

Lesson 5

The fifth lesson consists of 4 standalone modules

- Caustics
- Clipper
- Diagrammatic Materials
- Material Wrapper

Each module comes with scenes and assets that can be found in the Lesson 5 folder, in a sub-folder with a name corresponding to the module name.

Caustics

Caustics is a natural effect which appears when bright light shines through curved refractive objects or is reflected by curved reflective objects and then hits a diffuse surface. A good example of caustics is the pattern light forms on the bottom of a pool for example. In order to have caustics in a scene you need a caustics generator – a light source, a curved reflective or refractive object and a caustics receiver – a diffuse surface. In V-Ray the Caustics effect is generated by tracing a special kind of map called Photon Map which is used to figure out where the light is concentrated by the curved surface and how strongly it illuminates the surface. To control the caustics generation there are several places where there are relevant settings.

Light settings – each light source has a parameter called **Caustic Subdivs**, which controls the quality of the caustics generated by that light. Higher values increase the quality of the caustics, while lower values speed up the rendering.

Material settings – to create reflective caustics all you need to do is make sure that the material has strong enough reflections – the **Reflect** parameter is “bright” enough. To create refractive caustics the **Refract** parameter of the material has to be bright enough and the **Affect Shadows** checkbox has to be **disabled**. If the **Affect Shadows** is **enabled**, the object will cast transparent shadows based on its refractivity. This is not physically accurate and makes it impossible to generate real photon mapped caustics. The **Affect Shadows** parameter is useful when the caustics effect is not that obvious, for example when rendering flat refractive surfaces like window glass.

Render Settings – in the **Global Illumination** settings there is a rollout called **Caustics** which allows us to enable the tracing of photon mapped caustics. The settings inside control how the caustics are generated but the default values are good for most cases. The only parameter we would adjust here is the **Multiplier** which controls how strong (bright) the caustics are going to be. Higher values make the caustics brighter. The options here allow us to save the photon map used to create the caustics and reuse it for a later rendering.

Render Elements – in the **Render Elements** rollout you can add a **Caustics** element which will show you just the effect of the caustics on a black background so you can better see the effect.

Clipper

This module covers the two ways of clipping geometry during render time that V-Ray supports. Clipping the geometry allows you to expose its inside without having to remodel it and it is useful in architectural visualizations.

Section Plane – this is the native SketchUp way of using a plane to clip geometry. It can be found in the **Tools** menu of SketchUp. It will affect only the objects which are in the same **Group** with the **Section Plane**. Once you create a **Section Plane** it will appear in the **Geometry** section of the **V-Ray Asset Editor** and you can use the parameters here to adjust how it affects the rendering:

- **Enabled** – enables and disables the Section Plane
- **Affect Lights** – when this checkbox is enabled light sources will shine through the clipped-out geometry and will illuminate its inside. When the checkbox is disabled only lights that are inside the geometry that is left after the clipping will shine inside it.
- **Camera rays only** – when enabled the geometry will not appear clipped in reflections and refractions and when calculating the Global Illumination.
- **Clip lights** – when enabled V-Ray will also clip light sources in the scene
- **Use Object material** – this checkbox controls the material V-Ray uses to shade the faces it generates to fill in the holes that result from the clipping. When its enabled V-Ray uses the material that is applied on the corresponding geometry. When its disabled, you can use the **Material** parameter below to specify a custom material for V-Ray to use.

V-Ray Mesh Clipper – this is a V-Ray specific modifier that can be applied to any mesh in the scene and use it to clip geometry. It works in the same way as a **Section Plane** and has exactly the same options with the only difference being that you are not limited to using just a plane, and can use any complex mesh instead.

Diagrammatic Materials

This module examines the different V-Ray materials that can be found in the **Diagrammatic** folder in the **V-Ray Material Library**. These materials are used to create rendering with a stylized or diagrammatic look.

Toon materials can use any material in the scene as a base and add an outline around the geometry edges. This creates a “cartoonish” or stylized look

- **Base Material** – allows you to specify the material that is going to be used as a base



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- **Line color** – controls the color used to draw the outlines
- **Line Width** – controls the width of the lines used to draw the outlines
- **Opacity** – allows you to reduce the visibility of the outlines
- **Distortion** – allows you to distort the outlines so they are not always straight lines
- **Overlap Threshold** – controls where the outlines will be created. Lower values reduce the overlapping of lines inside curved surfaces

Wireframe materials use the **Edges** texture connected to the **Diffuse** parameter of a **Generic** material to create a wire frame rendering of the objects that they are applied to. You can adjust the settings of the **Edges** texture by clicking the texture icon next to the **Diffuse** parameter slider. Use the **Edges Color** parameter to change the color of the wire frame and the **Pixels** parameter to adjust the thickness of the wireframe lines.

Falloff materials give one color to horizontal surfaces and another color to vertical surfaces. You can change the colors by clicking on the texture slot next to the **Diffuse** parameter slider of the material. **Source A** is the color for vertical surfaces and **Source B** is the color for horizontal surfaces.

MaquetteWood materials can be used to make the building look like it is a small wooden model. This effect can be made stronger by enabling the **Depth of Field** effect in the **Camera** settings in the **V-Ray Asset Editor** and increasing the **Defocus** value

Material Wrapper

This module covers the workflow for inserting a CG object in a real-world photograph also called a backplate.

The first step in the process is loading the backplate image in to the **Background** slot in the **Environment** options in **V-Ray Assets Editor**. It is important the aspect ratio of the backplate matches the aspect ratio of the image we are going to render. Once the background image is loaded we need to make sure we are using the proper mapping. This can be done in the **UVW** roll out by switching the **UVWGenChannel** parameter to **UVWGenEnvironment**. Next, we need to switch the Mapping Type parameter to **Screen**. We might need to adjust the brightness of the **Background** image to compensate for the **Camera Exposure Value (EV)**. This is done by adjusting the number value next to the **Background** color swatch. In our particular scene, we need to set that value to 60. Finally, we need to enable the **Environment Overrides** for **GI(Skylight)** and **Reflection** and set their multipliers (the values next to each swatch) to 0. This makes sure that the Backplate is not considered when calculating GI and Reflections.

Next, we need to make sure that the CG object casts shadows on the table in our backplate. This is done with a plane that matches the table in the background. We need to make it invisible to the camera but still able to receive shadows. To do that we are going to use a **Wrapper** material applied to the



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plane. In order to catch the shadows, the **Wrapper** material requires that we give it a gray diffuse material to use as a **Base material**. To do that we set the **Base material** parameter to **Ground_mtl** (a **Generic** material that has its **Diffuse** parameter set to a gray color). We need to enable the **Matte** checkbox in the options of the **Wrapper** material – this makes it invisible to the camera. To catch the shadows, we enable the **Shadows** checkbox. Now the rendering should look like the wooden model is casting shadows on the table in our background image. We can use the **Shadow color** and **Shadow brightness** parameters to control the color and brightness of the shadows respectively. Finally, if we want to have a proper alpha channel for compositing purposes, we need to set the **Alpha contribution** parameter to -1. This will allow us to switch the backplate with a different image in Photoshop for example.