Specular to TA Light

An object is lit by light and this light is called Diffuse or HDRI Effect for IBL. The object must be set to accept Diffuse. Specular is used for the glossy effect. There are means to make Specular create Diffuse.

Introduction

The idea was brought forward by David Brinnen who sent me an example file in October 2015. It took me over half a year until I got the time to look closer at the idea and experiment with different setups and parameters.

The objects to be lit are set to receive *Diffuse*. The light sources do not emit *Diffuse*, only *Specular*. The scene is rendered *Premium* with *True Ambience* and *Boost Light* enabled. TA is a global illumination (GI) implementation and does not render gloss very well, if at all. However, specular can act as diffuse light.

You would use this method for lighting a still life rather than a landscape, though it can also be done. Above at left a conventional render and at right using IBL and sun specular, and a radial as PHT specular object around the scene.

Concept

The concept is quite simple. The materials on the objects are conventional. One or more lights emitting specular only is needed and any object with PHT (Phased Hyper Texture) boosted specular. This document https://horo.ch/docs/mine/pdf/PhasedHT.pdf explains how a PHT can be made in the DTE in a minute.

Specular Light Sources

At least one specular light source is needed; there can also be more than one. The size of the specular light source matters. It gives the direction from where the light shines and the colour. Specular is the only output, shadow casting can be disabled but it is ignored for specular anyway. Falloff has an effect how much specular reaches the object. Types of specular lights:

a) Any conventional light (radial, spot, parallel).
b) A radial with the size up to 102,400 BU that surrounds the scene completely.
c) A small radial inside an object that has holes where the specular can shine out.
d) Several coloured radials.
e) Sun (specular only).
f) HDRI (specular only), *True ambience optimization* disabled.

g) HDRI from Inside (specular only), *True ambience optimization* disabled.

h) An object with PHT boosted *Specularity* (2D-Disk, 2D-Face, whatever).

The specular lights illuminate the objects. If the specular light surrounds the scene (like b above or an HDRI), additional specular lights shine from their mirrored position. This is also true for the sun or any prominent light in the HDRI. If the sun is set to shine from the left, the light actually comes from the right.

A prominent light source in the HDRI from *Inside* shines from the correct side because it usually shines from the opposite side. If an HDRI is used as specular light source, a specular map suffices (also Quality 16) because the colours get averaged into one single colour.

PHT Specular Object

The PHT specular object can be a light or an object. The light has the advantage that it is invisible in the render, a 2D-Disk, for instance, is either visible or must be moved outside of the image frame.

a) Radial or any other light; no *Diffuse*, no *Specular* (both at 0), *True Ambience Optimization* enabled, *Use Gel*, *Procedural*. *Cast Shadows* and *Falloff* can be ignored. The procedural gel is the same as for an object.

b) Any object, 2D-Disk or 2D-Face. Material default grey, *Specular* any colour and *Specular Halo* fully white, *Specularity* driven by a PHT and the level set as appropriate.

The *Specularity* level controls the overall brightness; increment or decrement to adjust the brightness in the scene. If the objects in the scene should get different light intensities, adjust *Diffusion* for the objects.

Specular does not pass the ground plane from below, even if it is set to not cast shadows. Use a bit of *Transparency*, 25% for example, to get some light from below.

Turn it around

The roles of the Specular Lights and PHT Specular Object can be swapped. Make the specular lights PHT specular objects and the PHP specular objects specular lights. This gives different results. An HDRI, however, cannot take the role of a PHT specular object; it is always a specular light; the same is true for the sun.

Just for the fun of it, specular can be set negative for the specular lights and the PHT specular object must use a negative PHT. This is easily done in the DTE by setting the noise of the PHT from 1D to 2D.

Render Settings

Render *Premium* with *True Ambience* and *Boost Light*. Boost light enhances light and colour saturation; unfortunately also makes the image look noisy. Set *Rays per pixel* high for the final render. *Maximum Ray Depth* can be reduced from the default 6 to 4 to make the render a bit faster.

