

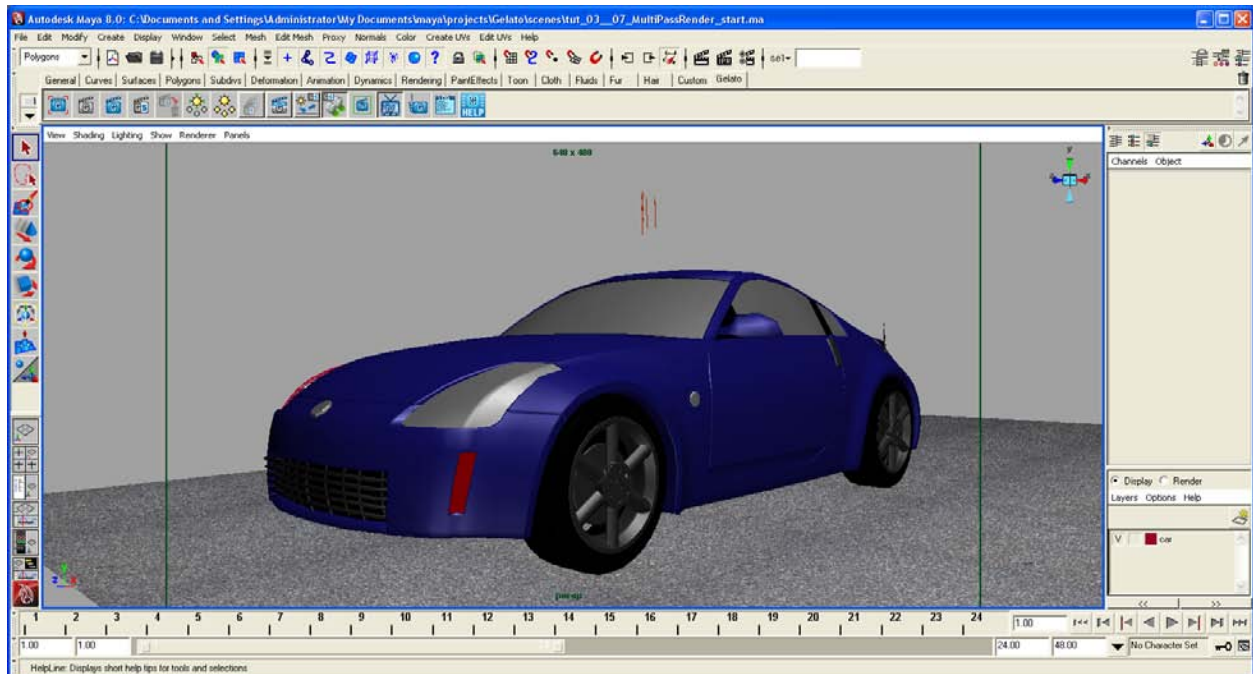
3.7 MULTI-PASS RENDERING



This is the companion to the movie, tut_03_07, 7th of the 8 NVIDIA® Gelato® Advanced Tutorials.

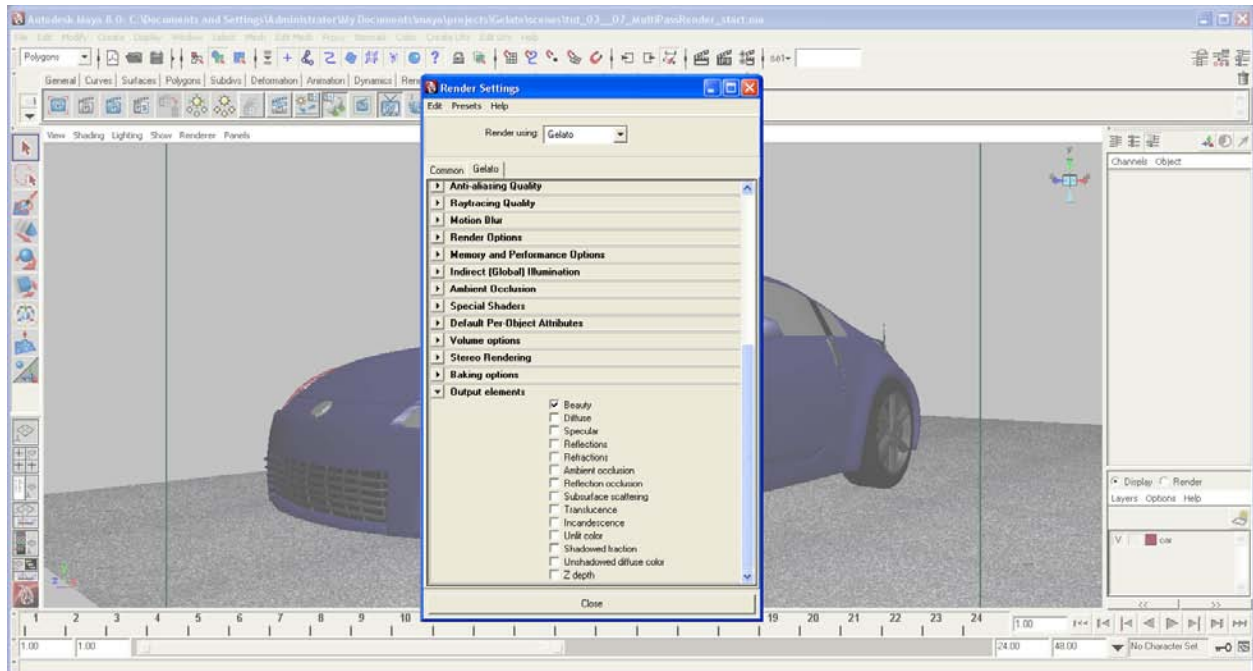
Multi-pass rendering is a technique used in most studios, especially when 3d elements are composited into live action footage. It allows control over individual elements that make up the image, such as reflection, specular highlights and shadows. Compositors usually want control over these elements separately so the entire image doesn't need to be affected if they just want to lighten a shadow, bring down a highlight or change the color of a highlight. Why go back and re-render an entire image if a slider adjustment or a node addition could adjust the opacity of a highlight render pass? It's much less expensive and a lot faster for the entire production.

Maya does have render layers which allow one to select objects, place them in a render layer and say what that render layer is supposed to do. It's a powerful feature, but... it can take a while to set up. Gelato will play well with Maya's render layers, so you can integrate this if it's necessary for your workflow, but, as well, Gelato offers a quick and simple way to set up multi-pass rendering. Let's take a look...



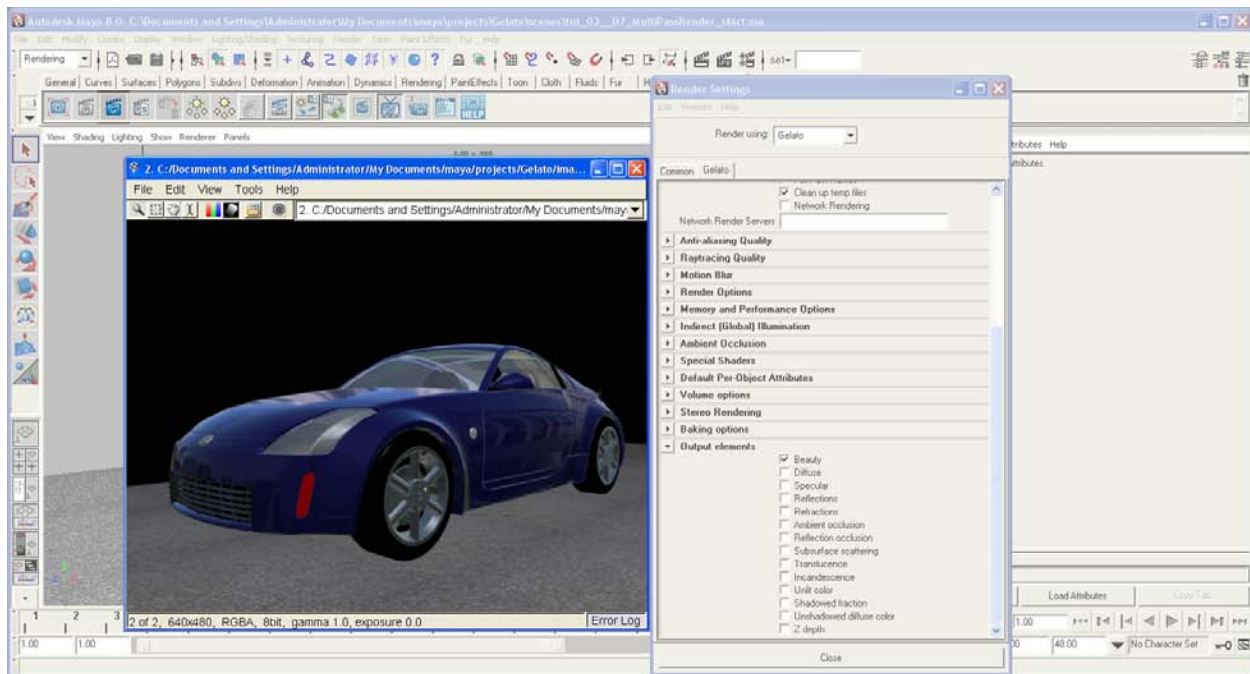
- Open “tut_03_07.”

