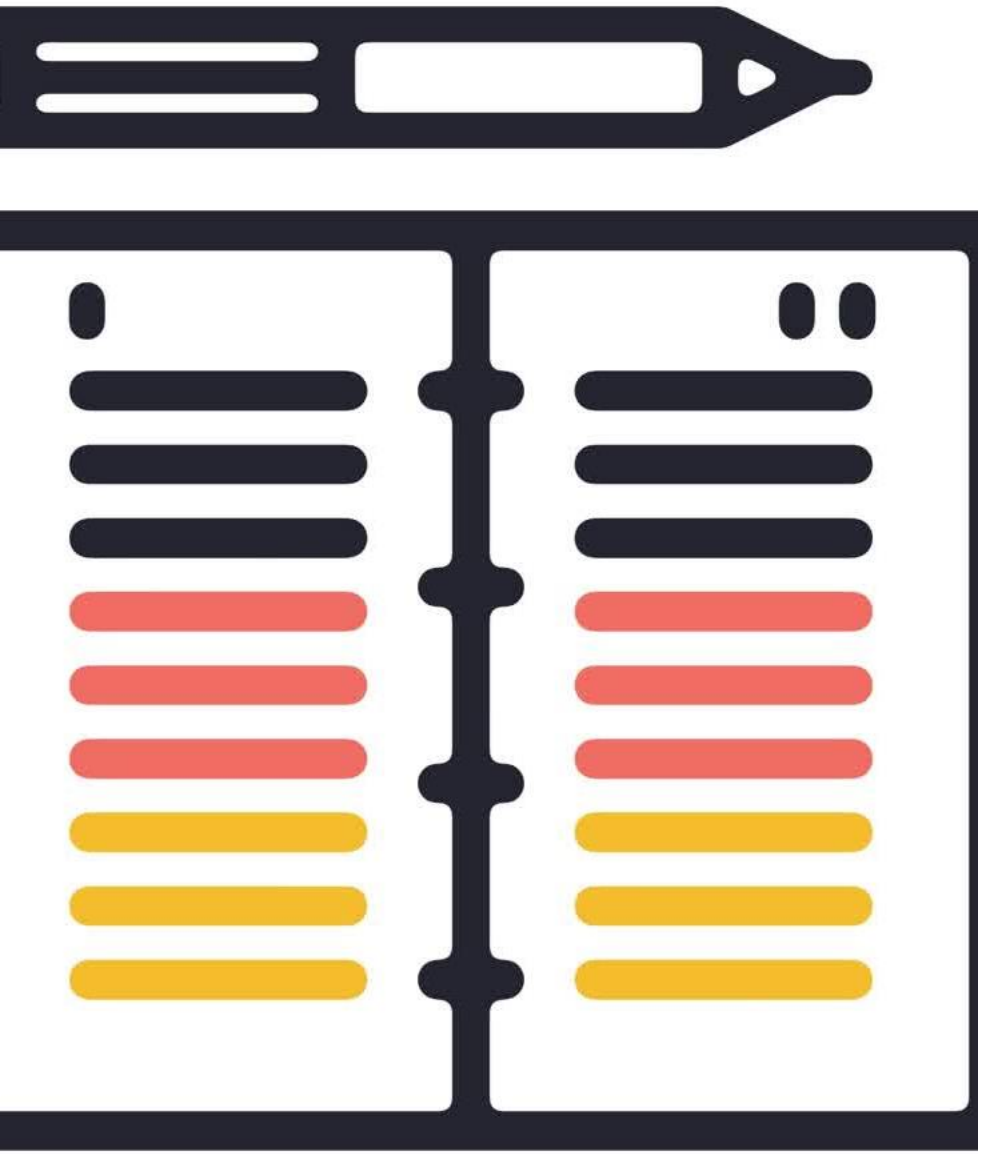
Politecnico di Torino

Laboratorio 07

Materials



Outline

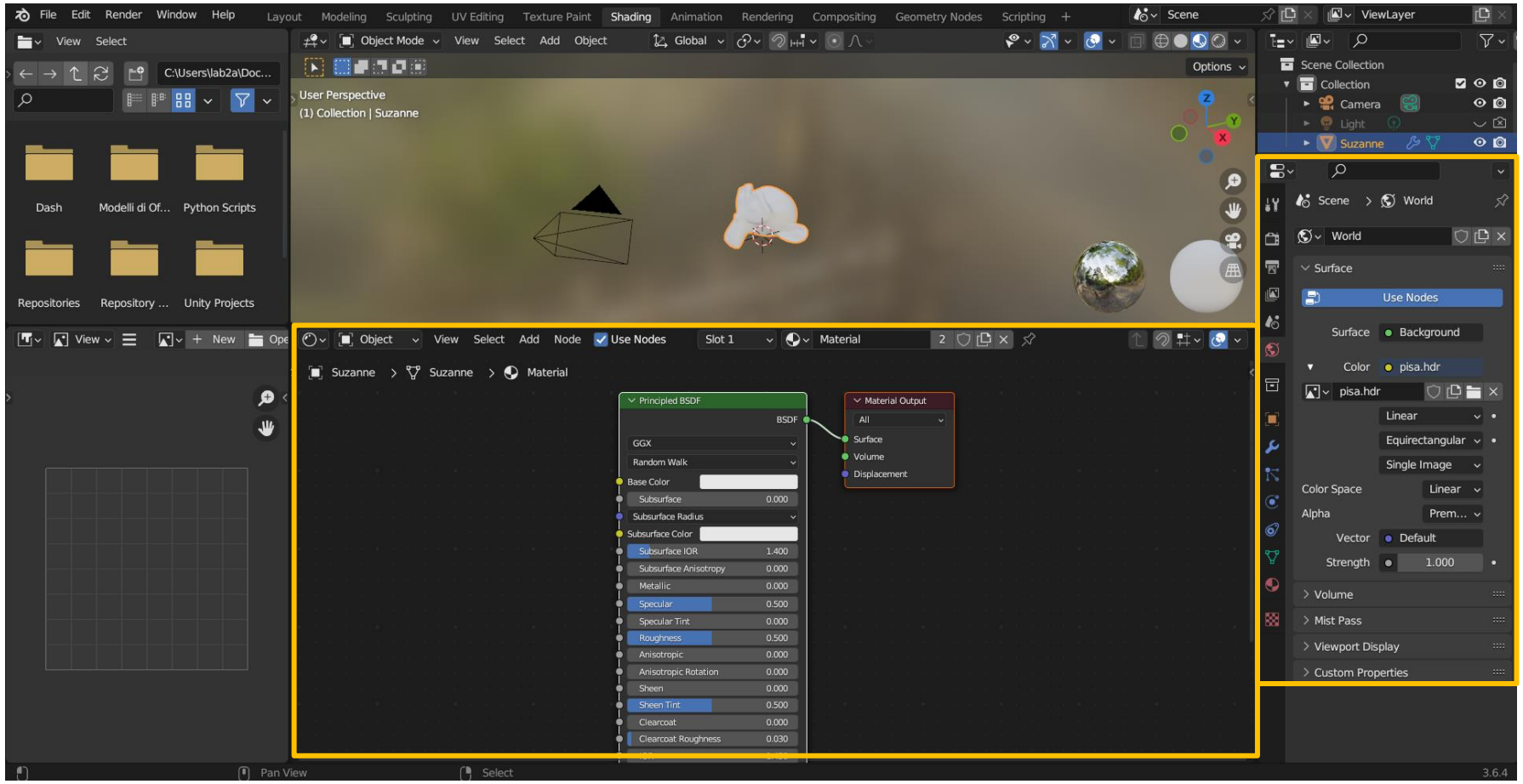
- Materials
- Exercise

Materials

Materials control the appearance of meshes, curves, volumes and other objects. They define the substance that the object is made of, its color and texture, and how light interacts with it.

Materials can be created in either the Material properties, or in the Shader Editor. These provide a different view of the same shader nodes and material settings.

Materials



Material properties

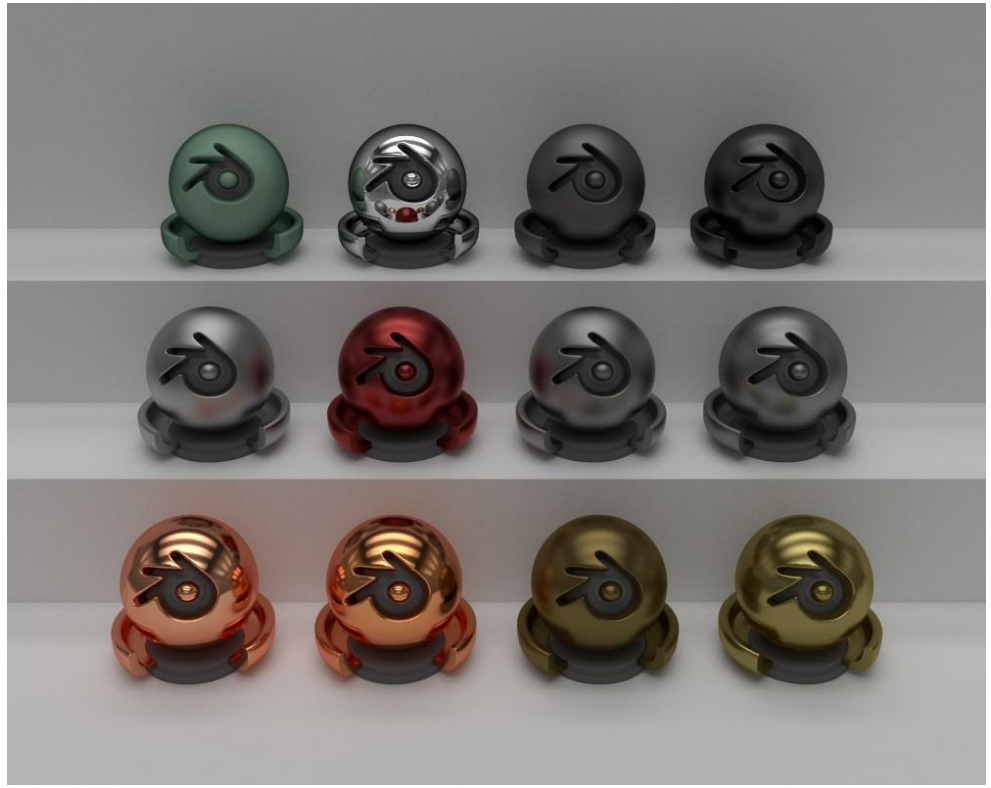
Shader Editor

Materials

Materials are data-blocks that can be assigned to one or more objects, and different materials can be assigned to different parts of meshes.

Material slots link materials to objects and meshes.

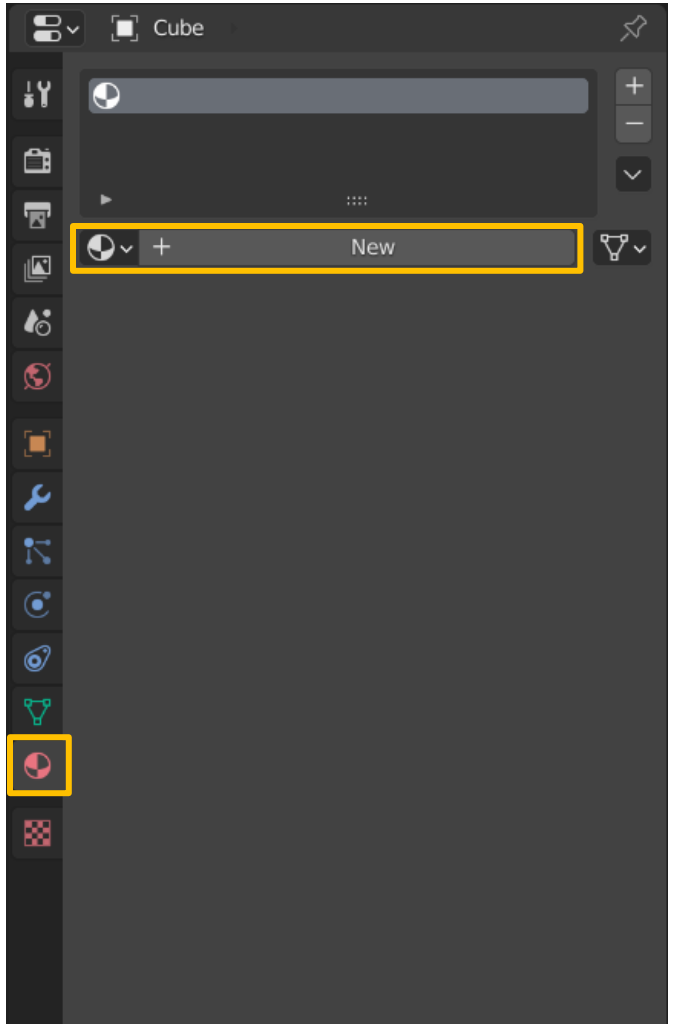
By default objects only have a single material slot, which assigns a material to the entire object. If different parts of the mesh need different materials, multiple material slots can be created.