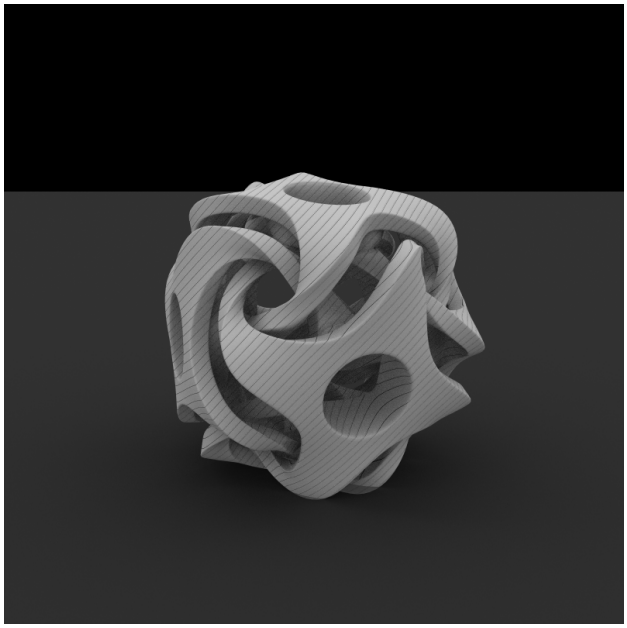
Observations and Experiments

The object used is from the *Fifty Funky Shapes* and *Fifty Funky Metals* (row 5, column 1 in the Objects Library,) and has just fully white diffuse; there is a bit of bump to create the lines. The ground plane is a fourth as bright and is 25% transparent; no bump. All examples were rendered with 256 rays per pixel.

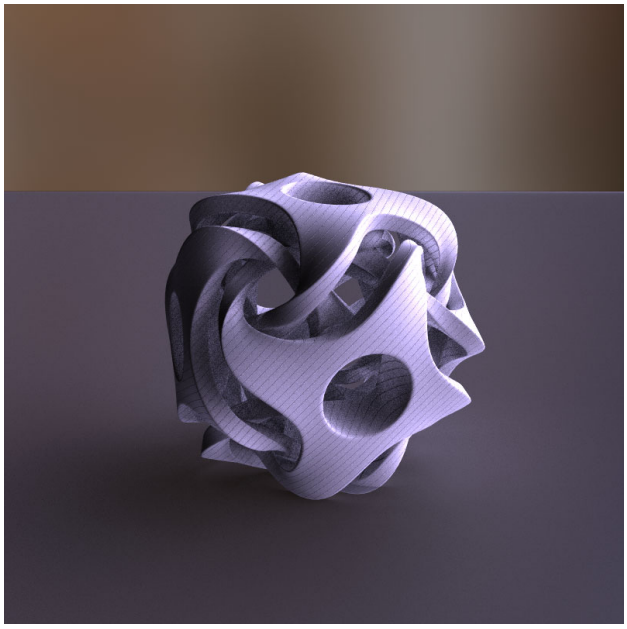
http://www.daz3d.com/bryce-7-1-pro-fifty-funky-shapes-and-fifty-funky-metals

The first series of experiments use a radial as PHT specular object that has the maximal size of 102,400 BU (Bryce Units), and different specular lights.

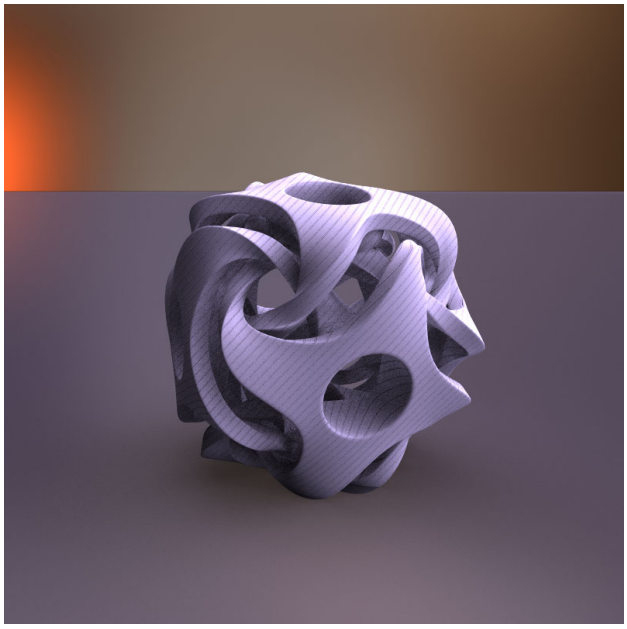
[01] Specular light: Sun with specular 100, set to 270°/5° and shines from 90°. Render time 12:32.



