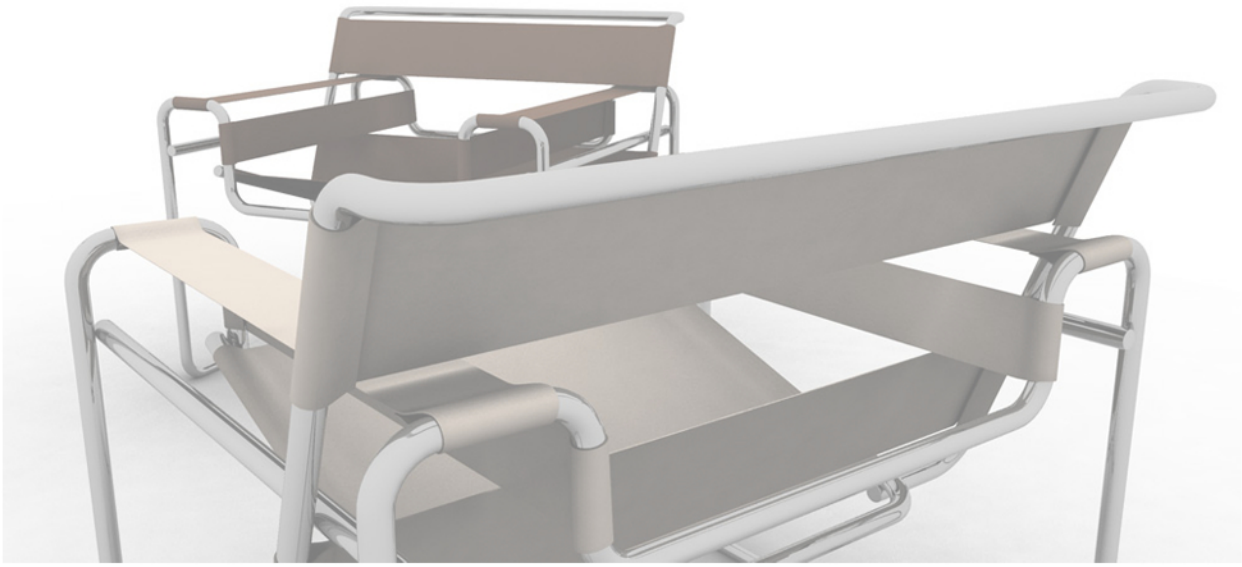
Brazil r/s v2 for Rhino

Getting Started Guide

What's it all about?

This "Getting Started Guide" is intended for the Rhino user unfamiliar with advanced rendering programs such as Brazil. If you are fluent when it comes to industry standard rendering technologies, you will certainly breeze through the explanations and work flows included. If you are new to Brazil and advanced rendering, much of the learning process will come down to absorbing new terminology. Don't get dismayed if you're baffled by descriptions like "Mitchell-Netravali Image Filtering" and "High Dynamic Range Textures". If nothing else, they'll only serve to improve your Scrabble game.

The entirety of options included in Brazil r/s v2 for Rhino will not be covered in this guide. Instead, a synopsis of the settings that can be used for fast high quality renderings is provided. Once you become accustom to the basic principles of rendering with Brazil in Rhino you'll be free to explore the veritably endless possibilities!

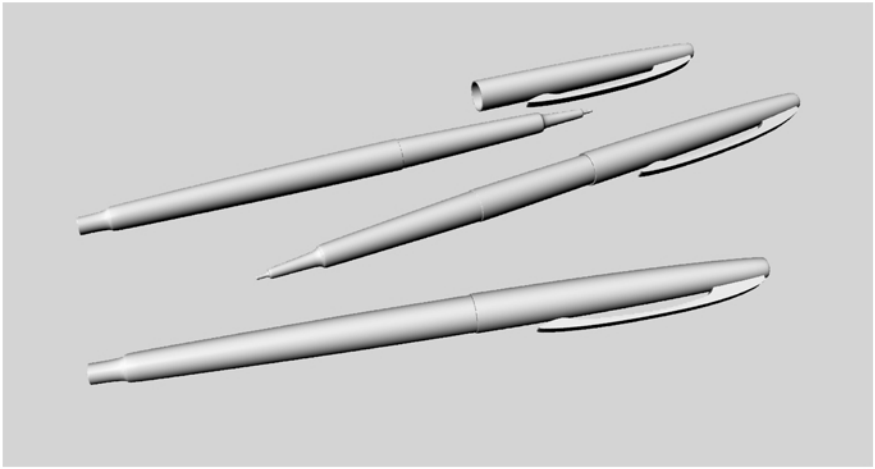


Brazil r/s v2 for Rhino / Options

Open the options dialog for Brazil r/s for Rhino by typing the command “BrazilOptions” in the Rhino command line or by clicking on the options icon located in the Brazil tool bar. The shear scope of options available to you may seem overwhelming at first glance but fear not, we won’t need to use many of these to produce our first rendering.

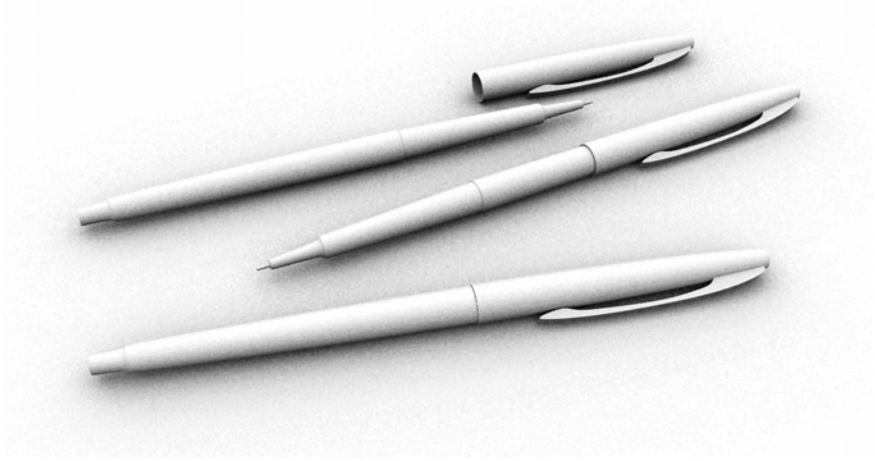
You’ll first need to open “Brazil_Pens.3dm” from the “Brazil Getting Started Guide” you downloaded at http://brazil.mcneel.com/files/.