Materials

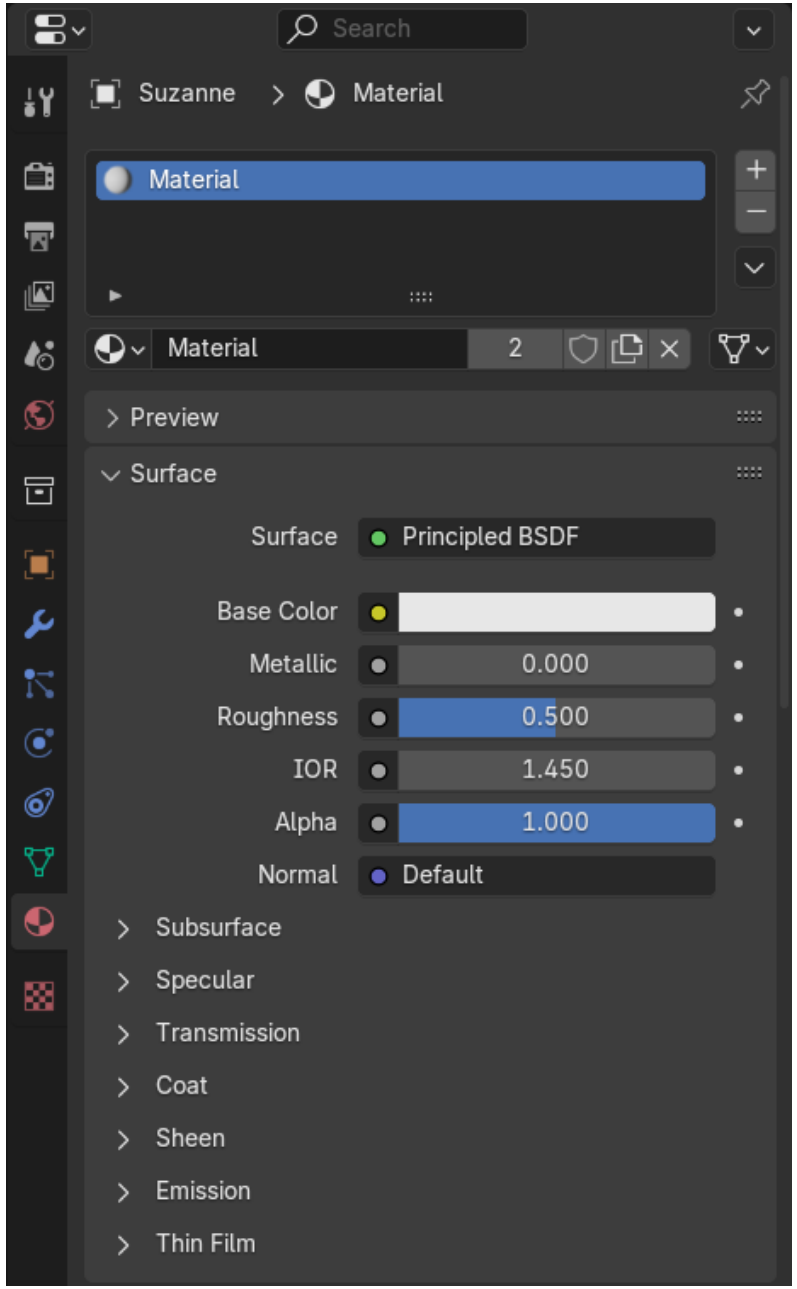
Once an object is selected, you can define material through the Material Properties.

This window will appear terribly empty, unless the Object already has a material linked to it. If there is no linked material, add a new one with the *New* button, or choose an existing one from the menu opened by clicking the  button.



Materials

Once you have added a material the buttons will disappear showing the material options.



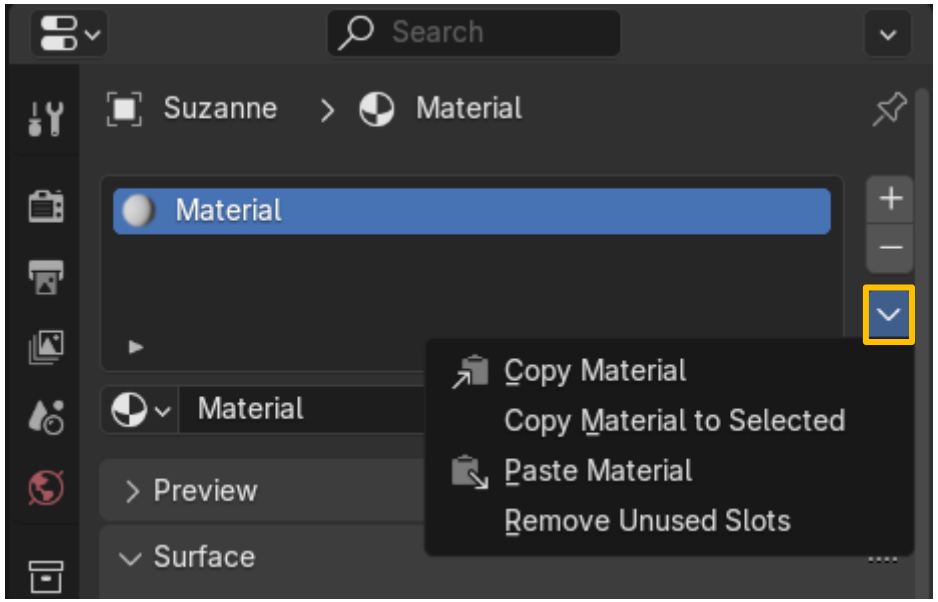
Material slots

With a material linked or created, one or several material slots can be created, and further options become available:

Material slot buttons:

- **+** sign: Add a new material slot or copy the one selected
- **-** sign: Remove selected material
- Slot Copy and paste dropdown menu

Down arrow Copy and paste the selected material slot



Material types

Physically based materials can be created using the *Principled BSDF*, *Principled Volume,* and *Principled Hair (Cycle Only)*.

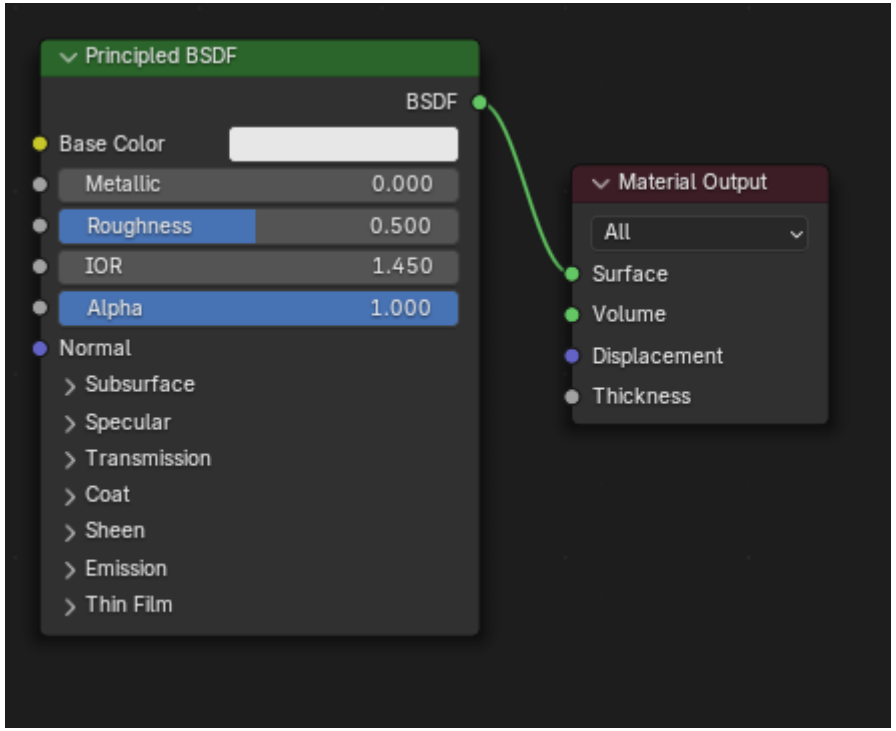
With these shaders, a wide variety of materials including plastic, glass, metal, cloth, skin, hair, smoke and fire can be created.

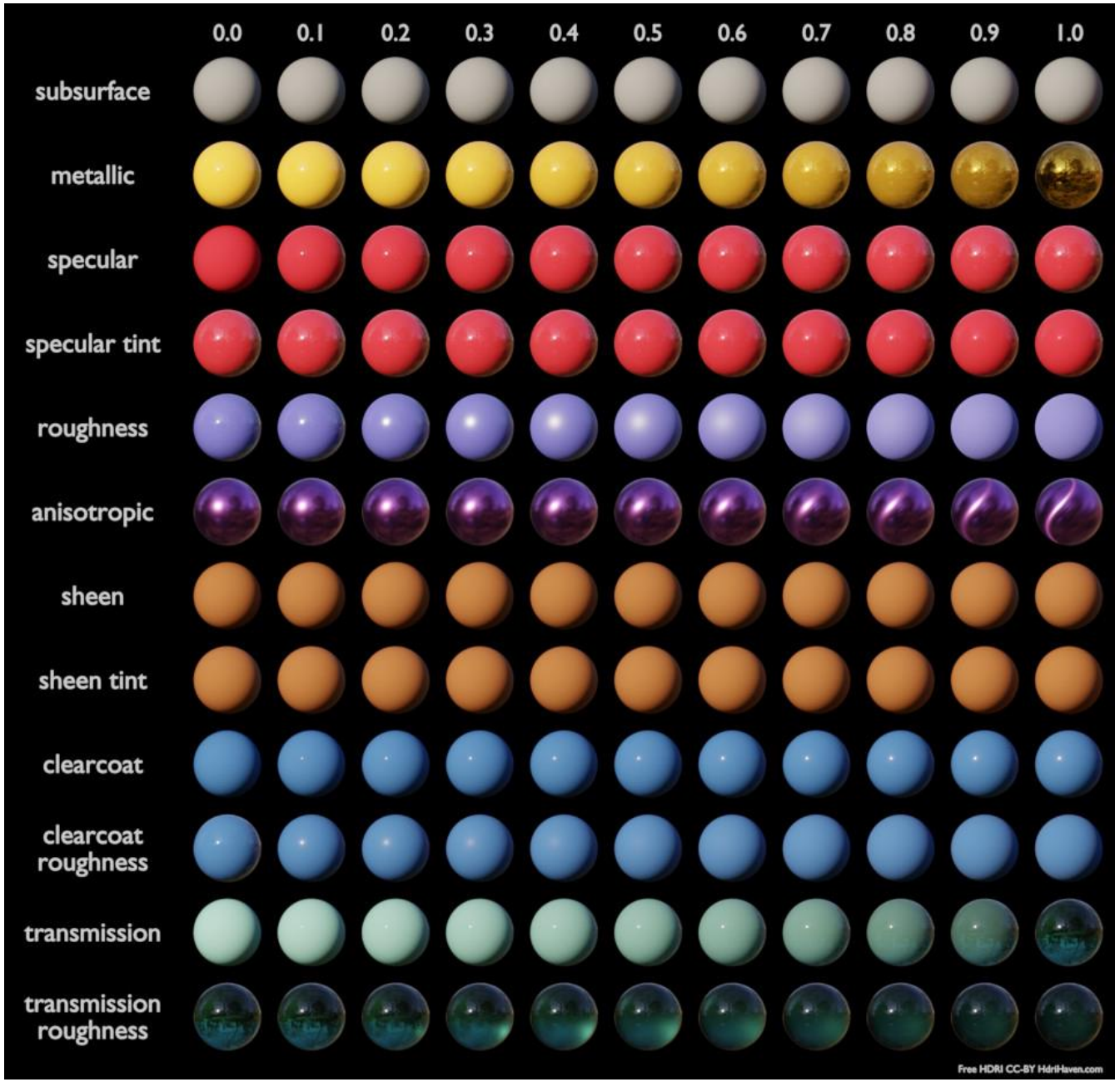
A flexible shading nodes system is used to set up textures and create entirely different types of materials like toon shading.