[02] Specular light: radial diameter 102,300 BU, Specular 2, no falloff. Render time 10:05.



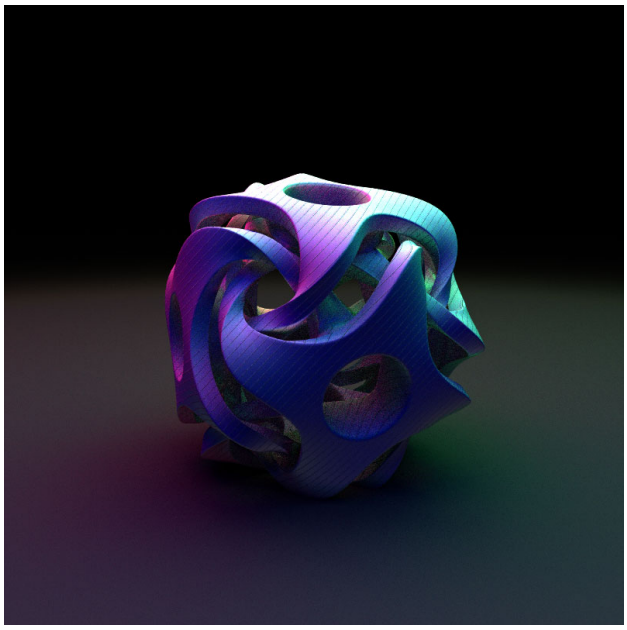
[04] Specular light: HDRI (Chapel) yaw at 240°, light shines from 60°. Render time 14:10.



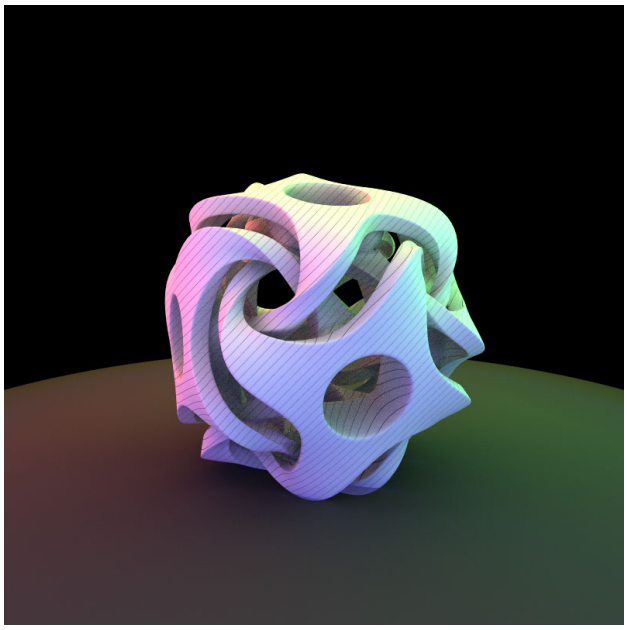
[05] Specular light: HDRI (Chapel) from inside, yaw 60°, light shines from 60°. Render time 14:12.

The following experiments do not have a radial as PHT specular object at full size surrounding the scene; neither is it always a radial. Also, the specular lights are sometimes small radials and sometimes 2D-Disks. Essentially, there is no difference in the result.

