3. Materials and textures
I. Adding materials

Sobhi Ahmed

Comp3351

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Outline

I. **Adding materials**

II. Adding textures

III. World settings

IV. Ray-Tracing

Introduction

- Real objects are presented by their **nature**; dark, shiny, colored, transparent. Hard, soft, textured gives them certain feel, etc.
- Bad Material or Bad texture may destroy **the beauty of the scene**.
- An object is visible when it **is illuminated by a lighting source**.
- What we see is **the reflected light by the object**.
- Many proprieties and options may influence the appearance.

Introduction

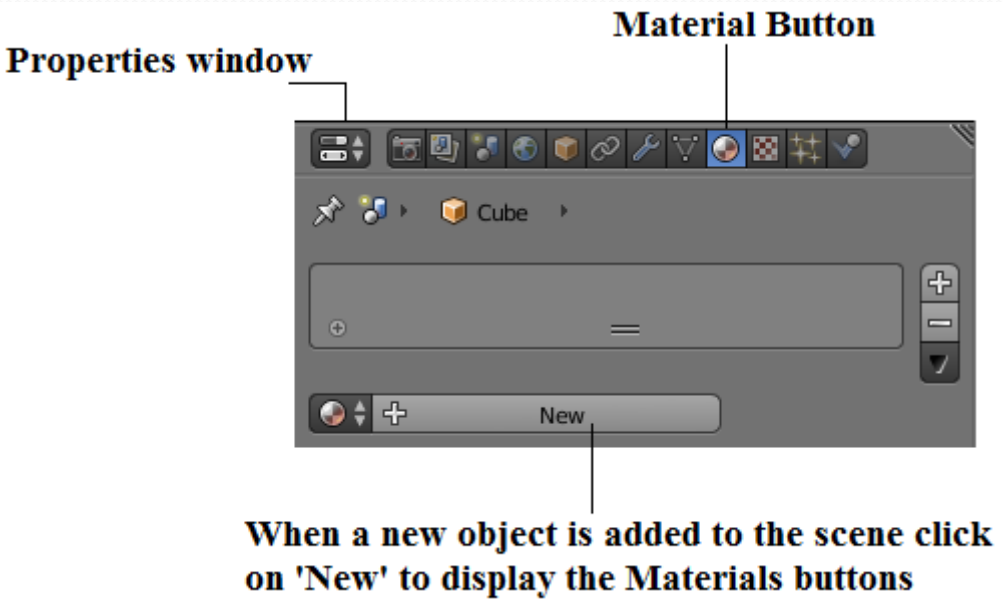
- Materials vs. textures:
  - A **material defines the optical properties of an object**: its color and the characteristics of its color (transparency, fading, …)
  - A **texture is a pattern that breaks up the uniform appearance of the material**
- Blender allows **textures to influence materials** in various ways
- It is important though, to **set your material first in Blender before the texture can be applied**
- In blender, Objects don't have material when added

I. Adding materials

- Materials allow you to determine **the color, shading, specularity**, and many other attributes of a surface.
- The Materials properties panel allows you to **add new materials**, or to **modify and remove existing materials**.
- The Materials properties panel is made up of multiple sections:
  - **Data** : gives you access **to all materials that are assigned** to the active object selection
  - **Preview** : gives you a hint of what **the material will look like** at render time
  - **Diffuse** : is where you **set the color and intensity of the material**
  - **Specular** : is where you set **the intensity and sharpness of specular highlights** on the material surface

I. Adding materials

- To add a material to an object:
  - Select the object you want to work with,
  - Go to the Materials panel in the Properties window
  - Click the "New" button
- You will see the Material Properties buttons open up
- Materials are reusable.



I. Adding materials

List of **all materials linked to object**

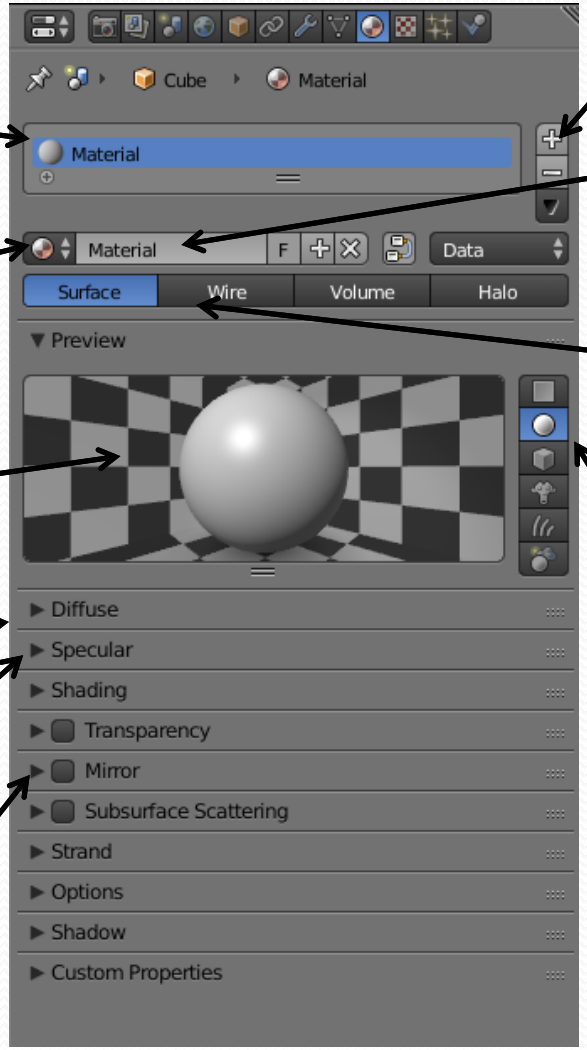
Browse **list of all materials** in file

A preview of the current material mapped on a sample

A color, which is seen when a surface reflects light

gives a **surface highlights** or a **shiny** appearance

the color used to fake **mirror reflections**



Add a new material or duplicate the one currently selected

Change the **material name** here

How to display the material:
Surface: Normal mode
Wire: Render as a wireframe
Volume: useful for smoke simulations
Halo: Gives a glow to a vertex

Different ways to display the sample

I. Adding materials

- **Shaders** calculate rendering effects of the scene as seen throw the camera based on lighting source existing in the scene.
- **Diffuse color**, the general color of a material when light shines on it (The way in which light is reflected By the material).