Principled BSDF

The Principled BSDF (acronym for Bidirectional Scattering Distribution Function) combines multiple layers into a single easy to use node. It is based on the Disney principled model also known as the “PBR” shader, making it compatible with other software such as Pixar’s Renderman® and Unreal Engine®.

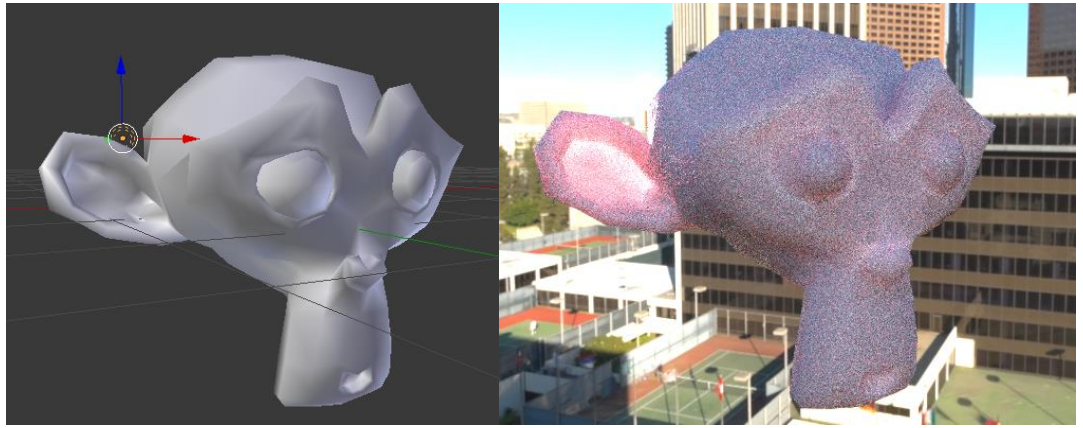
The base layer is a user-controlled mix between diffuse, metal, subsurface scattering and transmission. On top of that there is a specular layer, sheen layer and clearcoat layer.




0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
subsurface
metallic
specular
specular tint
roughness
anisotropic
sheen
sheen tint
clearcoat
clearcoat roughness
transmission
transmission roughness
Free HDRI CC-BY HdriHaven.com

Principled BSDF - Examples

- Transmission: 1
- Roughness: 0
- Base color:



- Subsurface:0.5
- Subsurface Color:

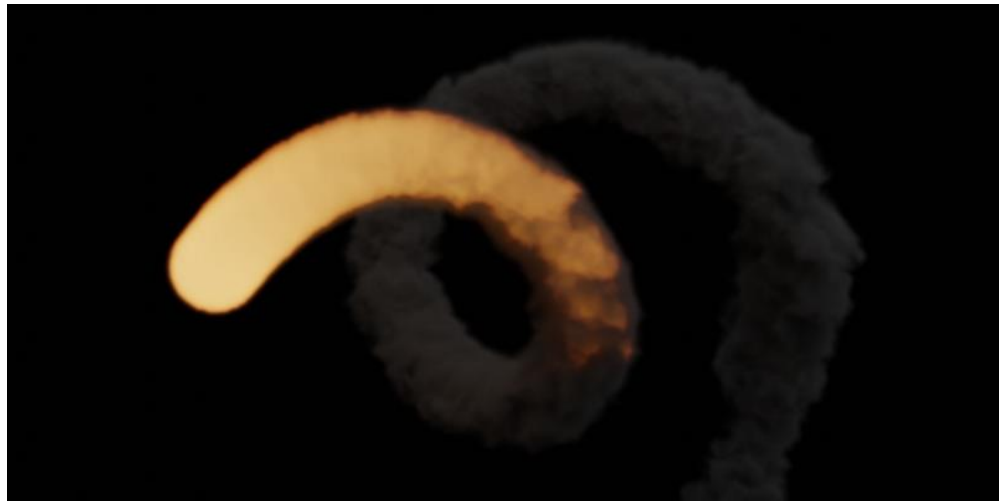
Principled BSDF - Examples

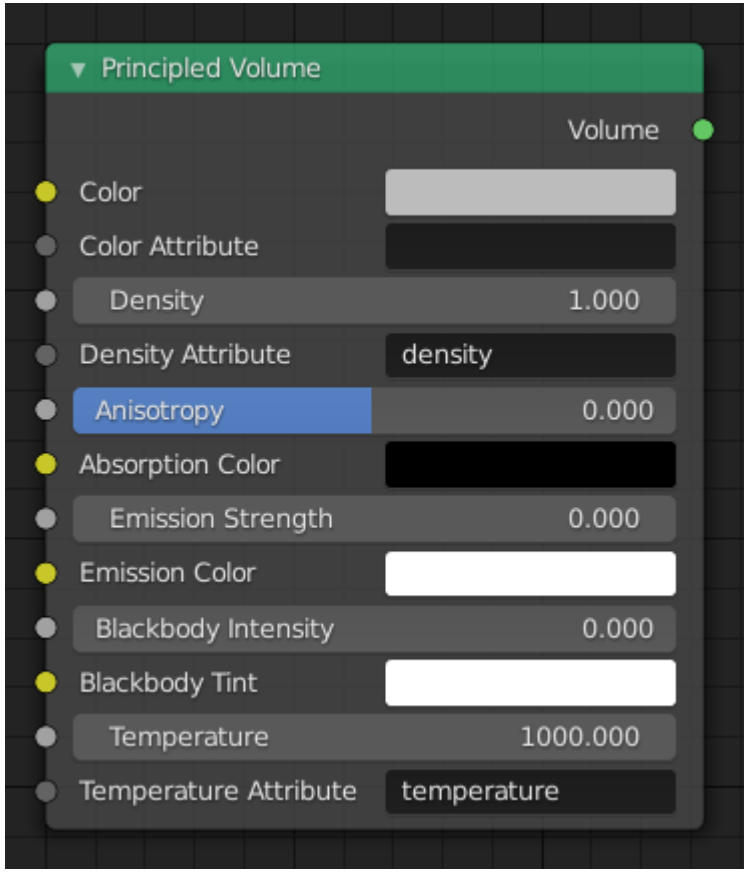
- Metalic: 1
- Asinotropic: 0

- Base color:
- Sheen: 1

Principled Volume

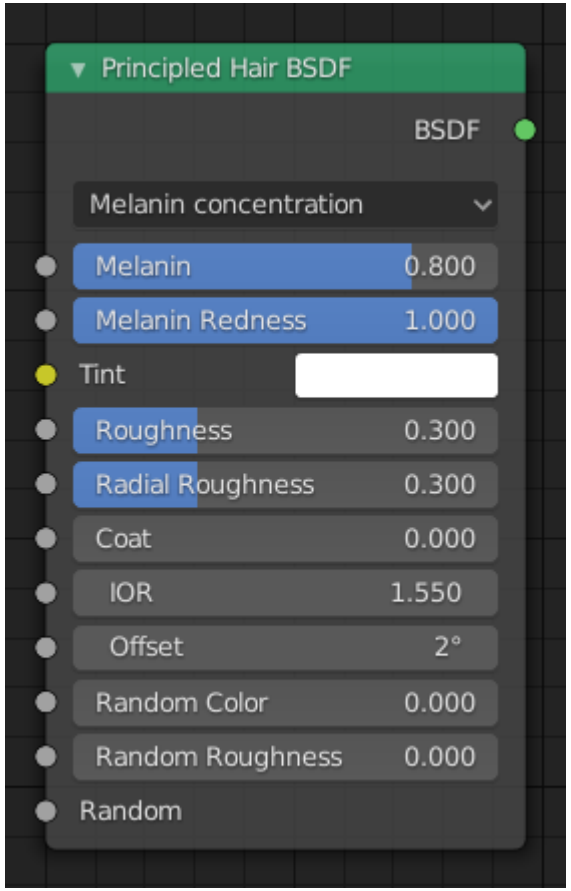
- The Principled Volume shader combines all volume shading components into a single easy to use node. Volumes like smoke and fire can be rendered with a single shader node, which includes scattering, absorption and blackbody emission.





Principled Hair (Cycle only)

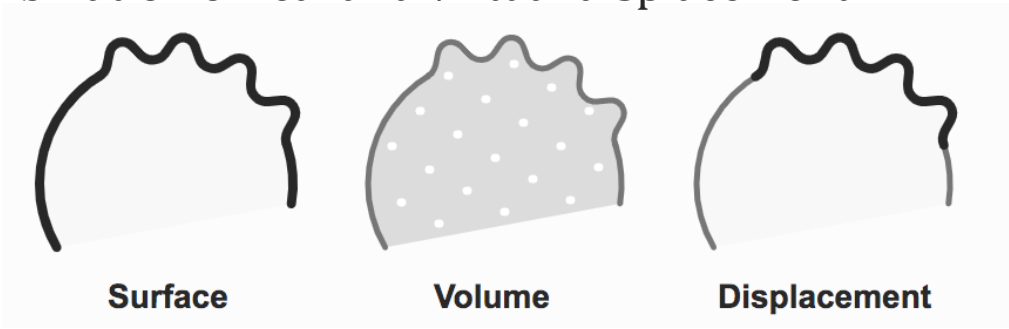
- The Principled Hair BSDF is a physically-based, easy-to-use shader for rendering hair and fur.



Components

Materials consist of three shaders, defining the appearance of the surface, the volume inside the object, and the displacement of the surface.

- *Surface Shader*: The surface shader controls the textures and light interaction at the surface of the mesh.
- *Volume Shader*: The volume shader defines the interior of the mesh. A material can have just a volume shader for cases like smoke and fire, or it can be combined with a surface shader for materials like cloudy glass.
- *Displacement*: The shape of the surface and the volume inside it may be altered by displacement. This way, textures can then be used to make the mesh surface more detailed. Depending on the settings, the displacement may be virtual, only modifying the surface normals to give the impression of displacement, which is known as bump mapping, or a combination of real and virtual displacement.

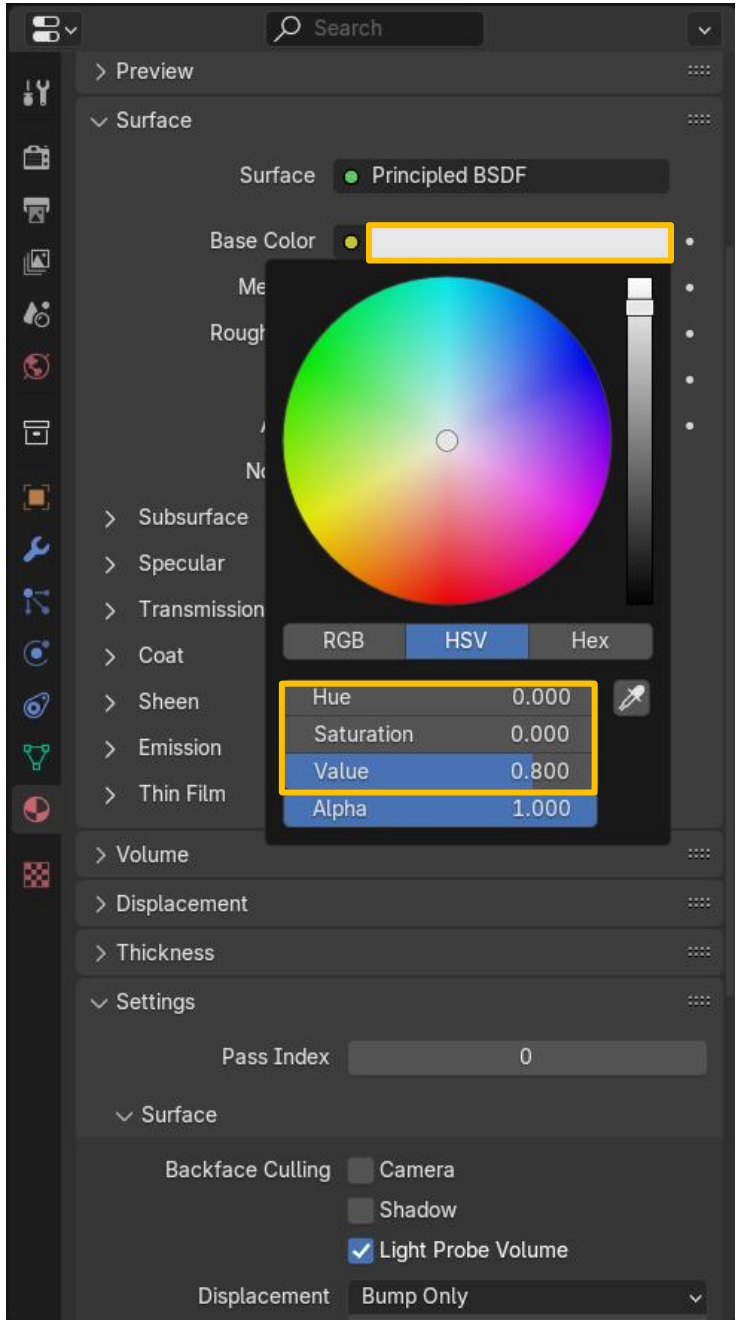


Material colors

The Material Panel allows you to set the material colors properties.

