

Anisotropy

If something is isotropic it means that it is uniform in all directions, and anisotropy means the contrary: that it is directionally dependant. Bryce has an Anisotropy control that is not covered in any document.

Introduction

Bryce 7.1 Pro features anisotropy options in the Materials Lab that are not well understood and it is, in fact, not very obvious what effect the different settings have. Therefore, renders of 100 settings were made, covering all combinations. The combinations of the options are listed in the table below and the corresponding renders follow the table.

Anisotropy in Bryce 7.1 Pro

A material applied to an object — be it a procedural or image — is uniform in all directions and hence isotropic. For glossy materials this can be a limitation and shiny materials often look more realistic if this uniformness can be broken up by introducing anisotropy.

The implementation works with *Specular* and *Specularity*, as glossiness is called in Bryce. The *Specular* colour defines colour and — together with *Specularity* — intensity of the glossy spot on a surface. The *Specular Halo* colour controls width and colour of the spot; a black colour results in the smallest spot.

Moving the *Anisotropy* control from 0 to 100 creates a line that extends from the glossy spot and the brighter the *Specular Halo* colour is set, the thicker this line gets (line with halo). This line must be considered as a vector that is tied to the glossy spot and the behaviour and angle of this vector can be controlled by different means.



Controls for Anisotropy.

Modes

The vectors are controlled either by colour or by a greyscale, depending on the mode. Except for *Tangent Mapping*, only one of the three modes *Planar*, *Radial* or *Circular* can be selected.

Tangent Mapping always uses the grey value of the colour set in the swatch or by a procedural or image in a channel.

Planar Mapping takes the colour to orient the vector in one direction. It appears that red rotates the X axis, green the Y axis and blue the Z axis. If *Tangent Mapping* is enabled, the grey value of these colours controls the vector. When *Planar Mapping* is selected, *Tangent Mapping* is also selected. When *Tangent Mapping* is deselected, *Planar Mapping* also loses the tick mark but it stays enabled. The picture above shows this state.

Radial Mapping automatically uses *Tangent Mapping*. If *Tangent Mapping* is deselected, *Planar Mapping* gets active and *Radial Mapping* disabled. *Radial Mapping* makes the vectors to point away from the axes. To disable, click once on *Radial Mapping*.

Circular Mapping sets the vectors perpendicular to the axes. *Tangent Mapping* is automatically selected. There is no control to select *Circular Mapping*; it is implemented as an “Easter Egg”. To activate *Circular Mapping*, press the [Shift]-key while clicking on *Radial Mapping*. This additional option was not specified and implemented by the programmer on his own accord because it complements *Planar* and *Radial Mapping*. To disable, click twice on *Radial Mapping*. The first click returns to *Radial Mapping* — or hold [Shift]-key and click on *Radial Mapping*.

Conform to Axis

There are three options for the three axes X, Y and Z. Only one or none of these modifiers can be selected at a time and they go together with the mapping modes.

The Table with the Rendered Modes

The leftmost column shows the image number of the resulting render. The Modes are Planar, Radial, Circular and Tangent Mapping; an “x” means the option was selected. Conform to Axis is obvious. Colour notes the red, green and blue values, and Grey is the greyscale using red, green and blue at the same values.

Colours and grayscale define the angle of the vector. One increment rotates by about 1.4°. The grayscale values shown are 0 = 0°, 63 = 90°, 127 = 180° and 191 = 270°. 255 = 360° = 0° is not shown for grayscale because it is the same.

Planar Mapping without *Tangent Mapping* works on the colours. Each colour was rendered separately at 63, 127, 255 — and 0 for all three colours.

Bryce 7.1 Pro Anisotropy Test Renders											
Img	Mode				Conform to Axis			Colour			
#	Plan	Rad	Circ	Tan	X	Y	Z	R	G	B	Grey
00	x							127	127	51	
01	x							0	0	0	
01a	x							63	0	0	
01b	x							127	0	0	
01c	x							191	0	0	
02	x							255	0	0	
02a	x							0	63	0	
02b	x							0	127	0	
02c	x							0	191	0	
03	x							0	255	0	
03a	x							0	0	63	
03b	x							0	0	127	
03c	x							0	0	191	
04	x							0	0	255	
05	x			x							0
06	x			x							63
07	x			x							127
08	x			x							191
09	x				x			0	0	0	
09a	x				x			63	0	0	
09b	x				x			127	0	0	