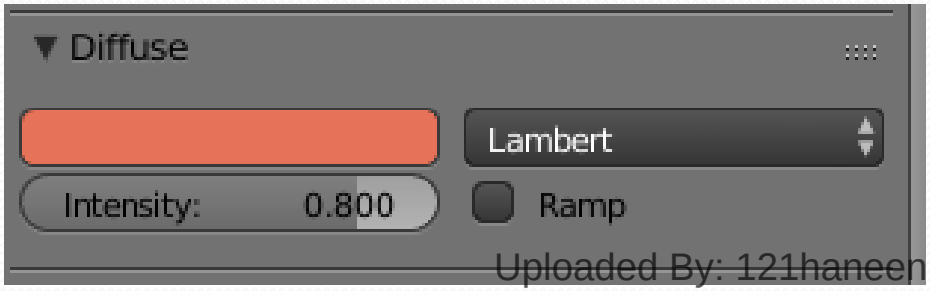
Display a smooth fall off from light to dark illumination from the point of illumination to the point of shadow.

- **Intensity** brightness of diffused color.

Several Shaders: Lambert, Oren-Nayar, Minaert, ect.

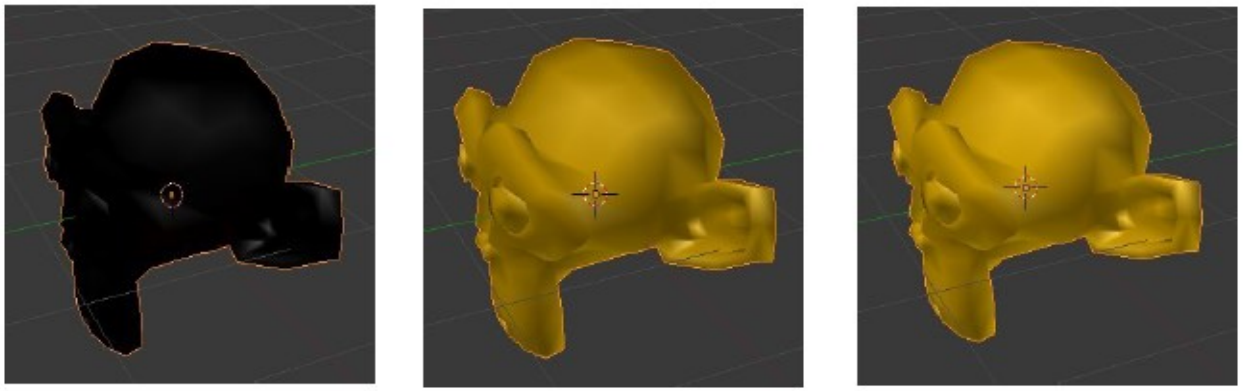
Lambert is the default shader for blender, toon , etc.

- **Ramp** Allows you to set a **range of colors** for the *Material*, and define how the range will vary over a surface.

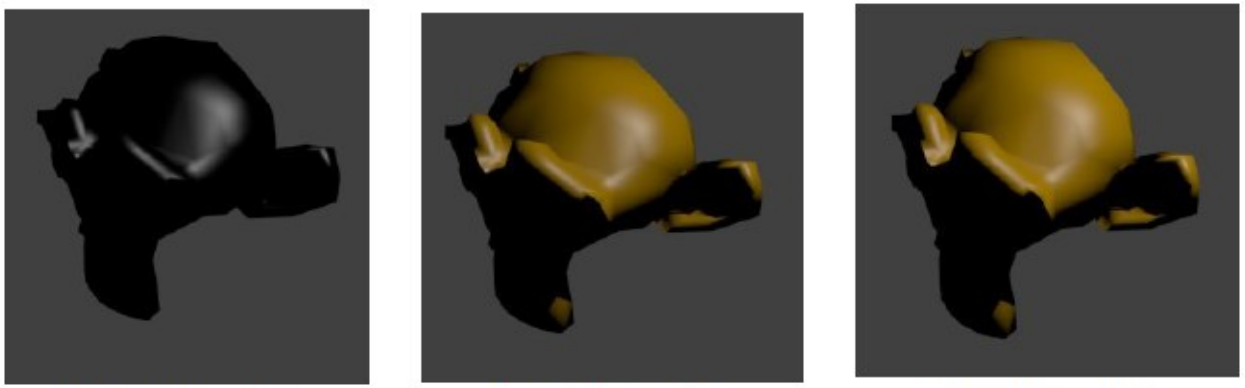


Solution

3D Viewport :



Rendered images:



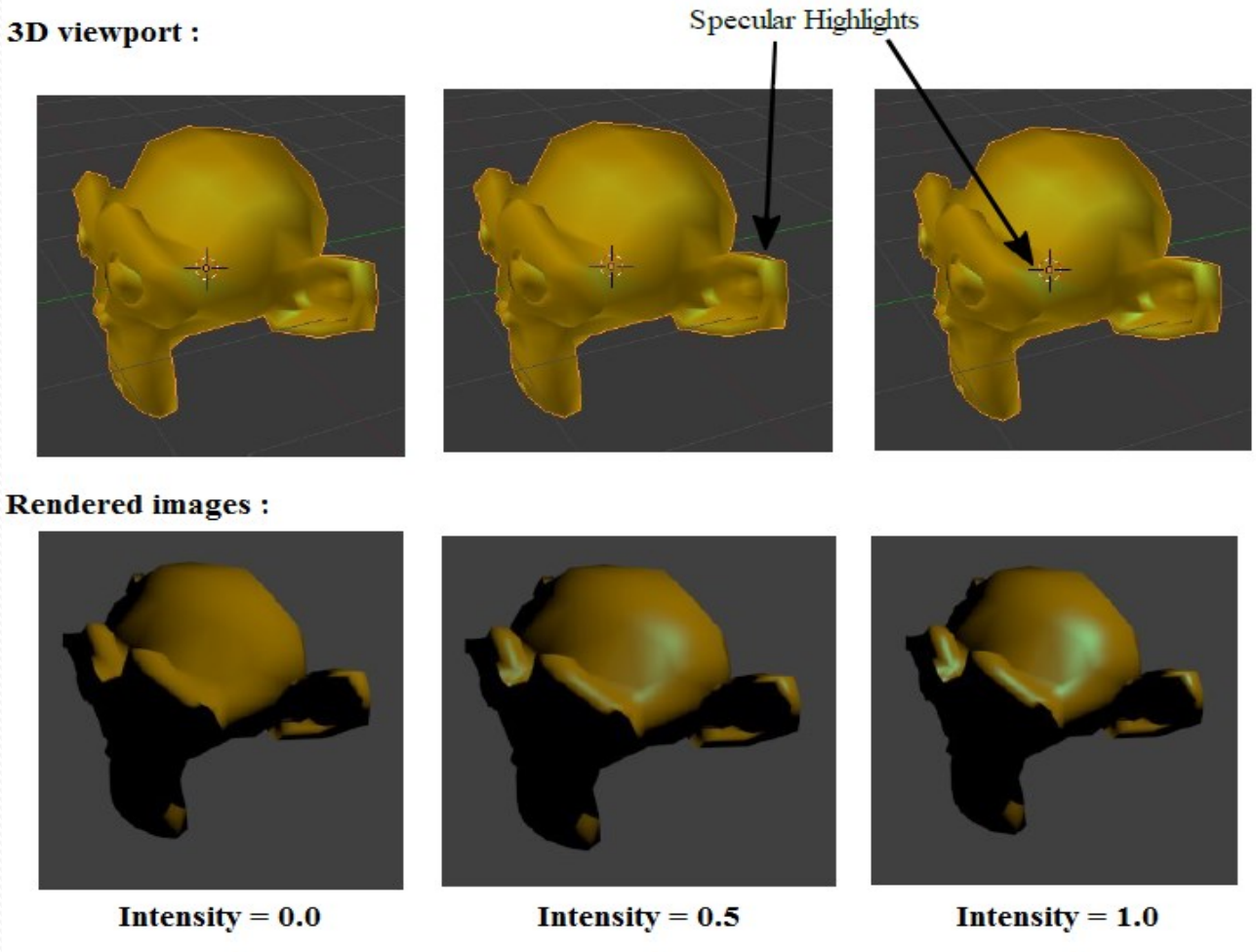
Intensity = 0.0 **Intensity = 0.5** **Intensity = 1.0**

I. Adding materials - Shaders

- **Specular**, Light reflections that can be observed at the surface of objects subjected to bright lighting
- Gives a surface highlights or a **shiny appearance**, reflection of light sources, depending on the **position of the camera and the lighting source**.
- More evident in the rendered image
- CookTorr is the default Blender shader.

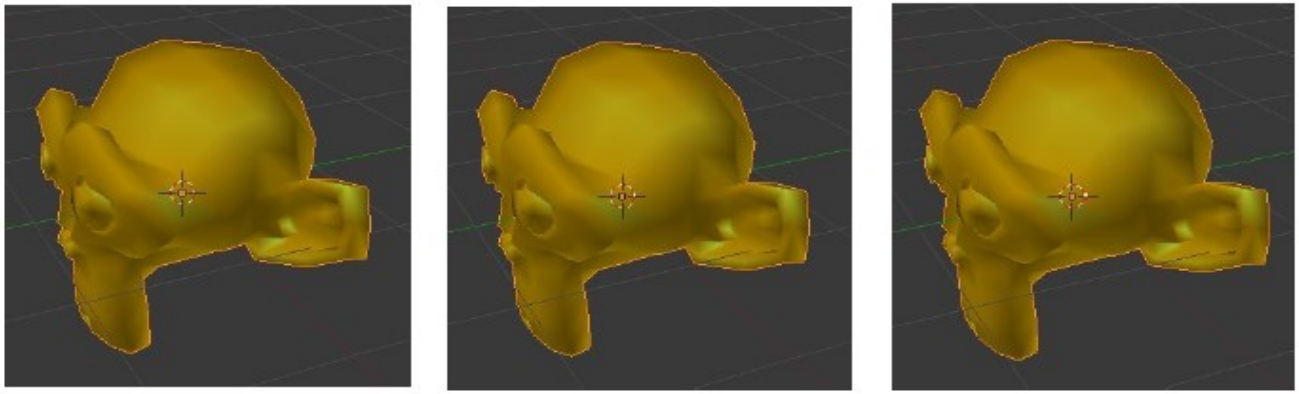
Hardness spreads the specular color across the surface of the object (known as "soft light") or focuses it (known as "hard light").

