

IBL from Inside and Obscure Lighting

IBL from Inside behaves differently when used with Obscure Lighting than if it is used for IB Lighting. Additionally, a Bryce mirror does not reflect the light intensity, except if used with Obscure Lighting.

Introduction

If a spherical panorama is mapped spherically on a sphere, it is done so on the outside. If the camera is set within such a sphere, the panorama is mirrored, i.e. left and right swapped. To make use of a panorama with the camera inside a sphere, the panorama has to be horizontally flipped first — or the X-Size made negative.



At left, the panorama mapped inside a sphere with the camera inside and rendered as a spherical panorama using the <http://www.daz3d.com/bryce-7-pro-spherical-mapper> and at right the outside of the same sphere. The room with the orange light gives the clue that the left image has the left and right sides swapped. The panorama is the tone-mapped HDRI Chapel: <http://www.daz3d.com/tourbillion-chapel-hdri-and-scene-files>.

HDRI Mapping

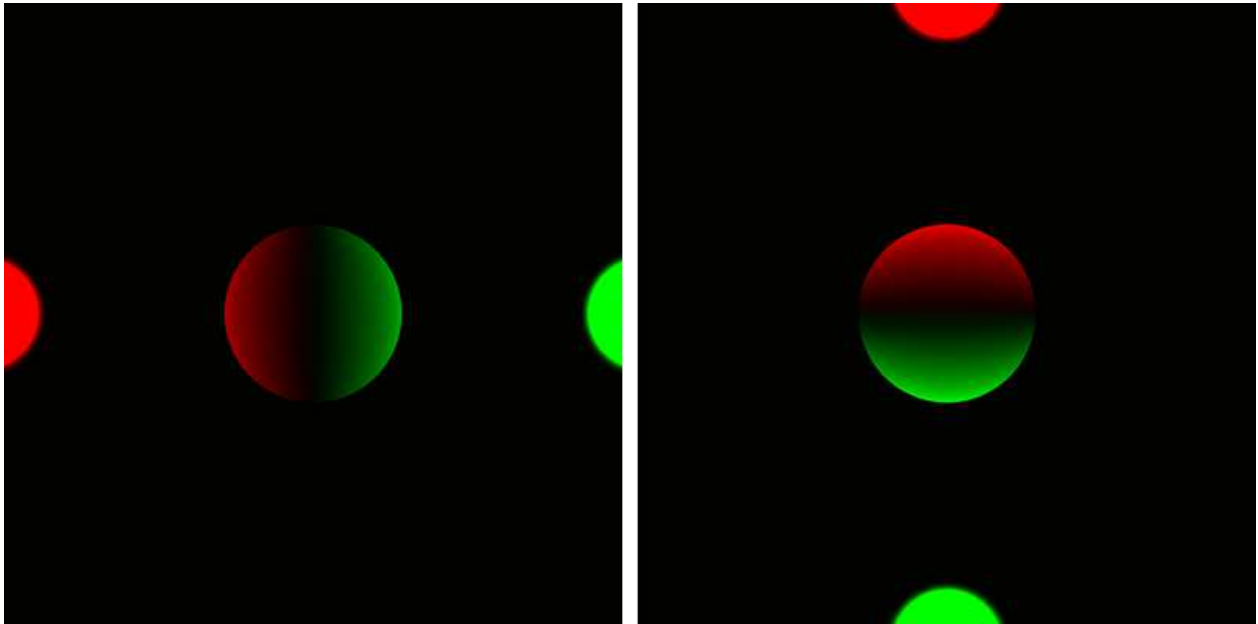
An HDRI is mapped on a virtual sphere with an infinite diameter. The camera is always inside this sphere. When Bryce loads the HDRI panorama, the image is flipped automatically and it appears correctly if rendered as backdrop; also the light comes from the correct direction.

To test this, two simple HDRIs were made. One has a red light at left (west) and a green one at right (east). The other one has the red light in the zenith (sky) and the green light at the nadir (ground). The rest was left nearly, but not completely, black. The dynamic range is 3,240:1.