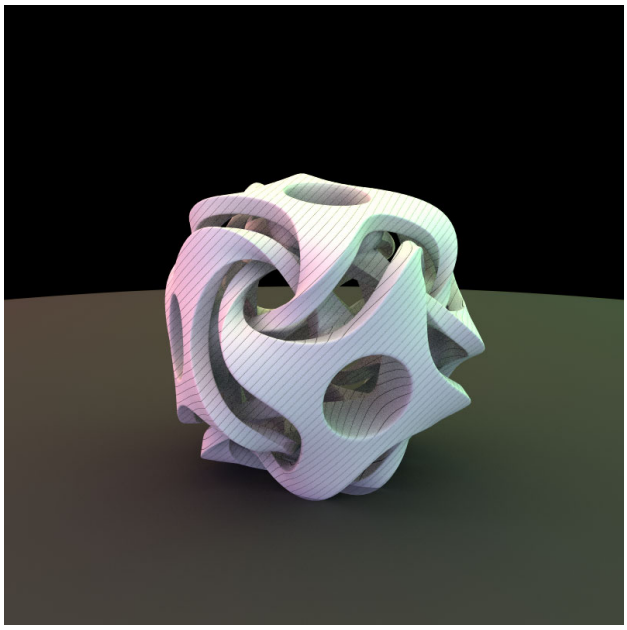
There are three radials as specular light sources: at left red, at right green and below the ground plane blue. The second, third and fourth examples have only the size of the surrounding PHT specular object (a radial) with a different diameter. The bigger the radial and thus its inner surface farther away from the objects, the more the three colours are mixed, resulting in a lower saturation, until the object is lit uniformly white.



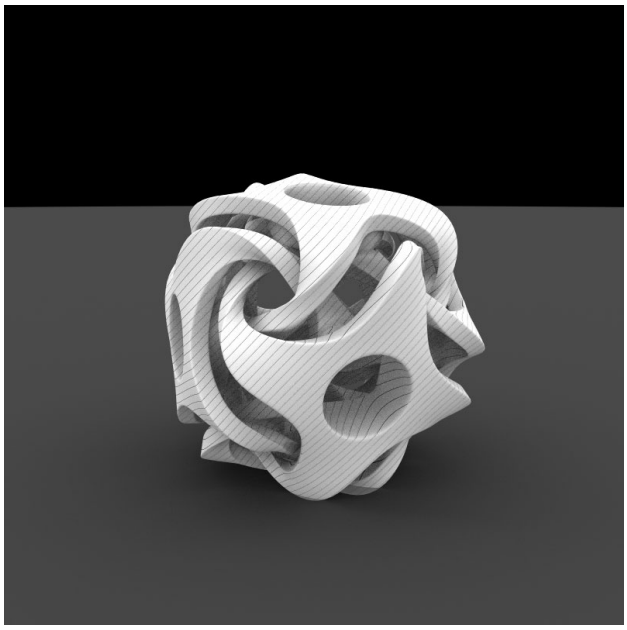
[11] 3 coloured radials as specular lights and a 2D-Disk as PHT specular object above the scene. Render time 09:03.



[12] 3 coloured radials as specular lights and a radial as PHT specular object with a diameter of 75 BU surrounding the scene. Render time 09:49.



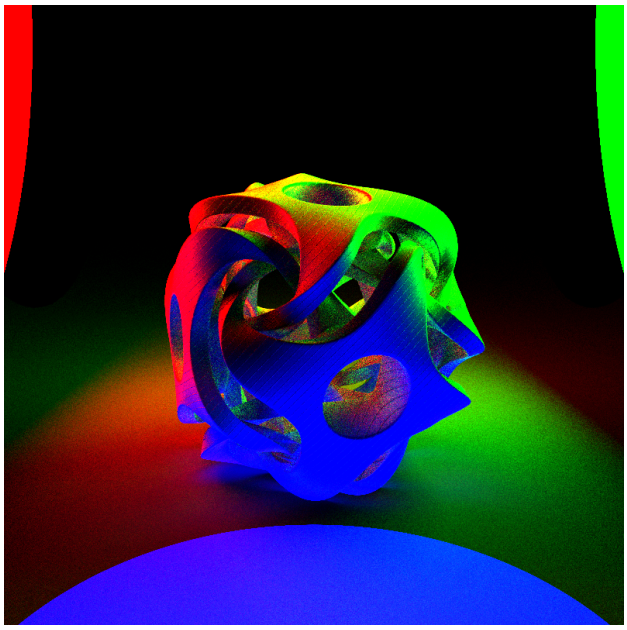
[13] 3 coloured radials as specular lights and a radial as PHT specular object with a diameter of 200 BU surrounding the scene. Render time 10:37.