Solution

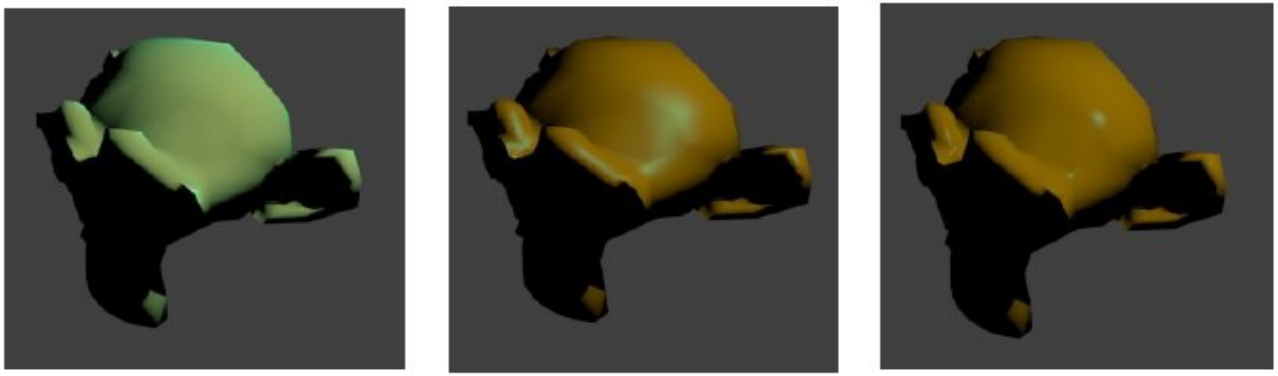


Solution

3D viewport :



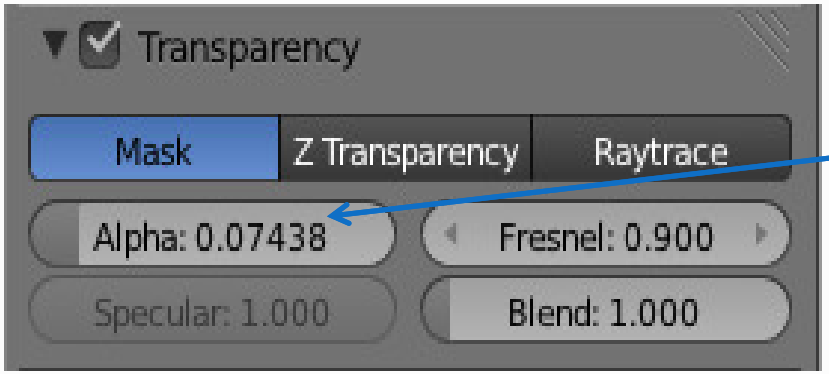
Rendered images :



Hardeness = 1 **Hardeness = 50** **Hardeness = 115**

I. Adding materials

- **Transparency**, make an object transparent.
- Increase The **realism** of a scene
- Transparency is controlled using an "alpha"



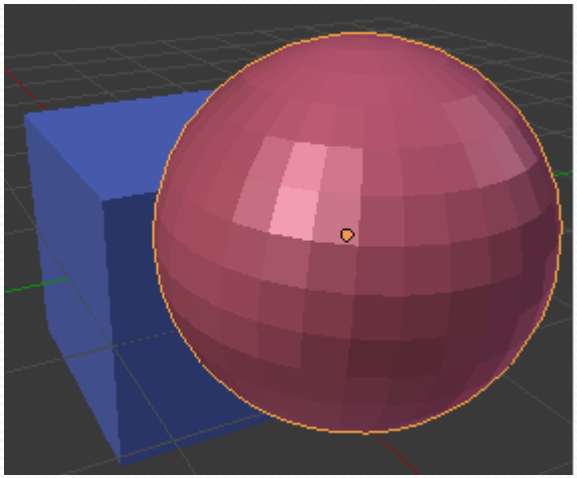
Transparency Panel.

A value close to 0.00 indicates an almost invisible object and A value equal to 1.00 a totally opaque object

Solution

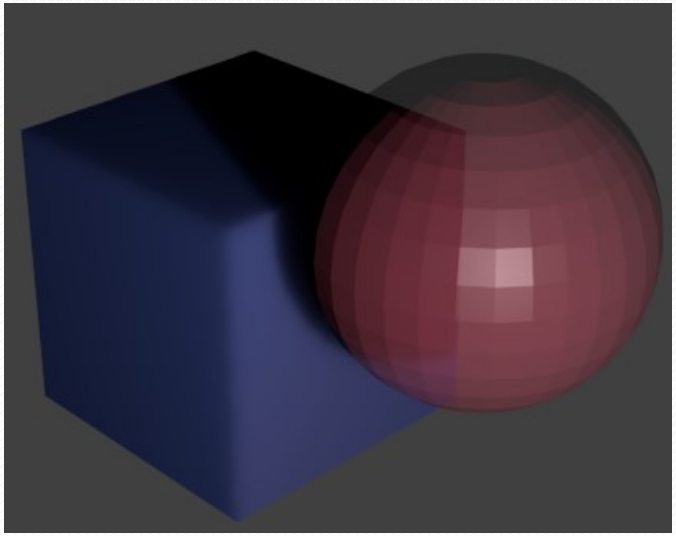
Z-Transparency inform rendering engine which of the object faces are in front of other faces based on the position of the camera.
Quick, light weight.
Problem: doesn't make light refraction.

3D view



Transparency panel: Alpha = 0.4 (for the cube)