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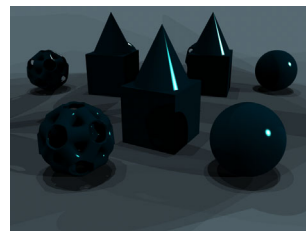
09c	x				x			191	0	0	
10	x				x			255	0	0	
10a	x				x			0	63	0	
10b	x				x			0	127	0	
10c	x				x			0	191	0	
11	x				x			0	255	0	
11a	x				x			0	0	63	
11b	x				x			0	0	127	
11c	x				x			0	0	191	
12	x				x			0	0	255	
13	x			x	x						0
14	x			x	x						63
15	x			x	x						127
16	x			x	x						191
17	x					x		0	0	0	
17a	x					x		63	0	0	
17b	x					x		127	0	0	
17c	x					x		191	0	0	
18	x					x		255	0	0	
18a	x					x		0	63	0	
18b	x					x		0	127	0	
18c	x					x		0	191	0	
19	x					x		0	255	0	
19a	x					x		0	0	63	
19b	x					x		0	0	127	
19c	x					x		0	0	191	
20	x					x		0	0	255	
21	x			x		x					0
22	x			x		x					63
23	x			x		x					127
24	x			x		x					191
25	x						x	0	0	0	
25a	x						x	63	0	0	
25b	x						x	127	0	0	
25c	x						x	191	0	0	
26	x						x	255	0	0	
26a	x						x	0	63	0	
26b	x						x	0	127	0	
26c	x						x	0	191	0	
27	x						x	0	255	0	
27a	x						x	0	0	63	
27b	x						x	0	0	127	
27c	x						x	0	0	191	
28	x						x	0	0	255	
29	x			x			x				0
30	x			x			x				63
31	x			x			x				127

Bryce 7.1 Pro — Anisotropy

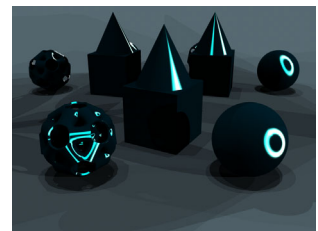
32	x			x			x				191
33		x		x							0
34		x		x							63
35		x		x							127
36		x		x							191
37		x		x	x						0
38		x		x	x						63
39		x		x	x						127
40		x		x	x						191
41		x		x		x					0
42		x		x		x					63
43		x		x		x					127
44		x		x		x					191
45		x		x			x				0
46		x		x			x				63
47		x		x			x				127
48		x		x			x				191
49			x	x							0
50			x	x							63
51			x	x							127
52			x	x							191
53			x	x	x						0
54			x	x	x						63
55			x	x	x						127
56			x	x	x						191
57			x	x		x					0
58			x	x		x					63
59			x	x		x					127
60			x	x		x					191
61			x	x			x				0
62			x	x			x				63
63			x	x			x				127
64			x	x			x				191
100											

The Renders

The renders do not follow exactly the numbering sequence. Rather, they were arranged to put similar settings together in a row. # 100 is a render without Anisotropy, # 00 used the default setting. (For reference at right.)



100

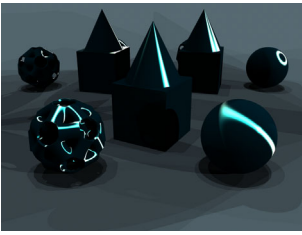


00

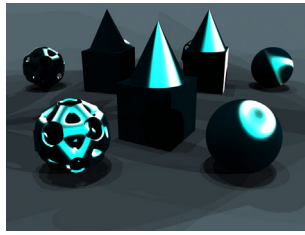
The sun is the only specular source, it has no *Diffuse*. There is an HDRI without specular that provides a bit of cyan coloured light that is shown on the shapes, the ground and the shadows. Two mirrors offset by $\pm 15^\circ$ (\wedge) show the backsides and a bit of the sides of the shapes.

The first row below shows *Planar Mapping* without *Tangent Mapping* with all three colours at 0; without conform to any axes (# 01), then conforming to X (# 09), to Y (# 17) and to Z (# 25).