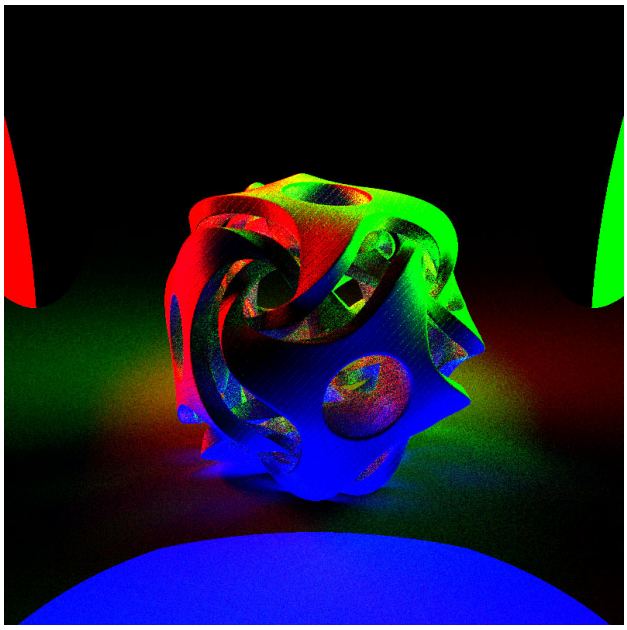
[14] 3 coloured radials as specular lights and a radial as PHT specular object with a diameter of 2000 BU surrounding the scene. Render time 10:32.

The next two examples use PHT boosted disks as specular light sources instead of radials. The 2D-Disks were left partly visible on purpose. They are four times the size as the radials were for the examples above.

The colours are fully saturated. The noise is very offending even at 256 rays per pixel.

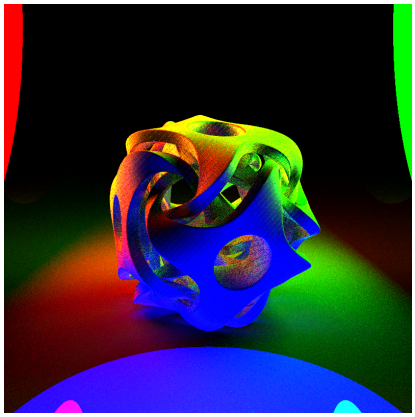


[15] Flattened radial as PHT specular object above the scene with specular 50 and no falloff. Render time 08:12.

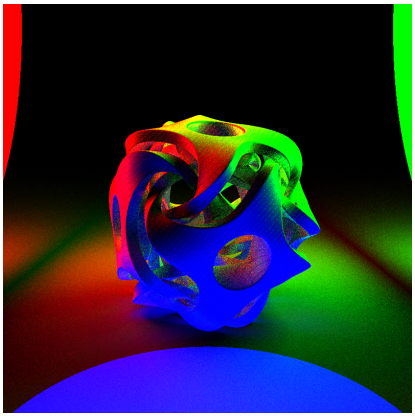


[16] Radial with a diameter of 2000 BU surrounding the scene as PHT specular object; specular 200. Render time 08:34.

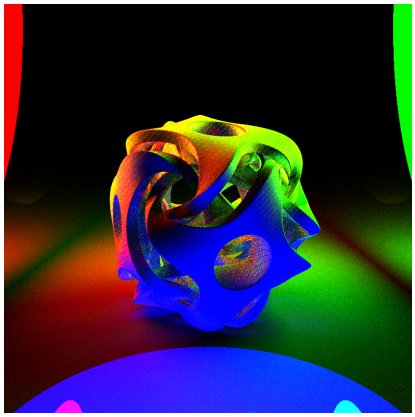
Since PHT boosted disks can be used as specular light sources (h), they also re-emit received light if set to reflecting. The examples below are based on the setup of the example [15] above at left. Note the mixed-in reflections from the red and green specular lights on the blue PHT specular light below the ground plane.