Once open, click the blue render icon or type the command “Render” in the Rhino command line. All objects in the scene are white at this time and rendering the perspective view should produce the following default result.



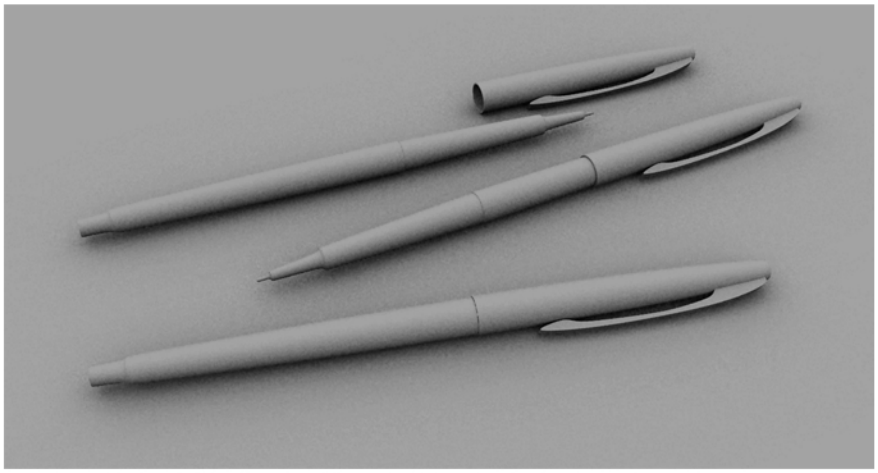
Direct Illumination / with sky light

In the Brazil options dialog open the “Luma Server” panel and check the “Sky light” box under the “Direct illumination” section. Render the scene again... your result should now look like this. (Note: the resolution of our renderings will be set to medium as we evaluate lighting changes in our scene.)

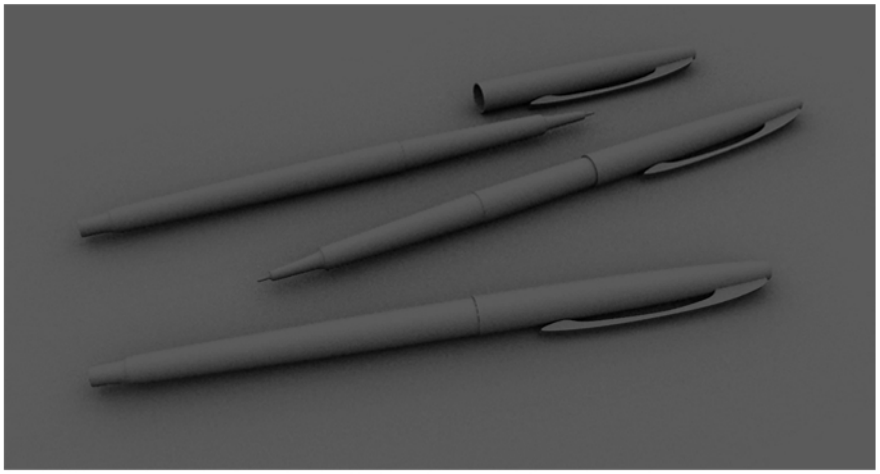


The default Brazil sky light has been turned on and is casting light evenly throughout our scene. To make our rendering less bright we can reduce the intensity of the default sky light by adjusting the value for the sky light “Multiplier” in the “Sky light” section of the “Luma Server” panel. The following images show the effects of various sky light multiplier settings.

Sky Light Multiplier .80



Sky Light Multiplier .60



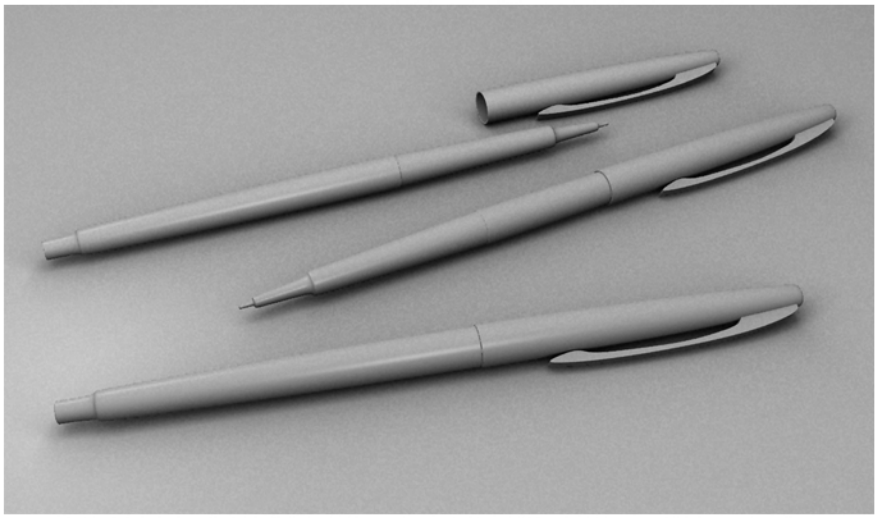
Regular Rhino lights can be used in addition to the Brazil sky light or on their own. It should be noted that faster rendering times will be seen when using fewer lights.