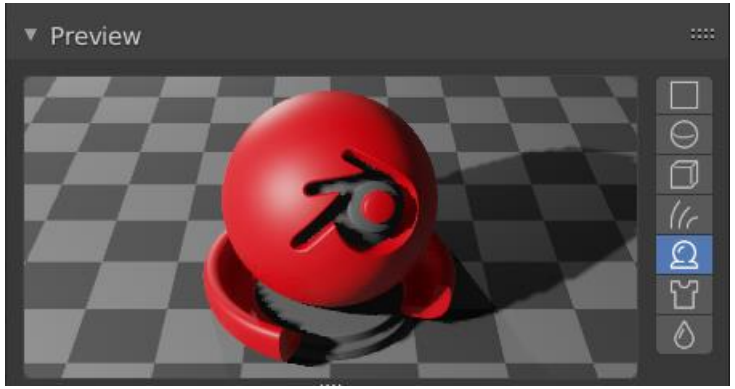
- The basic material color, or the Diffuse color, or, briefly the Color tout court (Base Color in the interface) is the color used by the diffuse shader or Principled BSDF shader.

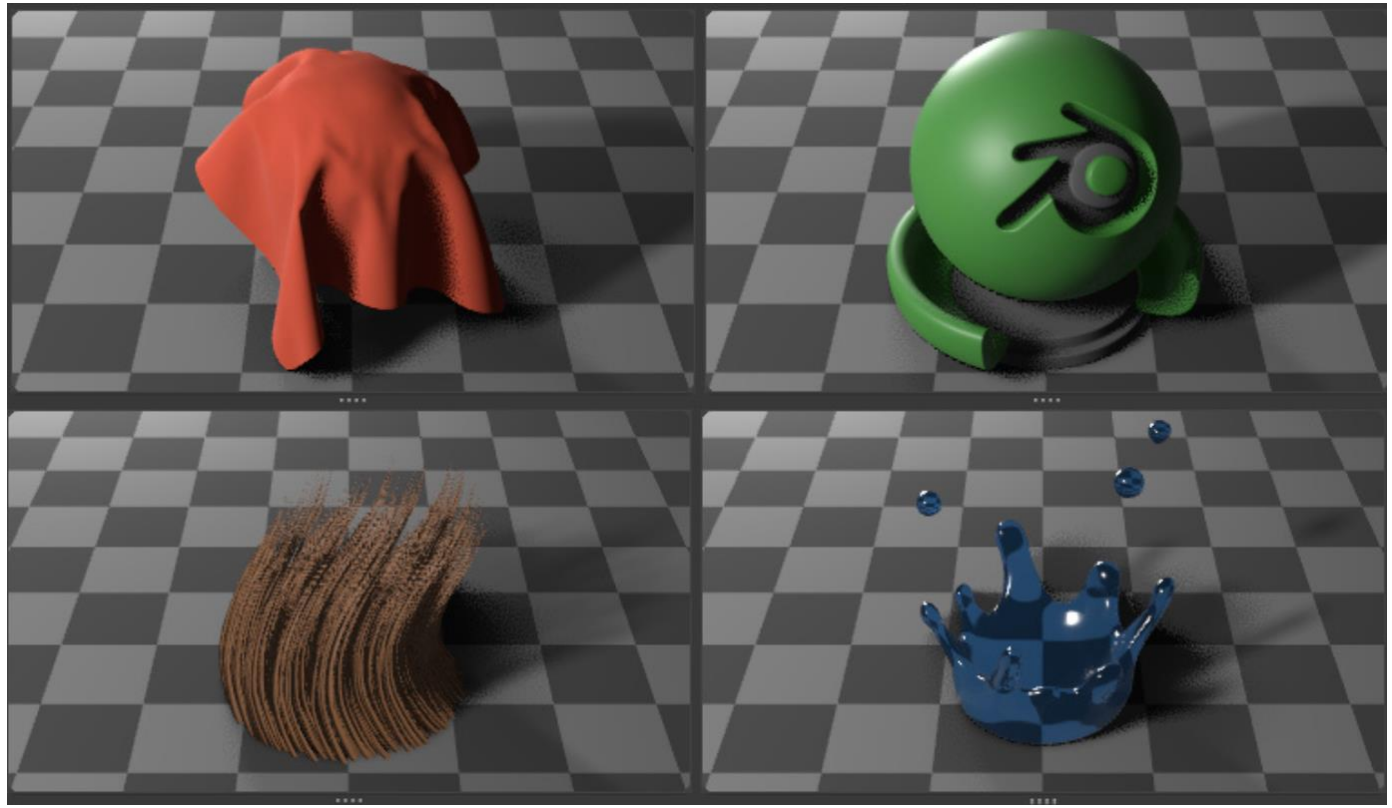
The button select the pertinent color, which is shown in preview immediately to the left of each button. The three sliders at the right allow you to change the values for the active color in both a RGB scheme and in a HSV scheme.



Materials in practice

The Preview panel shows the material preview.

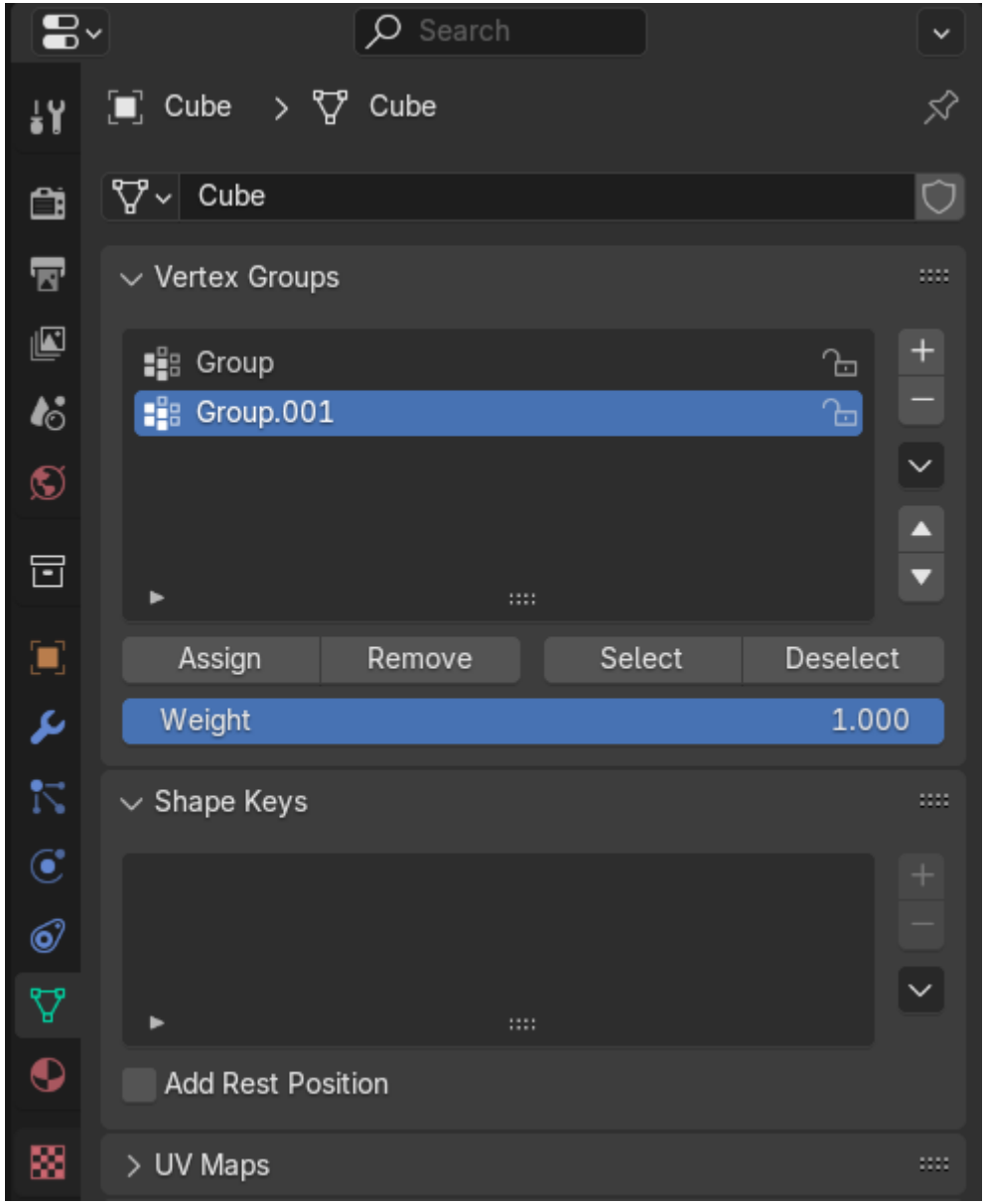




Vertex Groups

Materials are not assigned to vertex groups but to vertices directly

So it is not necessary to assign vertex groups to a mesh to add multiple materials, but vertex groups is a simple way to manage material assignment.

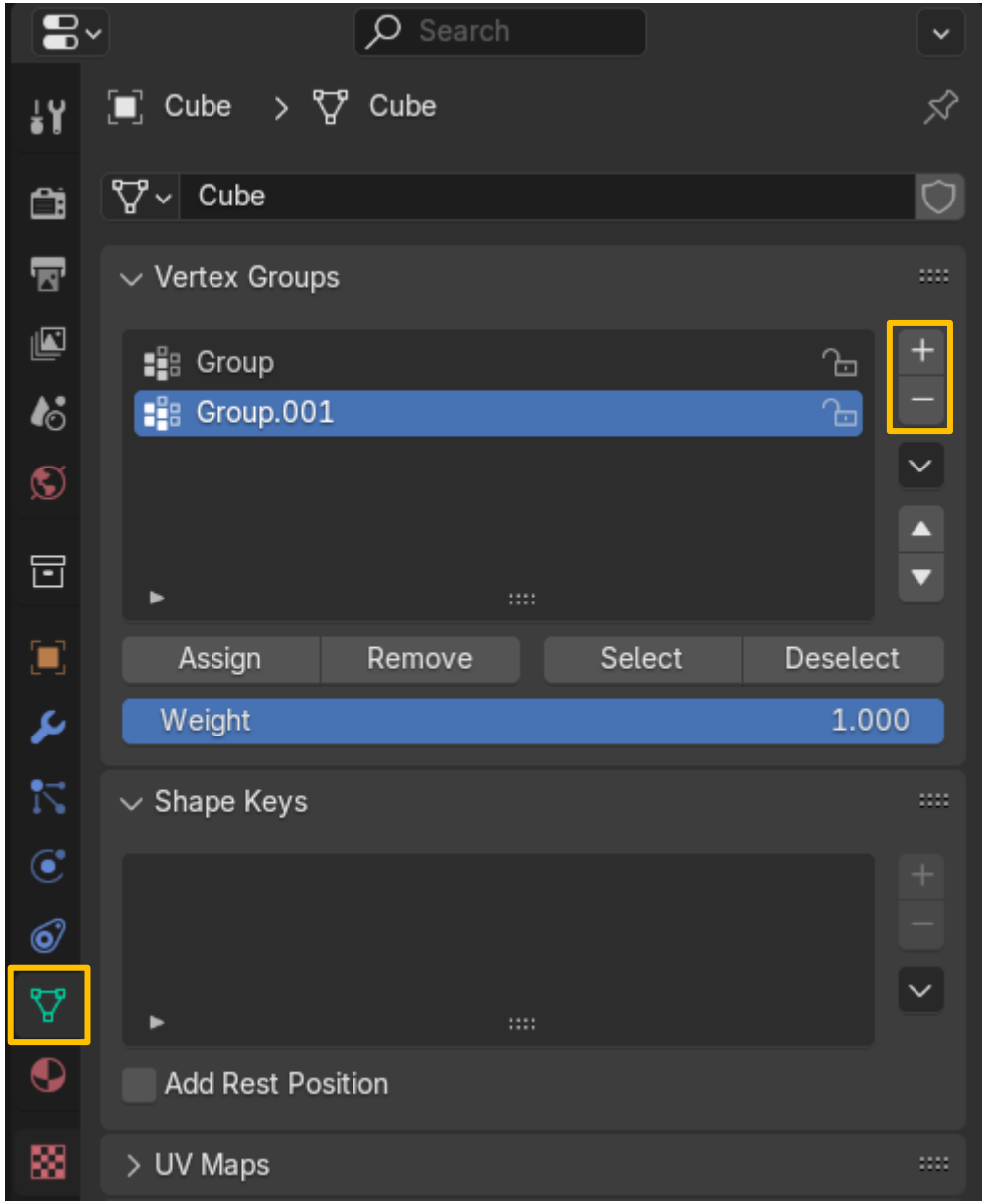


Vertex Groups

Managing vertex groups: new vertex groups are easily created by clicking the **+** button. Existing vertex groups can be easily removed by clicking the **–** button next to the list of vertex groups. New groups are added to the list.

