Bio Visualisation with Blender and MembraneEditor Part 2
Blender Rendering

Konstanz Research School Chemical Biology (KoRS-CB) Workshop
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Forum:
http://www.cellmicrocosmos.org/Cmforum/viewforum.php?f=63

Actual Version of Blender:
http://www.blender.org

Here, Blender 2.79 is used.

Target

Here, we learn the basics of creating materials with shaders in the Cycles rendering engine of Blender and then apply this to our swan scene to make it look more realistic.

Abbreviation

RMB Right Mouse Button

LMB Left Mouse Button

! For using most of the shortcuts discussed in this tutorial, you have to be sure that the mouse cursor is WITHIN the view port of the 3D View !

Base

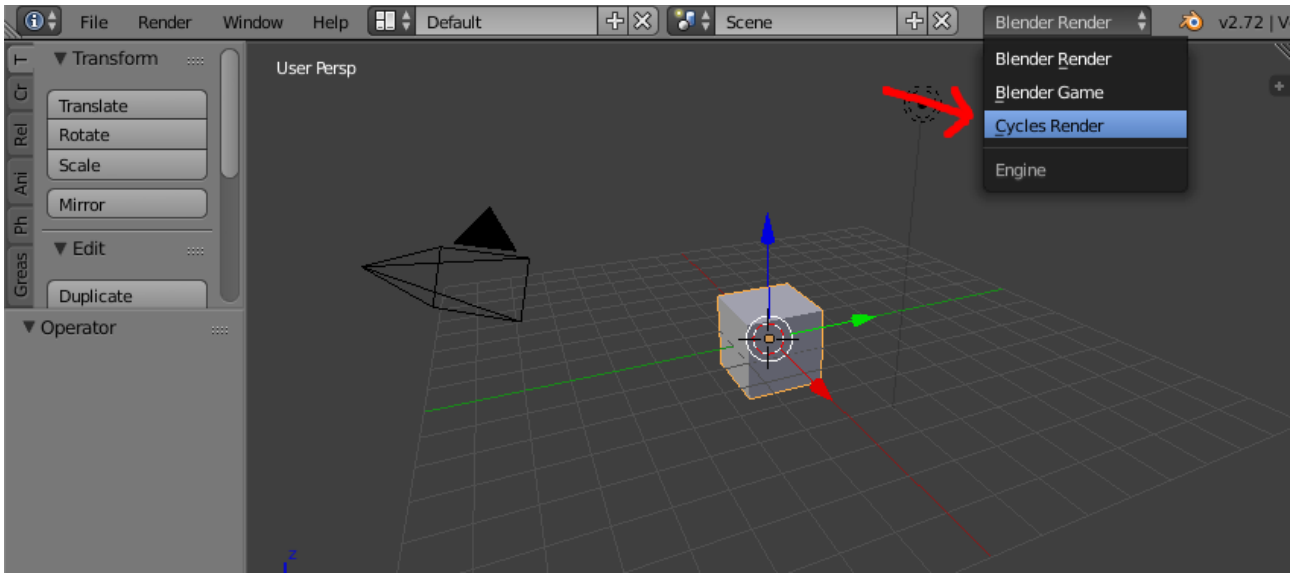
Create a new project (standard project with one camera, one lamp and a cube)

Render Engines

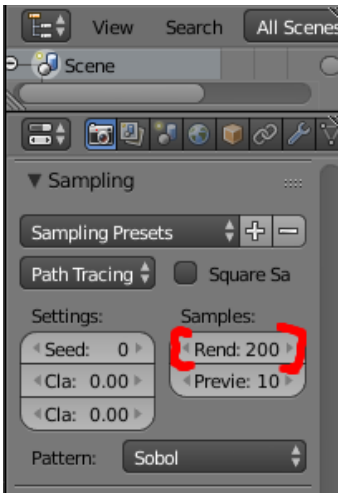
Blender has two kinds of render engines implemented: The standard renderer (Blender renderer) which we used so far and the newer Cycles renderer. Cycles is a ray tracing method, which is more resource-consuming, but it also produces much more realistic looking results.

Materials work differently under Cycles, so we have to update them or make new ones, once we switch to the Cycles renderer.

First, switch to Cycles:



The most important parameter is the amount of samples, or cycles:



This number determines how well a pixel is calculated. If you send out a single ray of light, it can be scattered on diffuse surfaces, taking one of multiple possible paths. Basically, this number is the amount of rays tested for one pixel and then these rays are summed up.

Fur our purposes, 200 samples should be appropriate. In case you use transparent or translucent materials, this number has to be higher.

Another intuitive value is the number of bounces. It gives the number of times a calculated light ray is bounced of a reflective surface or refracted by a transparent surface. If you only use diffuse and glossy materials, this number can be small, but again if you use transparent materials, this number needs to be higher. It can be also set differently for different kind of lights, but this is only reuired for the optimization of complicated scenes and not of any relevance for us now.

Materials in Cycles

Materials are given by shaders. A shader is a function that determines how light behaves upon incidence on a surface (BSDF: Bidirectional Scattering Distribution Function). There are several basic shaders, which make up more complicated materials. The basic ones are:

Diffuse: can be used for mostly everything

Glossy: used for everything metal and reflective surfaces

Transparent: used for parts that shall not be rendered or through which you can see the background

Refraction: used for every transparent material that interacts with light

Translucent: a special kind of transparency

Because glass is a commonly used material, the **Glass** material shader is already a premade mixture of several shaders, mainly refraction and glossiness.

There is also the **Emission** shader at which we will look later.

And there are other shaders for special applications, but they are not of much use for us now, for example:

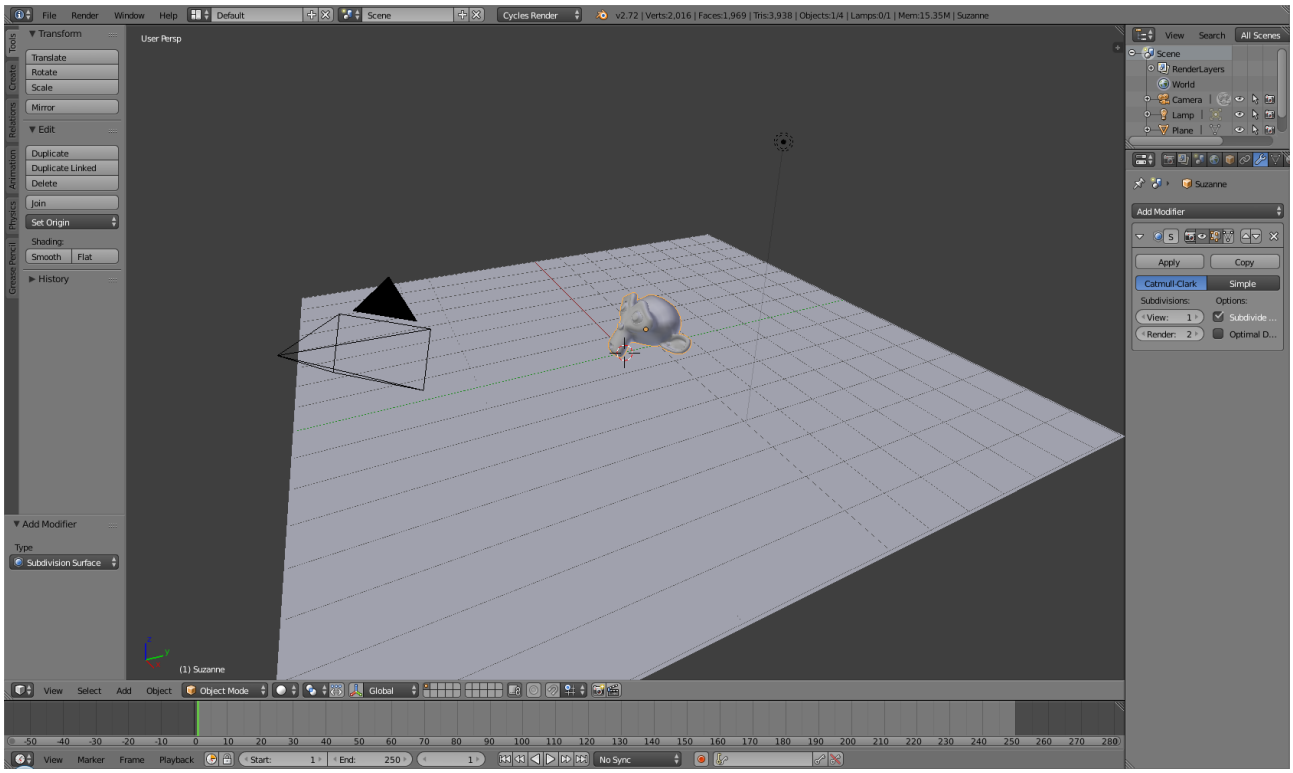
Velvet: used for cloth

Subsurface Scattering: used for skin

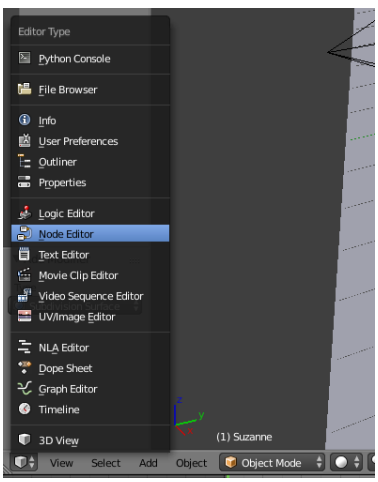
Anisotropic: a special kind of reflectivity