Direct Illumination / with area lights

Now turn the “Direct illumination” “Sky light” off in the Luma Server panel in order to evaluate the use of two area lights in our scene.

Switch the Rhino viewport to the top view and select both of the area lights. With the lights selected, open the Rhino “Object Properties” dialog by clicking on the Properties icon or by typing the command “Properties” in the Rhino command line.

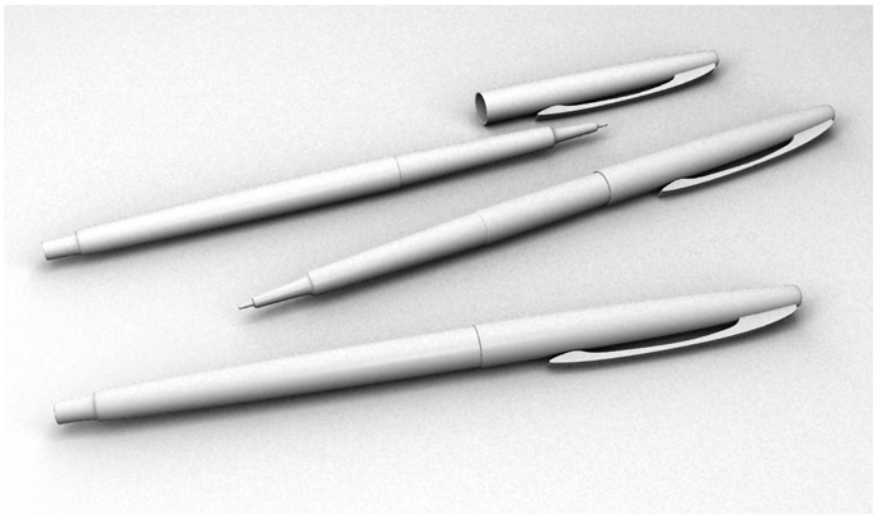
From the drop down list at the top of the Properties dialog choose “Light”. Expand the “Type” panel and turn on both of the area lights simultaneously by checking the “Light on” box. Render the perspective view.



The result is similar to the render made with the sky light set to .80 with the addition of a highlight now reflected in the pen bodies. There are a variety of options for area lights when using Brazil and these can be seen in the panels available in the Light properties dialog when a light is selected. Here’s a quick list of the options chosen for both of the area lights in our scene.

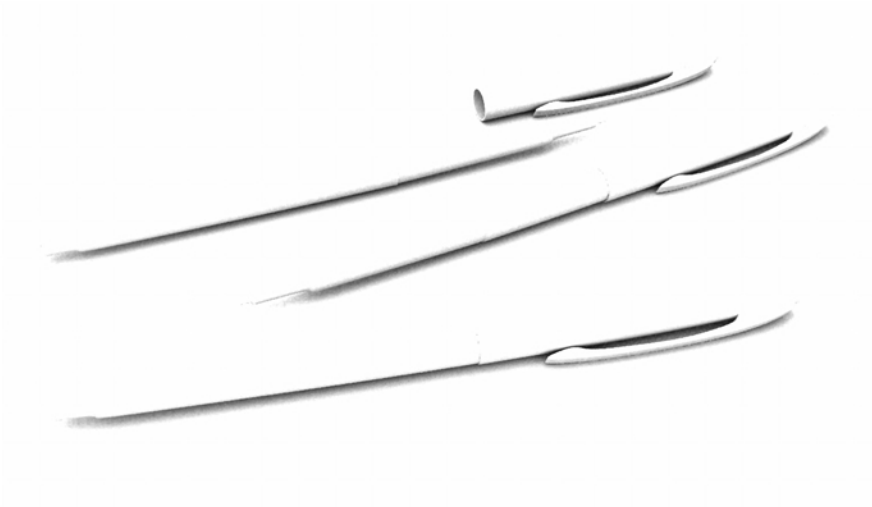
- Features panel: Shadow is checked (produces shadows)
- Color panel: Multiplier is set to .70 (this is the strength of each light)
- Area Parameters panel: Shape is set to Disc (makes softer shadows)

If we change the multiplier value for both area lights to 1.00 we get the following result.

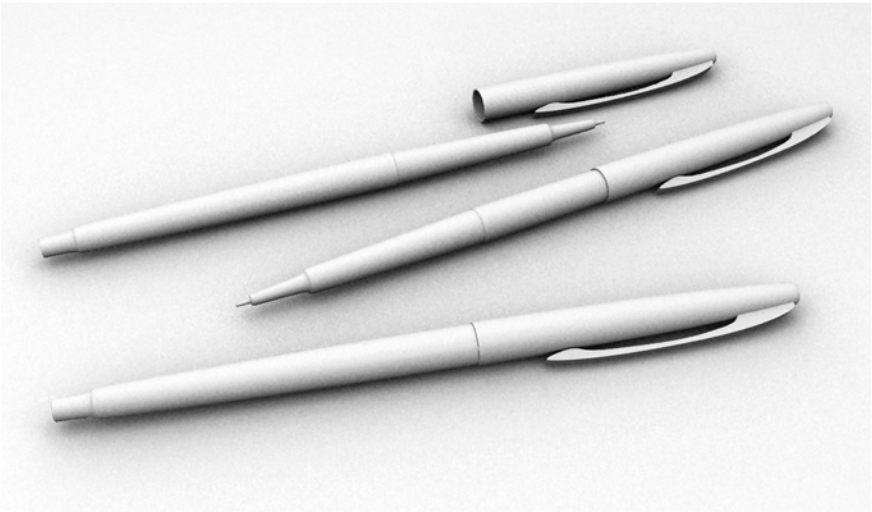


Direct Illumination / with both area and sky lights

Now turn the “Direct illumination” “Sky light” back on in the Luma Server panel and render again to combine the effect with that of the area lights. Our render is now clearly too bright and we will need to balance the multiplier values of the area lights and the sky light in order to have both in the scene.