A sphere with the default grey is lit by the HDRI, in front of the camera is the EWL (extreme wide-angle lens, a forthcoming product by David and myself) and the camera FOV set in such a way (110°) that the render covers 190° horizontal and vertical.

HDRI from outside (default)

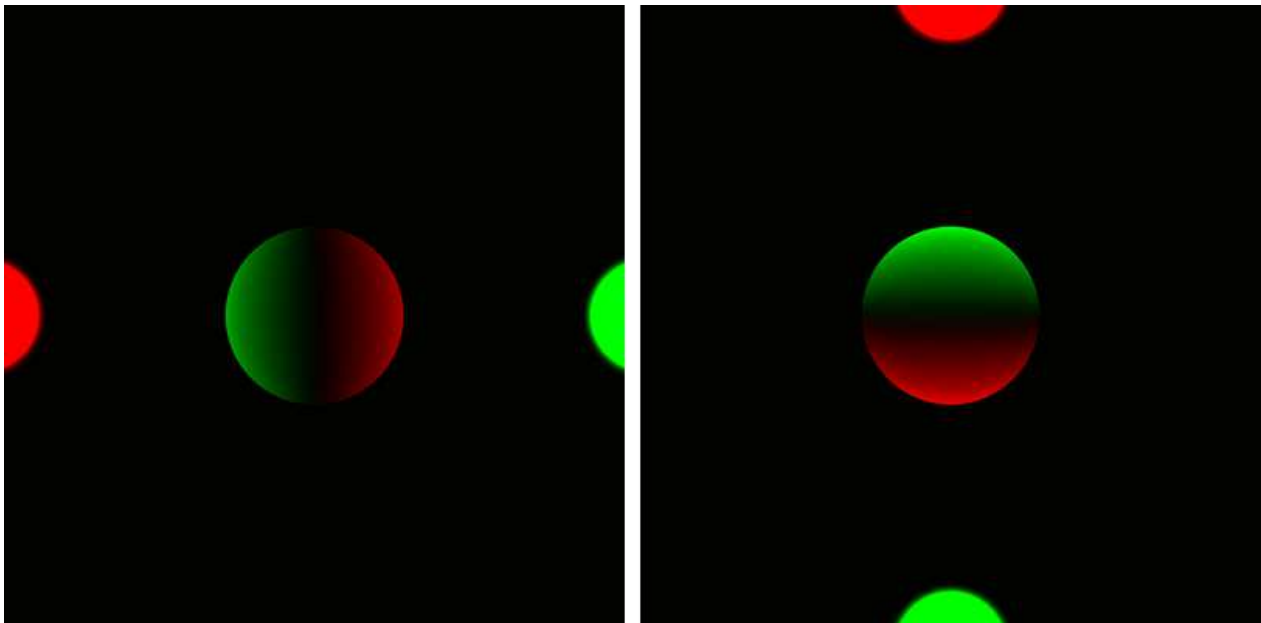
For this test, this simple scene was rendered in the normal IBL lighting mode with the HDRI as backdrop. The result is shown below. At the left and right edges (left image); and the upper and lower edges (right image), the HDRI backdrop shows part of the coloured lights which illuminate the sphere. The position of the light sources and the light received by the object is what we expect.



If the camera is moved inside the sphere, the left inner wall gets green, the lower inner wall red. Within the sphere the lights are swapped left and right, and top and bottom.

HDRI from inside

Repeating this test with HDRI from Inside enabled shows that left and right are swapped. Additionally, it is also upside down. The mirroring can be accounted for as the HDRI was flipped horizontally on loading because it is mapped on the inside of a sphere and this swapping is not corrected for when the HDRI is mapped onto the tiny sphere. What is rather surprising is that it is also turned upside down.



If the camera is moved inside the sphere, the left side of the inner wall of the sphere is indeed red, not green as on the outside, the same is true for the top and bottom.