We see a car on a plane.



- Render Settings > Gelato > Output elements.

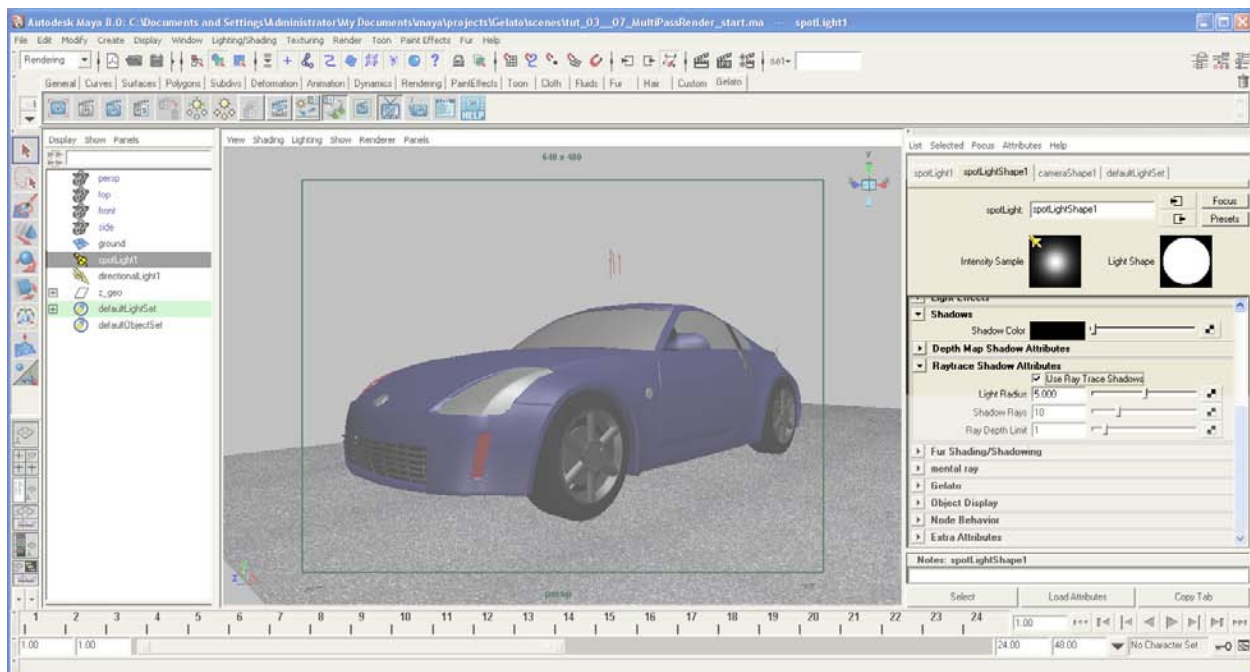
Here we see a list of the various passes that are commonly rendered out separately. Right now **Beauty** pass is enabled.



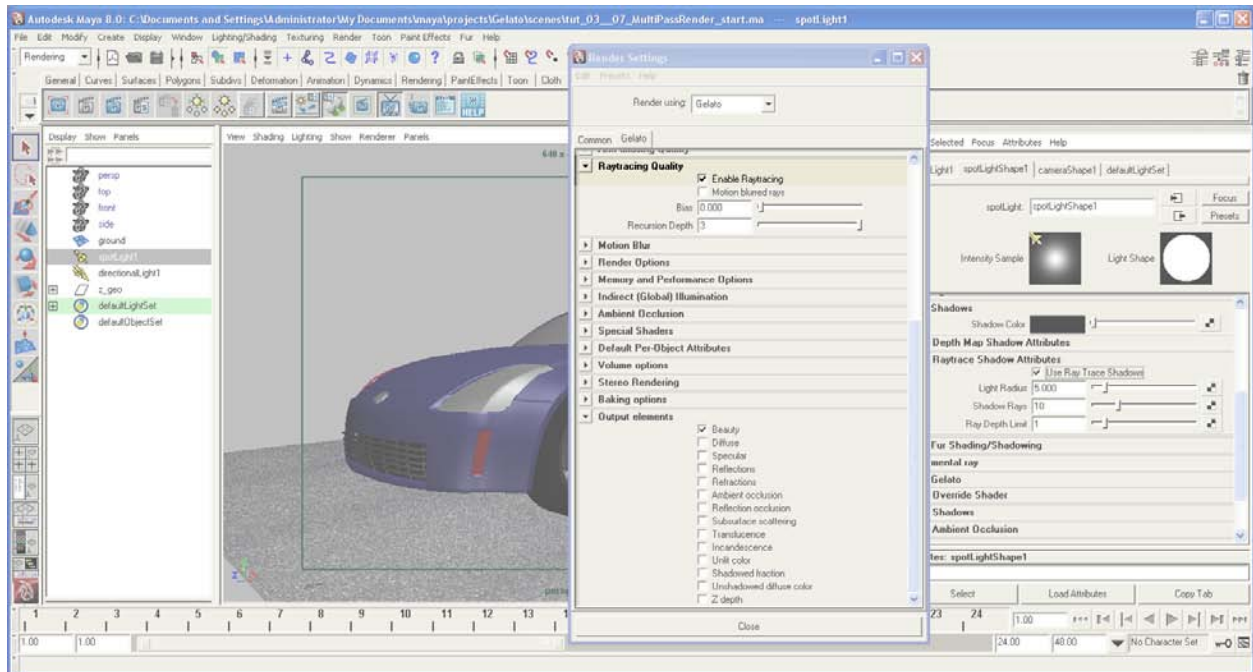
- Gelato Render.

This is our beauty pass, the composite of all the elements of the scene. So where are the reflections and shadows?!

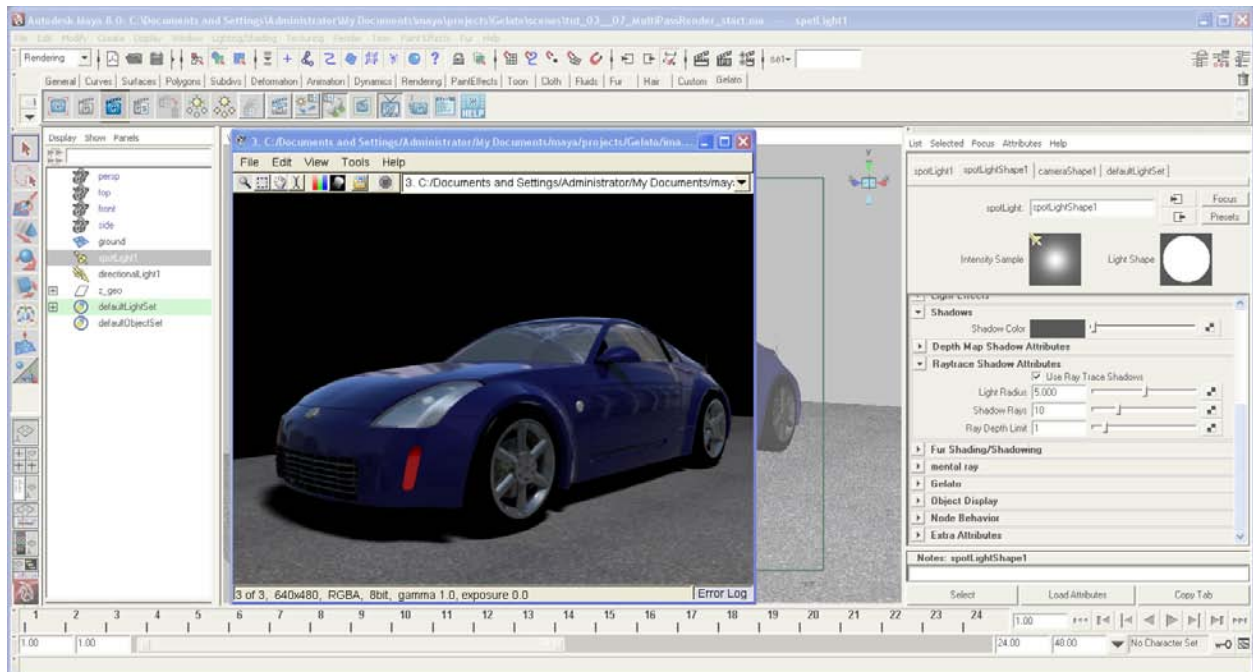
The beauty pass is a composite of all the elements of a scene, but *only if those elements are enabled*.



- Select the spotlight.
- Spotlight's Attribute Editor > Shadows > Raytrace Shadow Attributes > enable Use Ray Trace Shadows.