By reducing the sky light multiplier to .80 and the area light multipliers to .35 we get the following result. A general rule of lighting is to equal roughly a value of 1.00 when adding together all the multipliers of the visible light sources in a given scene... this includes the sky light. However, depending on the size and position of lights in the scene you may need to adjust multiplier values to equal greater or less then 1.00 for the desired result.

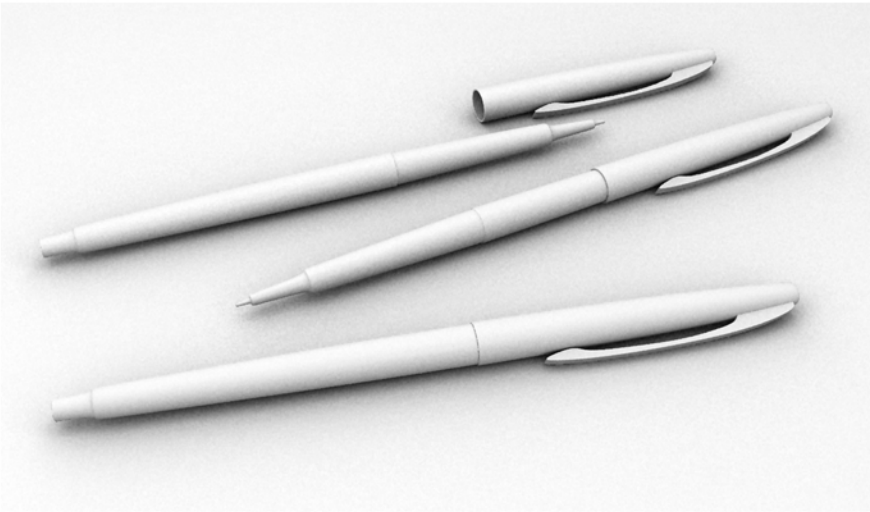


There are a few more items in the Brazil options dialog that you'll want to be aware of as you begin to experiment with various settings.

Global Illumination

Let's take a look at the "Global illumination" section of the Luma Server. In short, turning on global illumination or GI will produce more realistic lighting and shadows then would have been possible with only direct illumination. Our two area lights are currently providing only direct illumination. If we additionally turn on global illumination, the light from our area lights will be allowed to bounce off of objects in the scene and in turn add to the overall lighting. The GI section of the Luma Server also let's you decide how many times you want the light rays to "Bounce" in the scene. The more bounces specified in the "QMC sampler", the brighter the resulting image.

It will often be the case that turning on global illumination will make your rendering brighter and therefore your light multiplier levels may need to be lowered. Let's take a look at our scene after turning on GI.



And here's the result after changing the number of bounces to 2.

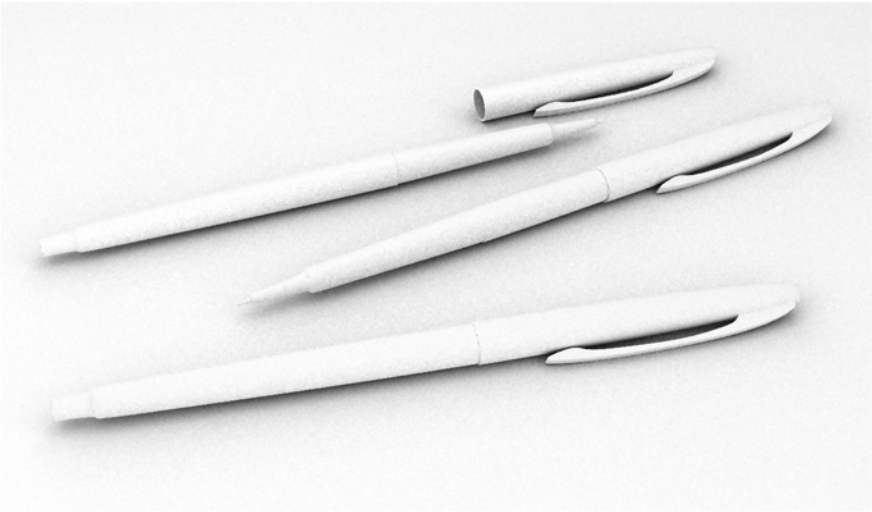


Image Sampling

The resolution of your rendering is determined mainly by the number of samples per pixel specified in the “Image Sampling” panel of the Brazil options dialog. There are three default settings provided, P1, P2 and P3. P1 is the lowest default setting and until now we have been using the medium default of P2. Increasing the number for the minimum and maximum samples allowed per pixel will raise the resolution of your rendering. Higher values will also equal longer calculation times. Here are some samples of our scene at the various default settings.

Render Cache

The GI section of the Luma Server also has an option called “Render cache” that can be quite useful when you need to see the effects of a lighting change quickly. Turning this option on will deliver a speedy first pass of the entire render letting you know if you’re ready to raise your sampling level to P3 production quality.

You may also choose to use the render cache option in your final render by including either the “Retrace” or “Auto-occlusion” settings. The render cache is also useful when rendering animations due to the reuse of lighting information between frames.

