptable for informal movies. With this codec, you can create movies up to full-screen at any color depth. The Animation codec saves the first image and then saves only changes from one frame to the next. It also cuts out the alpha channel, resulting in increased speed and smaller files.
- ***Cinepak***. This is a cross-platform codec for QuickTime and AVI movies that is best suited for video and CD-ROM playback. Movies take a long time to compress, but they decompress quickly at playback. Cinepak is best for 16- and 24-bit animations. Cinepak has better compression ratio, image quality, and faster playback than Apple's Video codec.
- ***Component Video***. This is best suited for the archival or interim storage of digitized video compression. At a compression ratio of 2 to 1, Component Video requires lots of disk space. Use this codec when image quality is more import than compression ratio or real-time playback.
- ***Graphic***. This is recommended for 8-bit still images. Useful for compressing pre-dithered animations in which decompression performance is not as important as the compression ratio.
- ***Photo-JPEG***. This is recommended for compression of still images with continuous tones such as photographs. It works too slowly for animation, and discards some data (it's a lossy compression method). Photo-JPEG is recommended for archiving 16- and 24-bit source clips. This codec saves the image in JPEG format, which results in high quality images with a high amount of compression.

Note: You may have other JPEG options available.

- ***Video***. Video is Apple's QuickTime video compressor. It is best for high-quality video clips that play in real time on faster Macintosh machines. Its only option is color. Video is appropriate for rotoscoping. This codec can play back regular animations, but the image quality not as high as when the Animator compressor is used.

AVI Compression Options

- ***Microsoft Video 1***. This codec compresses each frame of a clip (and is used for analog video (8 and 16-bit). Some data is discarded (the codec is lossy).
- ***Full Frames (Uncompressed).*** This option is best for capturing full frames of analog video. No compression is applied, so use of this codec requires lots of disk space.
- ***Cinepak Codec (Radius™).*** This is a cross-platform codec for QuickTime and AVI. Movies take a long time to compress, but decompress quickly at playback. Cinepak is optimized for 16- and 24-bit animations. Cinepak has a better compression ratio, image quality, and playback than the Microsoft Video 1 codec.
- ***Intel Indeo Video R3.2.*** This codec uses higher compression ratios, and results in better image quality and faster playback than Microsoft Video 1.
- ***Microsoft RLE***. Use this option for compressing animation and computer-synthesized 8-bit images.
- ***Intel Indeo Video Raw***. Use this compression method for capturing uncompressed video. You will obtain superior image quality because no compression is applied.

Compression tip: For optimal compression, use the right frame size: 160 x 120 for Apple Video compressor and 240 x 180 for Cinepak. When using Cinepak, frame dimensions need to be multiples of four for best performance.

To set compressor options for the QuickTime format:

1. Choose a color depth from the **Color** pop-up. The depths available depend on the selected codec.
2. Use the **Quality** slider to set the level of compression.

   The compression ratio is inversely proportional to image quality. The **Quality** slider allows you to set an optimum between the amount of compression and image quality.
3. For a codec that uses key framing, enter a **Key Frame rate**.

   The key frame is used in temporal compression methods. Each key frame is stored in its entirety. The next set of frames—up to the next key—are saved only as changes.
4. For a codec that supports the feature, you can use the **Limit Data Rate** option.

   This allows you to set a maximum size for any frame. QuickTime automatically adapts the compression quality to maintain this rate. This feature is available for only a few codecs.

G-Buffer

Ray Dream Studio 5 can calculate and save more than a dozen separate channels of geometric and lighting information in addition to your full color rendered image.

These additional channels appear as grayscale images, where the gray values represent information. The data in each of these channels describes the point in your 3D scene that each pixel in the image represents. For example, if the scene shows a drinking glass on a wooden table, each pixel in the rendered image corresponds to a point—on the glass or on the table—in your 3D scene.

Not all file formats are capable of storing all of the channels possible. Because Painter 5 RIFF and Adobe Photoshop 2.5 and higher

support multiple channels, rendered images saved in these format can contain all G-Buffer channels.

There are many versions of the TIFF format. The TIFF format used in the Windows version of Ray Dream Studio 5 can also contain all G-Buffer channels.

To select G-Buffer channels:

1. Display the **Scene Settings window: Output tab: G-Buffer** controls.

2. Enable the checkbox or each feature you want.

   Do not enable channels that you don't need. Each channel adds to the file size considerably.

   Pixel color The pixel color is determined by shading and lighting effects. For example, looking through a drinking glass, you can see the wooden table behind. The color of a specific pixel in the glass appears as the color of the wood after it has filtered through the translucent glass. Pixel color occupies channels #1, #2 and #3 for red, green and blue.