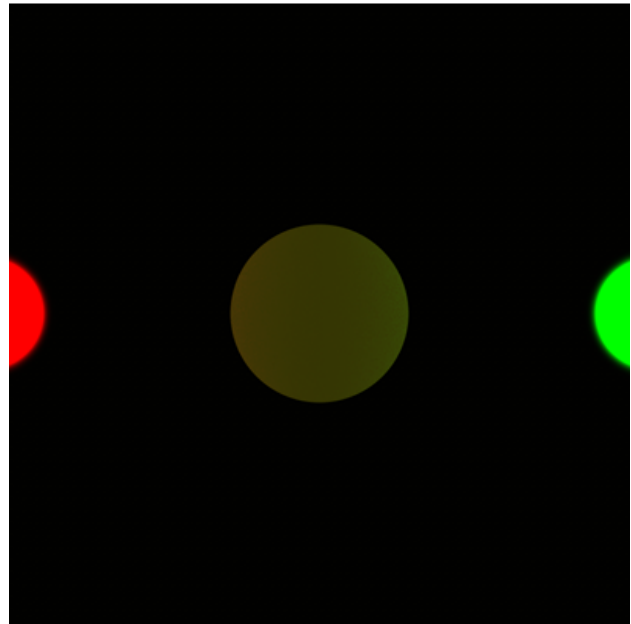
This behaviour is not understood. There should be no light inside the object, except when shadows for the object are disabled. This behaviour was tested in Octane and there is no light inside the object. So Bryce can behave a bit unexpected at times, though this is nothing to worry about. If the quirks are known, we can capitalise on them.

HDRI in TA Gel Mapping

Though we do not go into this option in detail, it is interesting to note how True Ambience handles the Gel on the radial(s). A TA optimised radial is a spherical object and the LDRI has to be mapped spherically on it as gel. These radials surround the scene.

The HDRI is on the outside but only as backdrop, it does not contribute to the light. Nevertheless, TA optimisation must be enabled for the HDRI Effect, which is set to 0.

Because the scene is inside the radials, we would expect it to be mirrored. This is not the case. It is not clear how the raytracer feels the gel on the light sources. It appears as if it would gather the light at the outside of the radial.