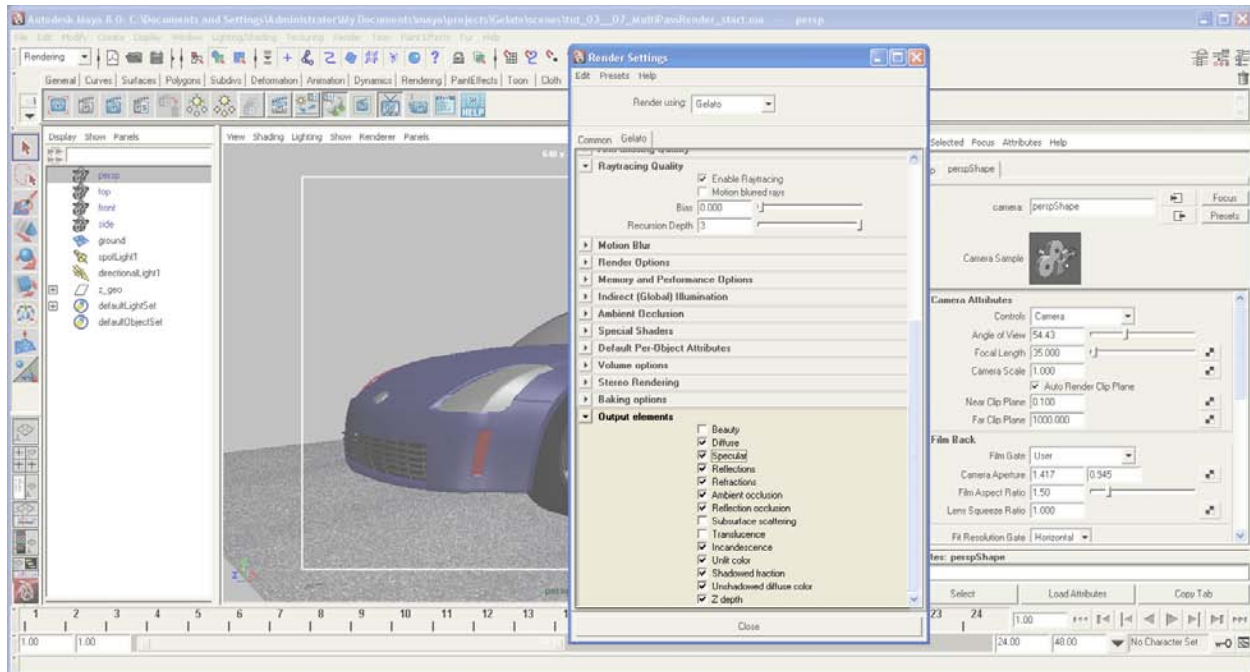


- Render Settings > Gelato > Raytracing Quality > turn on Enable Raytracing.



- Gelato Render.

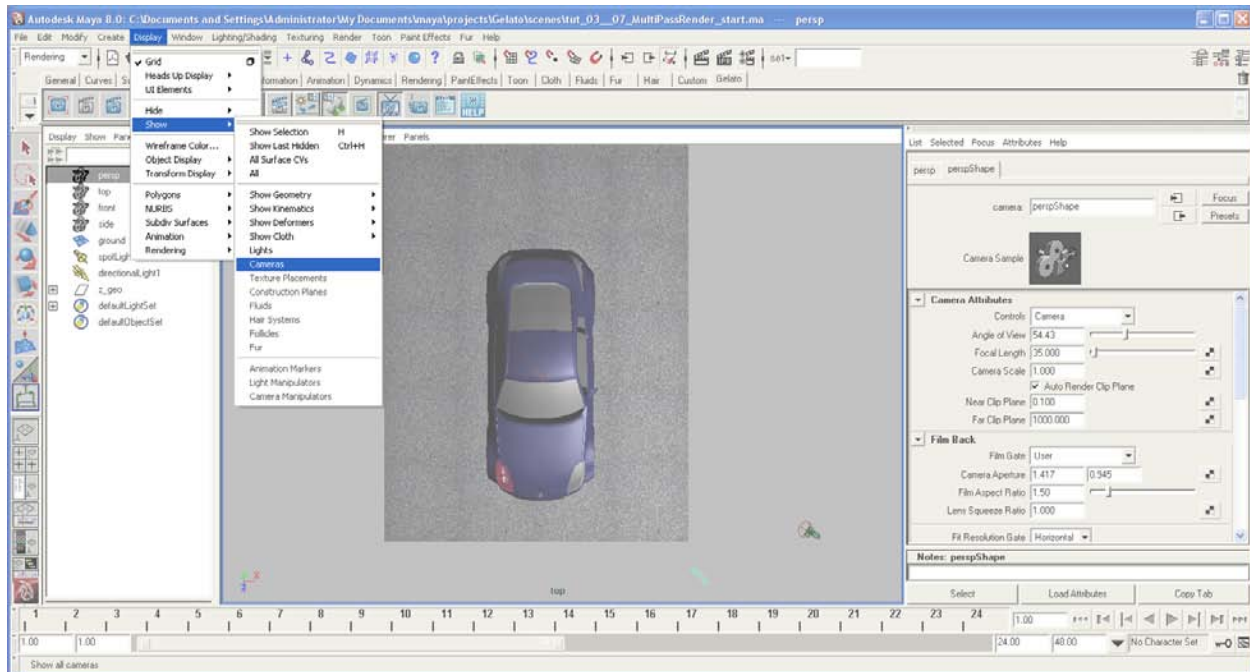
Voilà. Shadows, refractions and reflections.



Return to the Output elements section of the Render Settings so we can set up our passes.

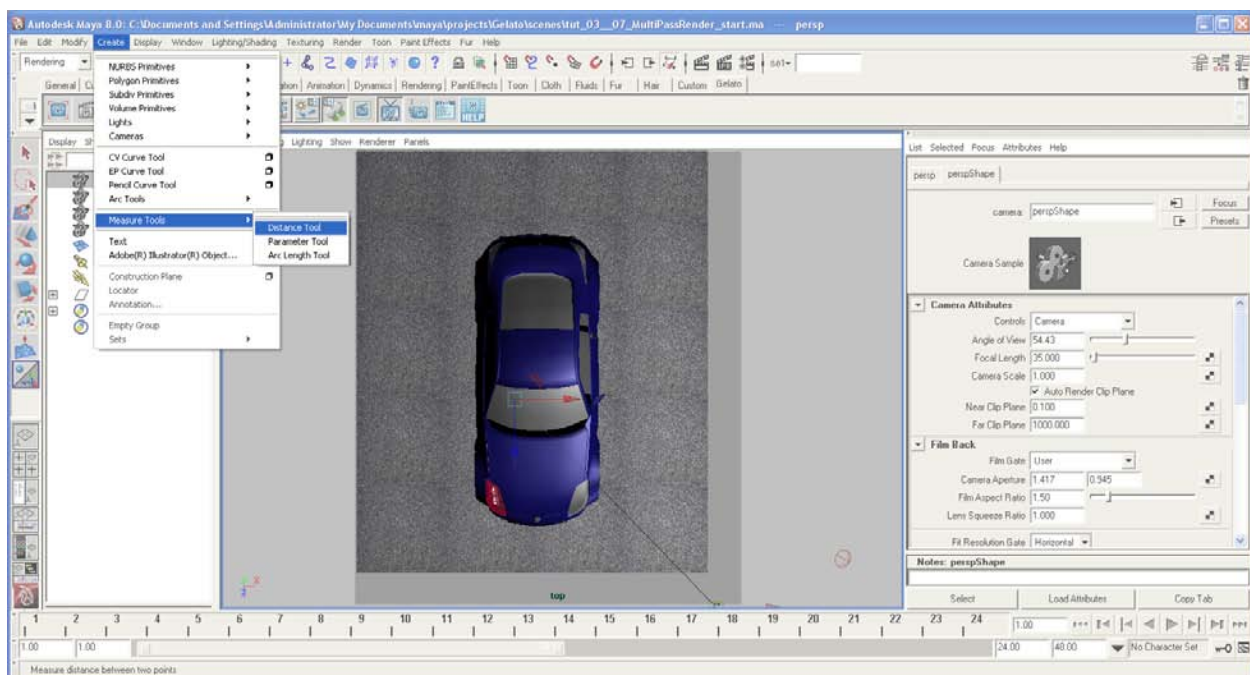
- Turn off **Beauty**
- Enable: **Diffuse** – this will give us the car with only the color and shading.
 - Specular** – this will give us the highlights.
 - Reflections** – this is both the environment and ray-traced reflections.
 - Refractions** – this is for the transparent objects.
 - Ambient occlusion** – a grey-scale pass which determines which areas fall into shadow, as seen in tut_03_02.
 - Reflection Occlusion** – this is a quick way to do occlusion based on a simple ray trace calculation. It's often used as a quick and dirty ambient occlusion.
 - Incandescence** – the car's lights will show up here.
 - Unlit color** - sometimes called an Ambient pass, meaning evenly or flatly lit. With it an entire image can be built from the ground up.
 - Shadowed fraction** - the shadow pass.
 - Unshadowed diffuse color** – the color pass without the shading.
 - Z depth** – depth information of the scene. When using this, one should use Maya's clipping planes to determine the beginning and end points.