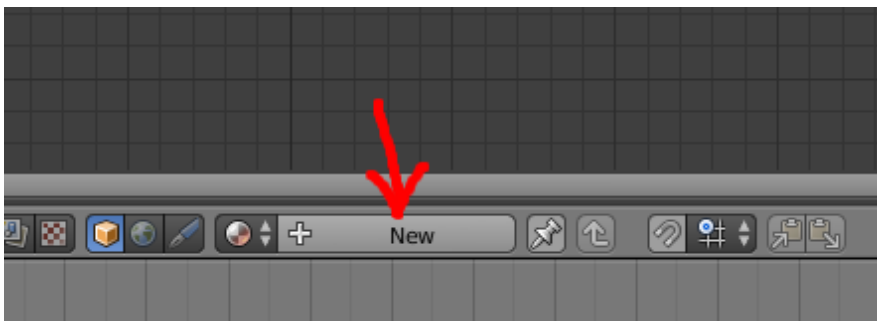
For now we will focus on the important ones.

First, delete the default cube and create a plane and enlarge it. On top of this plane, create a monkey head and turn it in that fashion that it lays on the plane. Additionally, make its shading smooth and assign a subdivision-modifier.

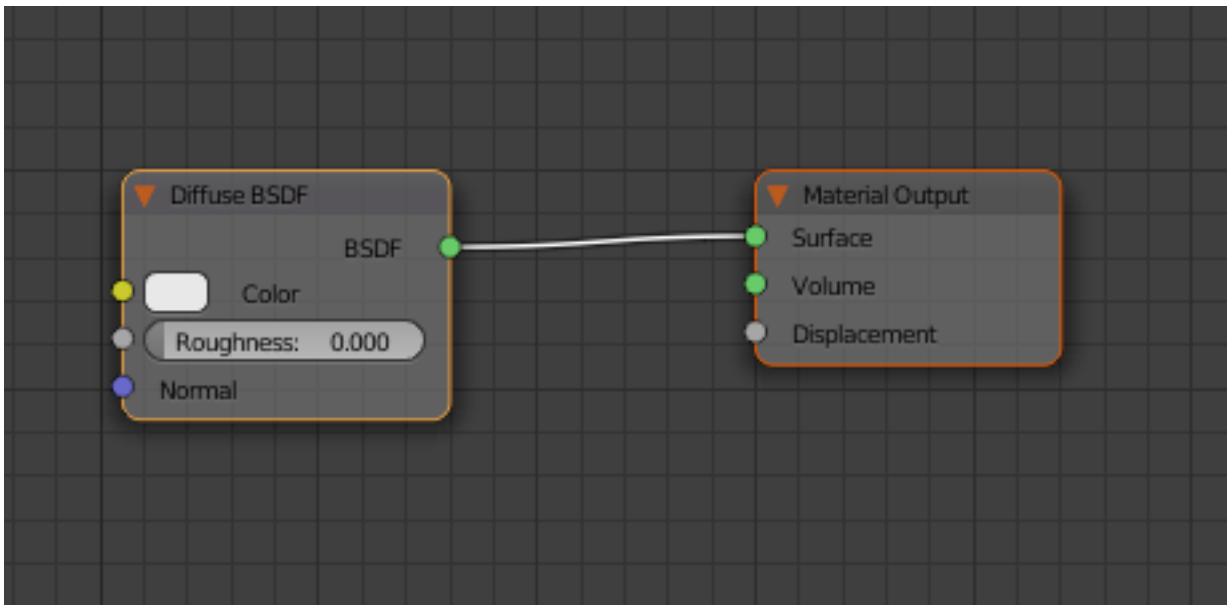


Now switch to the node editor and create a new material.