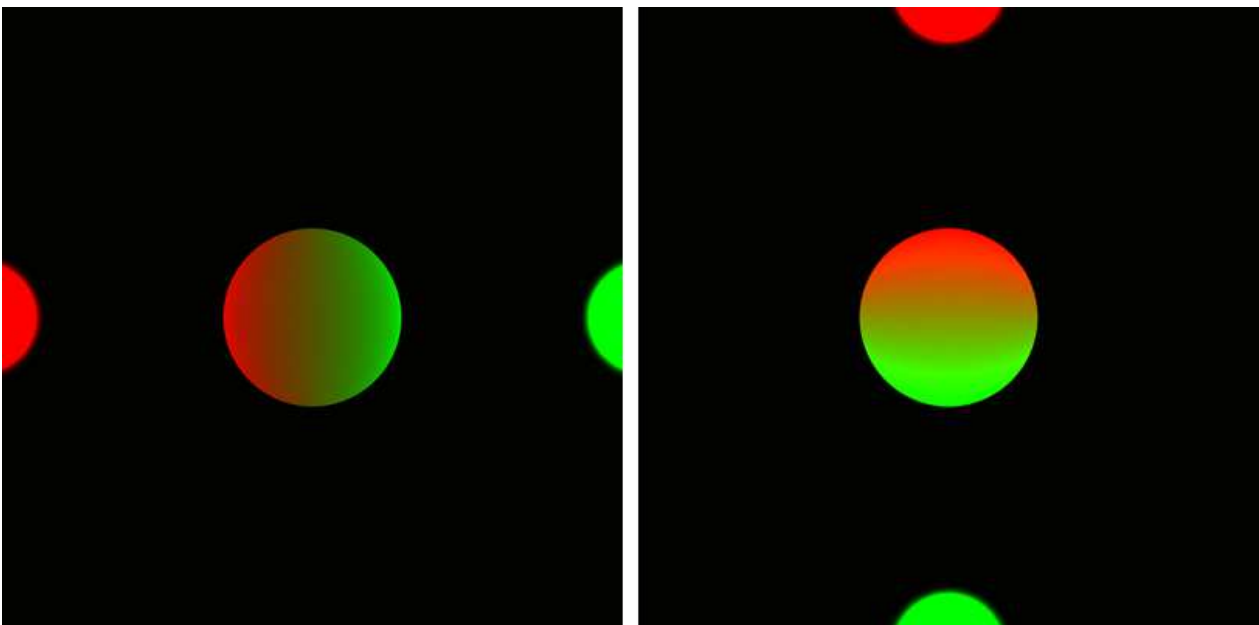


There is not much red and green light on the sphere, which is rather bright. This is because it is a low dynamic range image and hence the lights are not very bright. However, it is comforting to know that the image for the gel can be used without first mirroring it.

Obscure Mapping

Obscure Lighting works with IBL Inside, a radial that encompasses the scene, and an HDRI as backdrop to supply reflection on the objects, if desired. The radial is TA optimised and has a gel: usually default grey, but it can be set white to increase the light — though the light can be easily adjusted with HDRI Effect.

Even though the light generating HDRI is inside, the light comes from the correct direction. It is neither horizontally nor vertically swapped as when used in the pure IBL mode. Evidently, the light is gathered from the inside of the tiny HDRI sphere at world centre. Additionally, it does not matter at all where the scene is located; it does not need to be around the world centre, i.e. around the HDRI.



In Obscure Lighting, the HDRI backdrop and the light generated by the HDRI from Inside are consistent.

Properties of a Mirror

A real mirror does not only reflect the objects in front of it to a viewer, it also reflects the light. If you stand in front of a mirror and a lamp lights your back, your front is also illuminated through the mirror.

Classic Method with an additional Radial

If we set up such a scene in Bryce, using a radial or spot as light source, the side facing the mirror is not lit. We can correct this absence of reflected light by putting a light source behind the mirror and disabling Cast Shadows on order the invisible light behind it can shine through.



The above shows the issue. The white sphere shows the light source, a radial is within. From left to right: The mirrored grey sphere does not receive light from the radial reflected in the mirror, looking from the side shows that the backside of the sphere is indeed lit. The third picture has a radial behind the mirror and it appears as if the light is reflected from the mirror and at full right again the view from the side. The HDRI is just a backdrop and does not contribute to the light.

IBL and HDRI in TA Gel

Neither of these two lighting methods reflects light, only the image in front of it. If the object in front of the mirror is backlit, we have to resort to put a light behind the mirror. The example renders are made through the EWL (extreme wide-angle lens), a forthcoming product by David and myself. The horizontal angle of view is 190° , the vertical one 150° . The mirror in the frame was assembled for the test. The HDRI used for the backdrop and the light is *Sunset* and available from DAZ 3D <http://www.daz3d.com/hdri-pack-2>.



At left is the *IBL* and at right the *HDRI in TA Gel* render. With the angle of view in excess of 180° , we see the bright sun in the HDRI backdrop and also in the mirror. The mirror is distorted because the EWL is a fisheye lens.

In the *IBL* render, Victoria's back is nicely lit, but her front is almost completely black. This example was rendered with Quality 128, HDRI Effect 300 und Shadow Intensity 50%.

The render using the *HDRI in TA Gel* method has Victoria evenly lit. If the sun were down already, this render would appear quite natural with the cool colours on Victoria. However, the sun is still up. Both examples show that the light is not reflected by the mirror.

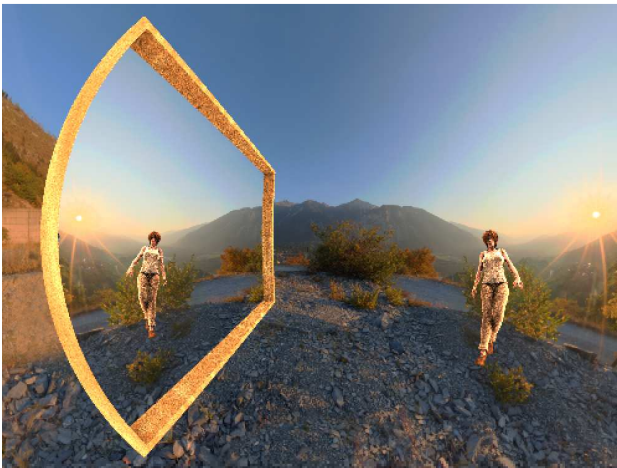
Obscure Lighting

This scene was again rendered using the *Obscure Lighting* method; once without the mirror and once with the mirror. In the render at left, just the mirror was removed.