   Mask A mask is a "shadow" image of your scene. It describes where objects are, versus where they are not. The mask is used as a selection of your image when you paste onto a background in an image-editing program. Pasting a foreground image onto a background is called compositing.

Refer to your image-editing application's documentation for instructions on selections, masks and compositing.

Ray Dream Studio 5 puts the mask data in channel #4, the Alpha channel, which is where masks are usually kept in applications like Painter and Adobe Photoshop.

Distance The distance channel describes the distance of each point from the camera, or viewpoint. Lighter pixels are closest to the camera, while dark colors represent areas of the rendering that are farthest from the camera. You can use the distance channel information in Painter 5 with the **Effects menu ▸ Focus menu▸ Depth of Field** effect to blur areas that are farther from the camera.

Object index The object index relates each pixel in the image to the object its corresponding point belongs to. With an object index loaded in Adobe Photoshop, you can easily select individual objects with the Magic Wand, regardless of color. This works as long as the objects do not overlap.

Normal vector The normal vector creates three channels describing the direction that each surface of the object faces. This information can be used after rendering to simulate additional light sources. For example, it's possible to add directional lighting or glows in Photoshop by loading the normal channel to select all the surfaces that face in a given direction, complete with information about how those facings fall off.

Position The position describes the coordinate of each point in the image. 3D position uses three channels, one for the x value, one for the y value, and one for z. An example of how you could use this information is to position low hanging clouds, making use of the Z, or height, channel.

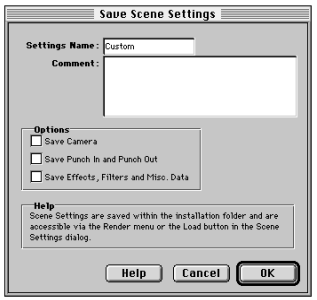
Surface coordinate The surface coordinate describes the location of the point on the object in relation to the object's surface coordinate system. This is two-dimensional information which allows adding, replacing, or repositioning texture maps on 3D objects in an image editing program.

Preset Render Settings

Ray Dream Studio 5 allows you to save frequently used render settings. Your saved settings will appear as presets on the **Render** menu, where you can use them directly

To create a new render preset:

1. Set all rendering options to your liking. The presets include the controls in the **Scene Settings: Render tab** and **Output tab**.
2. Choose **Render menu▸ Save Current Settings**.
3. Ray Dream Studio displays a dialog that lets you name the preset, add a comment and set three other options.
4. Enable the **Save Camera** option if you wan to include the choice of rendering camera.
5. Enable **Save Punch In and Punch Out** if you want to include the rendering range.



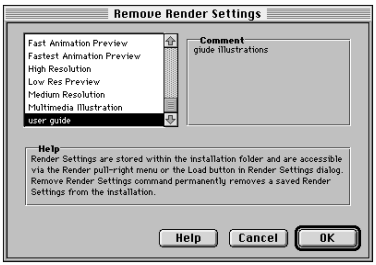
You can save a specific set of render settings using the Save Render Settings dialog

6. Enable **Save Effects, Filters, and Misc** data if you want these features to be included with the saved settings.
7. Click **OK** to close the dialog and create the preset on the **Render** menu.

To remove preset render settings:

1. Choose **Render menu▸ Remove Settings**.

   The **Remove Render Settings** dialog appears.



You can remove a saved settings from the list of settings by using the Remove Render Settings dialog

2. Select the render setting to be removed in the left window.
3. Click **OK**.

Starting a Rendering Job

When you have set your options and framed your scene, you can start a rendering.

To start rendering using the current settings:

Choose **Render menu▸ Using Current Settings**.

You may also use the key shortcut **Command-R/Ctrl+R**.

An **Image** window opens and rendering begins. The progress bar advances as rendering proceeds.

When you start a rendering, Ray Dream Studio displays a window showing the rendering's progress

To render with a preset:

Choose **Render menu▸ Preset Name**.

For example **Render menu▸ Fast Animation Preview** starts a draft movie rendering.

Rendering is computationally intensive, and depending on the render settings, jobs may take several hours to complete. Rendering can run in the background. You can go on working with Ray Dream Studio and even launch other applications—if memory permits.

Because rendering is time consuming, Ray Dream Studio provides a feature that helps you fit heavy rendering jobs into your schedule: the batch queue.

When using applications such as word processors or 2D drawing programs, the CPU is not using maximum capability and spends a lot of time idling. Ray Dream Studio 5 takes advantage of this by taking control of the CPU and performing its calculations in the background. The computational load between Ray Dream Studio's ray tracer and other programs has been set up so that you can type in your favorite word processor without perceptible slowdown.