We're not including Subsurface scattering or Translucence passes since these are not properties found in this scene.

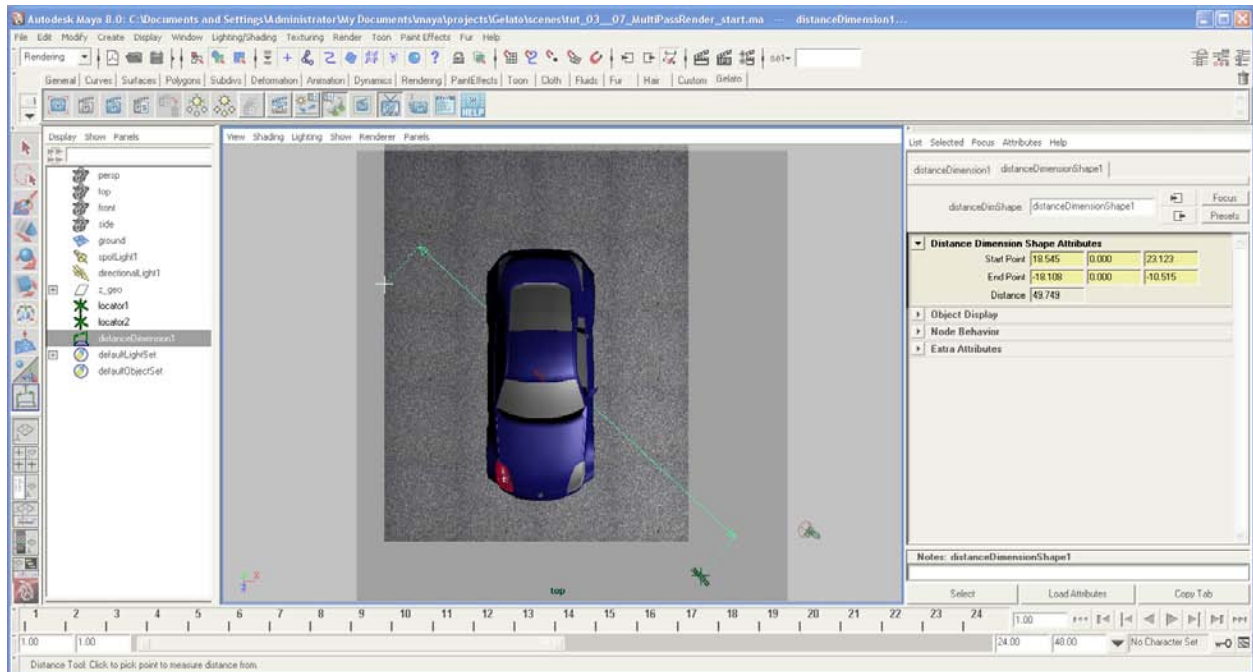


As we have already discovered, enabling a pass won't do any good if we haven't enabled everything that pass needs. We've taken care of the ray-traced elements, but we need to set up the Z depth information. We need to set a distance range.

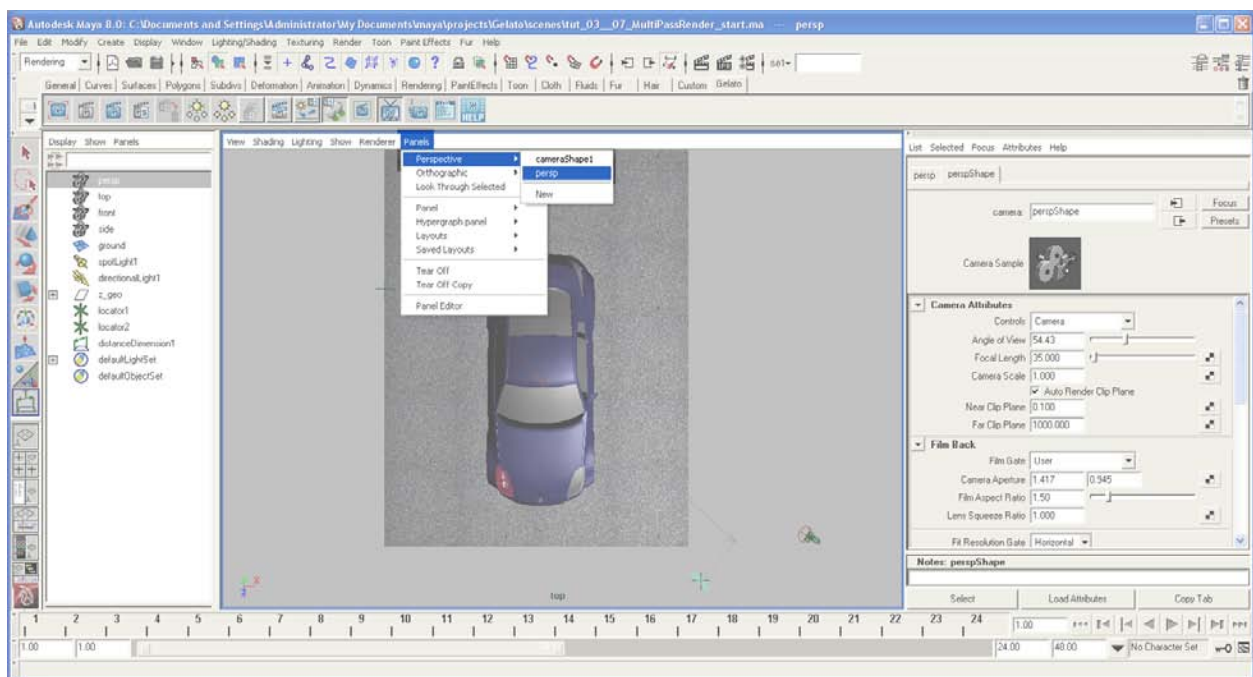
- Change to a top view of the scene.
- Main Menu > Display > Show > Cameras
- Select persp camera.
- Zoom out in the scene until you can see this camera.



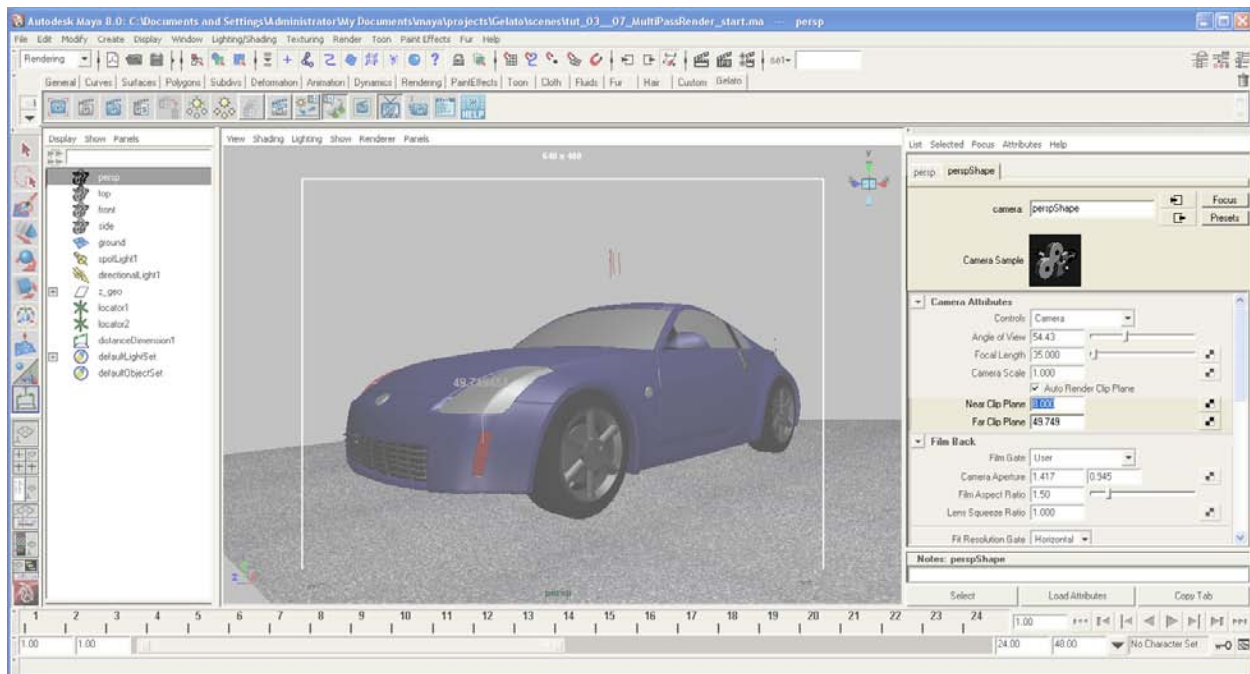
- Main Menu > Create > Measure Tools > Distance Tool



- **[CLK]** on the middle of the camera, then again on the edge of the pavement, roughly parallel to the direction of the camera, as indicated in the above image.
- Select the Distance value shown in the Attribute Editor – in the above image, it is 49.749.
- **[CNTRL+C]** to copy it.