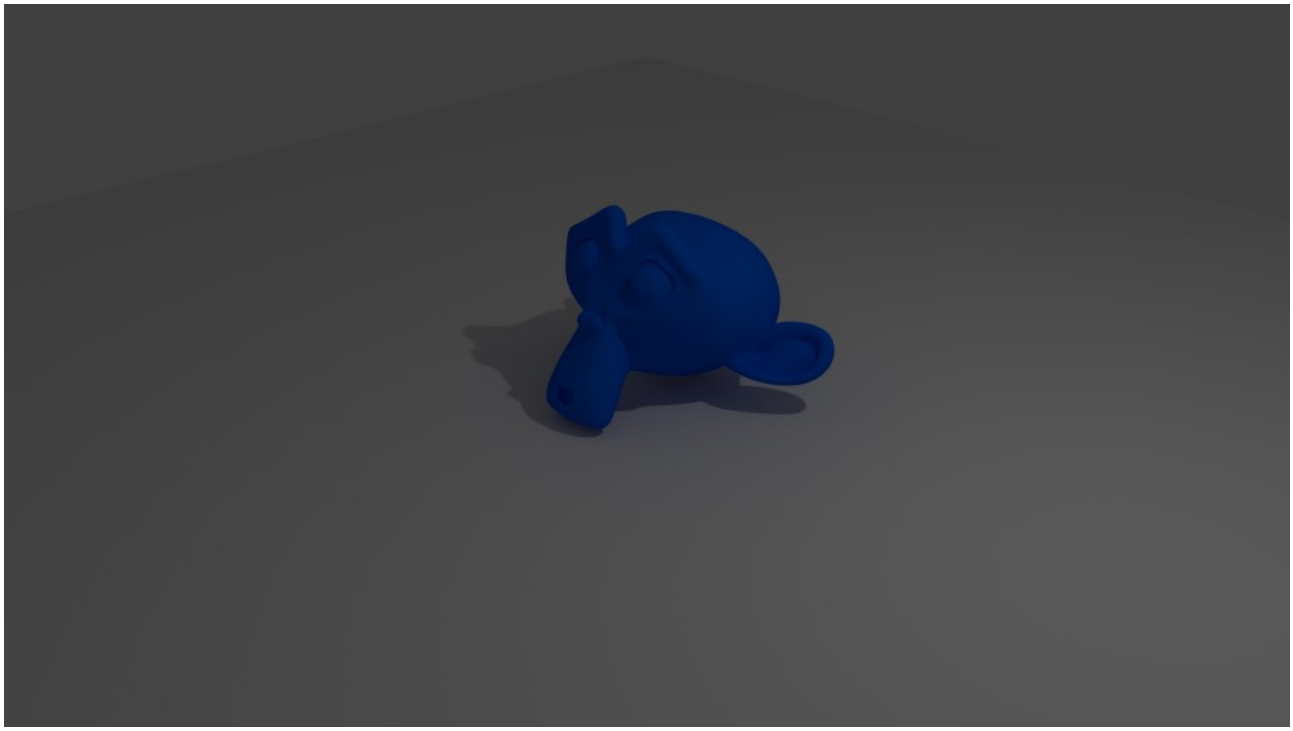




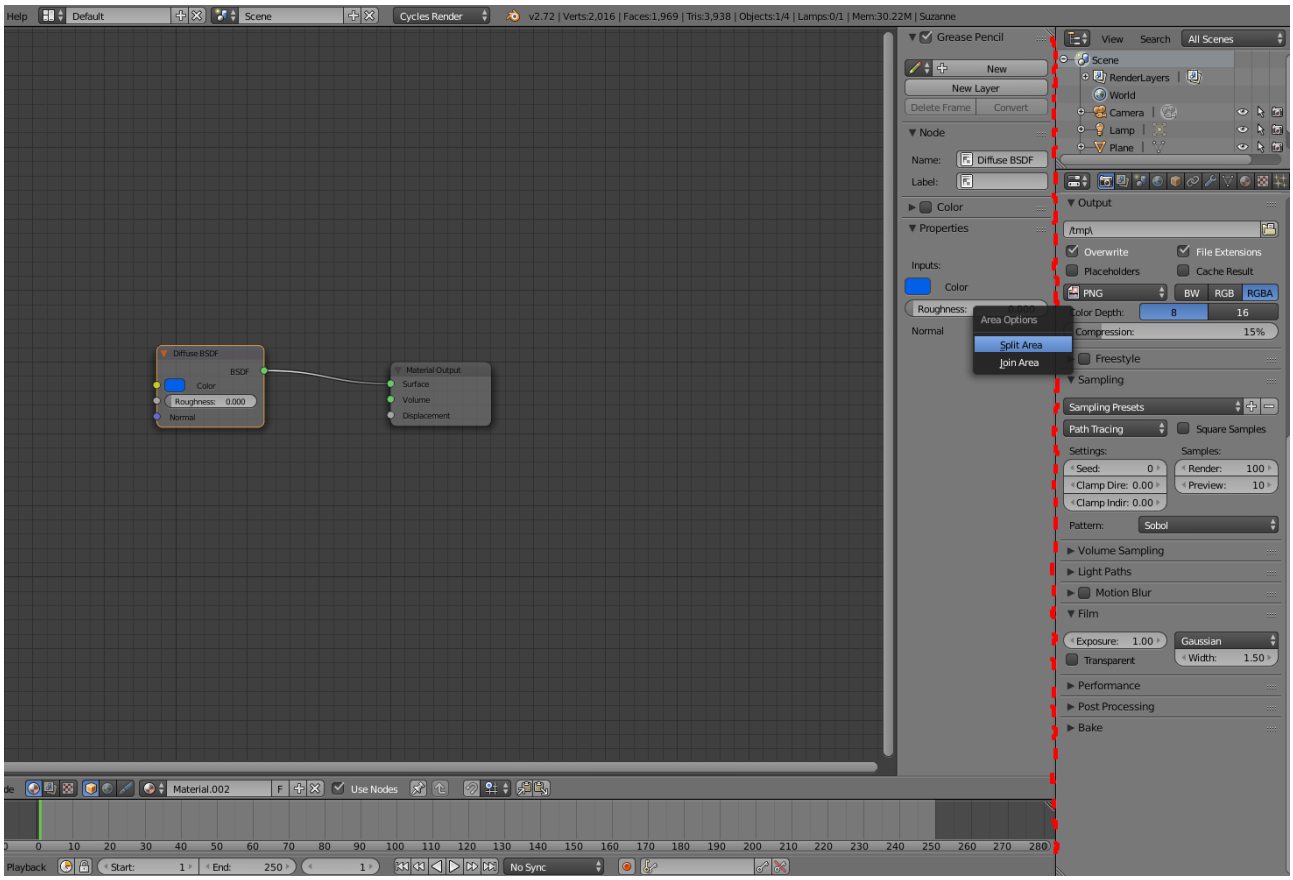
This is a very basic diffuse material. The rectangles are called nodes, which are logically connected by the lines. The right one, “Material Output”, is the material which gets applied onto the object. The node on the left represents the shader type, which is plugged into the output.

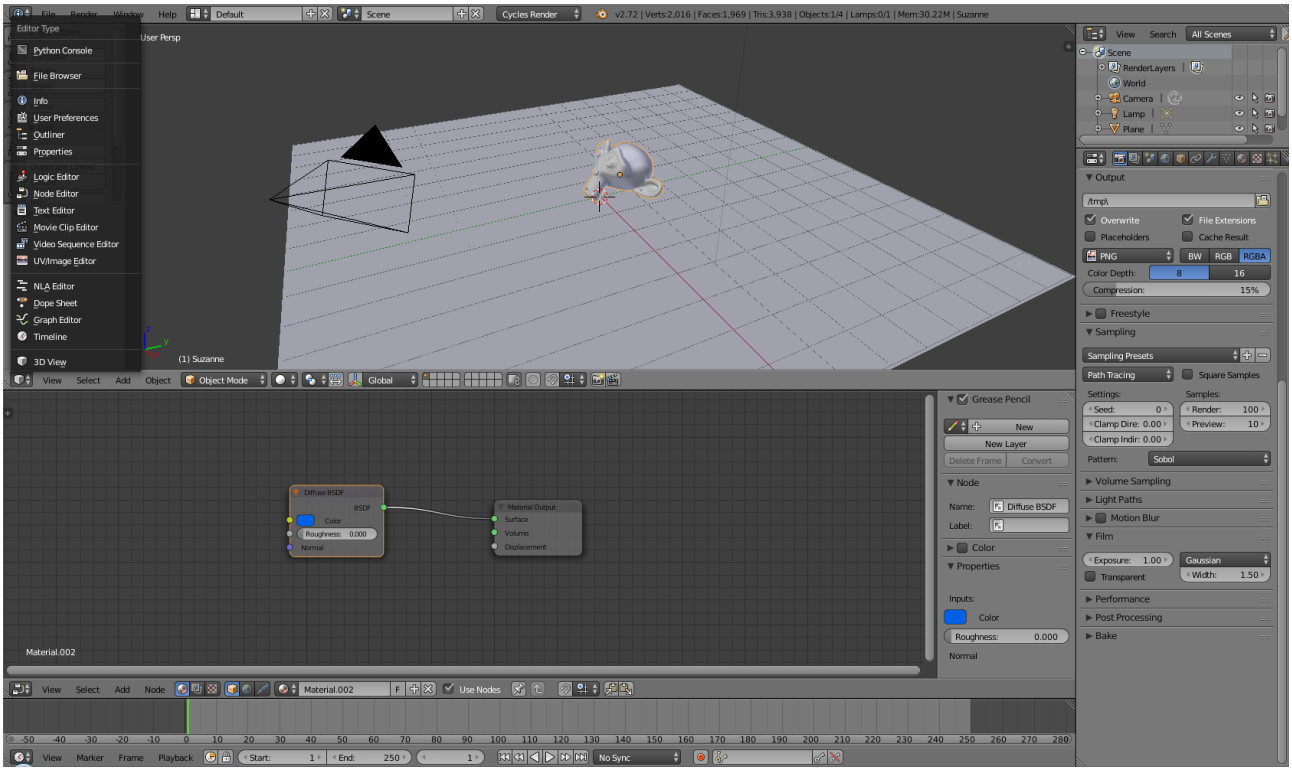


Choose a random color and render the scene (F12).

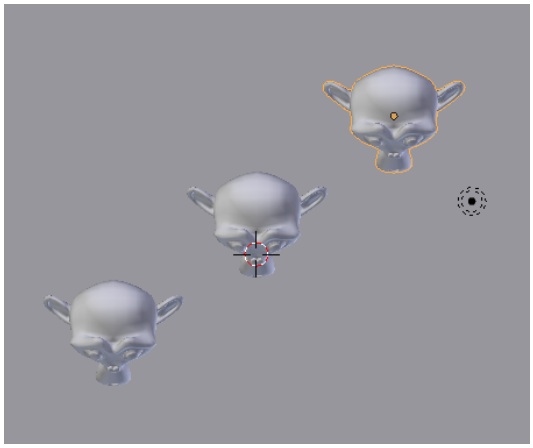


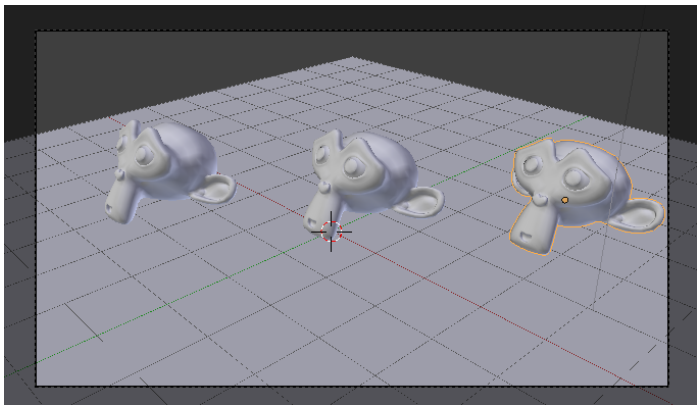
Now we will experiment with more shader types. To not always need to switch between modes, we will split the window into a 3D view and a node editor. Hover over the marked vertical line, press RMB and choose “Split Area”, then place the line somewhere in the middle and click LMB. Choose 3D view for the upper window.