Vertex groups are easy to manage:

- Use the up and down arrows to move the selected vertex group up and down the list.
- The drop-down menu offers several more alternatives to sorting and copying vertex groups in the list.

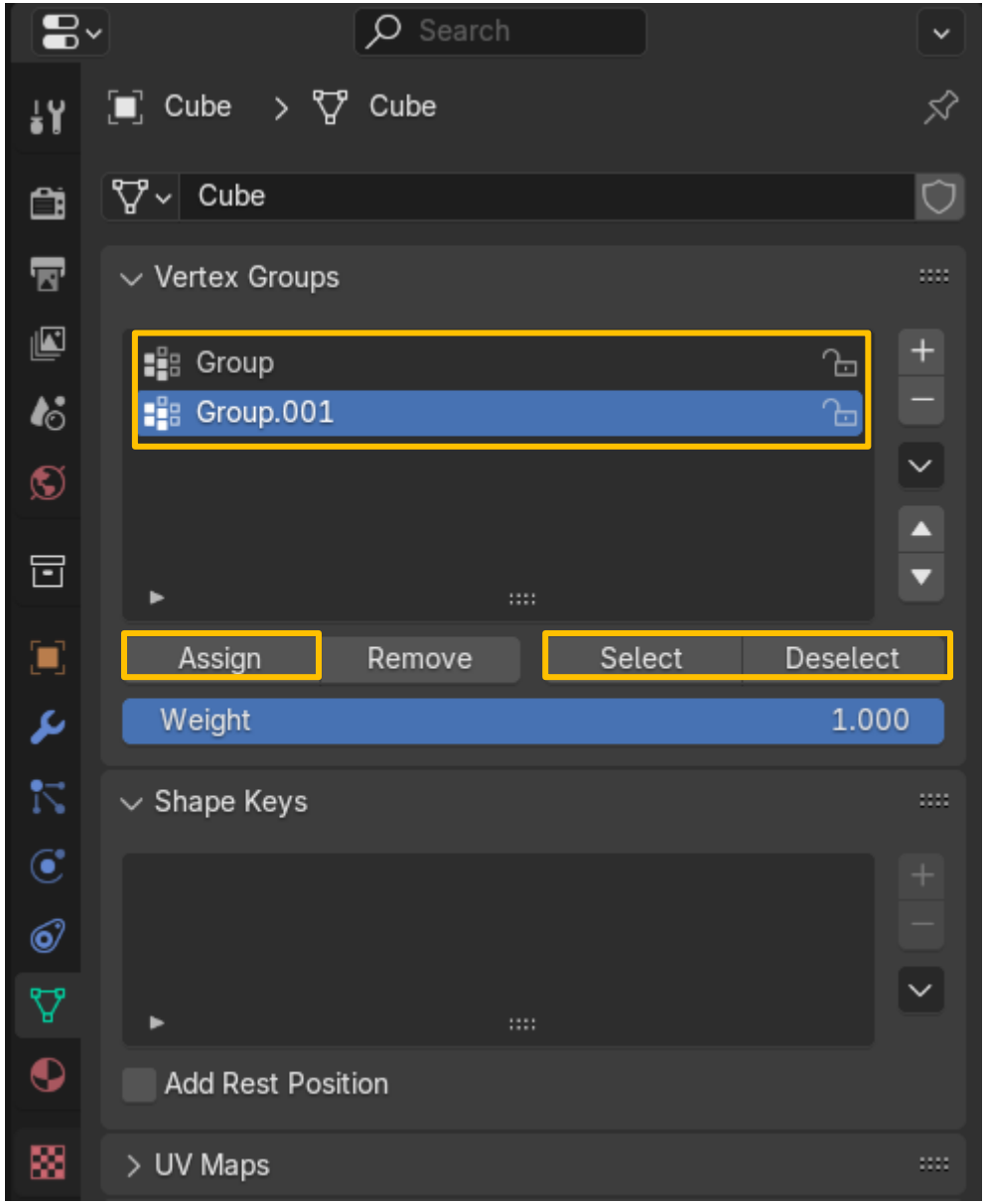


Vertex Groups

By default Blender names the vertex groups *Group*, *Group.001*, and so on. Each vertex group can be renamed in the name field.

In edit mode, you can use the material properties to assign the selected material to to the selected vertices by clicking the *Assign* button.

Use the *Select* and *Deselect* buttons see what vertices the selected material is assigned to.



Using multiple materials in one mesh

One of the trickier things to do is mix materials on a single mesh.

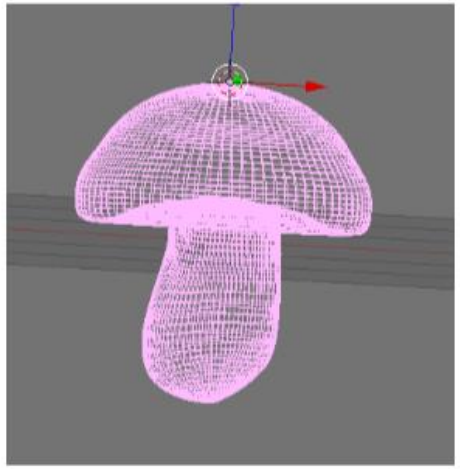
If you give the mesh a material (e.g., yellow), enter edit mode and select a few faces, and then add a red material, the entire mesh will change to red—not just the faces you've chosen. Any time you select faces and change the material, the whole mesh changes.

The reason is that for a mesh to have separate materials, it must first be divided into separate islands of material slots, each of which can then be assigned its own separate material as needed. Once these material slots are so assigned, then it is possible to assign them to separate faces.

Using multiple materials in one mesh

Most objects are assembled so that they can be modeled in parts, with each part composed of a different material. But on some occasions it may be useful to have an object modeled as a single Mesh, yet exhibiting different materials.

Consider the mushroom image. This object is a single mesh to which we need to assign two materials: one for the stem and one for the cap.



mesh

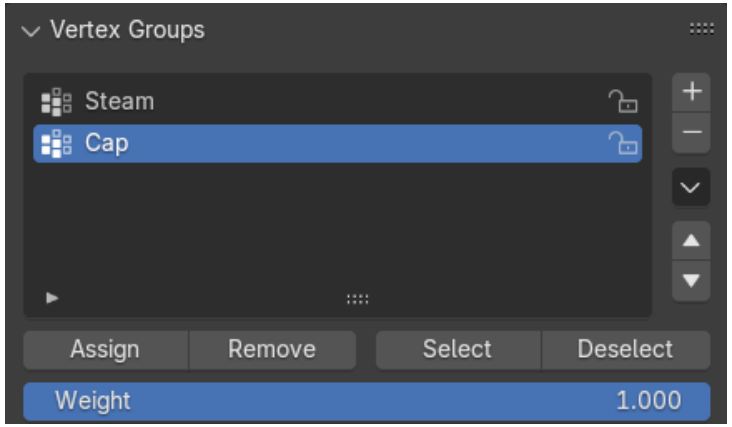
single material

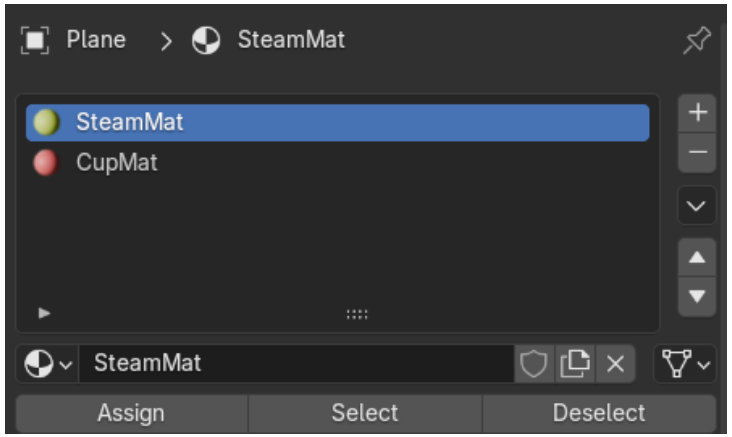
double material

Using multiple materials in one mesh

Here's how to do it:

- Create a mushroom, in top view, as a spin rotation surface.
- Create a creamy stem material of your choice, and assign it to the entire mushroom.
- In EditMode, go to the material content and add two slots
- Select the first slot a add a new material; choose a creamy material, then select vertices of the steam and assign them the material above defined (it’s better if you created before a vertex group!).
- Repeat the same process for the cap: select the second slot and add a new material; define the material and select vertices of the cap, then assign them the second material.