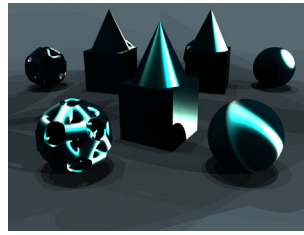
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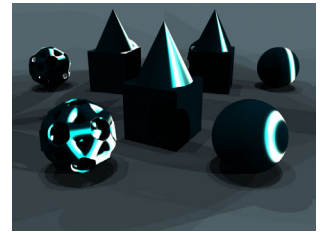
01



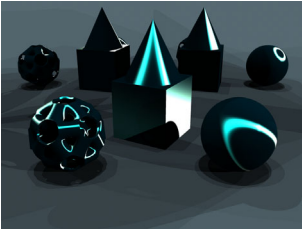
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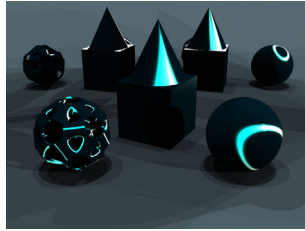
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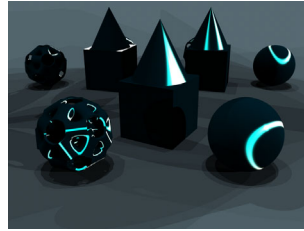
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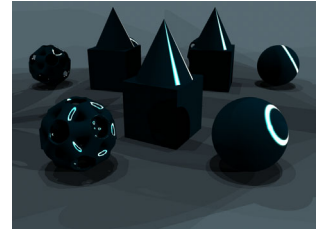
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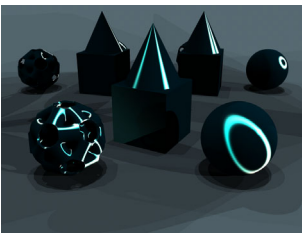
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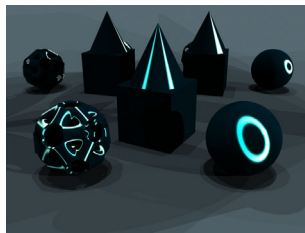
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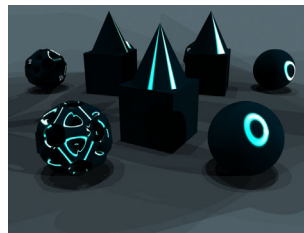
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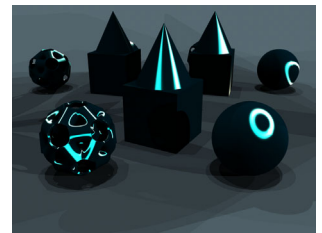
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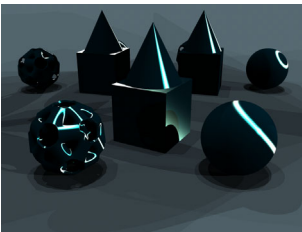
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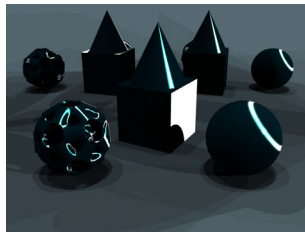
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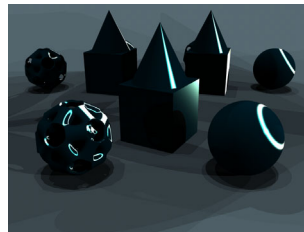
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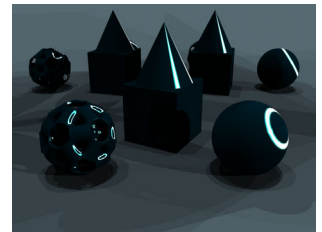
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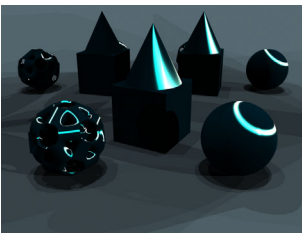
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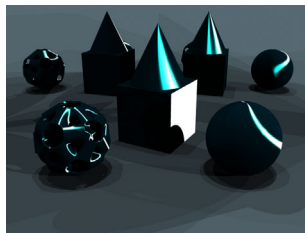
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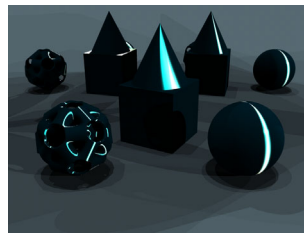
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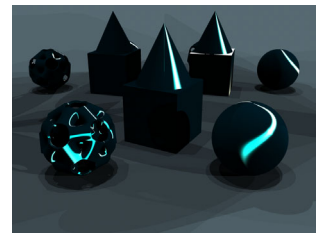
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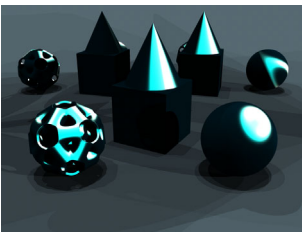
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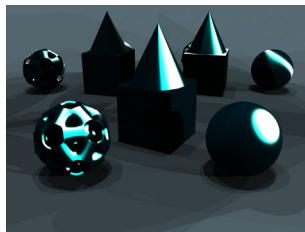
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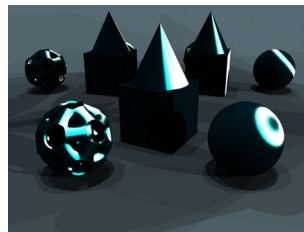
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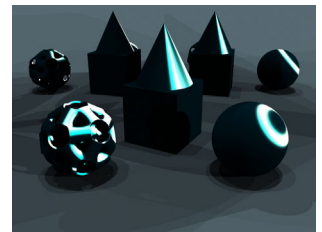
09a