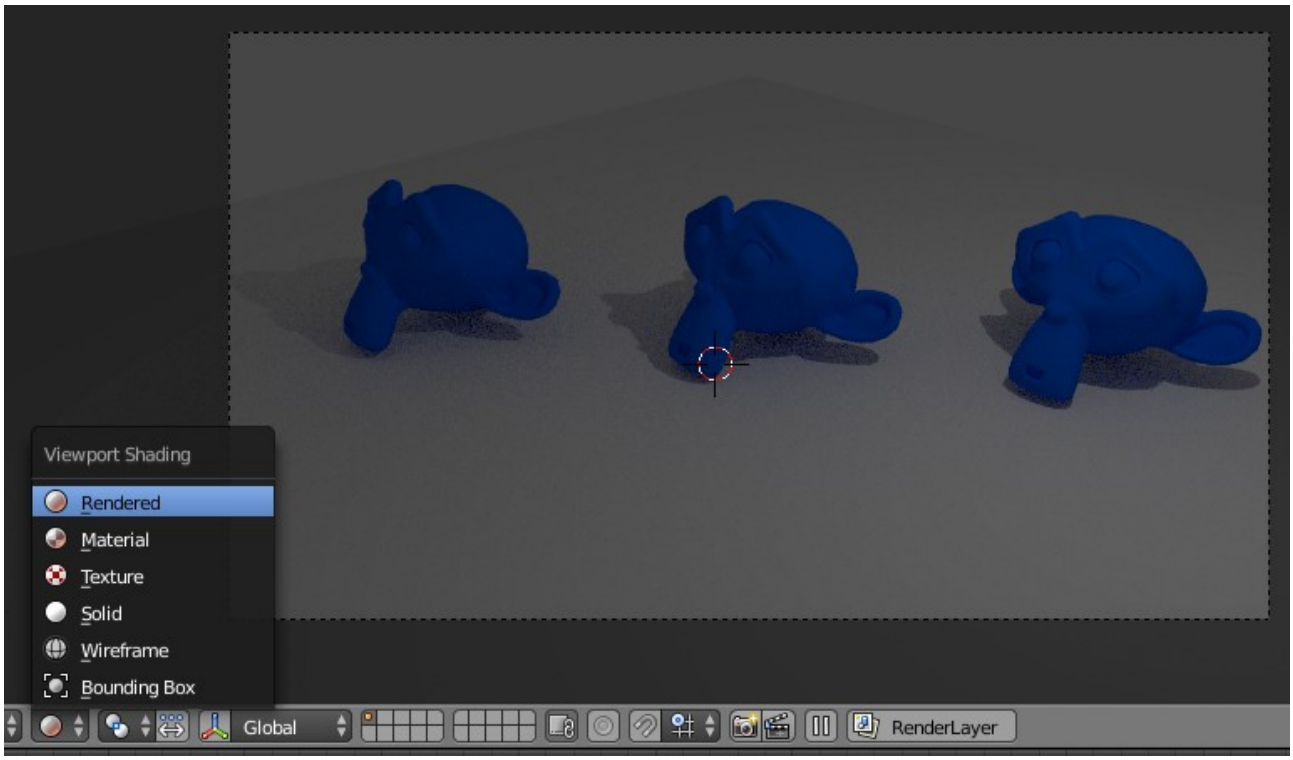


Make two duplicates of the monkey head, with Shift+D, and place them in a way that they all lay on the plane and fit into the camera field of view.

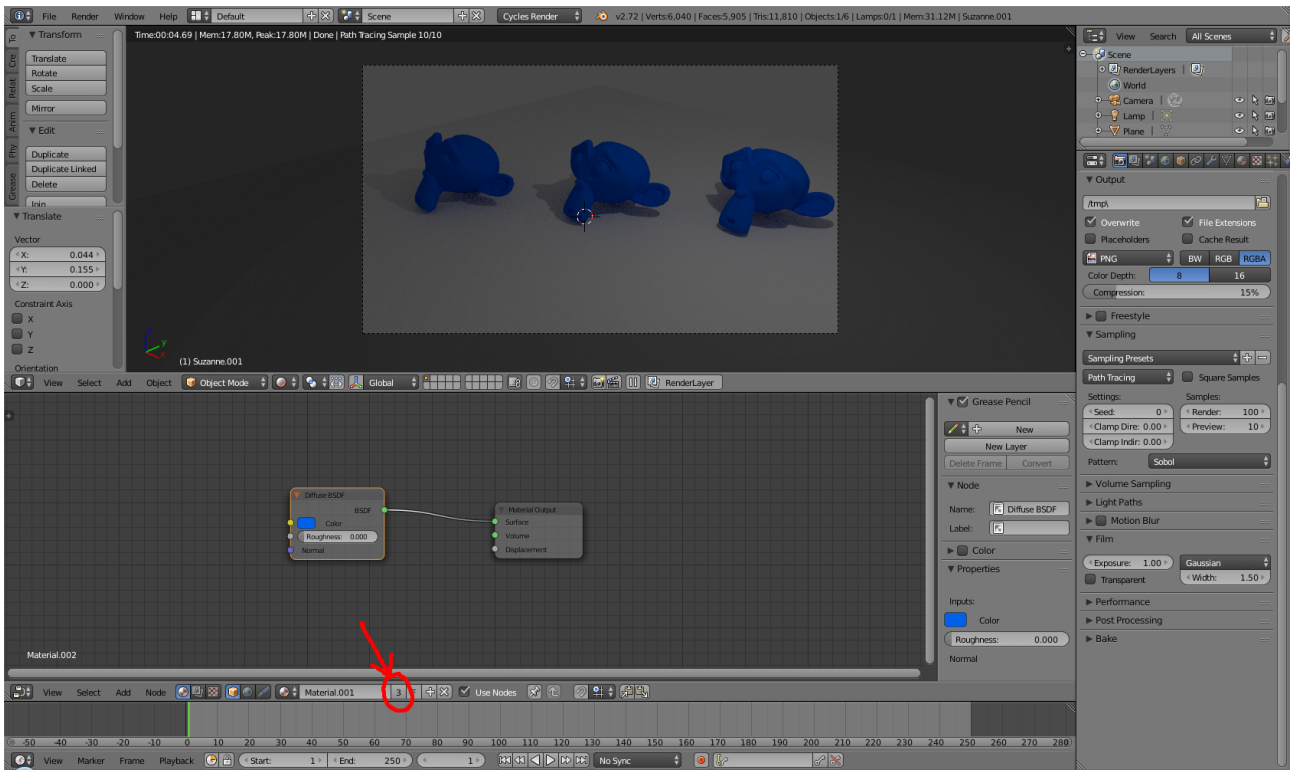




A very useful feature in the cycles renderer is the ability to view an instant rendered image of the scene. This is especially handy when you experiment with material parameters. Choose “Viewport Shading” to “Rendered”.

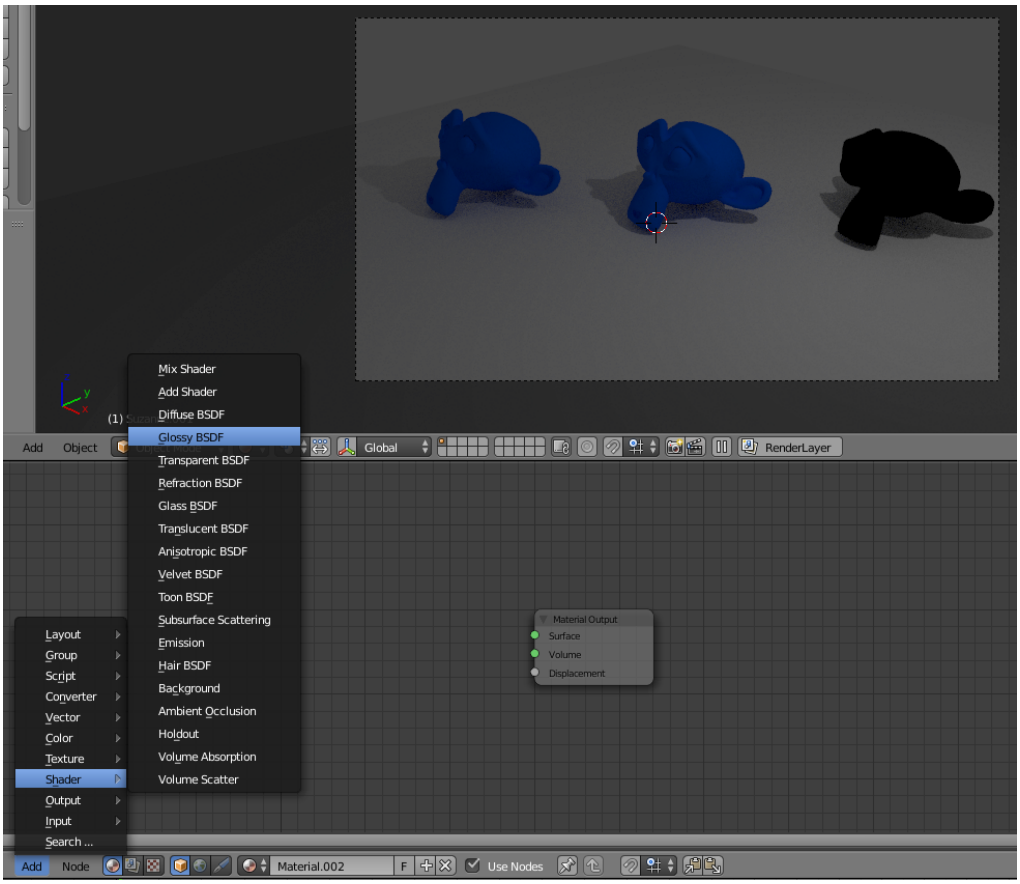


The monkey heads all look the same, because they all have the same material applied. The 3 means that currently three objects use the material called “Material.001”. If we manipulate it, we change the appearance of all three heads. As this is not what we want, we can duplicate the material by clicking on the 3:

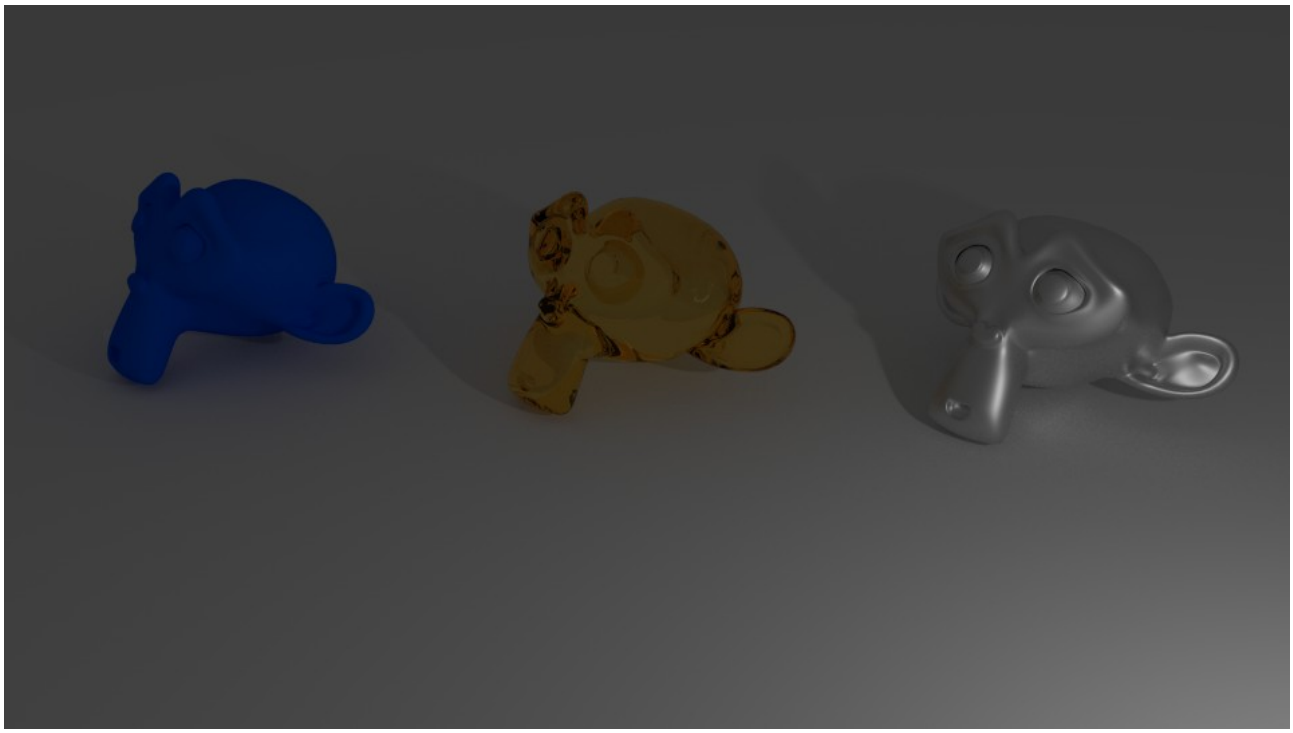


Now the name of the material changed and the 3 is gone; only one object use this material now.

Delete the diffuse node and add a glossy node. Draw a connection from the output of the glossy node to the Surface input of the Output node. It already looks like metal. If live rendering is activated, you can watch the material change from the moment of the deletion.



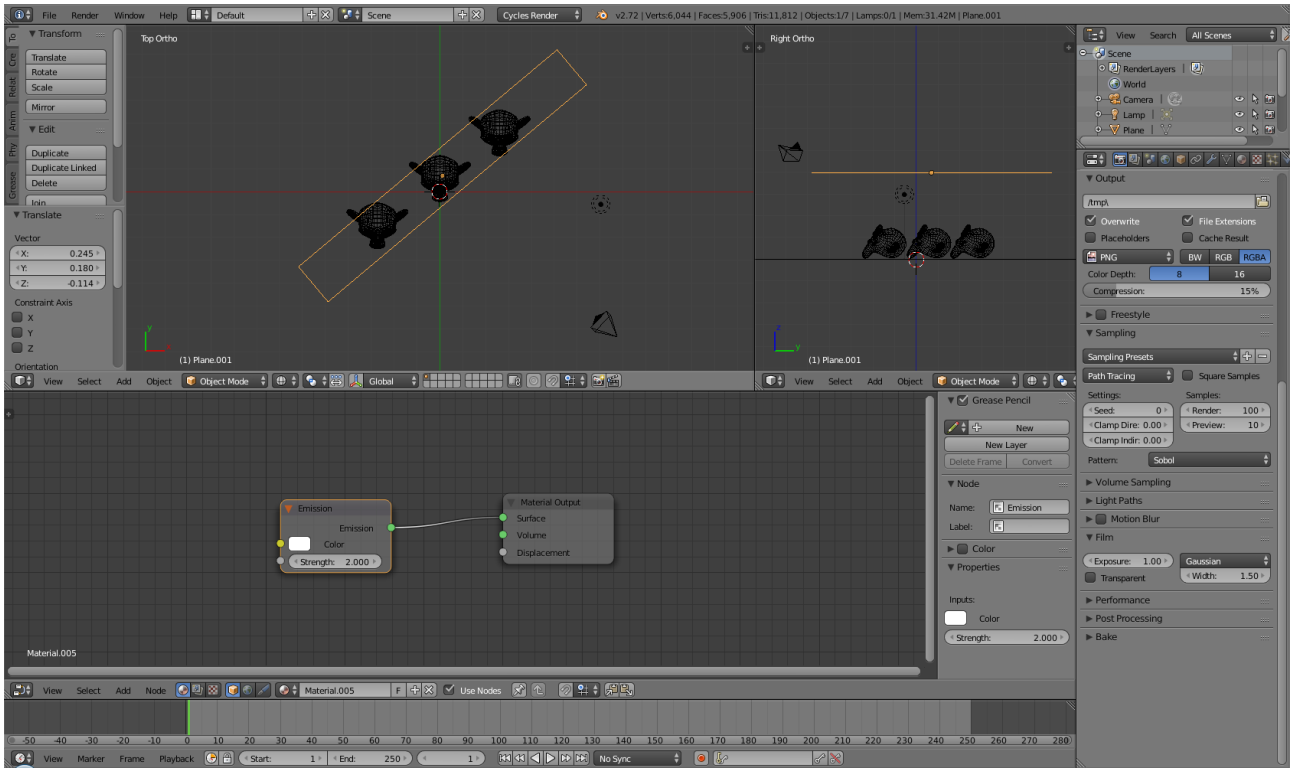
Choose another head and give it a new material by clicking on the 2. Add a glass shader and connect the nodes. You might add a random color.



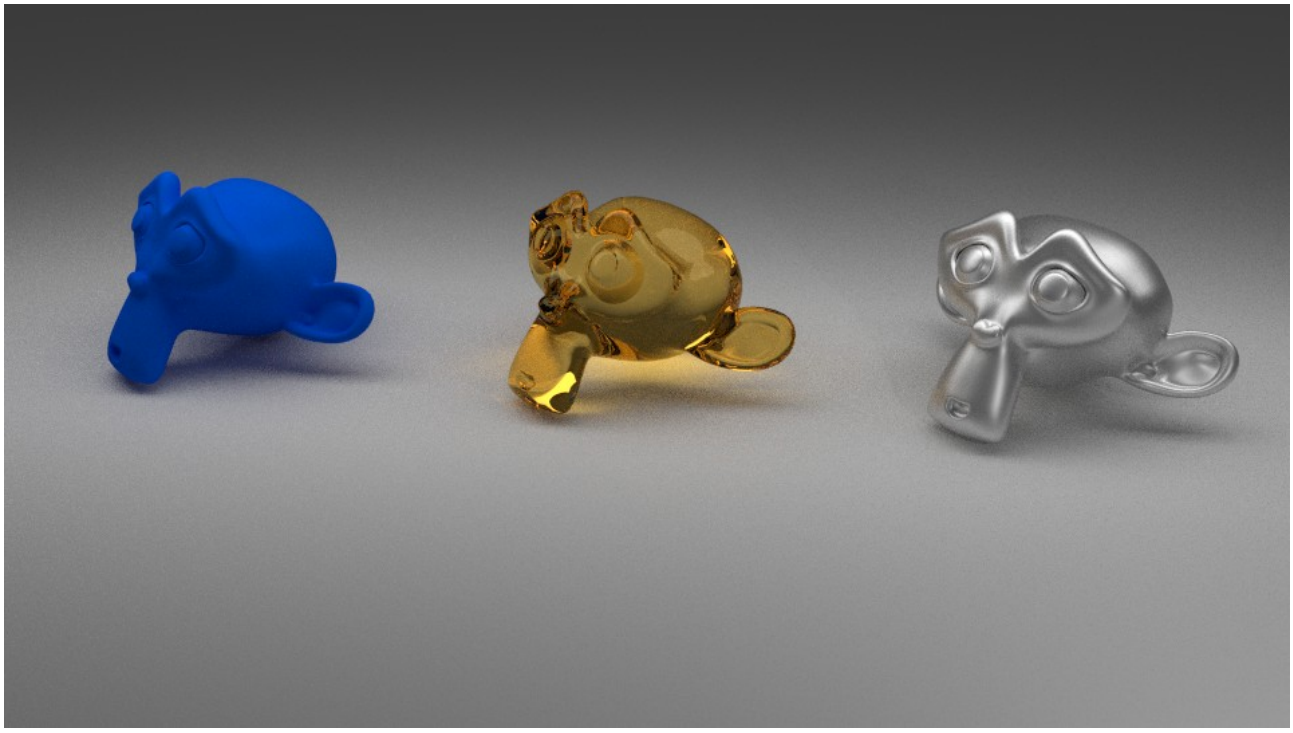
Lighting in Cycles

We can use the old lamps from our scene, but Cycles also adds a new kind of lamp: Light emitting materials. These can be used to make a softer and more realistic lighting of our scene.