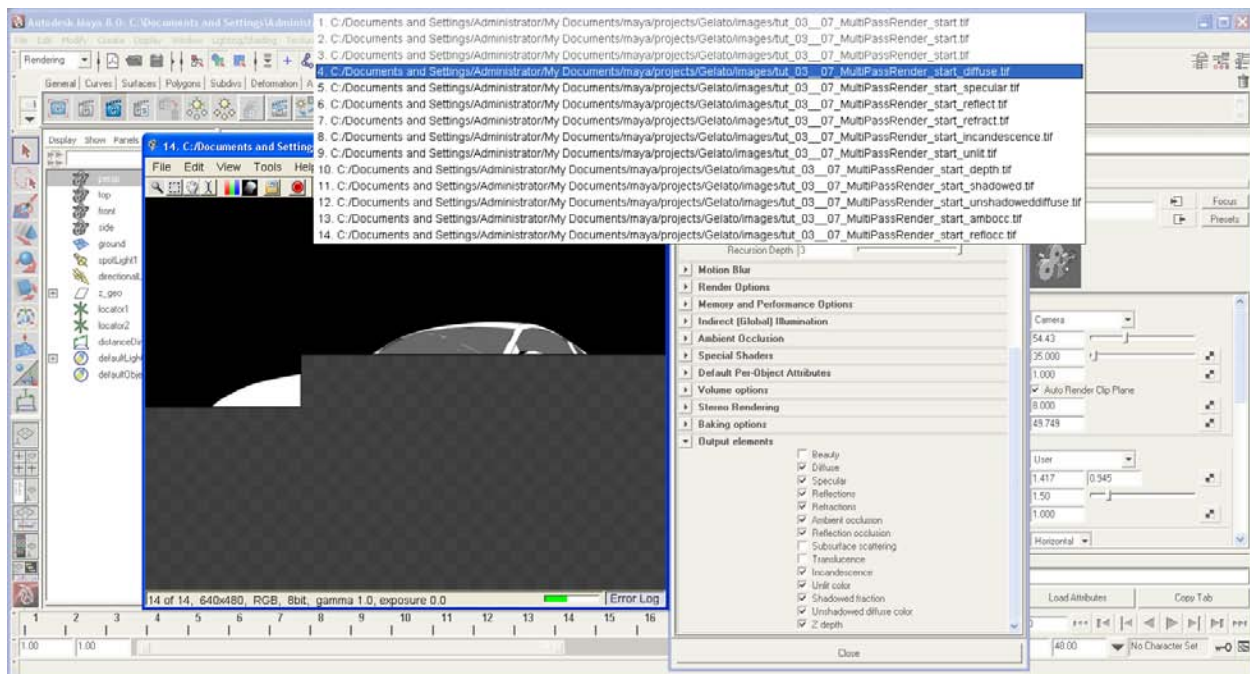


- Viewport Window > Panels > Perspective > persp.

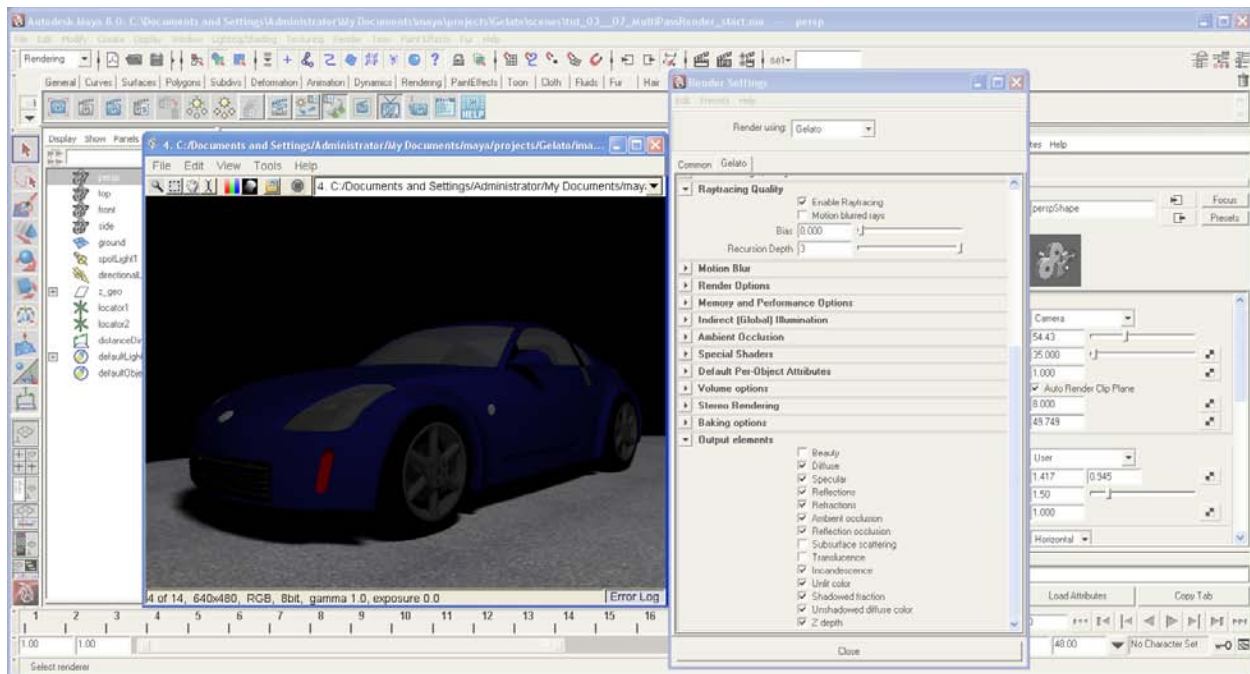


- Persp camera > perspShape > Camera Attributes > Far Clip Plane > **[CTRL+V]** to paste the Distance value into the value field.
- **[CTRL+DRG]** in the Near Clip Plane's value field to find a suitable value for this distance. In the above example, we've chosen a value of 8.

Now that the Z depth pass is set up (we've established a depth range), we're ready to go...



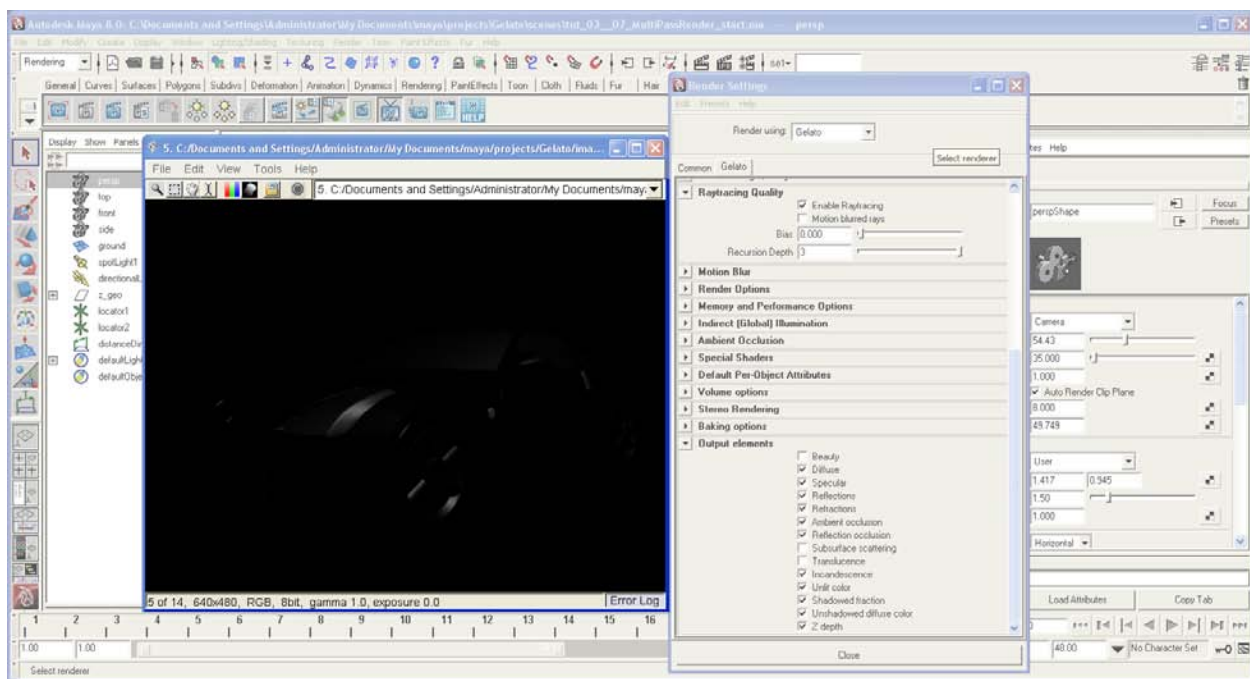
- Gelato Render.
- **[CLK+HOLD]** on the iv's Documents field while the render is underway. You'll see all the requested passes listed; if you select them one by one, you'll see that all the passes are in the same stage of render. *Gelato renders the passes simultaneously.*



When the render is done, take a look at what is in each of the passes.