The examples above demonstrate nicely that this lighting method is capable of reflecting at least a part of the light. The trousers below the mirror are unlit like in the render without the mirror. The Diffuse colour of the TA enabled radial named Background which surrounds the scene was set to full white and Diffusion set to 100 to increase the light output.

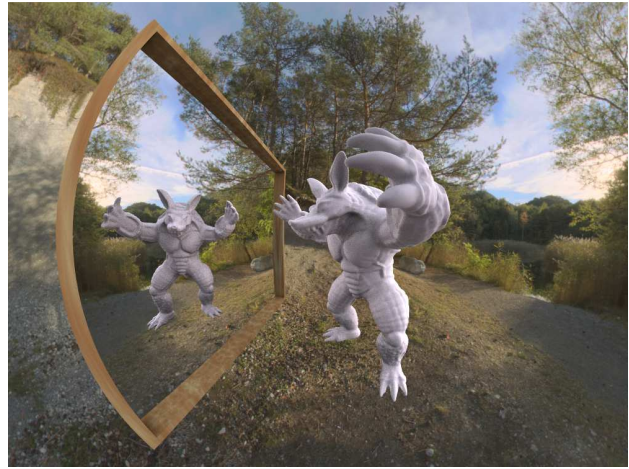
If the reflection in the mirror cannot be seen and the background gives no clue about the brightness of the environment, setting Diffusion and Ambience for the mirror to 100 can be quite helpful because the light falls off with the distance of the object to the mirror.



How much is difficult to say. Measurements showed that the brightness stays about the same up to a distance of the object to the mirror of 10 Bryce units, and then about falls off at approximately the rate the distance increases, which means double the distance half the light. The size of the mirror is important as well. If its surface is smaller, less light is reflected. Above at right, the mirror was replaced by a terrain to give the mirror an uneven surface in the hope the reflections would produce something like caustics — which is, sadly, not the case.

More Examples: below are more examples that show the light reflected from the mirror towards the reflected, backlit Armadillo from the *Stanford 3D Scanning Repository*:

<http://graphics.stanford.edu/data/3Dscanrep/>. The HDRI used is *Wall+Lake* which comes with <http://www.daz3d.com/bryce-mentoring-dvd-videos-scenes-and-resources> the Bryce Mentoring DVD



Here, the mirror was moved up out of view and the front side of the Armadillo is dark and in the shadow. Then, the mirror was set in place again and the Armadillo is lit through the mirror.



A transparent 2D face with an orange transparency colour is in front of the mirror. Maximum Ray Depth had to be increased by one from 4 to 5. The colour filter also tints the colour of the light reflected at the object. The HDRI from Inside is responsible for the light. In the right example, the HDRI was rotated by 180°, the sun is behind the mirror and does not shine in it. The Armadillo gets low light and only a tiny bit of orange.

As is evident, with this method, parts of the scene can be indirectly lit and coloured if there is enough light from an HDRI and the mirror is not visible for the camera. The light reflected can then be boosted by turning up Diffusion and Ambience for the mirror.

Recap

If the camera is inside a sphere, the panorama wrapped around it must be mirrored. The light from an HDRI inside has not only the light mirrored, it is also swapped vertically. If *HDRI in TA Gel* is used, the panorama wrapped around the radial is correctly mapped. For *Obscure Lighting*, the HDRI Inside emits the light in the correct direction. The light from this HDRI is reflected in a mirror but regrettably does not create caustics. The mirror can have a colour filter and the object in front of it is illuminated by coloured light.