

10.2.1.4.3 Render - Blender Render Engine - Materials - Material Properties - Diffuse Shaders

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Diffuse Shaders

Reference

Mode: All Modes
Panel: Shading/Material Context -> Diffuse

A diffuse shader determines, simply speaking, the general color of a material when light shines on it. Most shaders that are designed to mimic reality give a smooth falloff from bright to dark from the point of the strongest illumination to the shadowed areas, but Blender also has other shaders for various special effects.

Common Options

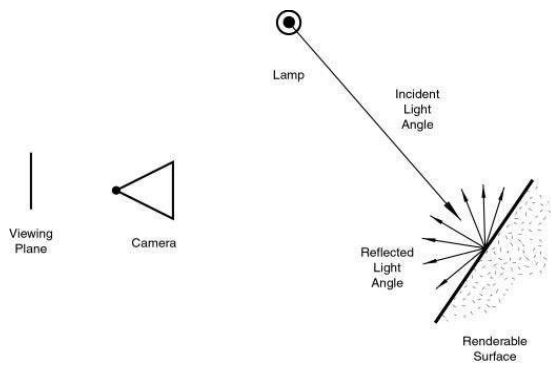
All diffuse shaders have the following options:

- Color**
Select the base *diffuse color* of the material.
- Intensity**
The shader’s brightness, or more accurately, the amount of incident light energy that is actually diffusely reflected towards the camera.
- Ramp**
Allows you to set a range of colors for the *Material*, and define how the range will vary over a surface. See *Color Ramps* for details.

Technical Details

Light striking a surface and then re-irradiated via a Diffusion phenomenon will be scattered, i.e., re-irradiated in all directions isotropically. This means that the camera will see the same amount of light from that surface point no matter what the *incident viewing angle* is. It is this quality that makes diffuse light *viewpoint independent*. Of course, the amount of light that strikes the surface depends on the incident light angle. If most of the light

striking a surface is reflected diffusely, the surface will have a matte appearance (*Light re-irradiated in the diffusion phenomenon.*).



Light re-irradiated in the diffusion phenomenon.

Tip

Shader Names

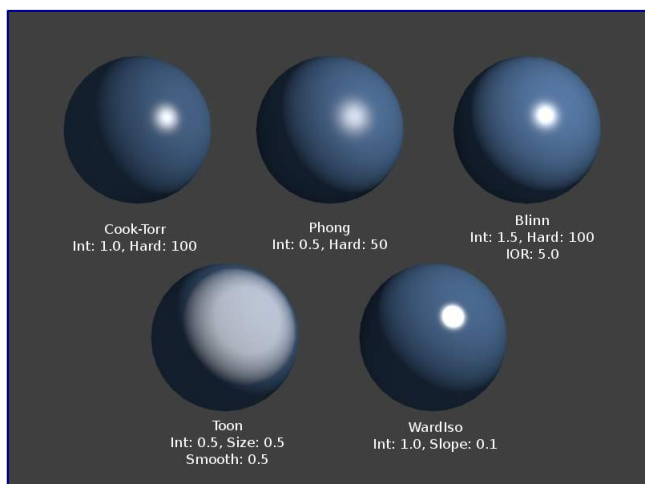
Some shaders' names may sound odd - they are traditionally named after the people who first introduced the models on which they are based.

Lambert

Reference

Mode: All Modes

Panel: Shading/Material Context → Shaders



Lambert Shader

This is Blender's default diffuse shader, and is a good general all-around workhorse for materials showing low levels of specular reflection.

Johann Heinrich Lambert (1728-1777)

was a Swiss mathematician, physicist and astronomer who published works on the reflection of light, most notably the Beer-Lambert Law which formulates the law of light absorption.

This shader has only the default option, determining how much of available light is reflected. Default is 0.8, to allow other objects to be brighter.



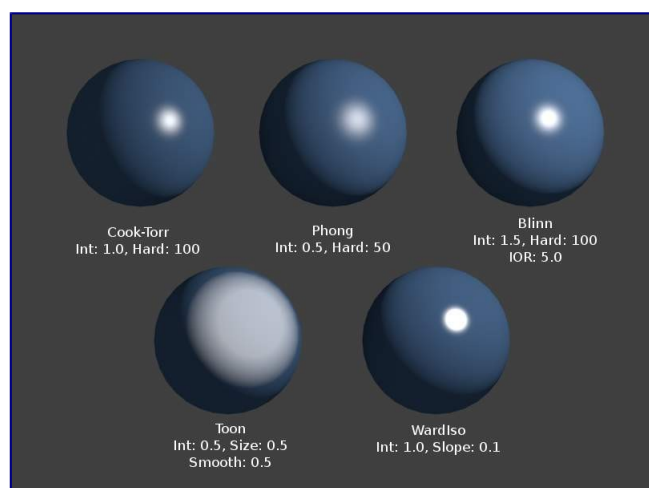
The Lambert diffuse shader settings.