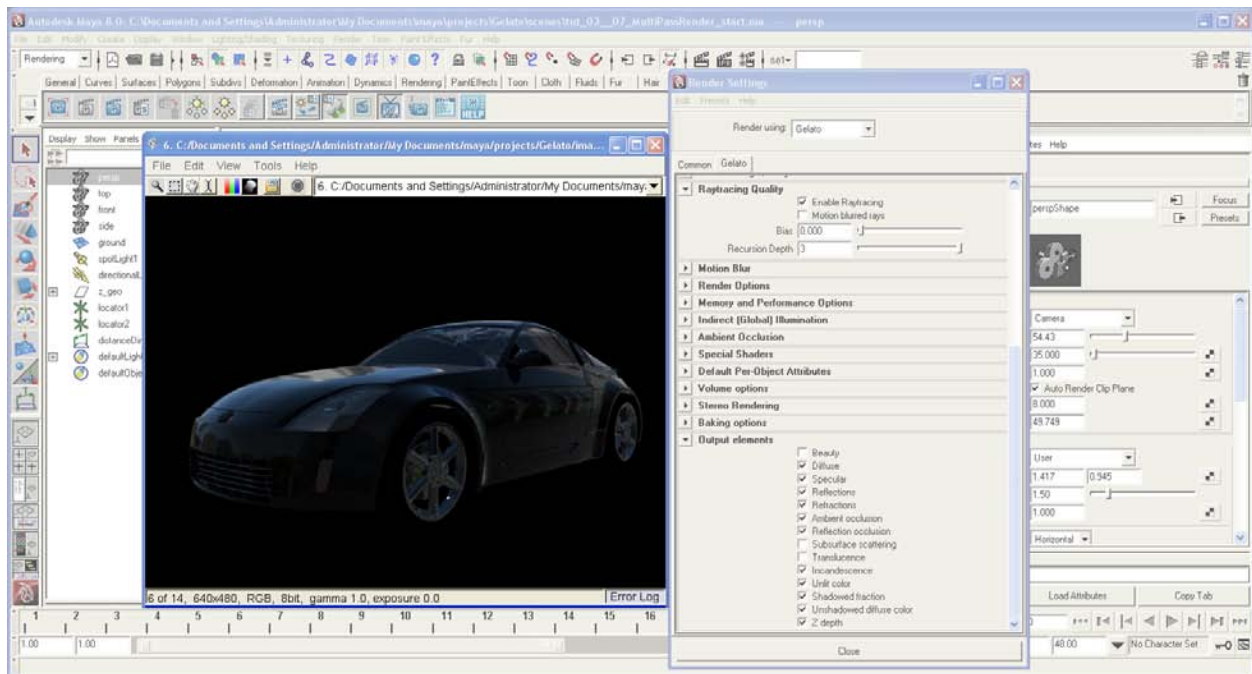
* Diffuse *

Colors and shadows.



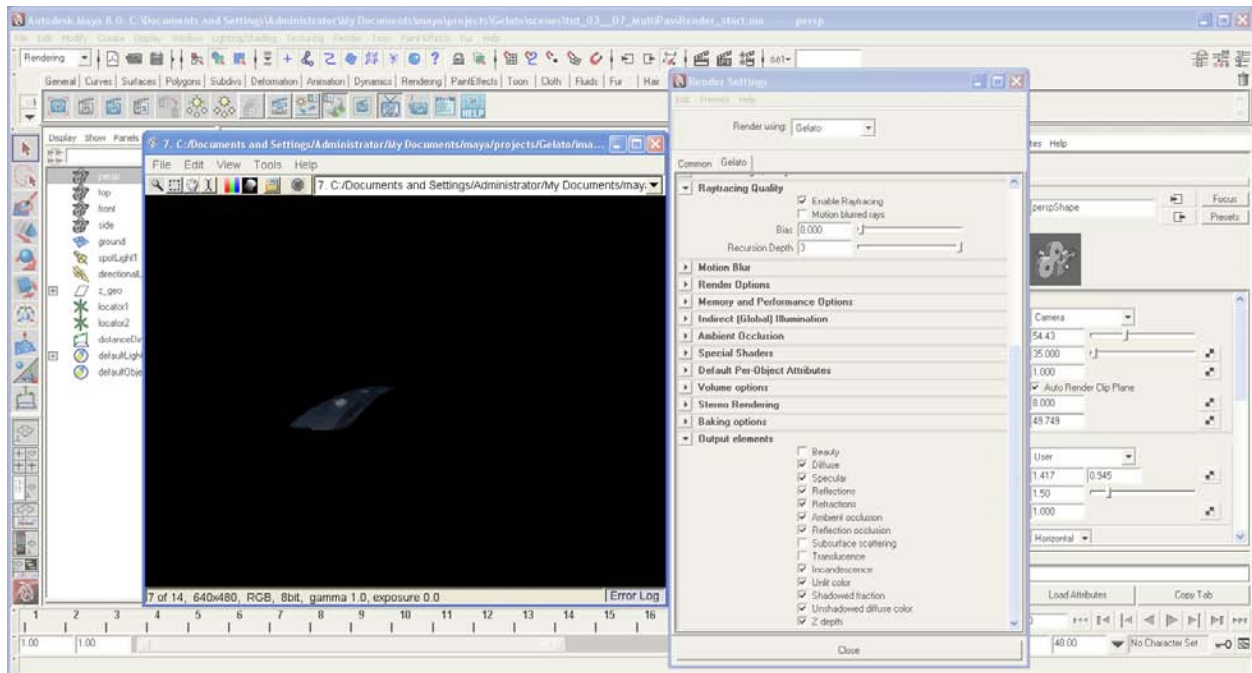
* Specular *

Highlights.

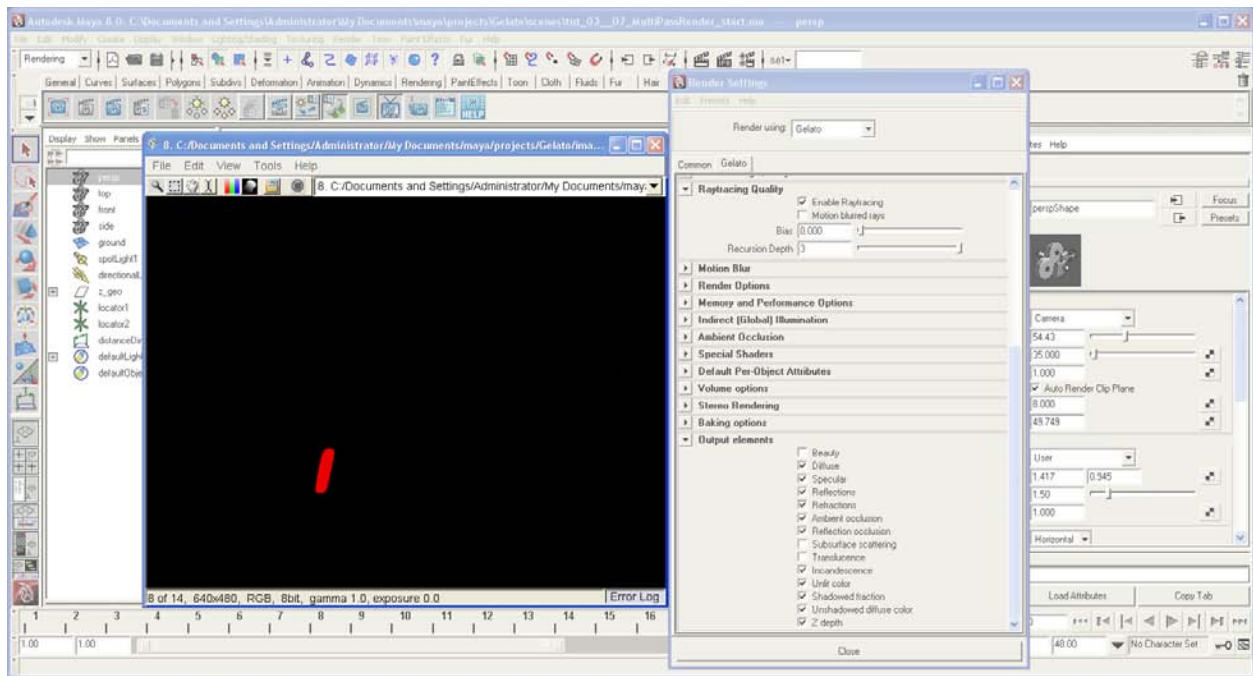


* Reflections *

Environment and ray-traced reflections.