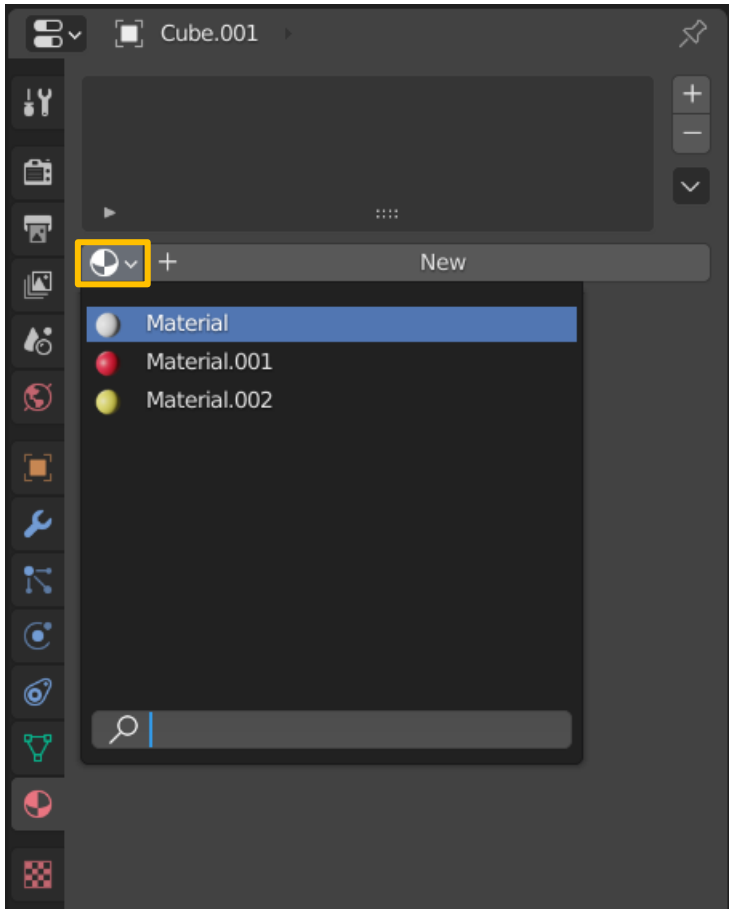




Reusing existing materials

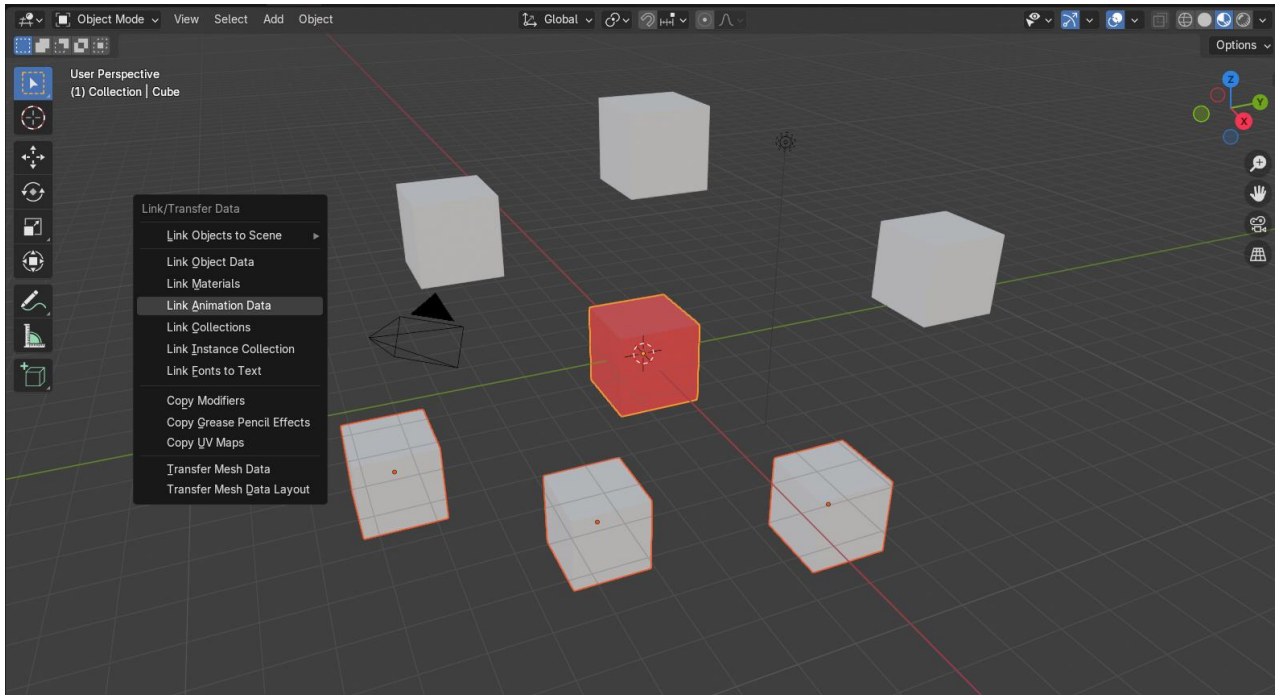
Blender is built to allow you to reuse anything, including material settings, between many objects. Instead of creating duplicate materials, you can simply reuse an existing material. There are several ways to do this using the Material's data-block menu:

- **Single Object –** With the object selected, click the sphere located to the left of the Material name. A pop-up appears showing all the materials available in the current blend-file. To use one, just click on it.



Reusing existing materials

- **Multiple Objects –** In the 3D Viewport, with **Ctrl-L** you can quickly link all selected objects to the material (and other aspects) of the active object. Very useful if you need to set a large number of objects to the same material; just select all of them, then the object that has the desired material, and **Ctrl-L** links them to that "parent".



Deleting a materials

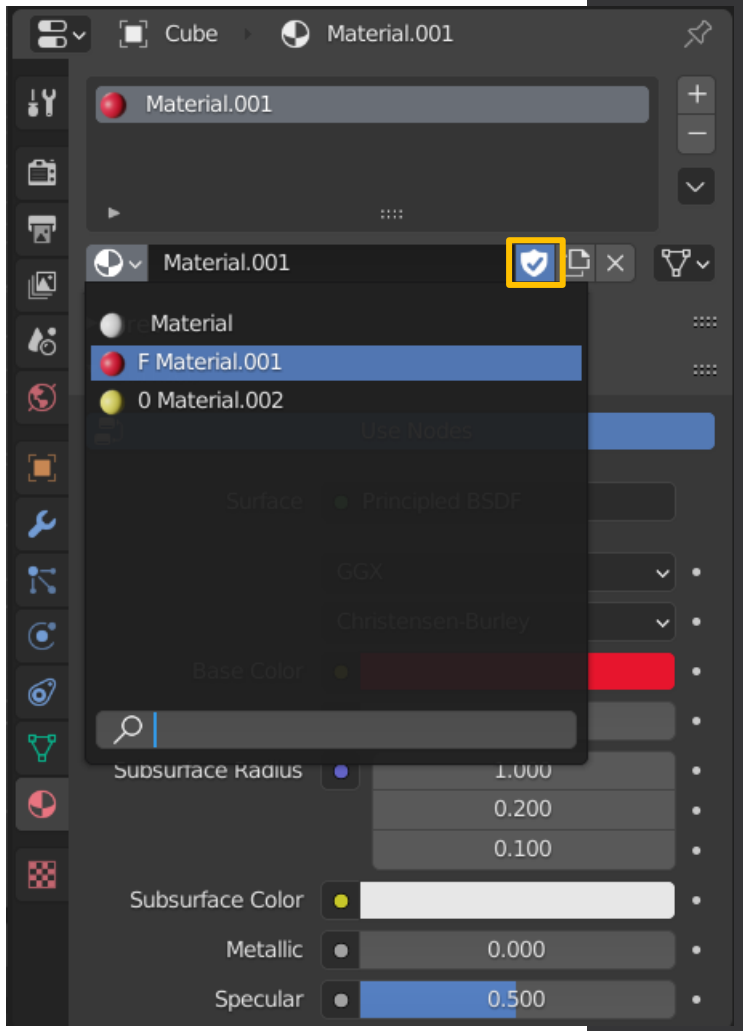
To delete a material, select the material and click *X* in the Available Materials List entry.

Although the material will seem to disappear immediately, the Delete action can depend on how the material is used elsewhere.

If the material is linked to the object and there are other objects which use this material, then the material will be removed from that object (but remain on all its other objects).

If the “Fake User” button has been lit in the Available Materials list, then the material will be retained when the file is saved, even if it has no users.

Only if it has 0 “real” users, and no “Fake” user, will the material be permanently deleted. Note that it will still remain in the Materials list until the blend-file is saved, but will have disappeared when the file is reloaded.



Working with nodes

In addition to creating materials as just described using all the settings on all the materials panels, Blender allows you to create a material by routing basic materials through a set of nodes.

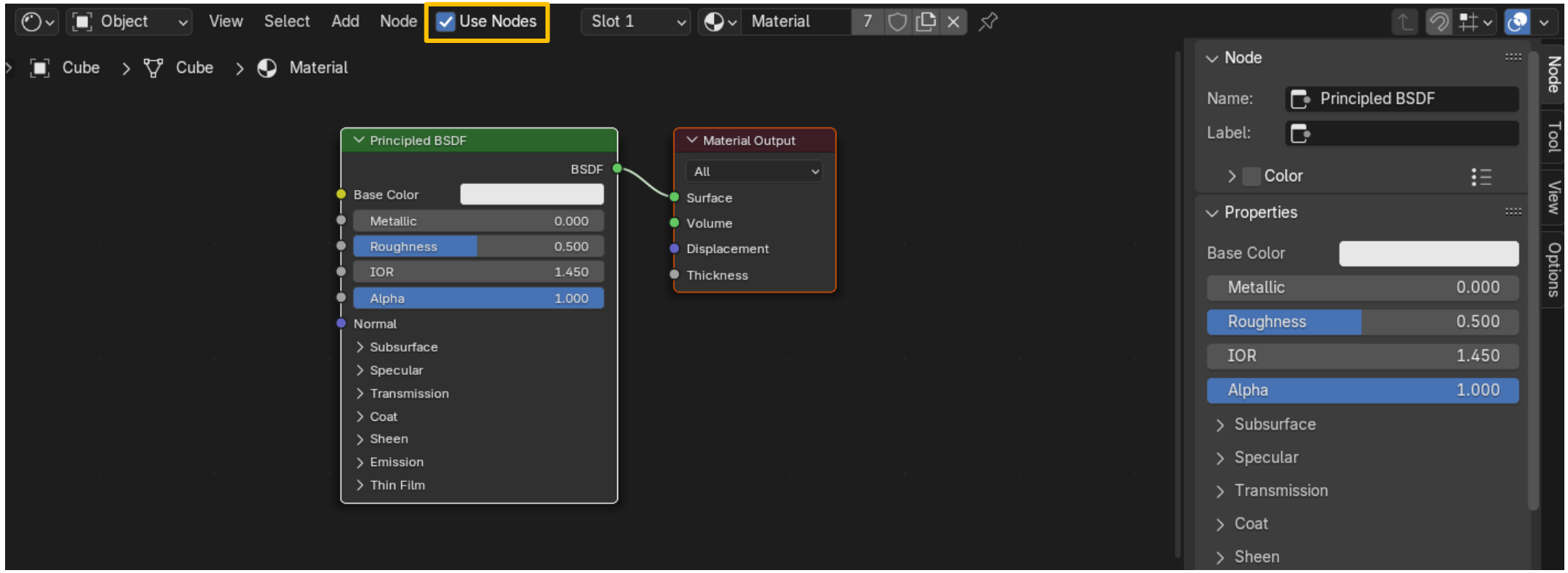
Each node performs some operation on the material, changing how it will appear when applied to the mesh, and passes it on to the next node. In this way, very complex material appearances can be achieved.

The node system does not make the material menu obsolete. Many features and material settings are still only accessible through the material panel.

However, with the advent of nodes, more complex and fantastic materials can be created since we now have greater control.

Working with nodes

- To make a Material Node-Based, create a material, and then go into the Shader Editor, and check "Use Nodes.“



Working with nodes

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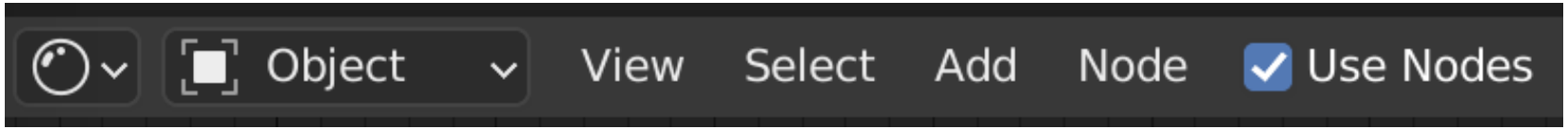
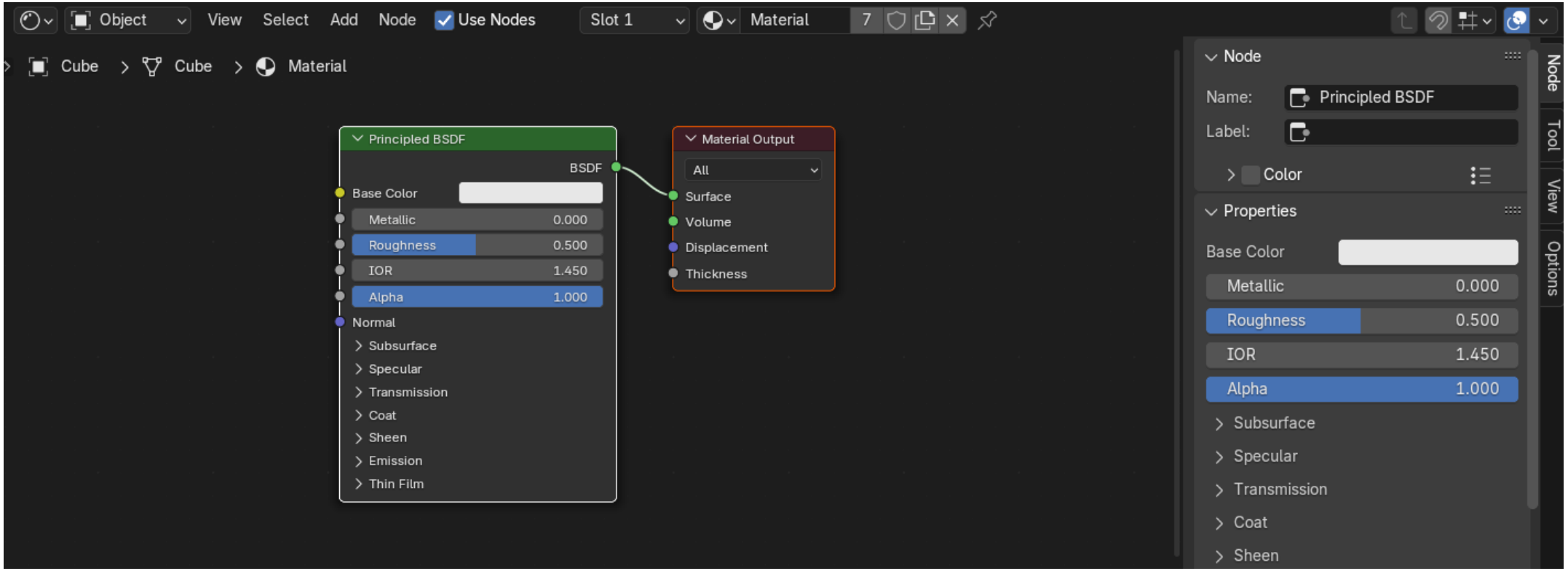


- Instantly, the Preview will turn blank black. It's not broken, it just needs a second input material.
- Material Nodes work by having one combined material with one or many sub-materials that make up the combined material.