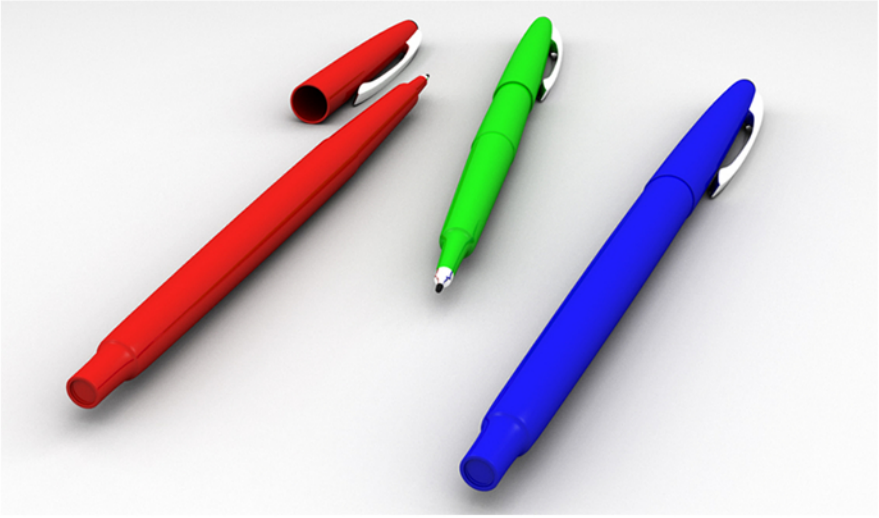
Assigning Materials

Open the “Material editor” for Brazil by clicking on the icon in the Brazil tool bar or by typing the command “MaterialEditor” in the Rhino command line. There are six materials in the editor and so far we’ve only been using the first one... the white BAM (Brazil Advanced Material).

Each pen has three object groups, 1) the pen body 2) the clip and chrome section of the nib and 3) the tip and top of the cap. Select the pen body section for the pen on the left and then right click over the red material in the editor. Choose “Assign to objects” to apply the red BAM to your selection. Repeat this procedure for the remaining two groups in our first pen using the materials named “Pen Plastic 2” and “Pen Chrome” respectively. Do a render at an image sampling of P2 and if the red pen looks like the one below you can begin assigning materials to the remaining two pens in the same manner.

Making Materials

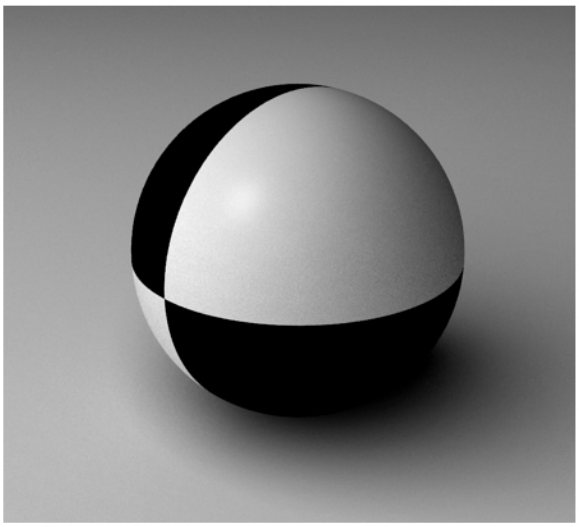
The possibilities for making materials with Brazil are enormous. To keep it simple, only two aspects of our “Pen Plastic” materials have been changed from the default BAM settings. Right click over any material swatch in the editor and choose “Create New”. In the “Content Browser” dialog choose “Brazil Advanced Material” and click “OK”. The new default BAM material now selected in the material editor is grey. You can change the color by selecting the “Diffuse(Cs)” color swatch in the “Brazil Default” panel. The only other change made will be to the reflective quality of our new material. Choose the “Reflectivity” color swatch in the “Reflection control” section of the “Brazil Default” panel and change the “Val:” or Value to be closer to white... “30” was used for our other pen colors. assign your new material and render again to see the result.



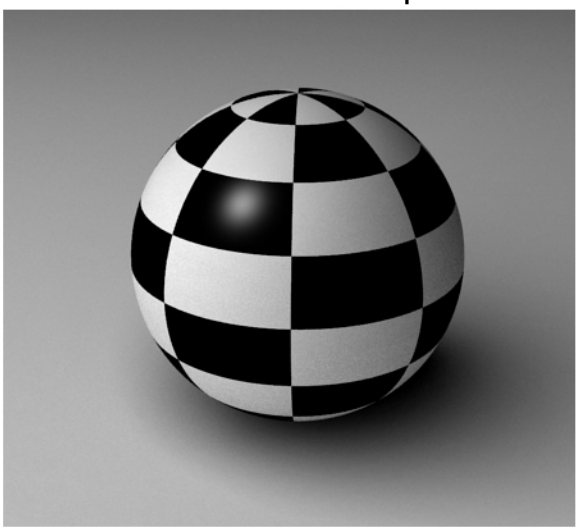
As we discuss the basics of the material editor, it may be helpful to think of materials in Brazil as simply containers for textures. A texture can be a .bmp or .jpeg image you've made or even a procedural pattern already installed with Brazil such as the "Turbulence" or "Tile" textures.

While still in the material editor and with your new BAM material selected, scroll down to the "Basic Surface Parameters" panel. You'll see several slots with the word "none" inserted. These "channels" are aspects of the BAM material chosen and can receive textures to customize the material further. For example, right clicking over the empty slot to the right of the "Color (Cs)" swatch will allow you to select an existing texture or create a new one by using the "Change" option. Here are a few simple uses of Brazil materials and the settings used to produce them.