Oren-Nayar

Reference

Mode: All Modes

Panel: Shading/Material Context → Shaders



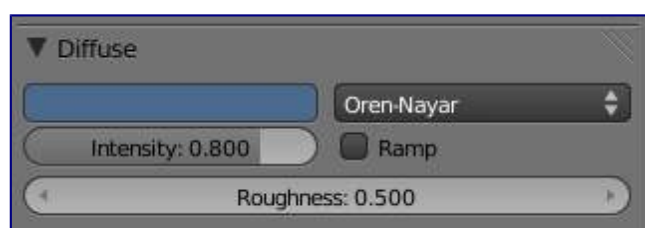
Oren-Nayar Shader

Oren-Nayar takes a somewhat more ‘physical’ approach to the diffusion phenomena as it takes into account the amount of microscopic roughness of the surface. Michael Oren and Shree K. Nayar Their reflectance model, developed in the early 1990s, is a generalization of Lambert’s law now widely used in computer graphics.

Options

Roughness

The roughness of the surface, and hence, the amount of diffuse scattering.



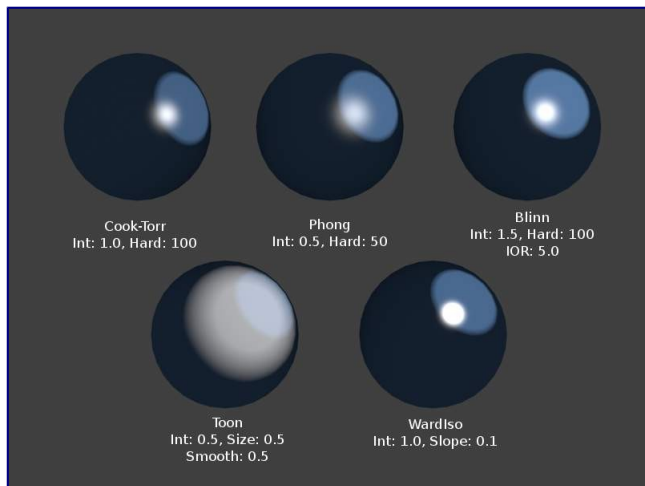
The Oren-Nayar diffuse shader settings.

Toon

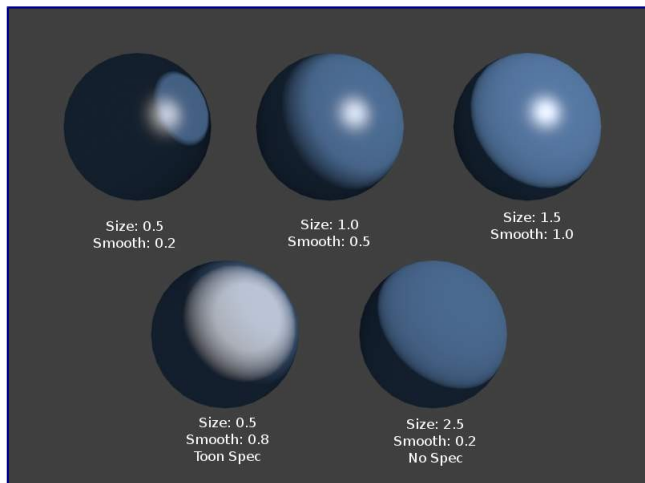
Reference

Mode: All Modes

Panel: Shading/Material Context -> Shaders



Toon Shader, Different Spec



Toon Shader Variations

The Toon shader is a very ‘un-physical’ shader in that it is not meant to fake reality but to produce cartoon cel styled rendering, with clear boundaries between light and shadow and uniformly lit/shadowed regions.