09b

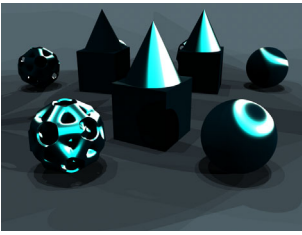


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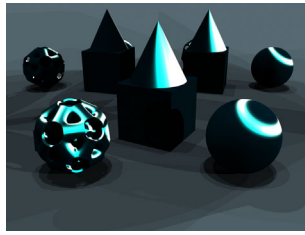


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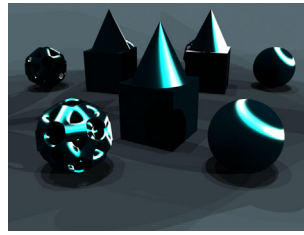
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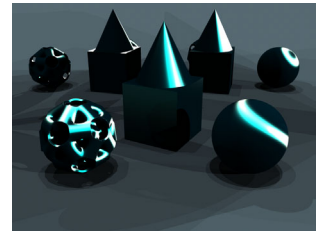
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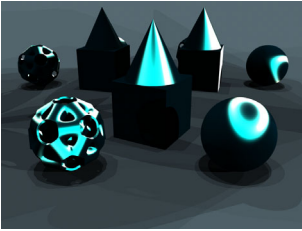
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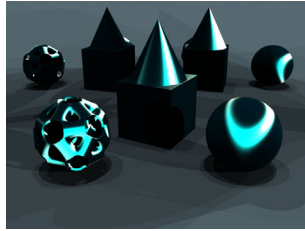
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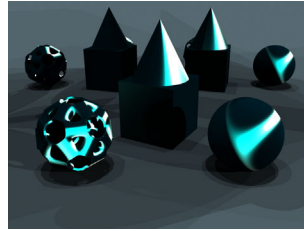
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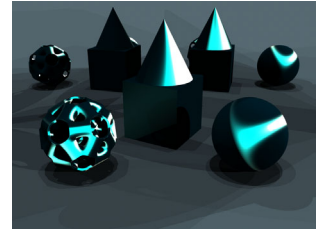
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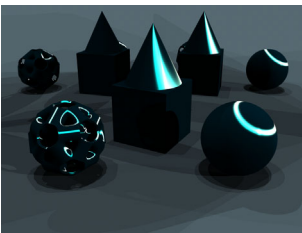
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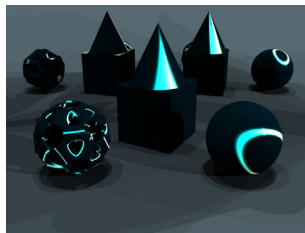
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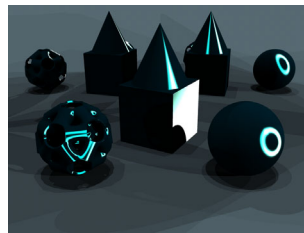
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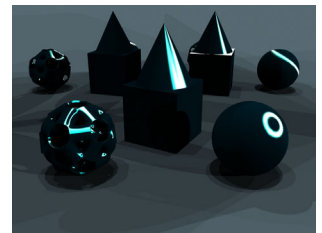
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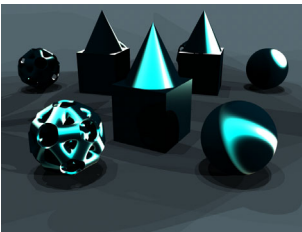
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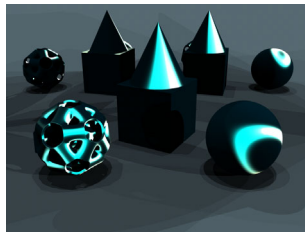
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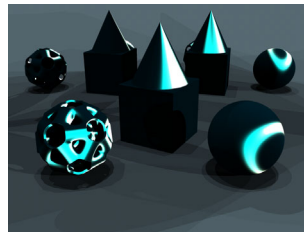