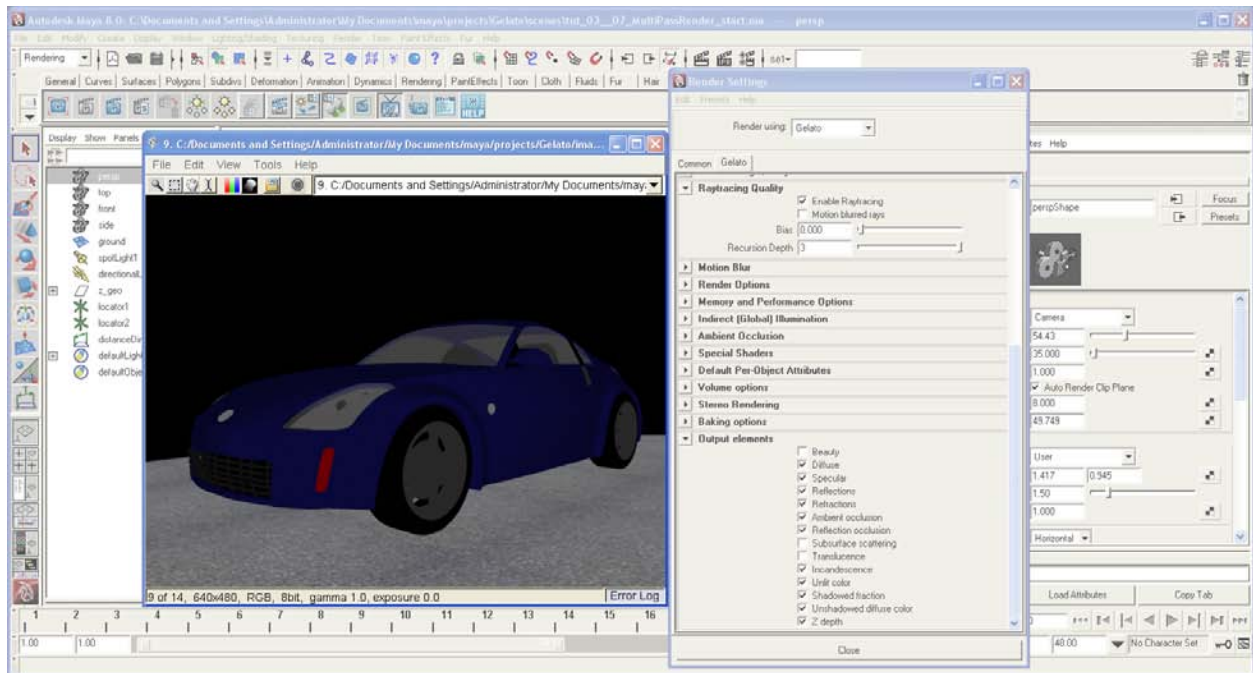


* Refractions *



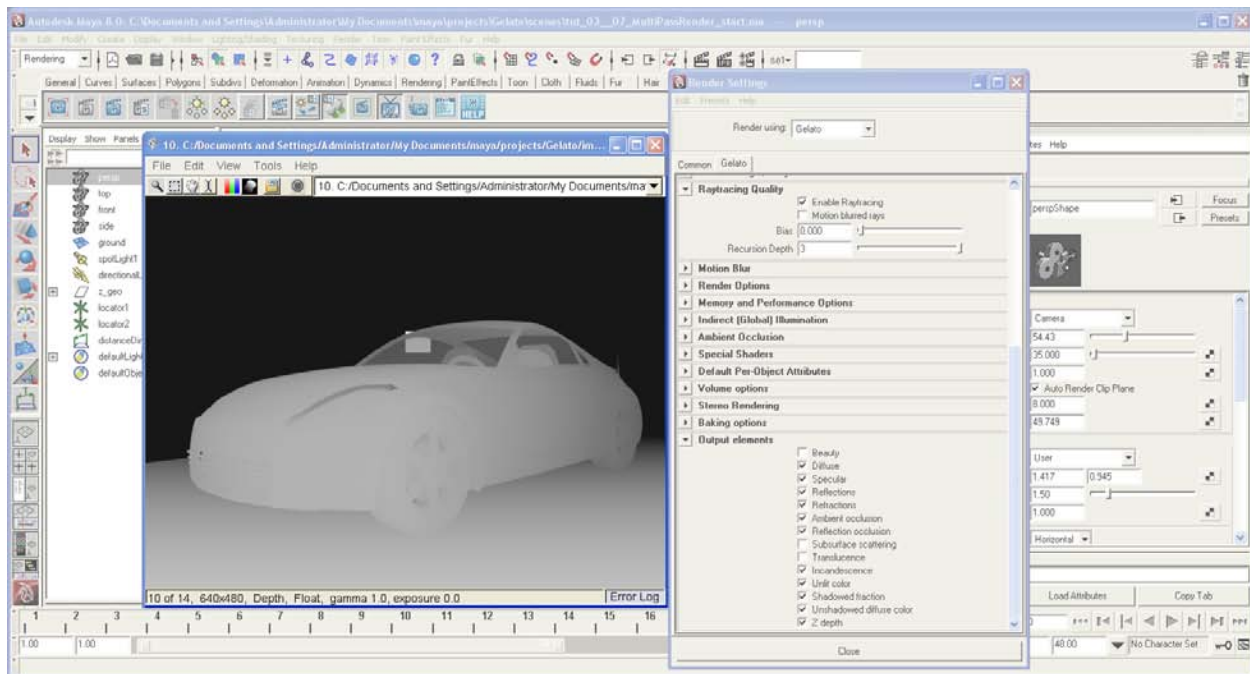
* Incandescence *

Often compositors use this pass to control the brightness of the light, to make the lights blink, to make things glow by blurring it.



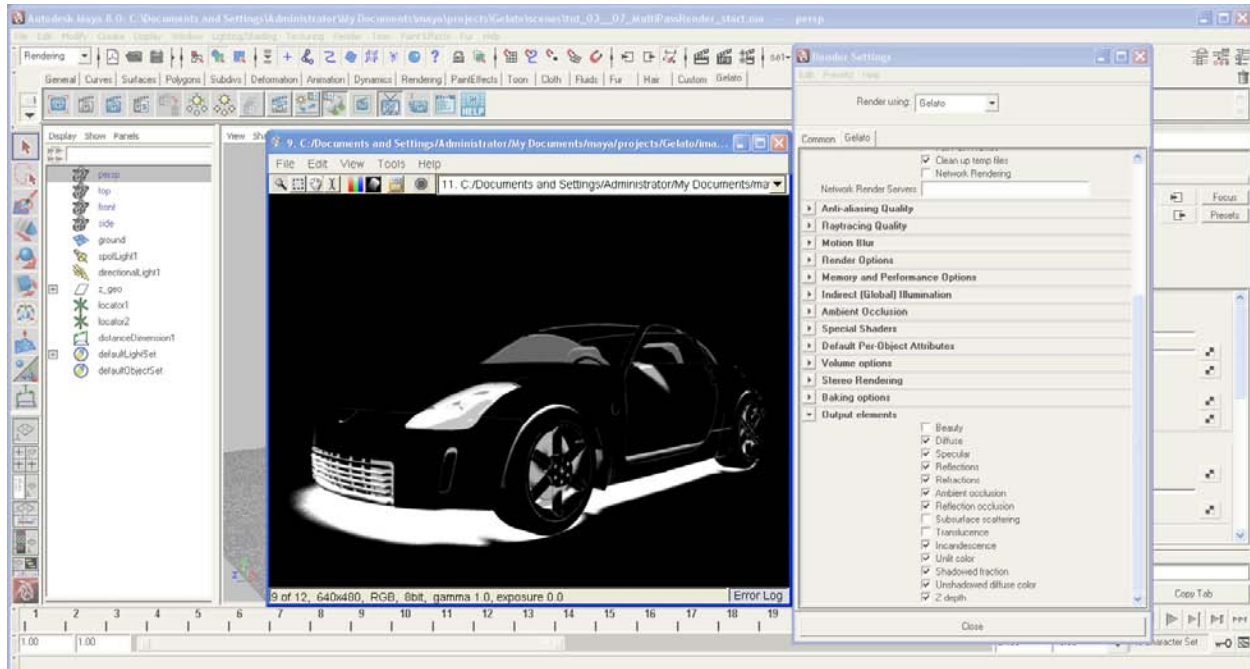
* Unlit color *

No lighting at all, often used as a base in a composite.