Rendered image

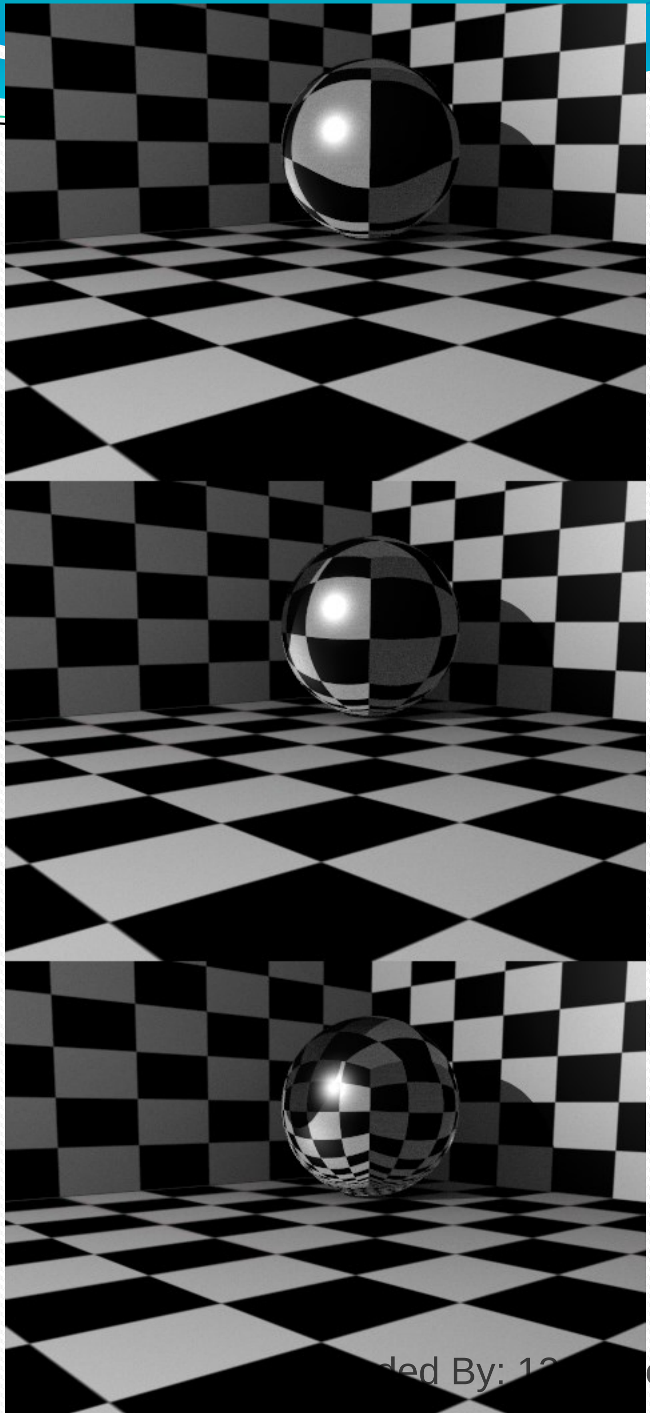


The easiest way to make something **transparent** in Blender is to use the **Z-Transparency feature** and controlling the **Alpha setting**..

Solution

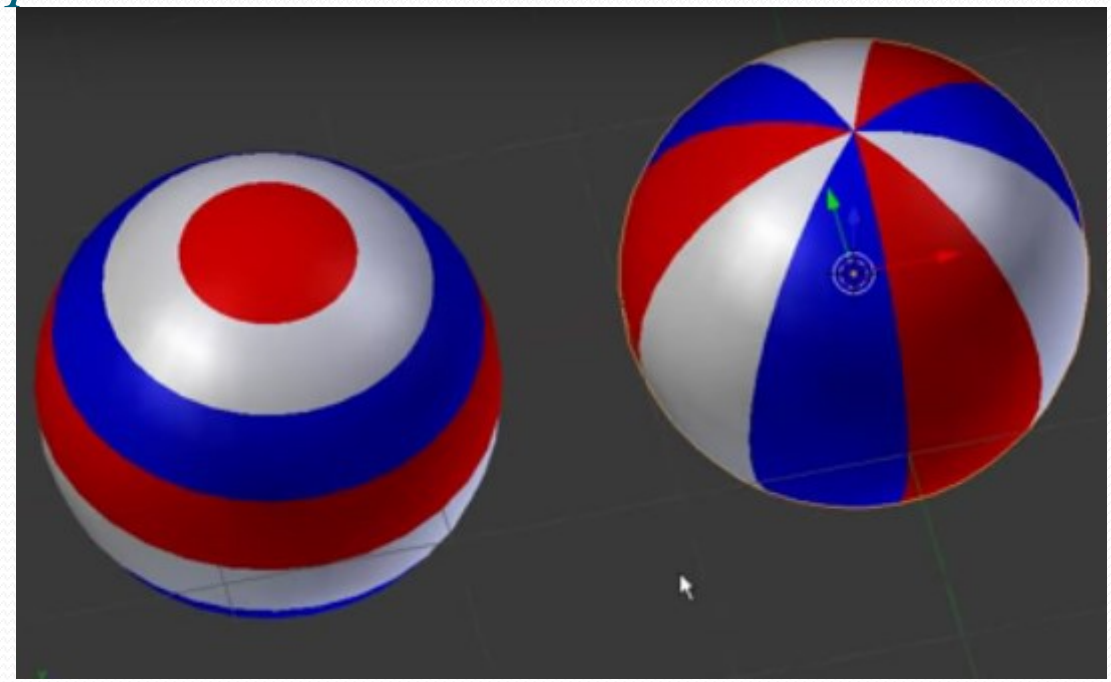
Raytraced: Uses ray tracing to calculate **refractions**. Ray tracing allows for complex **refractions**, falloff, and blurring, and is used for simulating the refraction of light rays through a transparent material, like a lens.