Create a plane, scale it in one direction, rotate and place it over the heads. Then assign a new material with an **Emission** shader to it.



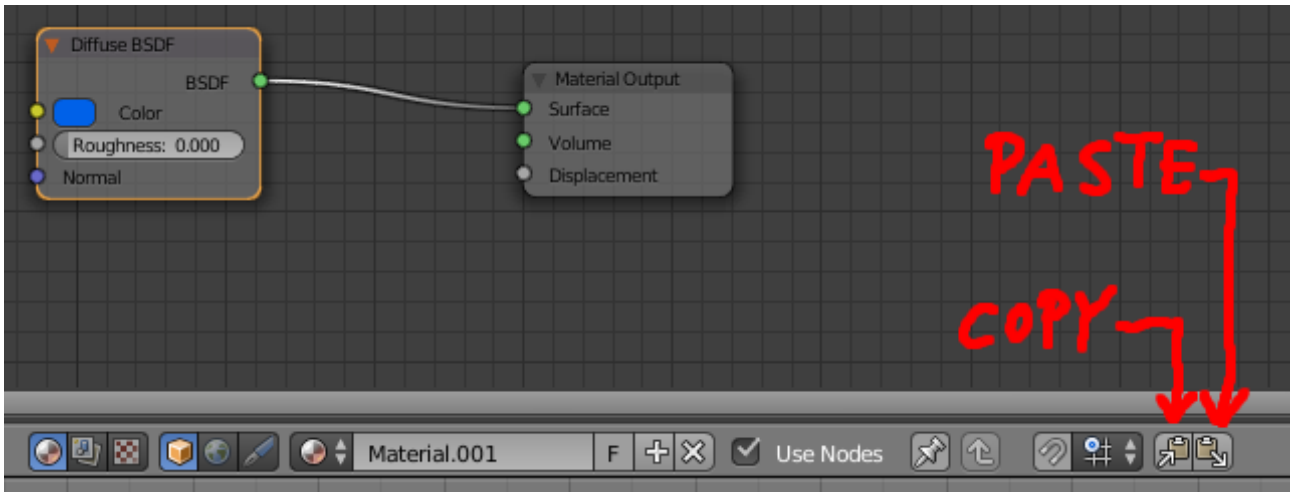
This looks much better:



Mixing

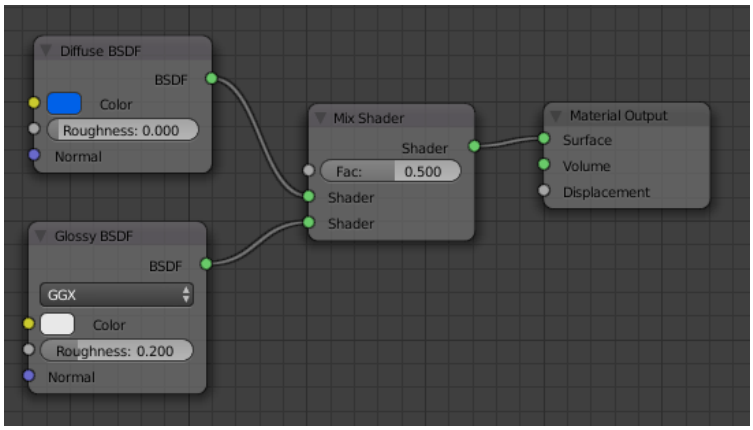
One important feature of the node editor is the ability to mix several nodes and this even easily, through the nodes and connections layout.

Select the head in the middle and assign a new, empty material (The glass material won't be lost until we close the file).

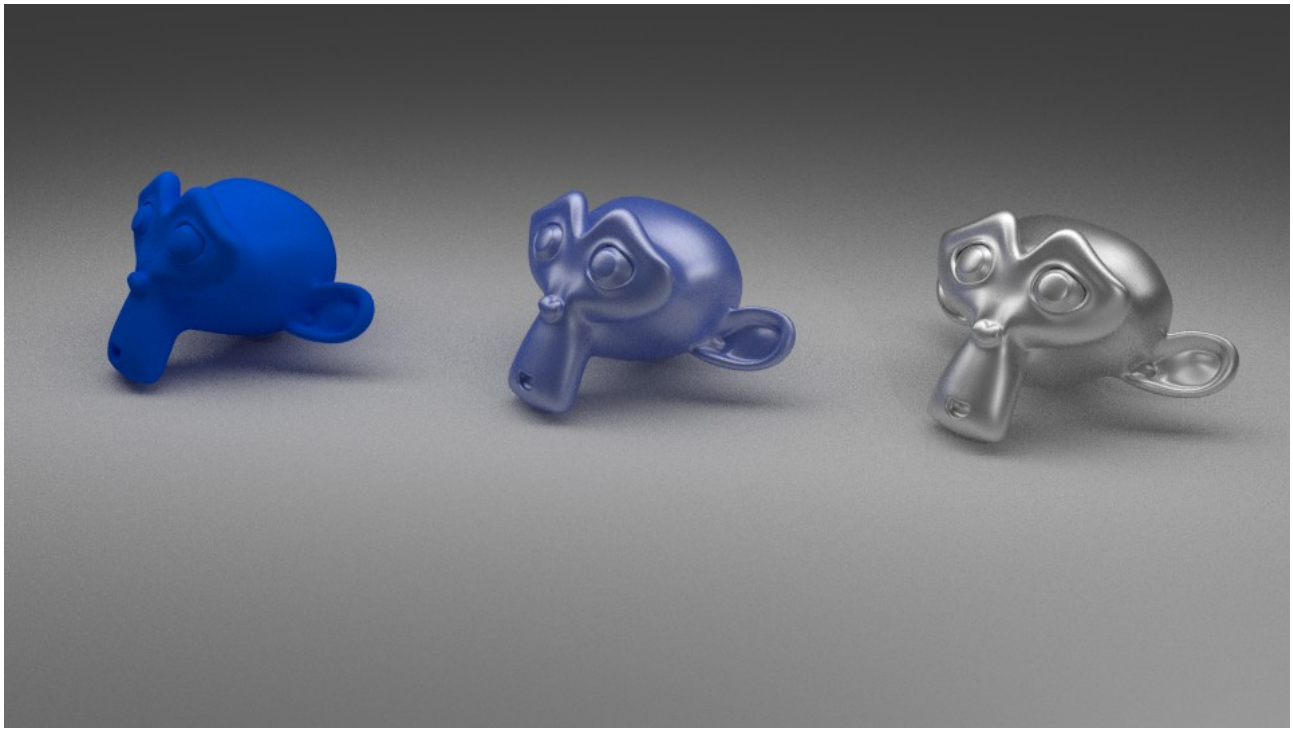


Now select the left head and select the diffuse node, and copy it. Then switch back to the middle head and paste the node. Do the same with the glossy node of the right head, paste it also into the material of the middle one.

Now add a **Mix** shader node, and connect everything like this:



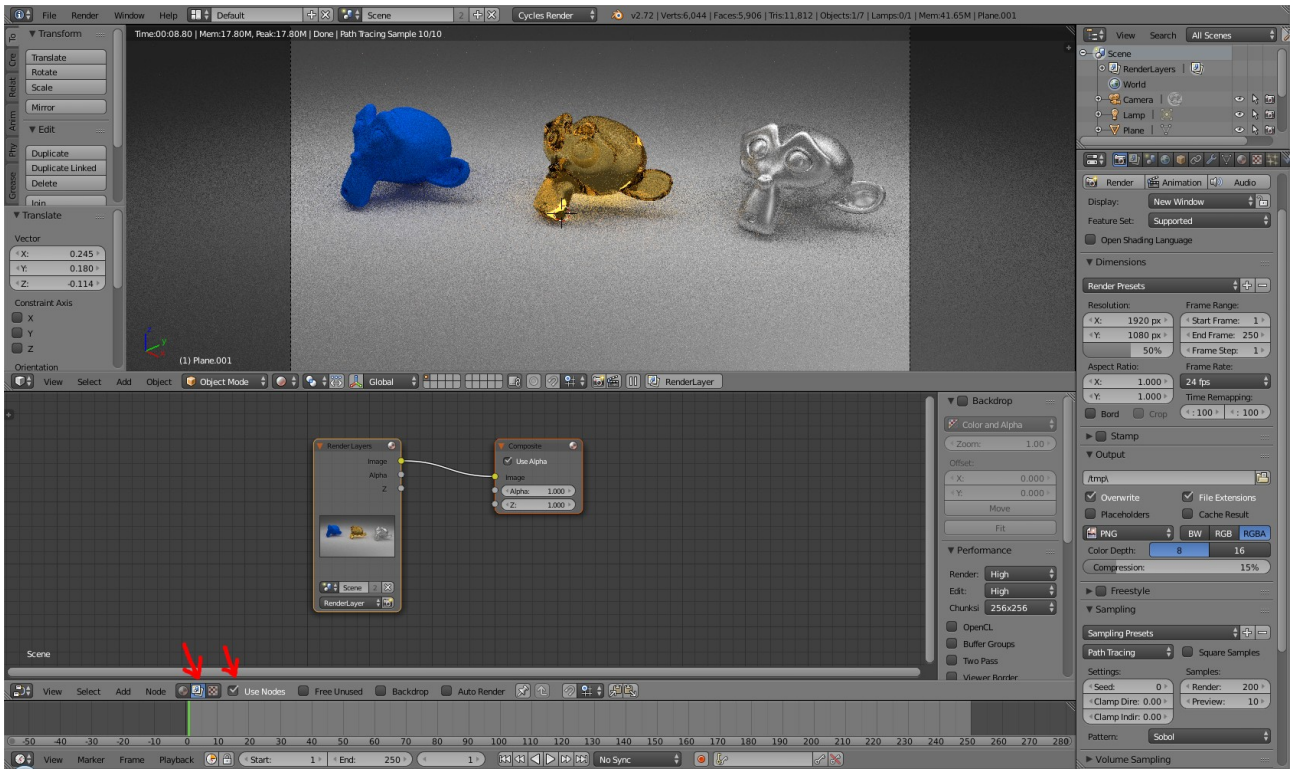
The new material has a diffuse color and also the glossy reflections of the metal. By cleverly combining these basic surface properties, nearly every material can be created.