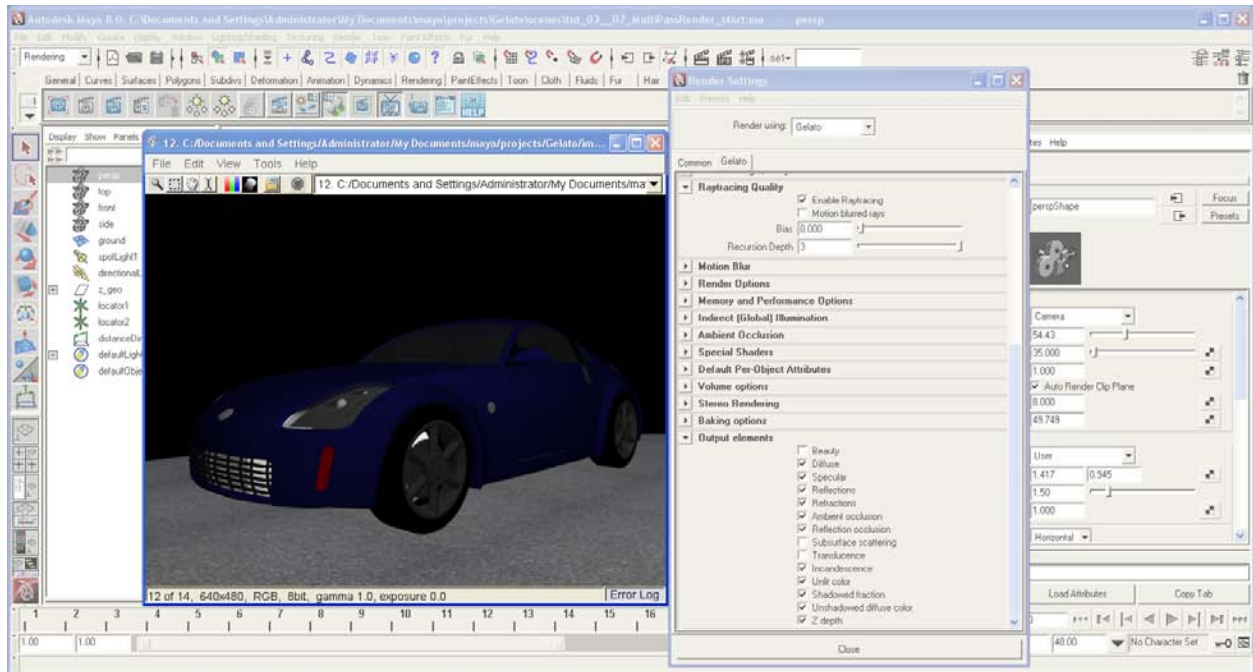
* Z depth *

The depth goes from white to black, black indicating receding distance.



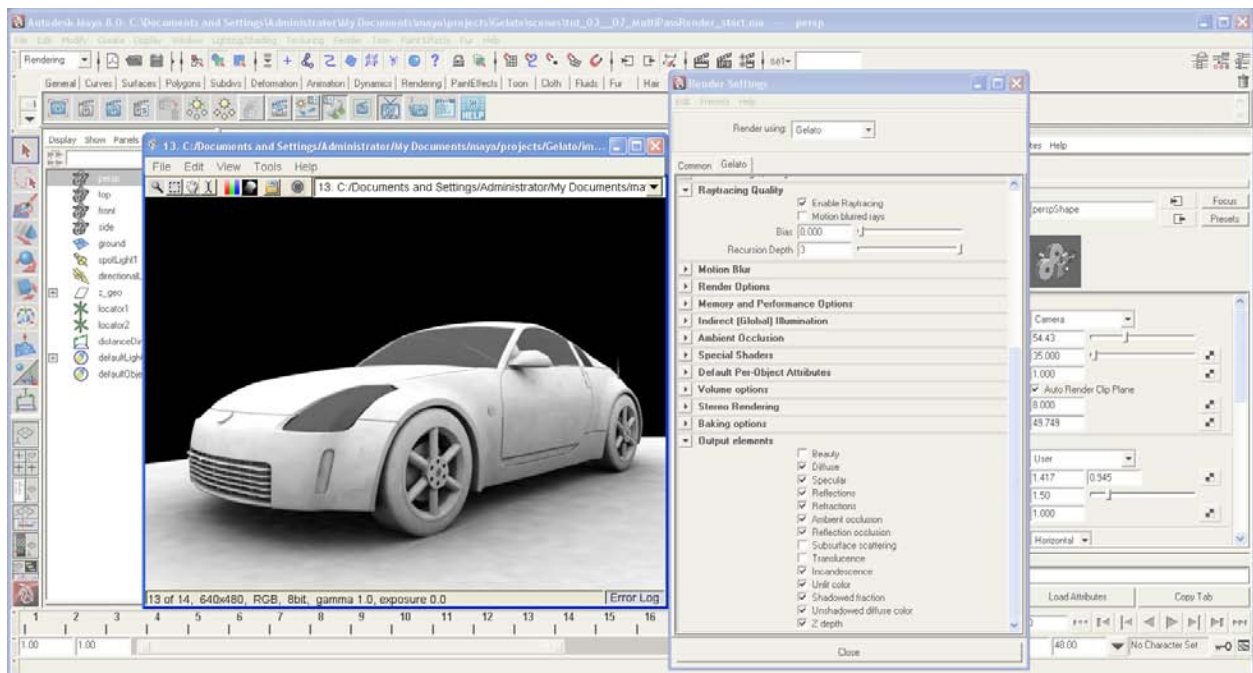
* Shadowed fraction *

A shadow mask for the shadowed areas.



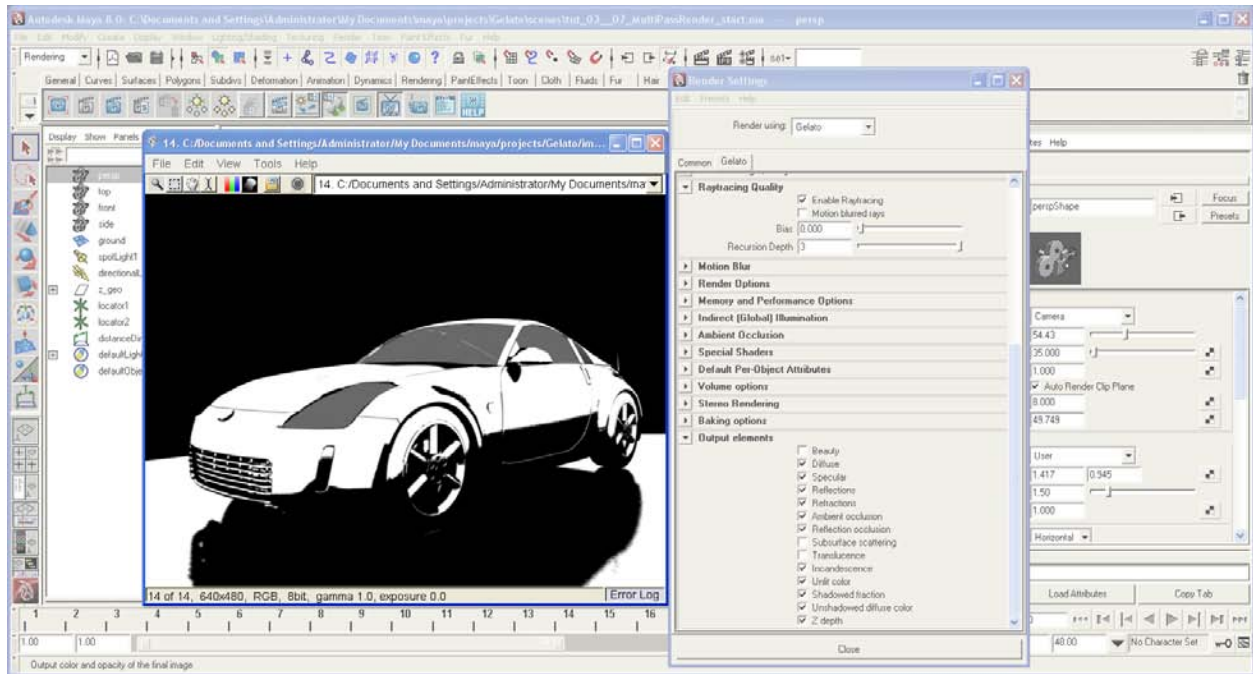
* Unshadowed diffuse *

Similar to the diffuse, but without the shadows. This is another pass which could be used as a compositing base.



* Ambient occlusion *

We've seen this pass in a previous tutorial.



* Reflection occlusion *

This pass is a cheat. It's a quick way of calculating an occlusion pass without getting any noise. Rays have a single bounce: if they bounce into the sky, things get rendered white; if they hit anything else, they render black. No interpolation or smoothing of points occurs. Combining this pass with an environment reflection pass is often an acceptable, and efficient, way to fake ray-traced reflections.

So, multi-pass. It offers wonderful control of your scene's attributes and has ever been easier.

The next tutorial will look at volumetric effects.