Options examples:
IOR
Depth
Filter
Gloss



I. Adding materials

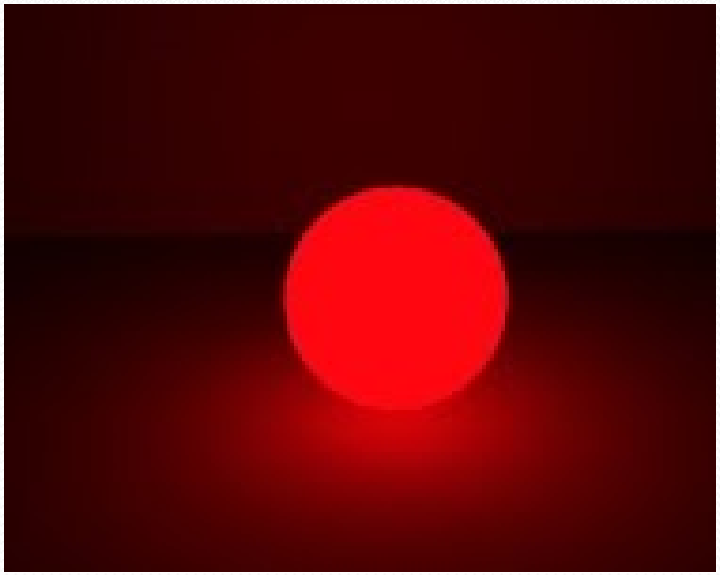
Multiple materials

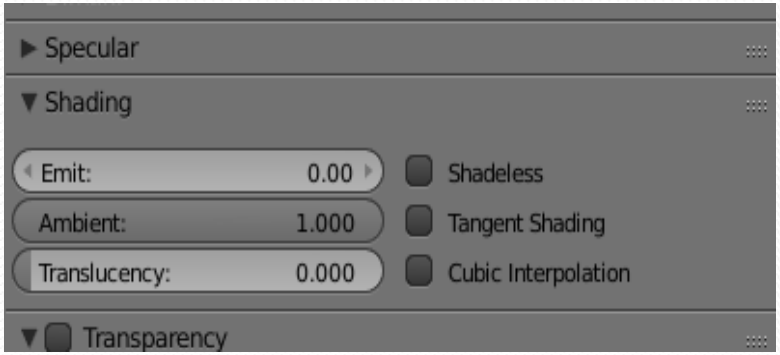


Select the surfaces in edit mode then select the material you want to apply, then click assign button.
When clicking on select will show the area influenced by current material.
https://www.youtube.com/watch?v=IrMhbuC8aMo

I. Adding materials

- Shadless: remove all shaders effects
- Emit: object emits light



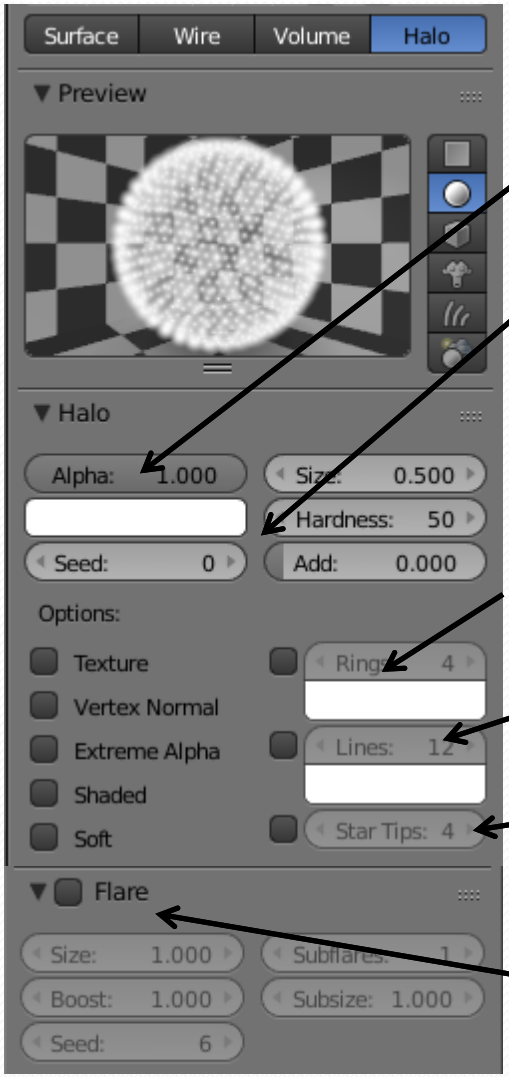


I. Adding materials

Halo settings

- Materials applied to vertices
- only the vertices of a mesh object will be visible when rendered
- Materials used to make the vertices visible when rendered
- 