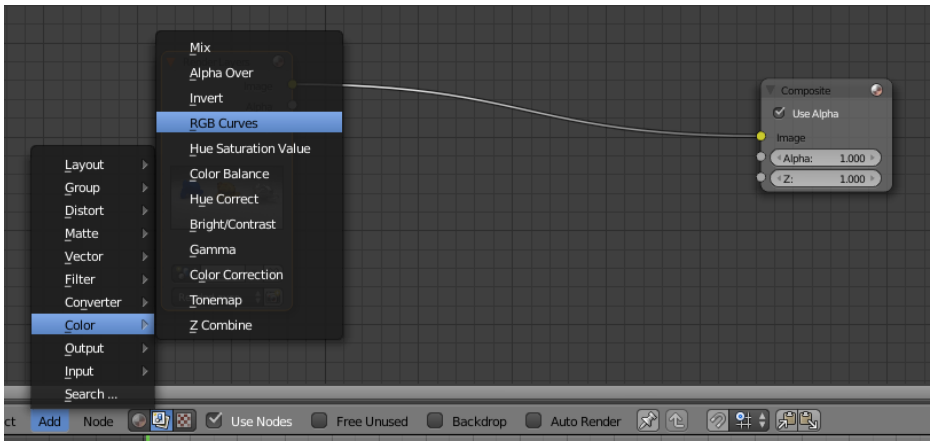
Switch back to the glass material if you like.

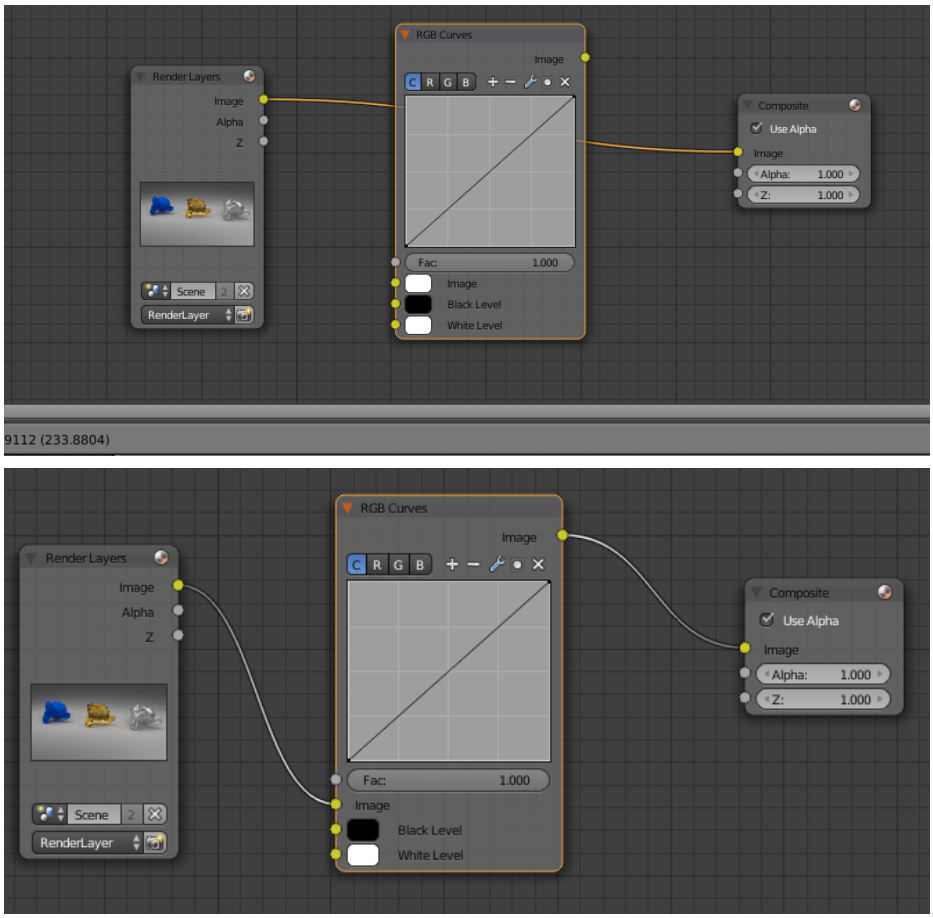
Postprocessing Capabilities

The node editor can also be used for postprocessing of the rendered image. For this, we switch the node editor from shader nodes to compositing nodes, and check “Use Nodes”:

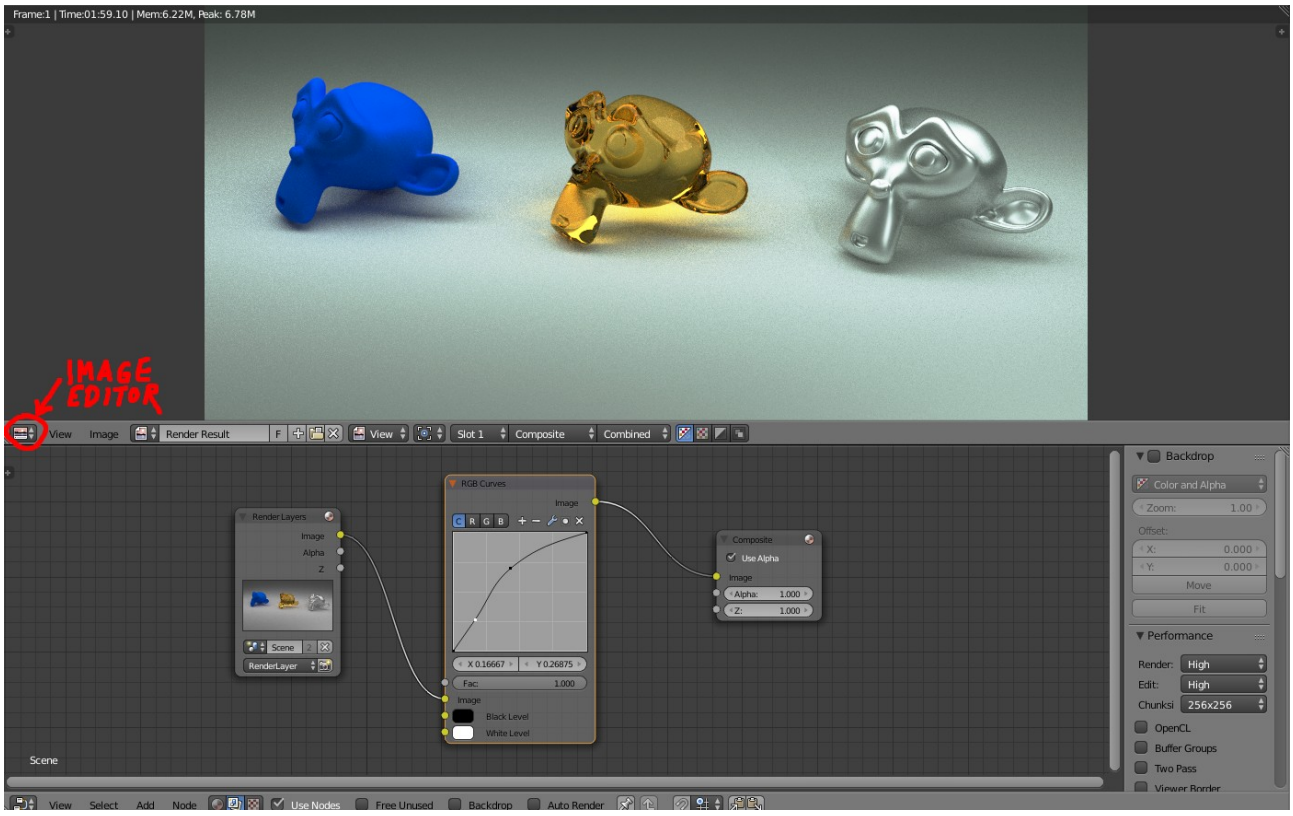


Useful are for example the color adjustment nodes, possibly known from Photoshop. Move the nodes apart and add an RGB Curves node. Hover it over the connection line and with LMB it will automatically snap in between:

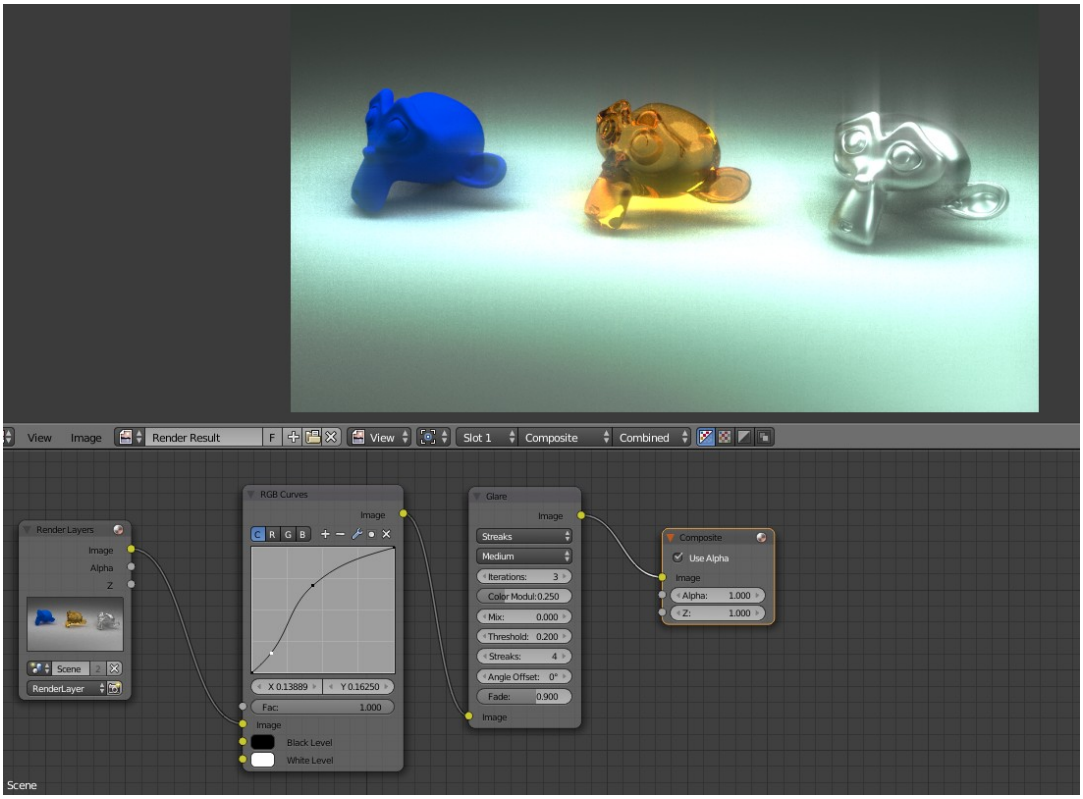




Like a photo you can now adjust colors. It will be updated in the rendered image, but not in the live rendered 3D view!



There are also many effects which can be applied onto the image. For example, add a Glare filter node and experiment with the parameters.

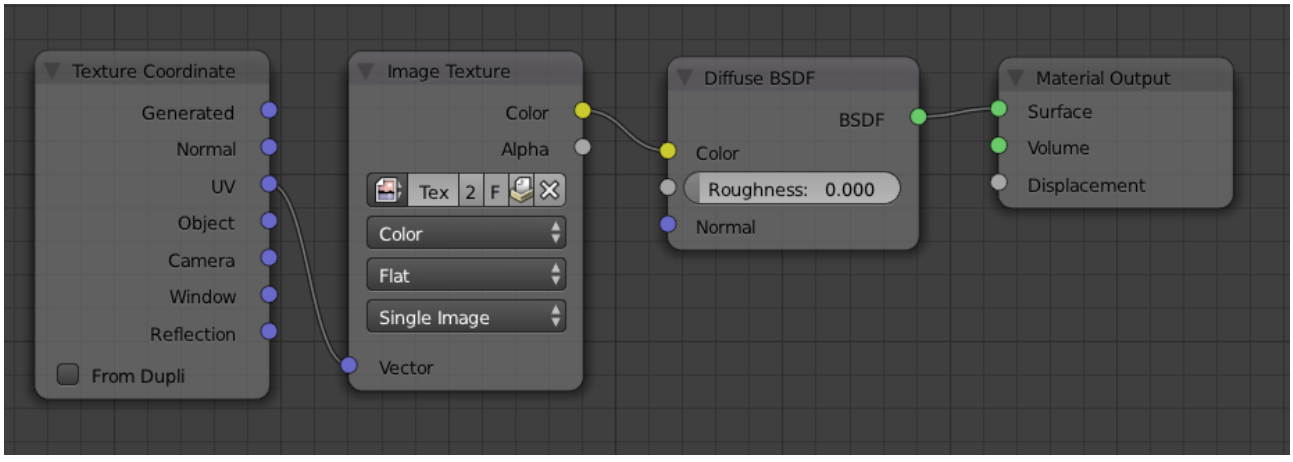


Changing our Scene to Cycles

This will not be discussed in the tutorial, but you can try this at home.

If we change our scene to the Cycles renderer, most old materials still can be used. But textures do cause problems, especially the UV-map of the swan-texture.

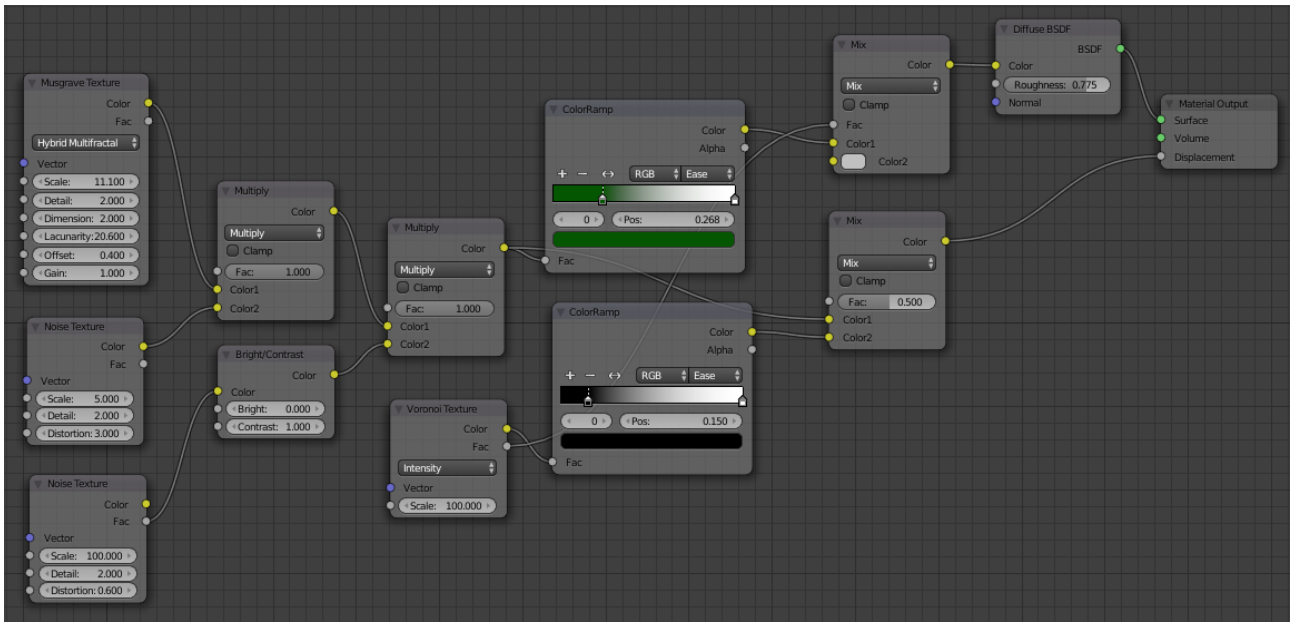
We solve that by selecting the swan, going to the node editor and checking „Use Nodes“. Then build this node-arrangement:



For the image, choose the painted texture file. Now the texture should be rendered like before.

Do the same to the background, just with Texture Coordinate „Generated“ (because we haven't set an UV mapping for the simple plane).

For the grass, make a simple diffuse green material. And for the stone, you can build something like this:



Experiment for yourself which kind of lighting looks realistically.

References/Images

The Cycle nodes stone definition is based on:

Creating a procedural stone texture (Blender Stack Exchange)/answer from gandalf3
(from 24.12.2013! Oh, Christmas 2013, he must have found a new computer under the Christmas tree, otherwise he will not play around with Blender on Christmas, I guess – or he is also a scientist, who knows ;-)

http://blender.stackexchange.com/questions/5699/creating-a-procedural-stone-texture