Using the Batch Queue

Ray Dream Studio 5 allows you to batch several rendering jobs in a queue for deferred, unsupervised processing. By default, batched files are rendered using the render settings saved in the file. However, batch queue rendering parameters can be set to use specific settings for the entire batch or to use particular settings for each file in the batch queue.

During rendering, Ray Dream Studio 5 displays and processes all scenes one at a time. You can add to or remove files from the batch queue at any time.

To add files to the batch queue:

1. Set up each scene you wish to include in the batch:
   - Remember to set the render settings, the production format, the framing, and the default camera.
   - Save and close these files.
2. Choose **Render menu▸ Batch Queue**.
3. Click **Add**.

   Ray Dream Studio displays a dialog so you can locate and add one or more scene files.

Readable files (scenes) in the current folder are on the left. Files you're adding appear on the right.

You can renderer a number of scenes at a later time using a Batch Queue.

4. Select a file, then click **Add**. You may also double-click a file to add it.

   To include all files in the current folder, click **Add All**.

   If you want to remove a file from the queue, select it and click **Delete**/**Backspace**.

5. Repeat step 4 until you've added all files you want in this batch.

6. Click **Close**/**Done**.

   At this point, you can launch the batch process or check and change the settings for any particular file.

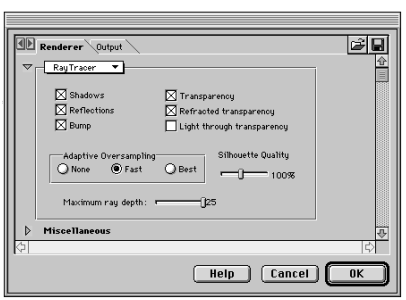
   If you think you'll want to use this same list of files in the batch queue at a later date, you can save the list. Click **Save List**. Ray Dream Studio displays a dialog so you can name the list and choose a disk location. Later, when you want these same files in the batch queue again, click **Load List**. Use the dialog to locate and open the saved batch queue list.

To change settings on a file in the queue:

1. In the **Batch Queue** list, select the file or set of files you wish to change.

2. Click **Settings**.

   The **Render Settings** dialog appears, where you can view and change the image size, file format and other options.



Use the Render Settings dialog to view the scene's rendering options.

- Page to the different tabs and change settings individually.
- Click **Load** to select one of the saved presets.
- Click **Save** to add the current settings to the presets. For more information, refer to "Preset Render Settings" on page 367.

Note: Changing the settings for a file in the batch queue only affects this batch process. The settings saved in the file itself are unchanged.

3. When you're finished with the **Render Settings** dialog, click **OK**.

To start the batch process:

To start batch processing, click **Launch**.

- While the batch is running, you can click **Abort** to stop it.
- Click **Pause** to temporarily halt the process. Click Resume to start the process again.
- Use the **Rendering Progress** and **Scene Statistics** items in the top panel to get information on the scene currently being rendered or on a scene you select in the lower panel. Use the **Information** pop-up to choose which.
- If you want to save the information, click **Save Text**. Use the dialog to name the file and choose a disk location.

To render a scene more than once from different cameras:

1. Choose **Render menu▸ Batch Queue**.
2. Click **Add** to add the scene to the Batch Queue.
3. Without exiting the Batch Queue dialog, click **Add** again. Keep clicking as many times as you need.

   A duplicate of your scene will appear in the Batch Queue list.
4. Click **Close/Done.**
5. In the Batch Queue dialog, select an instance of your scene in the list, then click **Settings**.

   The **Render Settings** dialog appears.
6. Click the **Output** tab.
7. Expand the **File Name** controls, and choose a new filename for your scene.

Note: If you don't choose a different name for when you render this scene, it will overwrite the original scene.

8. Expand the **Camera** controls, and choose a new render camera.

   Cameras aren't the only thing you can change. You can change any scene setting.
9. When your done adjusting the render settings click **Ok**.
10. Repeat steps 6-9 for each copy of the file in the list.
11. Click **Launch** to start the batch queue.

Speeding up Rendering

There are several techniques that you can use to reduce your rendering time. These techniques are especially useful when rendering animations that may have hundreds, or even thousands, of individual images to be rendered.

Use an image editing program to reduce your texture maps to 8-bit depth. Very few images actually use millions of colors, and many image editing programs discard insignificant information while maintaining the quality of the image. (Some textures even look good in 4-bit depth, or 16 colors.)

Reduce all texture maps to be used in non-color channels like the bump channel to 8-bit and grayscale before importing them. The color file wastes space and time while Ray Dream Studio converts it to gray.

If an object is distant from the camera, open it in the **Free Form** modeler and lower its surface fidelity to the minimum. This results in the minimum amount of RAM being used for its geometry.