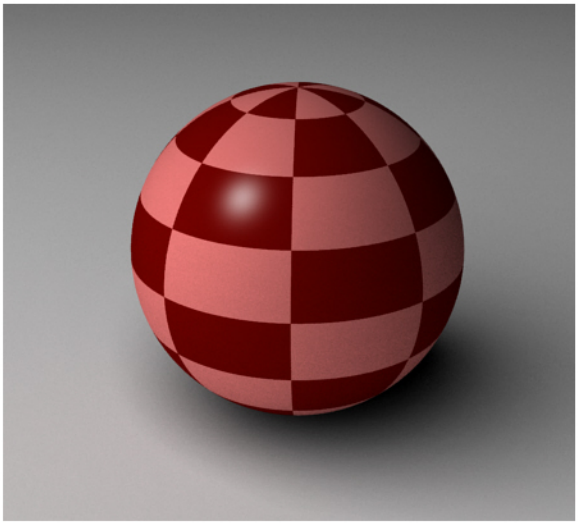
Checker texture applied in the Color (Cs) channel of a BAM.



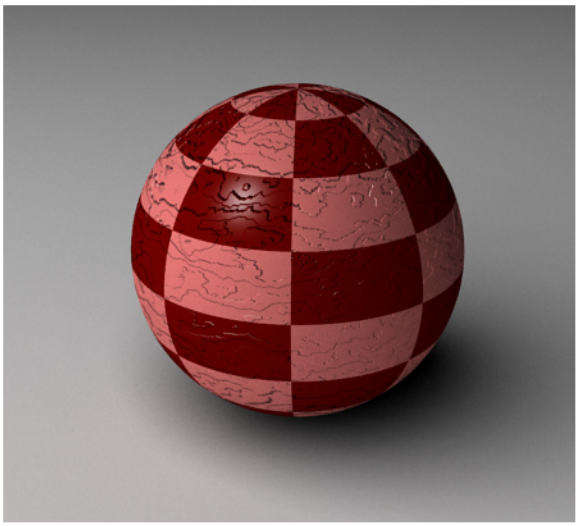
Same texture but with the tiling edited from 1 to 4 in both the U and V directions of the sphere.



Checker texture changed to 50% and the Color (Cs) set to red.



Added a Marble texture with a UV tiling of 4x4 to the Bump channel.



The material editor has a drop down list directly under the material sample swatches where the active materials name is displayed. When a material is selected this drop down list shows all the textures applied to that material. In the case of the checkered sphere example, the checkered textured can be selected from this list and edited. The tiling changes illustrated on the previous page were made in the “Local Mapping” panel for both the Checker and Marble textures which were inserted into a BAM.

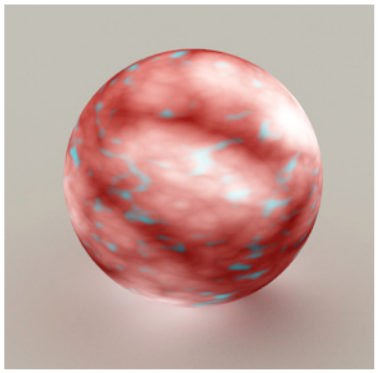
Making Textures

Select the “Textures” tab at the top of the Material Editor if it’s still open or type the command “TextureEditor” in the Rhino command line. The Texture Editor is part of the same dialog as the Material Editor and the Environment Editor which we’ll cover next.

There are a few default textures displayed in the Texture Editor, the Checker texture among them. By selecting a texture, the options will change below it in the same way as options for materials selected in the Material Editor. Different options exist in different types of textures as well as additional channels where further customizing can occur.

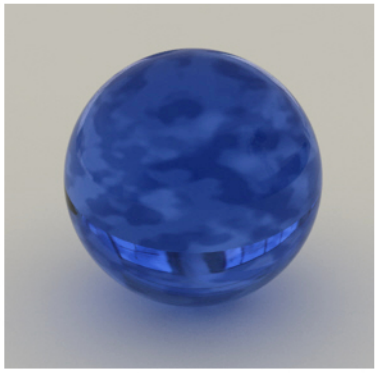
The major difference between textures and materials is that textures cannot be applied to an object in your Rhino scene unless they are first placed inside a material. Here are some example materials and a description of the textures used to create them.

BAM with a Stucco texture inside of a Turbulence texture. Added to the Color and Extra light channels.



Chrome with a CellBasic texture added to the Filter channel.

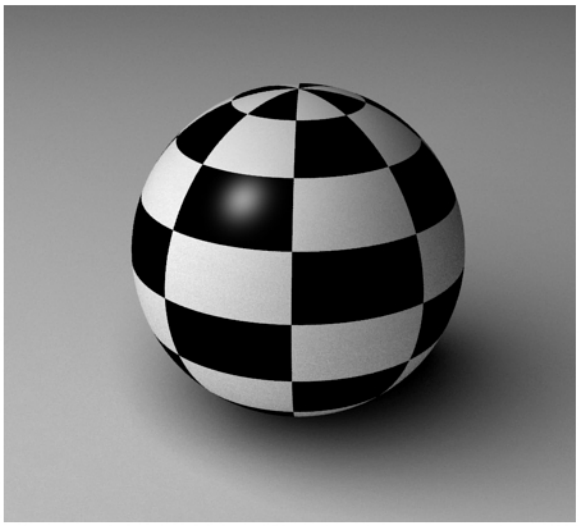
Blue Glass with a Granite texture added to the Refraction Filter channel at 25%.