Examples of halos



Halo Transparency

Halo Color and Hardness

Check to add rings, count and color

Check to add lines, count and color

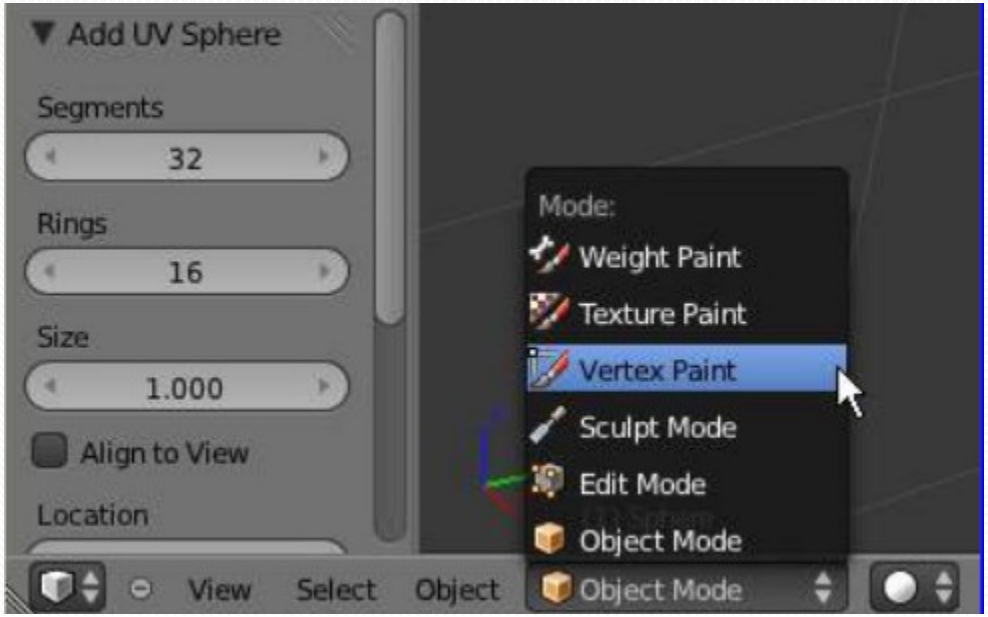
Check to add stars and tips

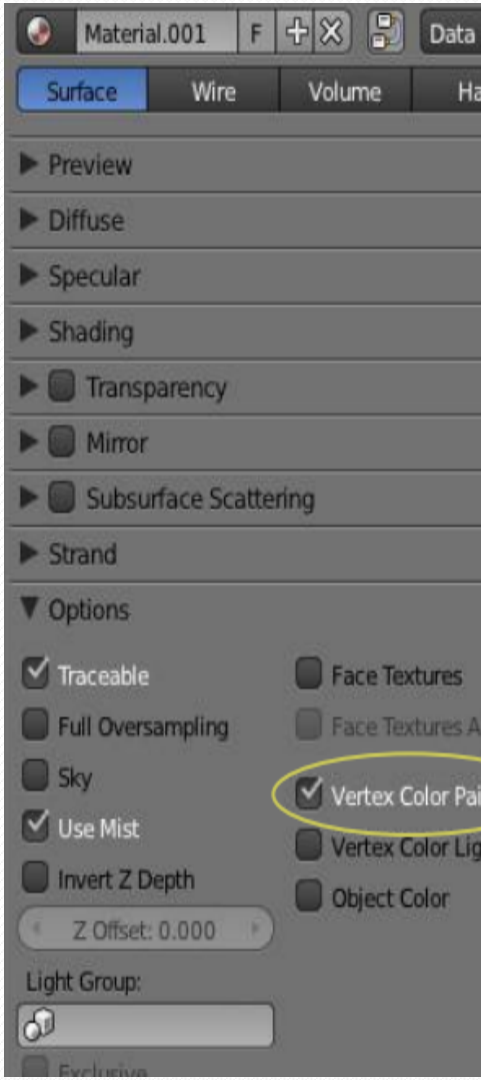
Flare adds additional rings and effects

I. Adding materials

Vertex Paint

- To **manually paint a material** onto the surface of an object.
- Object must have a material
- The vertex paint color can only be seen in vertex paint mode or in a rendered image

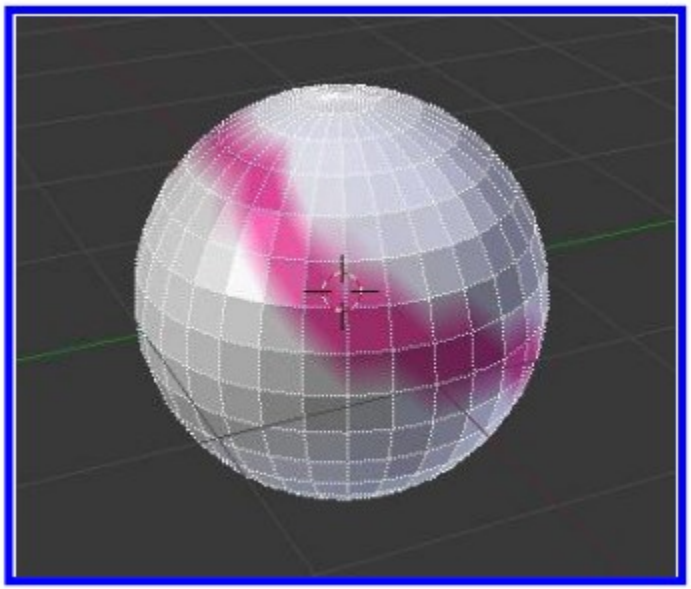




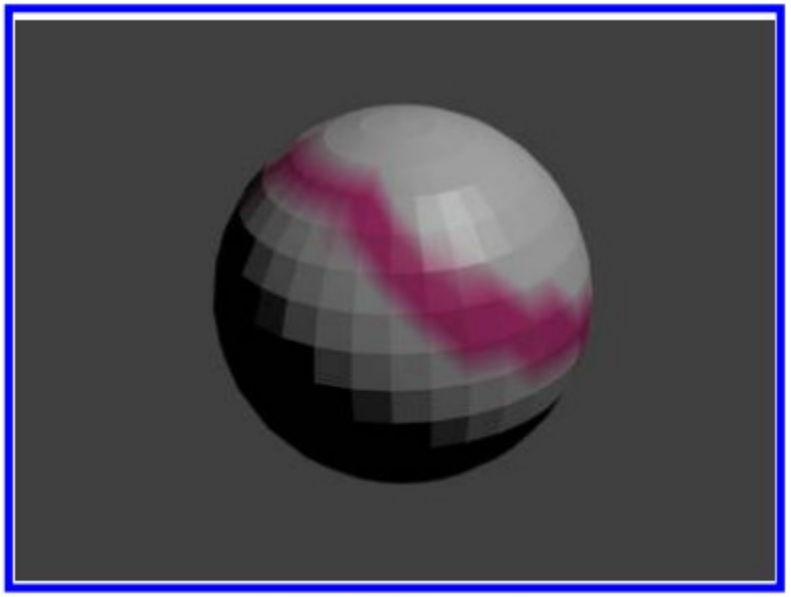
I. Adding materials

Vertex Paint

- The vertex paint color can only be seen in vertex paint mode or in a rendered image