[17] PHT objects reflecting; render time 09:08.



[18] PHT objects transparent; render time 08:44.

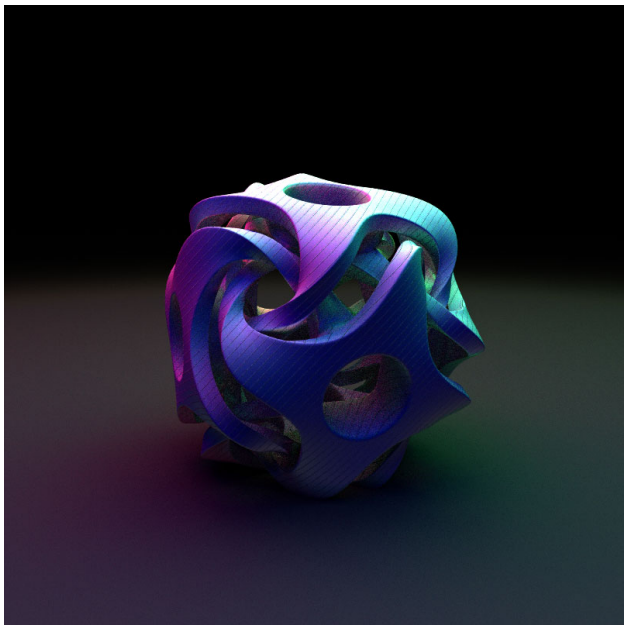


[19] PHT objects reflecting and transparent; render time 09:48.

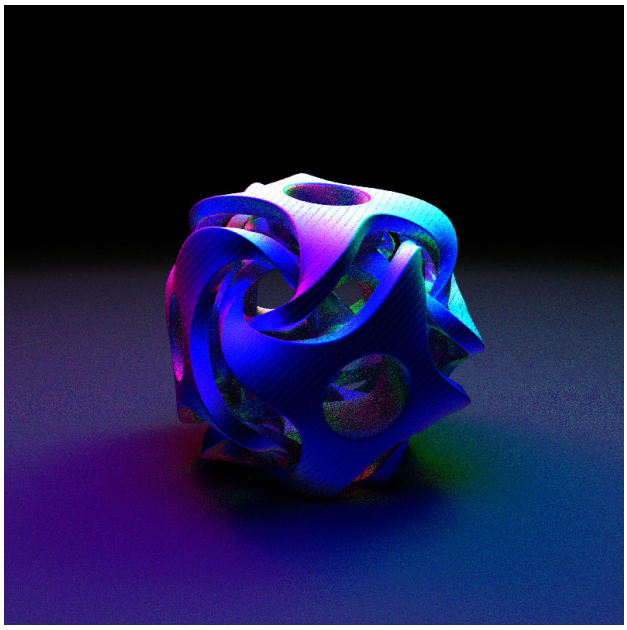
Specular Halo Colour

For the PHT specular object, it is important that *Specular Halo* colour is indeed fully white, i.e. R/G/B 255/255/255. The brightness can still be controlled if the Halo is a bit lower but the noise increases dramatically as is shown in the examples below.

The PHT boosting *Specularity* used for all examples is always a one-component PHT with *Phase* at 500.



[11] 3 coloured radials as specular lights and a 2D-Disk as PHT specular object above the scene; Specular Halo 255, Specularity 10.



[11a] 3 coloured radials as specular lights and a 2D-Disk as PHT specular object above the scene; Specular Halo 250, Specularity 100.

The Object as Specular Light Source

The object itself can also serve as specular light source. The examples below have the object as specular light source (*Specularity* 3) and surrounding it a radial as PHT specular object. The ground plane acts as a specular light source as well (*Specularity* 2), grey *Diffusion* 50% and *Transparency* 25%. In this configuration, there are no shadows.

[22] Ground plane Specular Halo 255. Render time 05:06.

[23] Ground plane Specular Halo 250. Render time 04:56.

The radial acting as PHT specular object cuts the ground plane. The border is sharp when *Specular Halo* is at 255 but creates a disk that fades into the distance when halo is reduced to 250.