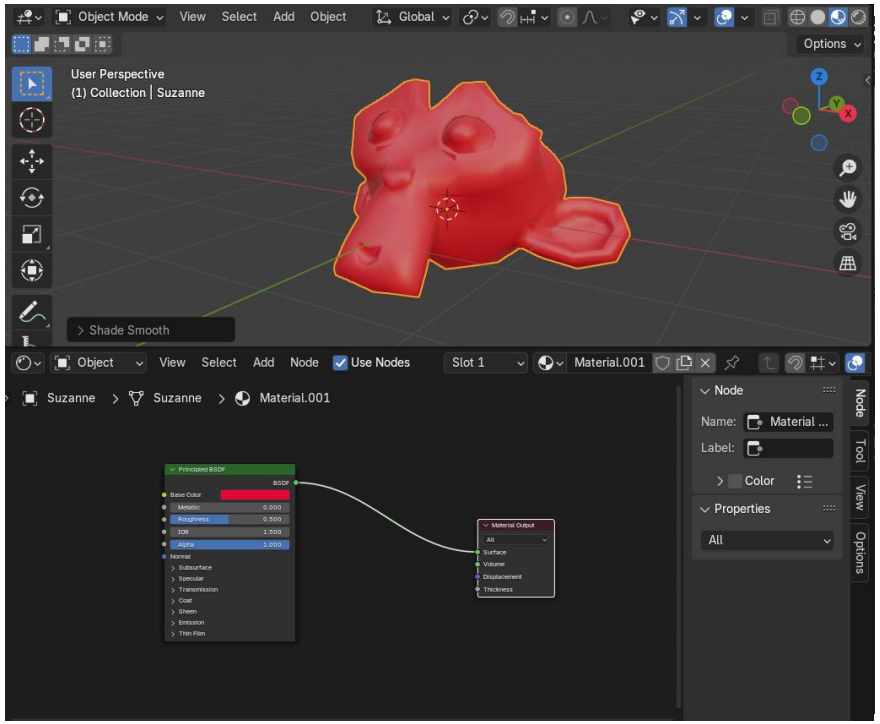
– You have to create a sub-material as an input for it to work.

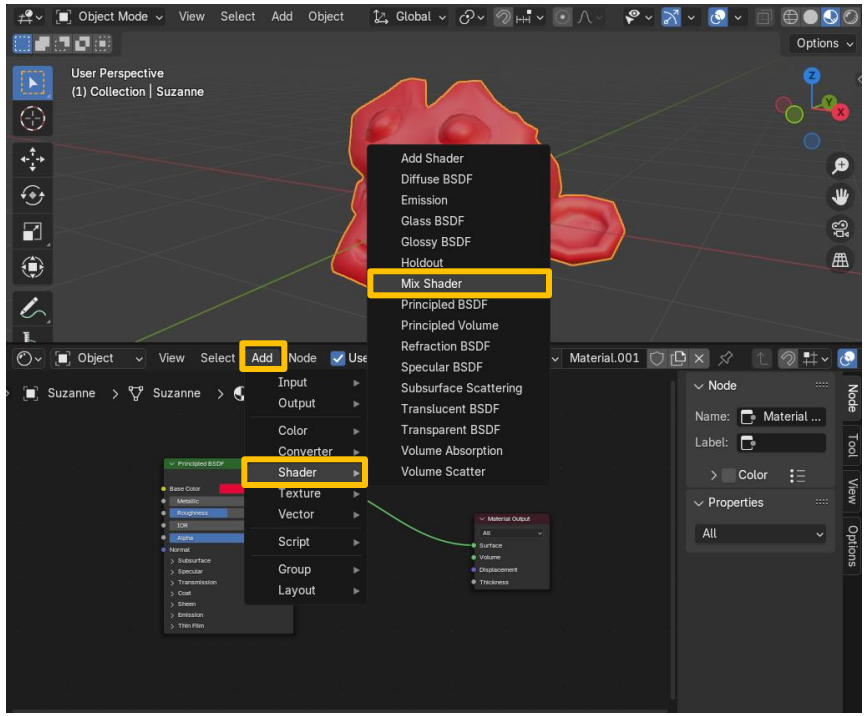
Working with nodes



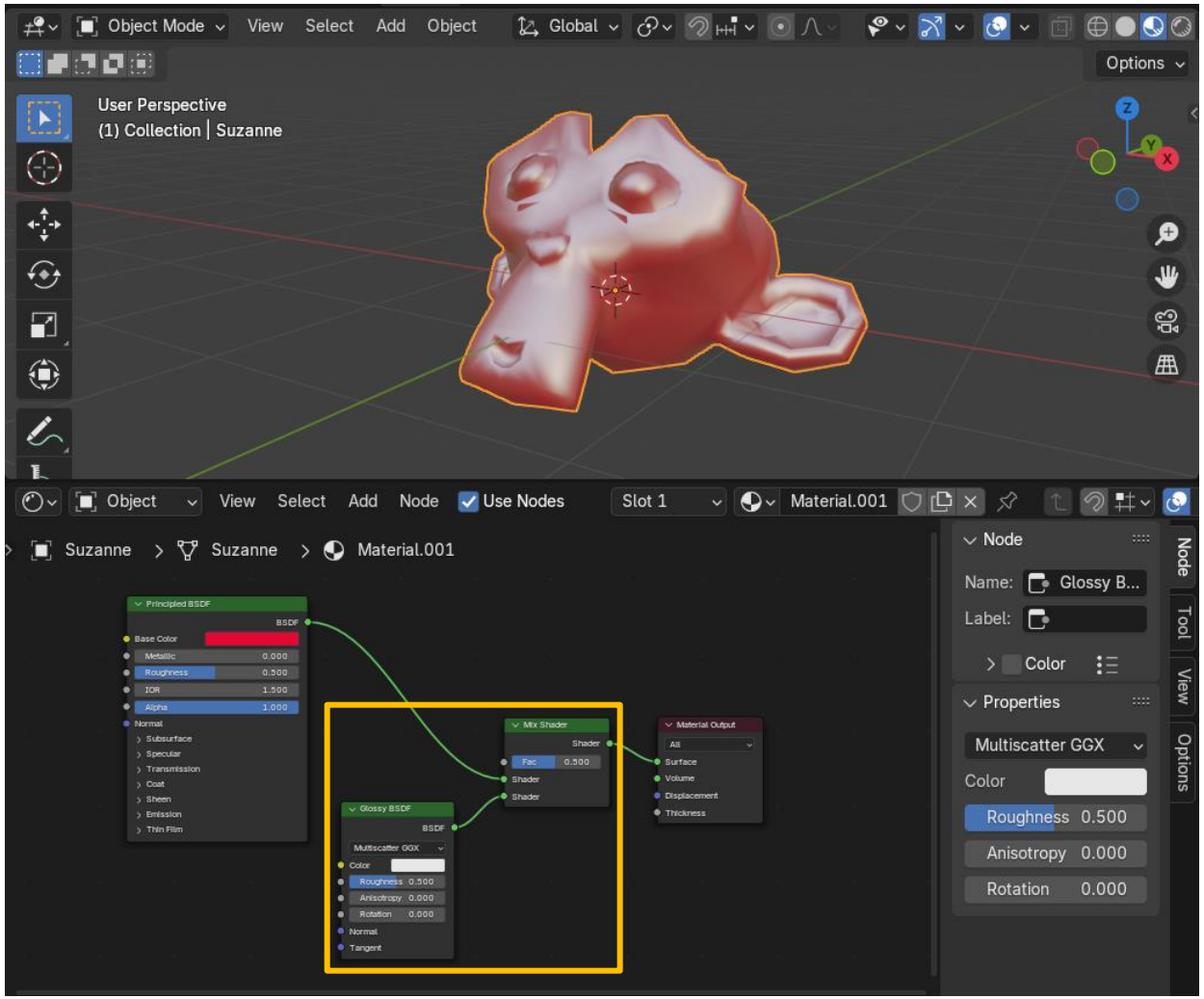
Working with nodes

- The cool part about Material Nodes is that you can MIX multiple materials.
- The mix node is just like any other mix node you might see in the Compositor or Texture Node editor.