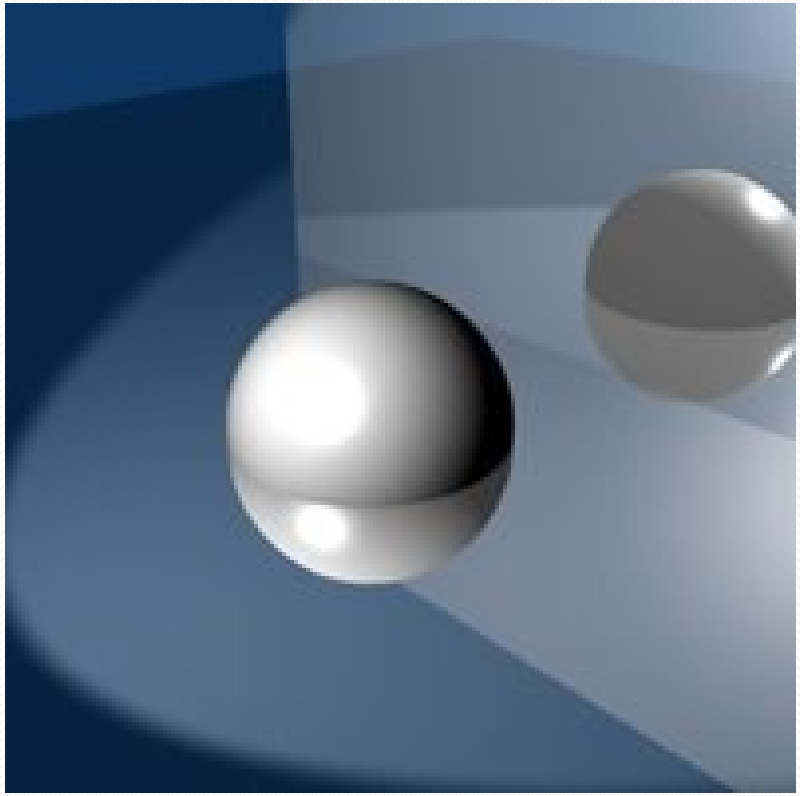
Vertex paint mode



Rendered image

I. Adding materials

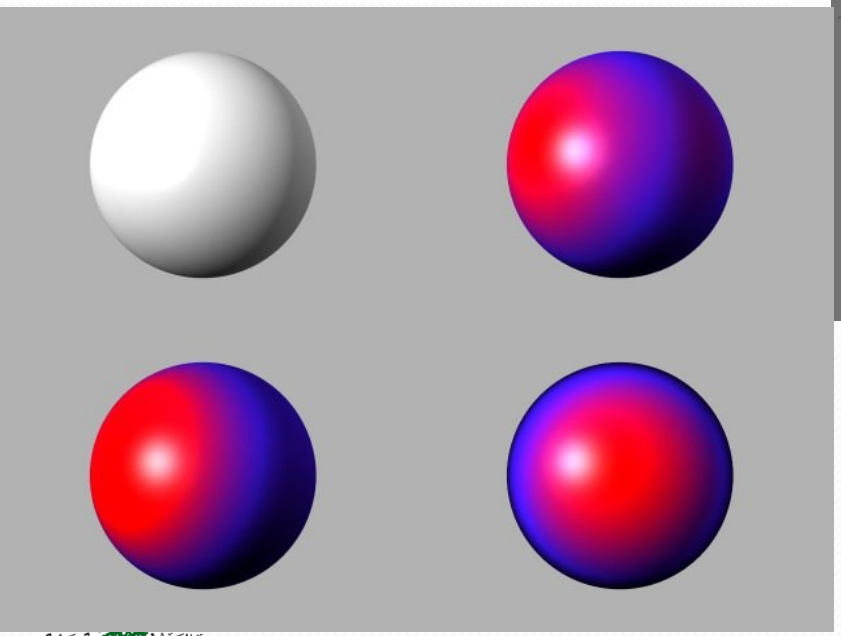
- **Mirror**: amount of reflection.
- see the Material Properties buttons open up

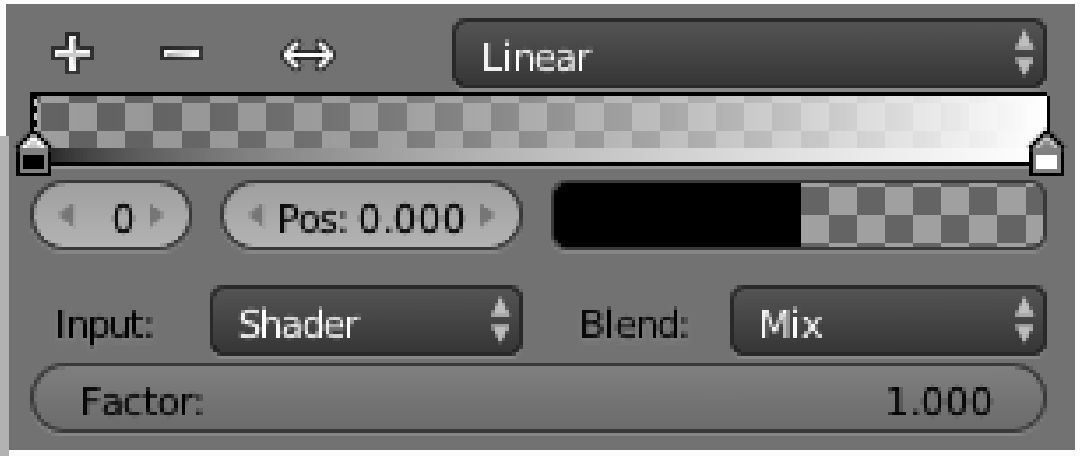


Insert two objects, a cube and a plane.
Change mirror to plane, increase reflectivity slider.
Change reflectivity color.
Fresnel: keep part of original color on the abject and mix it with reflection color.

I. Adding materials

- **Ramp** Allows you to **set a range of colors for the Material**, and define how the **range will vary over a surface**.
- On diffuse: specify color band joining different colors that will be diffused on an object
- On specular also.





Check ramp: **replace the diffuse color**.
Set left **marker** and specify color. Set right marker and set a color.
Alpha contols transparency of the color.
See toon shader.

Activity

- **Activity 3.1:** Experiment material effects (30 min)
  - Using primitive meshes, test the following materials effects:
    - Intensity Effect for Diffuse Color
    - Specular effects
    - Hardness variation
    - Transparency effect
  - Give screenshots for each effect

Activity

Activity 3.2	**Title:** Use multiple materials in one mesh
Type:	Individual activity – Lab Exercise
Goal:	Demonstrate to student how to apply multiple materials in one mesh in Blender ILO P1
Outline:	Apply multiple materials in one primitive mesh. The mesh must be divided into separate islands of material slots, each of which can then be assigned its own separate material. Once these material slots are so assigned, then it is possible to assign them to separate faces.
Timeline	One class session
Assessment	Assess the student's work

Activity

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Thank you for your attention!