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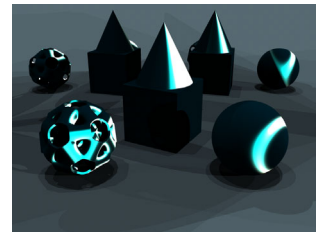
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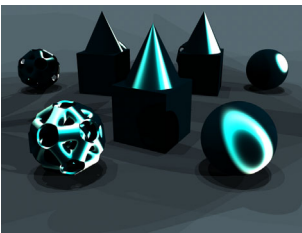
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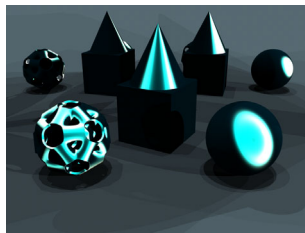
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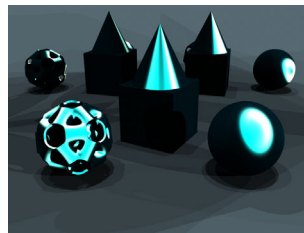
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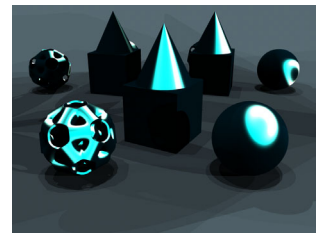
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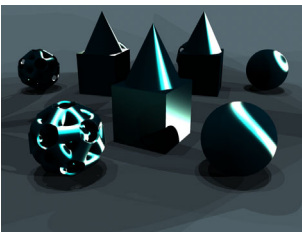
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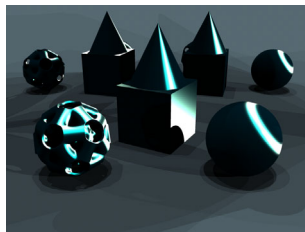
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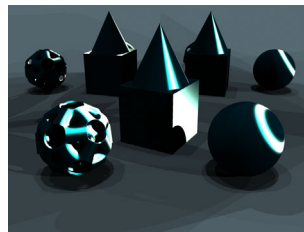
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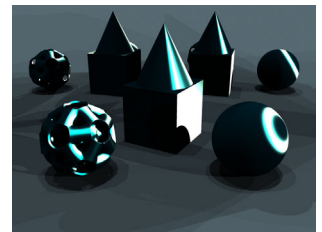
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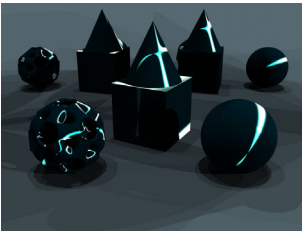
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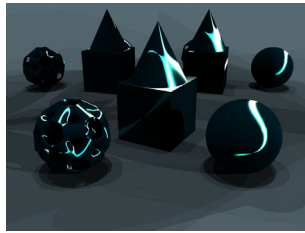
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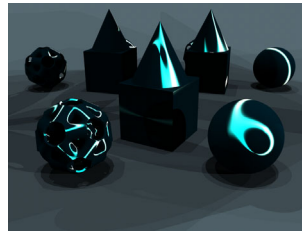
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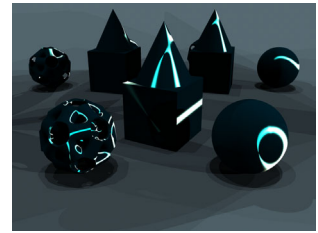
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62