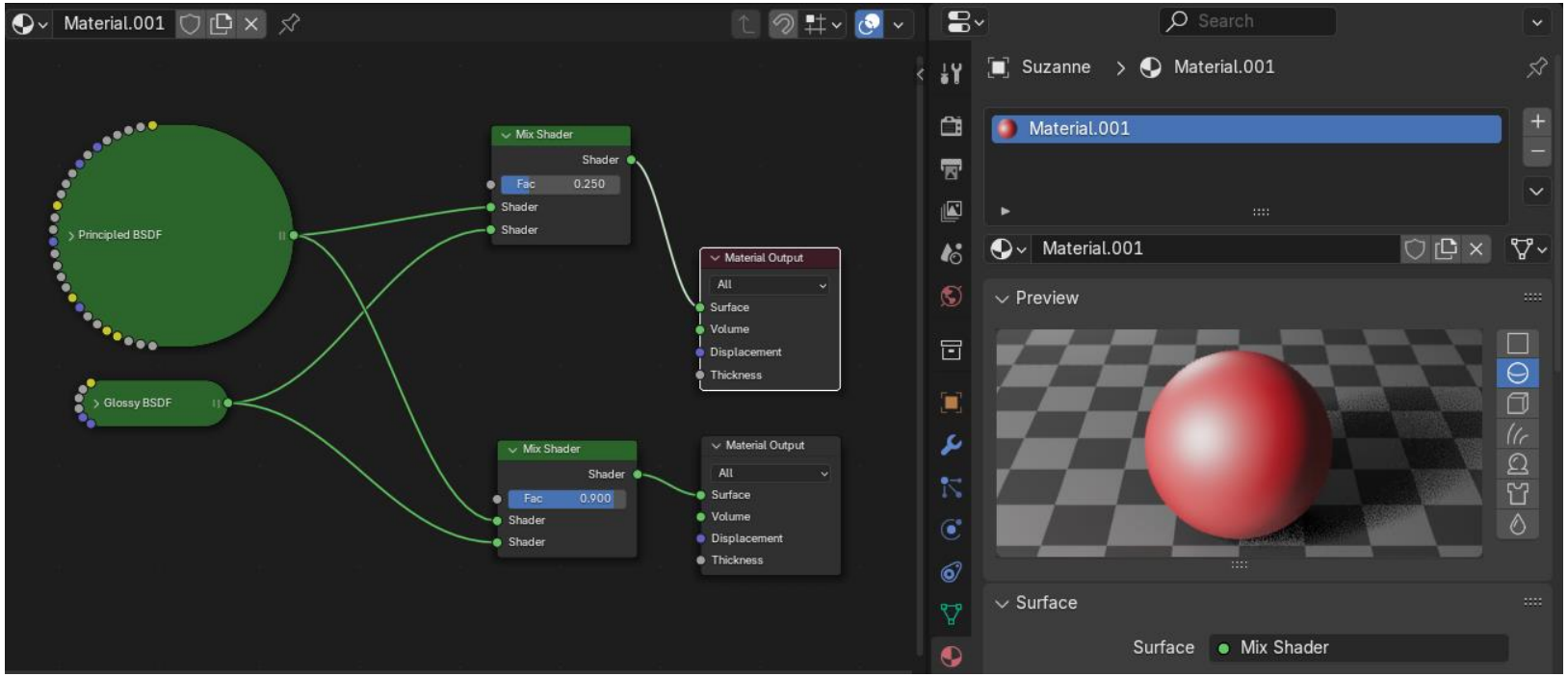


Working with nodes



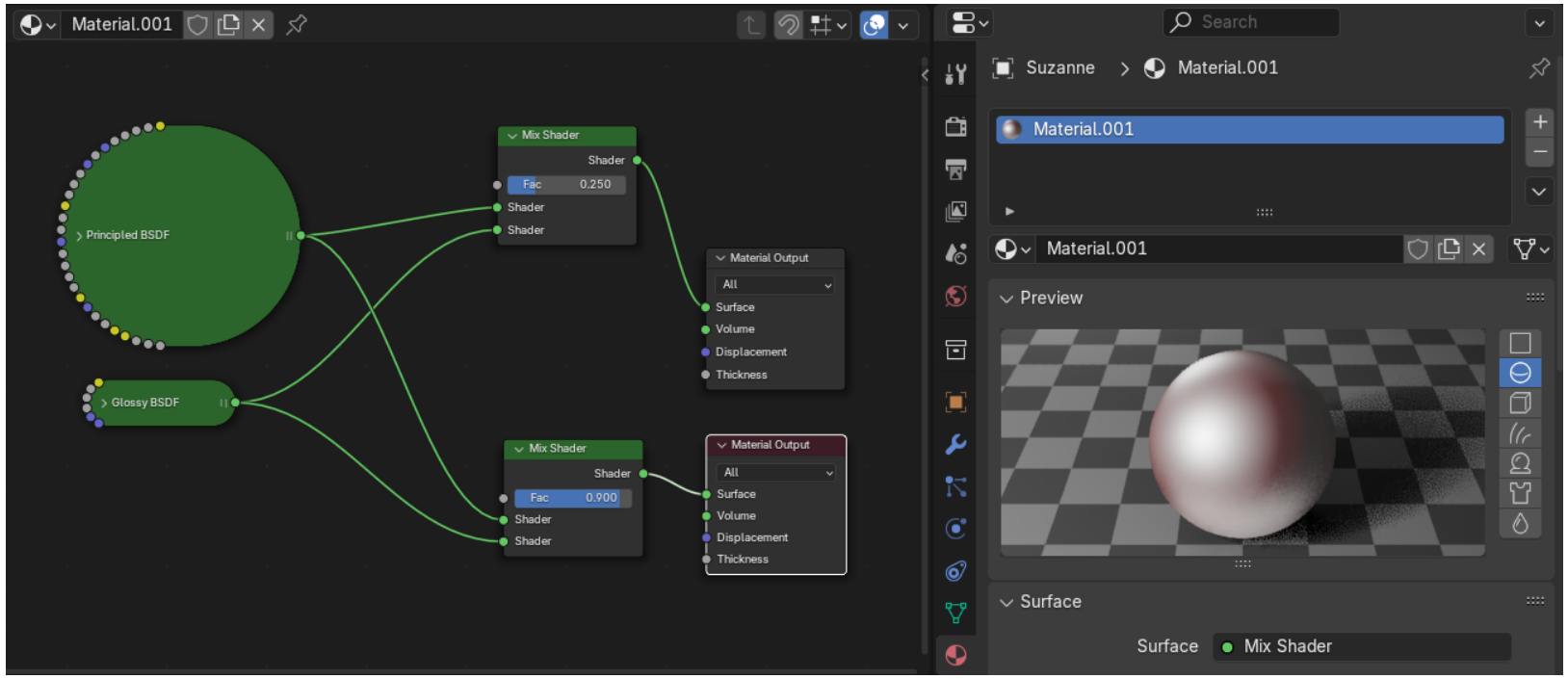
Working with modes

- It's important to know that the Preview will always show what's in the Output node, not what's selected. However, the settings and properties in the Material and Texture panels are for that material.



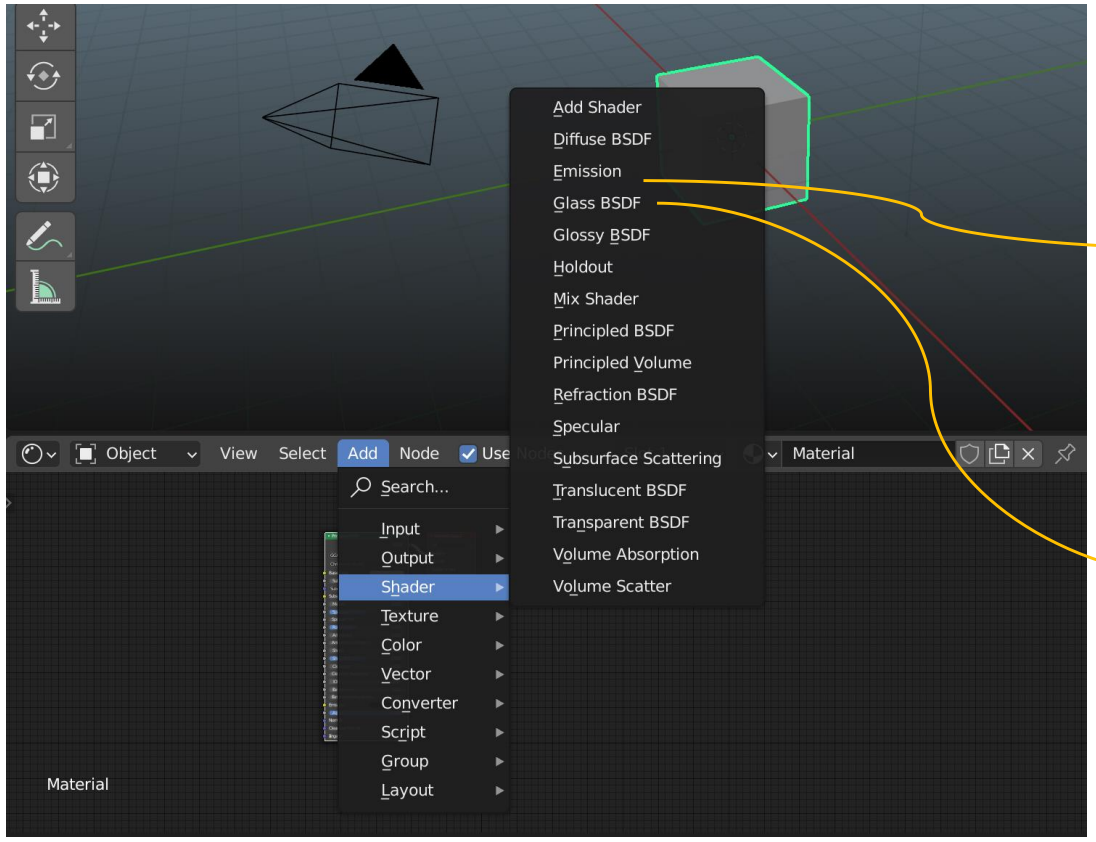
Working with nodes

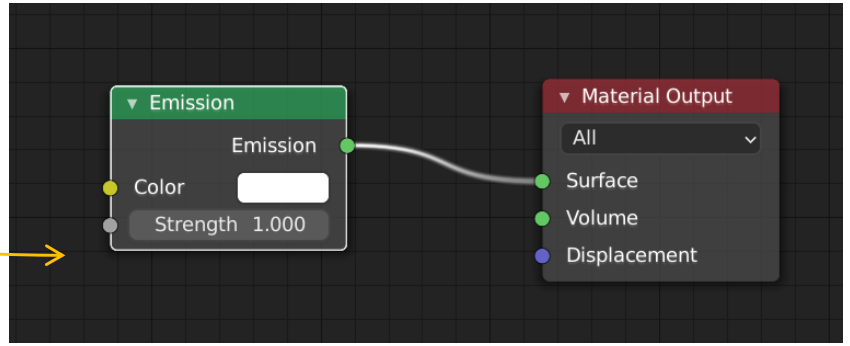
- Output nodes are like the Viewer node in Compositing. The selected Output node is the one that's used in Previews and Rendering.

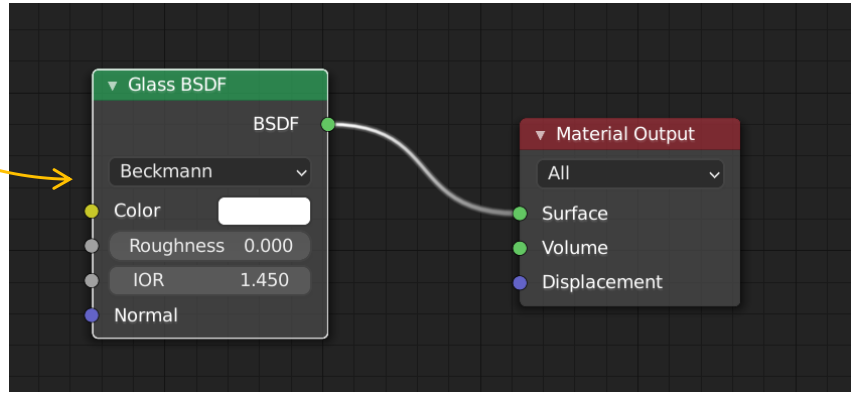


Working with nodes

- Using Node Editor and the default shaders we can make a different type of material for our models







Tutorial

All About Introduction to Materials in Blender 4.2 Tutorial

https://www.youtube.com/watch?v=YIe1Cz-lvew

How to Use Eevee Transparency in Blender 4.2 (Tutorial)

https://www.youtube.com/watch?v=Ti9s4OAe4uc

Tutorial

Plastic material in Blender

https://www.youtube.com/watch?v=AYDjqXizaYs

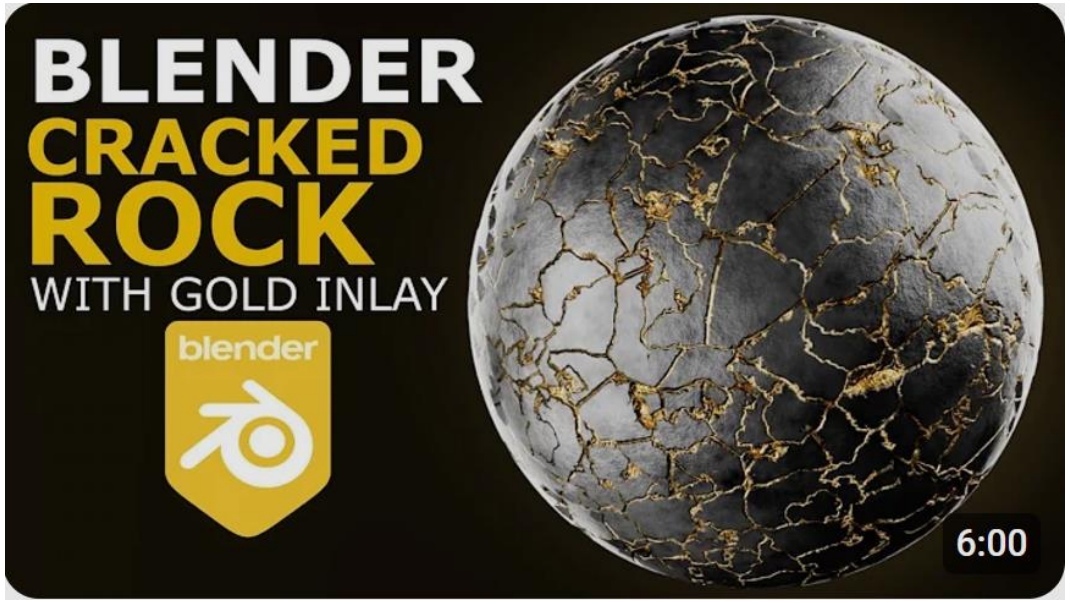
Transparent Plastic in Blender - A Fast Way for Good Loking Plastic (Cycles)

https://www.youtube.com/watch?v=PKwKT-tvu5E

Tutorial

Gold material in Blender

https://www.youtube.com/watch?v=MFVuo9HsSG0



Blender: Cracked Rock With Gold Inlay | Material Tutorial

https://www.youtube.com/watch?v=FVAmE0IHkB4

Tutorial

Advanced Materials in Blender 2.80 | Shader Editor Tutorial

https://www.youtube.com/watch?v=iVjnS5Z77Ww

Create a Scratched Metal material in BLENDER

https://www.youtube.com/watch?v=MH8iutCKtYc

Tutorial

Multi Color Material - Blender 2.8 Tutorial (Eevee and Cycles)

https://www.youtube.com/watch?v=3V8qQRsgqvQ

Blender - Stylized Emission Shader (Blender 2.8)

https://www.youtube.com/watch?v=8qKLkDr09Pk