Digital Representation
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V-Ray for Rhino Tutorial

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Basic concept

V-Ray is a rendering engine equipped with Global Illumination (GI). As the name suggests, Global Illumination allows users to light their scenes globally/uniformly. Global Illumination sets up a render to use diffused natural light present in the world. (Imagine a room with a window but no artificial light.) It allows users to render a scene that seems to be lit with a diffused natural light without having to spend time creating, placing, and adjusting individual lighting components (i.e. spotlights, point lights, directional lights, etc.).

V-Ray Menu

There are only a few options in the V-Ray menu pertinent to our use, most of which are pretty self-explanatory. Most settings in V-Ray's default setting can be left alone, however there are a few that should be changed for both faster and fool-proof renderings.

- **Global switches**: under *Lighting* turn off *Default Lights*. This will prevent V-Ray's default lighting system (which is unnecessary since you will be rendering using GI) to be rendered. Turn off *Hidden Lights*—this will prevent lights in hidden layers to be rendered, just in case you're testing out different lighting systems and are hiding them one at a time.
- **System**: this controls how V-Ray uses your system to render (CPU Usage, etc.). For our purposes, this can be left in the default setting.
- **Camera**: *Physical Camera:* pretty self-explanatory—controls a "physical" camera that is used to render your scenes. Can be turned on or off. The camera works just like a manual SLR camera. The benefit of using a physical camera is that the user doesn't have to modify the intensities of each light source (i.e. if there are multiple spotlights in a scene) to create a well-lit render; just like a real camera, one can adjust the exposure of a scene simply by modifying either the camera's aperture size or f-stop, or both. *Depth of Field:* same effect you get with a real camera; keep in mind that turning on this option will slow your render time quite a bit, so if it isn't that important to have a blurred background, turn it off. There's always Photoshop.
- **Output**: controls the rendering output—pretty easy to understand. By checking the box next to *Save File* under *Render Output*, V-Ray can automatically save your rendered image into a specified folder.
- **Environment**: Controls the general ambient light (or GI) intensity in a scene. Both values can usually be left at 1. More info about the other settings available under this option will be covered later.
- **Image Sampler**: controls the image quality that is produced by V-Ray when the engine is actually rendering (not when it's calculating light within a scene). For our purposes it is best to use *Adaptive Subdivision*—it'll produce an accurate enough quality rendering without long rendering time. *Min Rate* and *Max Rate* essentially define the level of quality-control of the rendering phase. The default setting is -1 and 2. The lower the *Min Rate* value is, the rougher the rendering will start out. The higher the *Max Rate* value is,

the finer the rendering will be. It's easier to think of these two values not as "presets," but rather as a starting value and an ending value. So -1 and 2 literally means "from a value of -1 to a value of 2." The higher these values are the better quality the render will start and end. Keep in mind that there should be a good gap between these two values (i.e. not 0 and 1 or 1 and 2, but 0 and 2 or even 0 and 4). This is comparable to the grit size of sand paper; you don't want to start with a grit size of 60 and end with 80—you'd want to go from 100 to 150 for a medium quality product, 200 to 400 for a high quality product, or you can even go from 60 to 400 and create a masterpiece, but that may take a while. For final renderings, turn on *Antialiasing Filter*—this will prevent jagged edges, but isn't necessary when rendering previews.

- **QMC Sampler**: Leave as default.
- **VFB Channels**: Virtual Frame Buffer Channels—allows user to separate different parts of a rendered image into different channels (i.e. separating background from actual object, etc.). Can be left alone for now.
- **Displacement**: leave as is.
- **Indirect Illumination**: or Global Illumination (GI). From this menu you can choose which light calculation engines to use. Make sure the box next to GI is checked. Leave all values as default. Under *Primary Engine*, choose Irradiance Map and under *Secondary Engine*, choose Light Cache. These two engines are the easiest to control for an entry-level user (most if not all architecture firms that render their own images can even be classified as entry-level users—vs. high end users like production/rendering firms).
- **Irradiance Map**: The concept of *Min Rate* and *Max Rate* is the same as above, but this time these two settings control the quality of light calculation. Because the Irradiance Map engine calculates light hitting a surface as a series of "light dots" (as seen during the rendering process), these two values control the amount of dots and the amount of interpolation required between dots; thereby controlling the accuracy of a rendering in terms of its lighting. For example, lower values will produce dots that are less fine, and as such there are more interpolations required. Usually -3 to -1 work quite well for faster preview renders, but for final renderings these values need to be increased. The difference in values also determines the amount of prepasses V-Ray goes through (and this step is clearly highlighted during the rendering process). *HSph. Subdivs* or *Hemispherical Subdivision* controls the rate of interpolation—the default setting is usually fine.
- **Light Cache**: options for the 2nd lighting engine. *Subdivs* or *Subdivision* controls the quality or accuracy of calculation performed by this engine. As always, the higher the value, the better it is; 500 is a good amount for previews, 1000-2000 is good for finals, depending on the resolution. *Sample size* controls the size grain/light particle size used to calculate lighting in a scene. The smaller the value, the finer the grain, and the more accurate the lighting is (less interpolation). Everything else can be left as default.
- **Caustics**: allows user to render caustic effects (i.e. direct light passing through a wine glass). Usually turned off as caustics take a long time to render.

Once you've set up a certain setting, you're able to save that preset. In the Render Options window, click on File > Save. You can Load presets this way too.

<u>Lighting a scene</u>

V-Ray uses the same lights as those available for other rendering engines in Rhino (spotlight, point light, rectangular light, etc.), but V-Ray has its own sunlight system. Although V-Ray uses Rhino lights, it enables more in-depth options that can be found under a light's property. The most commonly used lights are rectangular light, spotlight, and sunlight—everything else is rather useless because of V-Ray's GI and its sunlight system.

Sunlight:

- V-Ray's Sunlight system can be accessed by clicking on the yellow asterisk icon next to the blue box.
- Once you've finished entering all the required info in the sunlight window, click anywhere in the scene to place the light—its location doesn't matter.
- Open the V-Ray Options menu previously reviewed.
- Under Environment, click on the "M" next to GI (Skylight). The texture editor should pop up.
- At the right side of the window, under *Sun* and next to *Sun-light source*, click on the button that says "Default." Choose the light you placed in the scene. Hit apply and uncheck *Override Sun's parameters*.
- Do the same thing for *Background*.

Materials

V-Ray uses a different material mapping system than Rhino Renderer and Flamingo. To access the Material Editor, click on the "M" located in the V-Ray toolbar menu. To add or import saved materials, right click *Scene Materials*. Clicking the "+" sign will enable a drop-down menu where you can add "layers" or more advanced properties to the material.

Diffuse:

- Sets up the main colour of the material. The colour can also be replaced by an image texture (like Flamingo and Rhino Renderer). Simply click on the "m." Under *Common*, next to *Type*, choose *Bitmap*. Click on the "m" next to *File* to select a texture (.jpg) file to be used. Unlike other renderers, the texture's tiling is controlled in the *Texture Editor* window.

Transparency:

- Obvious. Black = opaque, white = transparent.

Reflection Layers (left drop-down menu):

- Right-click *Reflection Layers* and select *Add new layer*. Settings are quite self-explanatory and fairly similar to those of other rendering engines.
- To control a material's reflectivity level, click on the "M" next to *Reflection*. It's best to keep the texture type to Fresnel. Next to *Fresnel Colour* you can select a reflection colour: lighter colours are more reflective than darker colours. Moving *Refract Colour* towards white gives it a more mirrored finish.
- Back in the main *Material Editor* window, picking a *Filter* colour will tint the reflecting surface of the material.