When an object leaves the frame, and isn't reflected in any surface that you can see in the rendering, activate its Cloak property. This won't save memory, but it does save rendering time. Objects that pass behind solid objects can be cloaked to save time, too. Be careful that you do not lose a cast shadow where one is needed.

You can speed up rendering by applying these techniques:

- Use the **Draft Z-Buffer** to preview your object positions and movement.
- Work with smaller image (frame) sizes. The standard for CD-ROM-based QuickTime movies is half-screen size, or 320 by 240 pixels, although satisfying results can be achieved at 240 by 180. (You can then scale up to full-screen size for VHS output, although pixilation may be apparent when you scale up.)
- Limit the number of frames per second to 15, which is adequate for QuickTime movies. (Video uses 30 fps and film 24 fps.)
- Simplify objects and reduce the number of objects in the animation.
- Limit the number of lights.

- For the Ray Tracer or Adaptive renderer, disable the **Reflection**, **Transparency** and **Refraction** options.
- Keep objects near the background simple. (A complex bitmapped background does not affect rendering speed.)
- Limit the size of texture maps.
- Use 8-bit texture maps instead of 24 bit.
- Limit the number of reflective and transparent objects.
- Divide animations into smaller files and eliminate objects that won't be seen on-screen.
- Turn off anti-aliasing when previewing rendered animation.

Computer System Optimization

Ray Dream Studio 5's performance is affected by available RAM and disk space. You can never have a fast enough computer, enough RAM or disk space, a large enough monitor, or a fast enough computer. With that in mind, here are some things you can do to get the best performance out of your system.

If you have a scene that uses more RAM than you have, Ray Dream Studio uses its own virtual memory system to keep things running, spooling data back and forth to the hard disk. The greater the disparity between RAM needs and what is available, the more speed it costs you. If the scene ends up dipping into the operating system's virtual memory as well, performance can be very poor. In this case, adding RAM can improve speed, although this makes the computer run more efficiently, not any faster.

The fastest rendering takes place on a fast processor with plenty of RAM. Systems used in professional animation may 128 MB RAM or more.

Because all rendering involves some spooling to disk, you need a large hard disk with plenty of free space.

To keep your hard disk running efficiently, use disk utilities to scan for disk errors, and defragment your hard disk prior to starting a project or even a long rendering session.

Don't run other programs in the background. Some screen savers use as much CPU time as Ray Dream Studio 5.

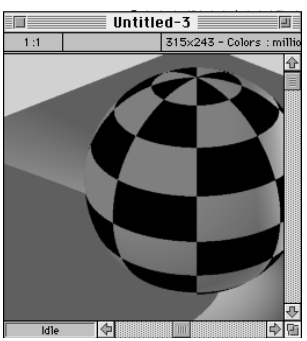
Viewing Rendered Images

When you render using **Render** menu commands, the image is displayed in a window when rendering is done. If you want to keep this rendering, you should save the file.

Renderings generated from the Batch Queue are automatically saved to disk. You can open these files in Ray Dream Studio 5 by double-clicking on the file icon. Or, you can open and view them in another graphics application.

The Ray Dream Studio 5 Image Window

When you open a rendered image, it's displayed in the window shown below.



When Ray Dream Studio is finished rendering, it displays the final image in the Image window

The program tries to load the image into RAM. If there is not enough available RAM, Ray Dream Studio spools the image from the scratch disk. For example, Ray Dream Studio 5's spooling enables you to display a 20MB image on your system with only 16MB of RAM. The penalty of spooling is slower access time. Each time you adjust the image, the computer must read/write to the disk.

The zoom ratio (scaling) appears in the top left. The ratio is "screen pixels-to-image pixels." When the ratio is 1:1, one screen dot represents one image pixel. When the ratio is 1:2, one screen dot represents two image pixels. The ratio changes as you zoom in or out with the **Zoom** tool.

The image resolution, color depth, and size of the image (in "K," for kilobytes, or "MB," for Megabytes) appear at the top.

Note: Images produced by Ray Dream Studio using **Render menu▸ Use Current Settings** and **Render menu▸ High Resolution** are rendered and stored on disk in 24-bit (millions of colors) format.

The Ray Dream Studio 5 Movie Window

When you open a rendered animation that's saved as a QuickTime or AVI movie, Ray Dream Studio displays it in the movie window, shown below.

When Ray Dream Studio is finished rendering an animation, it displays the final movie in the Movie window

The **Movie** window adds the duration and frame rate to the other statistics at the top of the window.

- Click **Play** to play the movie. During play, click **Pause** to stop.
- Click **Frame Forward** or **Frame Back** to step through one frame at a time.
- Click **Loop** to enable looping. Then click Play.
- Drag the slider to "scrub" through the movie.