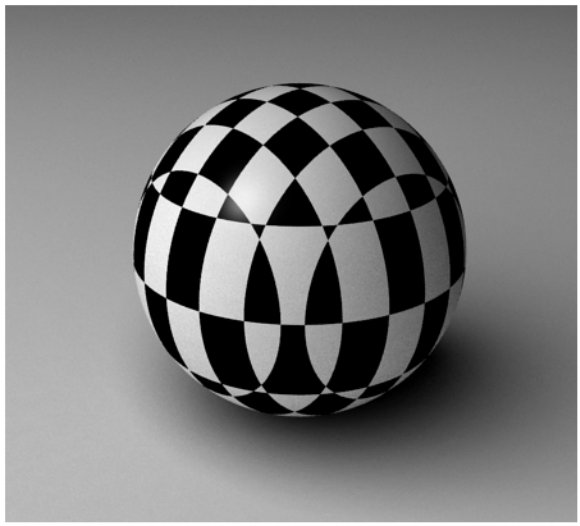


BAM with a bitmap of wood grain added to the Color channel.

Texture Mapping

In order for your materials to look correct when applied to your model you'll need to understand the concept of texture mapping. Take a look at the two spheres below. One sphere has a checkered texture wrapped or "mapped" around it's own UV coordinates. While the other has been mapped with the identical texture projected on to it as if from a flat plane.





With any model selected in Rhino, click on the "Object Properties" icon or type the command "Properties" in the Rhino command line. From the drop down list at the top of the Object Properties dialog select "Texture Mapping". The default texture mapping projection for all objects is "surface" which means that textures assigned to materials and applied to that object will flow along the UV direction of each surface within the object.

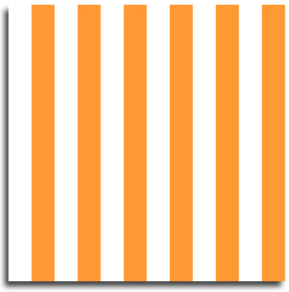
Check the box titled "Show advanced UI" in the Texture Mapping section of the Object Properties dialog. An "Add" button appears allowing for alternate methods of texture mapping materials to your selected object(s). Click "Add" and expand the drop down list in the "Projection" row of the "General" section. Here you will see six different styles for texture mapping materials to your selection.

Depending on the shape of your object and also the pattern of your textured material, you'll want to assign a specific projection mapping method for the desired result. In general, it is best to use a projection method that closely resembles the overall shape of your selection.

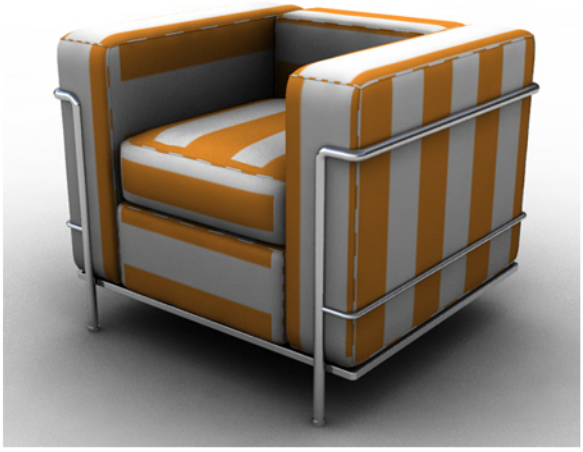
There is also a "Show Mapping" and "Hide Mapping" button that can be used to display or hide the texture mapping widget for the active selection. Standard Rhino orientation methods can be used to reposition the widget and alter the look of the resulting projection.

In the following example, the square cushions of the sofa chair mostly lend themselves to the "Box" style of texture mapping. However, two of the cushions responded better to the "Planar" projection type.

Here we have an orange and white stripe upholstery texture to project onto our cushions. These renderings employ several different projection methods, the last being the intended result.

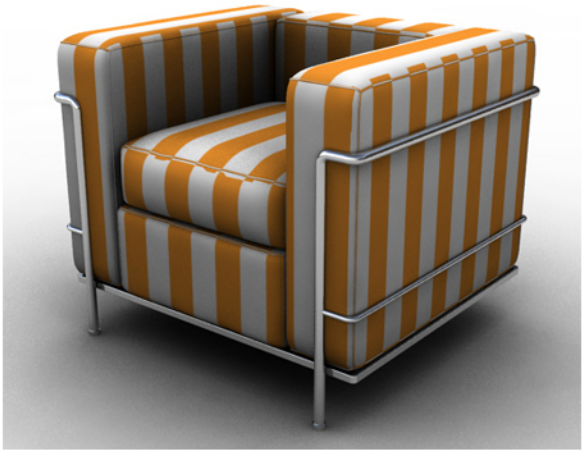


“Surface” for each cushion.

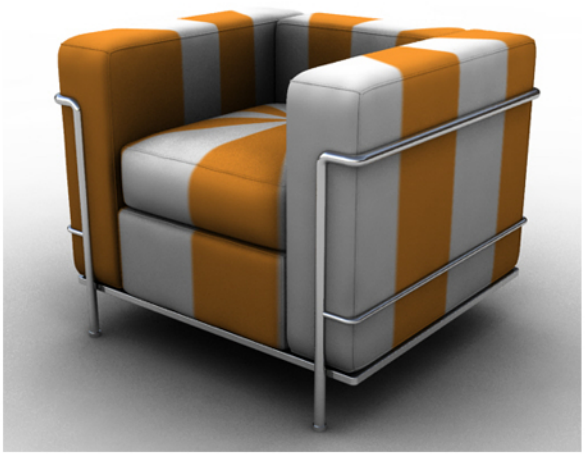


“Box” for each cushion.

“Box” for all cushions together.



“Spherical” for all cushions together.



“Planar” for seat and back cushion, “Box” for other cushions.