63



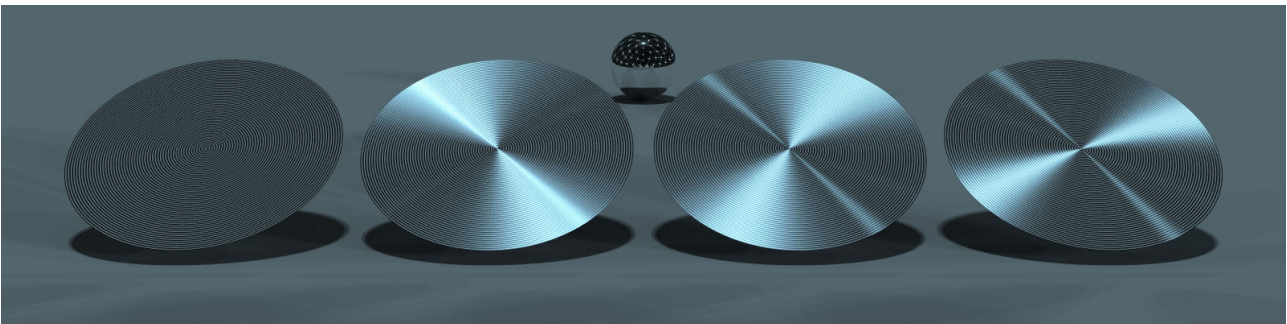
64

Some practical examples

Below are four 2D-Disks with the same material settings. *Specular* colour is white, *Specular Halo* colour R/G/B 32/32/32 for a rather narrow glossy spot and narrow halo. *Specularity* is at 50 and enhanced by a 1-component Phased Hyper Texture with *Phase* at 500. There is a light grey (192) colour for *Diffuse* and 100 *Metallicity*.

There is 0.05 *Bump* from a texture based on *Distance Origin, Standard, 0 Octaves, Frequency 5* and *3D*. It is filtered with a *SawWave* with $a=108$ and $b=2.25$; there is no *Phase*. There is only *Bump* output; *Transformation* size is 20. The *Anisotropy* colour swatch is set to mid-grey 127.

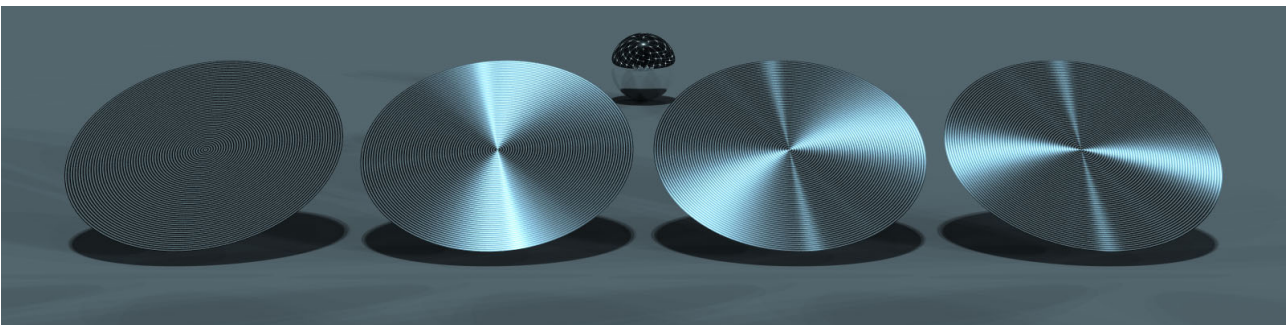
Light and *Specular* are from the *Stars_4ray1* HDRI shown in the mirror ball. *Quality* is set to 128, *Saturation* to 100, *Intensity* to 50, *Specularity* to 200 and *HDRI Effect* to 75. There is no other light source. The ground plane has the default setting but *Cast Shadows* disabled. The picture was rendered Premium with 16 *Rays per pixel* and no *Premium Effects*.