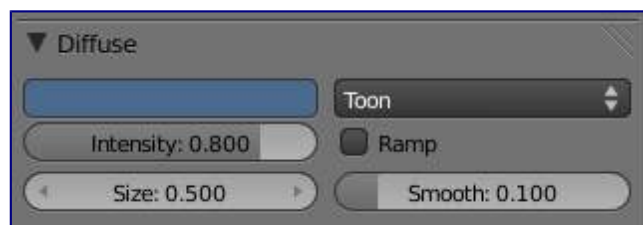
Options

Size

The size of the lit area

Smooth

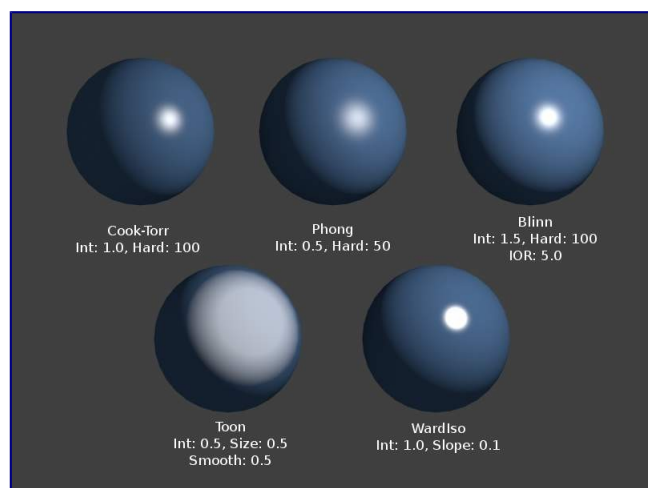
The softness of the boundary between lit and shadowed areas



The Toon diffuse shader settings.

Minnaert

Reference
Mode: All Modes
Panel: Shading/Material Context → Shaders



Minnaert Shader

Minnaert works by darkening parts of the standard Lambertian shader, so if *Dark* is 1 you get exactly the Lambertian result. Higher darkness values will darken the center of an object (where it points towards the viewer). Lower darkness values will lighten the edges of the object, making it look somewhat velvet. Marcel Minnaert (1893-1970) was a Belgian astronomer interested in the effects of the atmosphere on light and images who in 1954 published a book entitled *The Nature of Light and Color in the Open Air*.

Options

Dark

The darkness of the ‘lit’ areas (higher) or the darkness of the edges pointing away from the light source (lower).



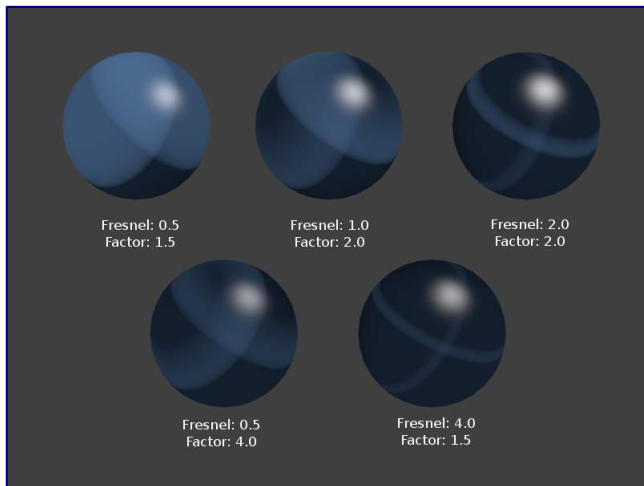
The Minnaert diffuse shader settings.

Fresnel

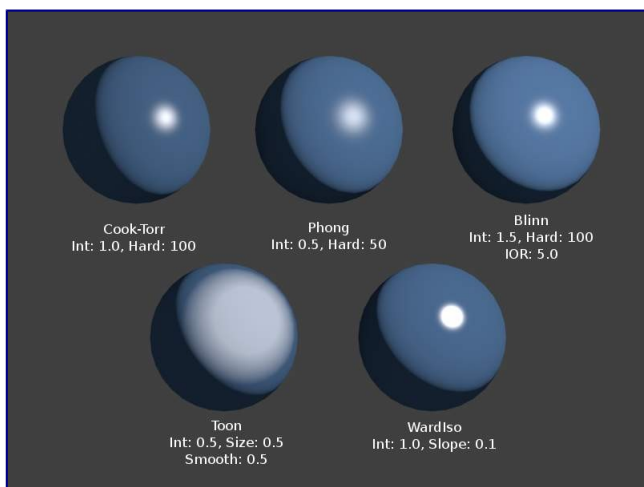
Reference

Mode: All Modes

Panel: Shading/Material Context → Shaders



Various settings for the Fresnel shader, Cook-Torr Specular shader kept at Intensity 0.5, Hardness: 50



Fresnel Shader, Different Spec

With a Fresnel shader the amount of diffuse reflected light depends on the incidence angle, i. e. from the direction of the light source. Areas pointing directly towards the light source appear darker; areas perpendicular to the incoming light become brighter. Augustin-Jean Fresnel (1788-1827) was a French physicist who contributed significantly to the establishment of the theory of wave optics.

Options

Fresnel

Power of the Fresnel effect, 5.0 is max.

Factor

Blending factor of the Fresnel factor to blend in, 5.0 is max.



The Fresnel diffuse shader settings.