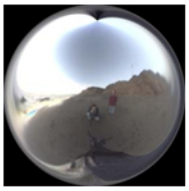
Changing Environments

A big part of how a rendering looks has to do with where the objects rendered are supposed to be. This could be in a kitchen or on the beach or even outside in your home town at twelve noon on the day you were born (assuming you were born after 1979). There are a variety of stock environments to choose from or you can create your own with the use of bitmaps or “High Dynamic Range Images” (HDRI). Here’s an additional rendering of our Brazil Pens file with the only change being the environment. The materials and lighting have not been changed and yet the plastic pens have a much glossier appearance.

Select the “Environments” tab in the Material Editor dialog if it’s still open or type the command “EnvironmentEditor” in the Rhino command line. The default or “Basic Environment” has only a background color but does offer the options of adding a background image as well as changing the way that image is “Projected” in the scene. Just as with the Material and Texture editors, right clicking over a sample swatch provides additional options for working with environments. Selecting “Create New” will launch the Content Browser dialog with a list of the environment types to choose from.

Create a new “Brazil GI Environment” in the Environment Editor in the manner described above. You’ll then see it represented in the Environment Editor as another sample swatch... it will look black... but not for long.

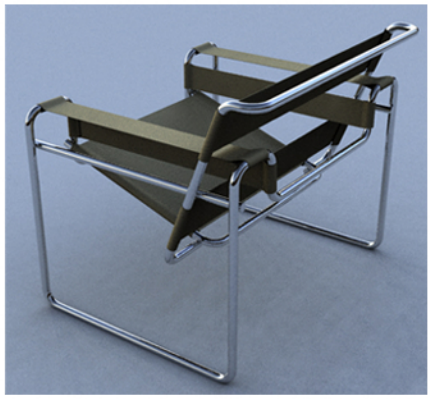
Go to...
http://www.debevec.org/Probes/
and download this .hdr image provided by Paul Debevec.

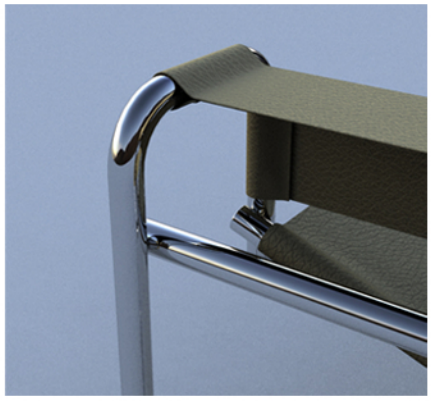


Save the .hdr image somewhere memorable on your computer and add it to the empty “Equirectangular Texture” channel in the options for the Brazil GI Environment you just created. You should see the sample swatch update in the Environment Editor. Right click over the sample swatch and select the “Set As Current” option. The next choice is the important one and determines how this image will be used by Brazil.

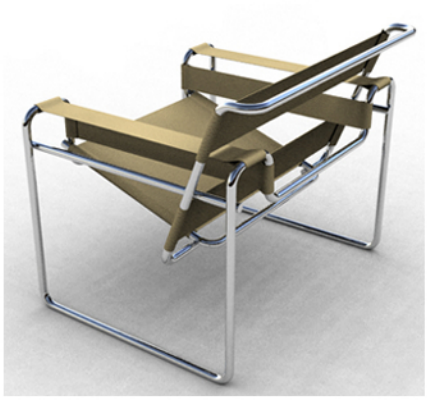
In the Brazil Options dialog go back to the Luma Server panel we began with. If you still have the Brazil Pens file the way we left it after assigning our materials, the sky light and the two area lights will still be on. In the “Sky Light” section of the Luma Server panel there is an option labeled “Use Environment Settings”. This option when checked will take the HDR image from our current environment and use it as the sky light in our scene. When this option is not used, the sky light will be white in color. Try a render with both options to see the difference. Notice that even when we are not using the current environment as our sky light the HDR image will still be used for the reflections in our pens making them look glossier. Here’s another example showing the same technique...

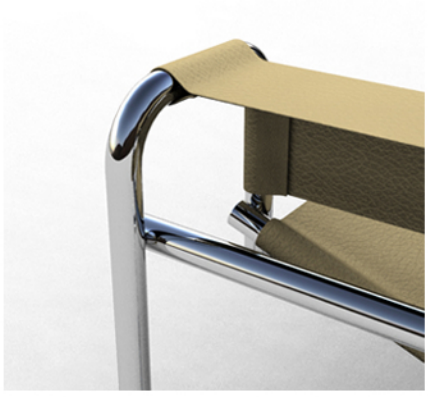
Use environment settings for sky light on.





Use environment settings for sky light off.





Another environment available for your use is the “Brazil Physical Sky Environment”. Right click on an environment sample swatch in the Environment Editor and select “Create New” then choose “Brazil Physical Sky Environment” from the Content Browser.

Below the new environment sample swatch you will see the options for the physical sky environment. In the “Brazil Physical Sky Parameters” panel select the icon of a sun at the end of the “Date & time” row. This launches the “Sun Angle Calculator” dialog with controls for choosing a date, time and global location for the sun in your environment. Here’s an example from 6 AM and another from 6 PM on the same day... the sky light multiplier was set at 2 in both cases.

Final thoughts...

With any luck, you now have the building blocks to effectively use Brazil to render your Rhino models. You may want to add to your knowledge by reviewing professional photography lighting techniques. There are many similarities and the basic principles may give you some additional ideas for setting up your rendering scenes.

You should also be aware that any option settings, materials, textures or environments can be saved and loaded into Brazil when needed. You can find the “save to file” and “load from file” options when right clicking over a material, environment or texture swatch in the corresponding tab of the Material Editor. Options can be saved and loaded through the two buttons at the bottom of the Brazil Options dialog.

Be sure to check out more advanced tutorials and share your own work at www.brazil.mcneel.com

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