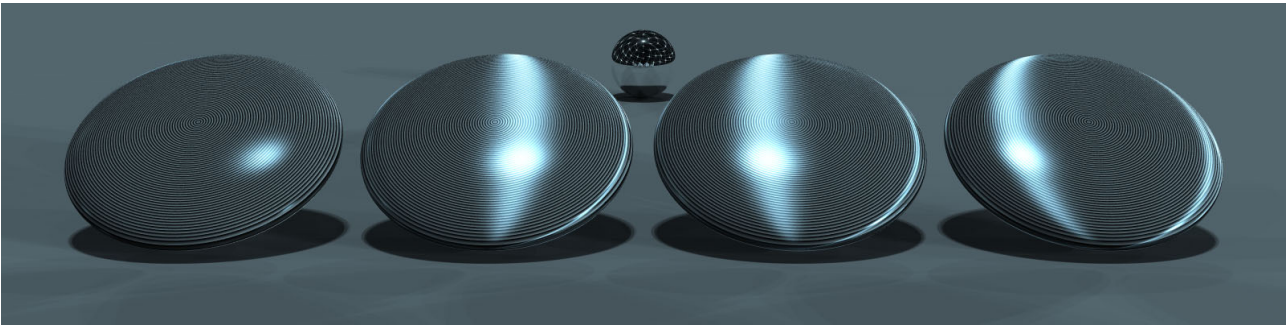
(The picture is embedded 1600 pixel wide, enlarge viewer to see the fine bump.)

The left one has no *Anisotropy*; the other three have it at 100 and always *Tangent Mapping* engaged. The second from left is set to *Planar Mapping*, the next one to *Radial Mapping* and the one at far right to *Circular Mapping*.

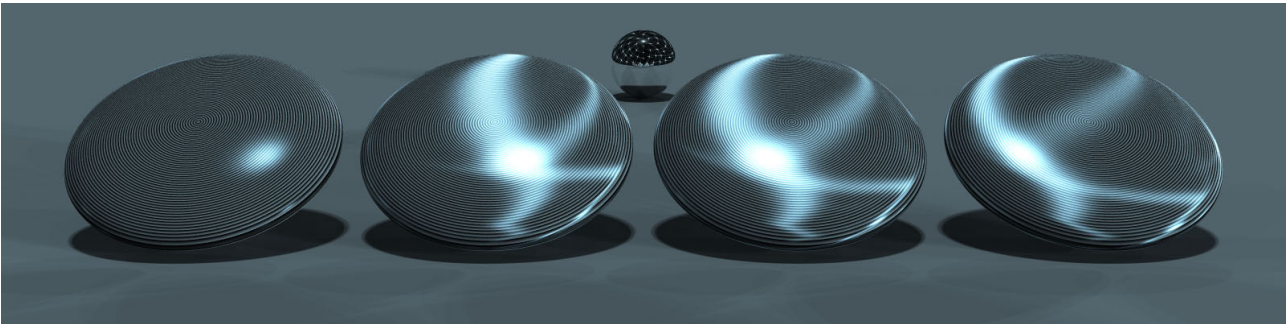
Below, *Anisotropy* is controlled by a rainbow colour texture. There are no other changes.



The next two renders are the same as the two above with the difference that the 2D-Disks were replaced by flattened spheres (lentils). The thickness is a fourth of a full sphere. For the bump, the texture was set from *3D* to *2D*.



Above, *Anisotropy* colour is mid-grey (127), below it is a rainbow coloured texture.



Hints

Anisotropy is a great addition to the Materials Lab and it helps making glossy objects look more realistic. Because it works on specular, it can be a bit tricky to get enough out of it from an HDRI. Using a Hyper Texture (HT) or a Phased Hyper Texture (PHT) to boost *Specularity* resolves this. A PHP can be made in the Deep Texture Editor (DTE) with a few clicks as described in this document <https://www.horo.ch/docs/mine/pdf/PhasedHT.pdf>.

The behaviour of the anisotropy options can be a bit baffling because they are not consistent throughout. When *Planar Mapping* is selected, *Tangent Mapping* gets also checked and when *Tangent Mapping* is unchecked, *Planar Mapping* loses the check mark but it is actually still selected.

Circular Mapping is implemented as an “Easter-Egg” and is activated by holding down the [Shift]-key while clicking on *Radial Mapping*. *Radial Mapping* gets a check mark. There is no indication that tells whether *Radial* or *Circular Mapping* is active. There are four means to disable *Circular Mapping*:

1. Click on *Planar Mapping*.
2. Press the [Shift]-key and click on *Radial Mapping*.
3. Click once on *Radial Mapping* to return from *Circular* to *Radial Mapping*.
4. Click twice on *Radial Mapping*.

Whenever *Tangent Mapping* is enabled, the greyscale value of the colour controls the vector. Only *Planar Mapping* can work without *Tangent Mapping* and then the individual colours red, green and blue control the vector.