MATERIALS HANDOBOOK

Filippo Fanciotti

This handout is aimed to help you in creating any kind of material to visualize your model.

Getting back to what anticipated in the previous preface, in some cases I'll use *Vray* as example, in order to give you a direct response to words which, otherwise, could sound a way too abstract. The point is that, more or less, the packages of algorithms which describe each material's behavior are, almost in any case, the same for any software.

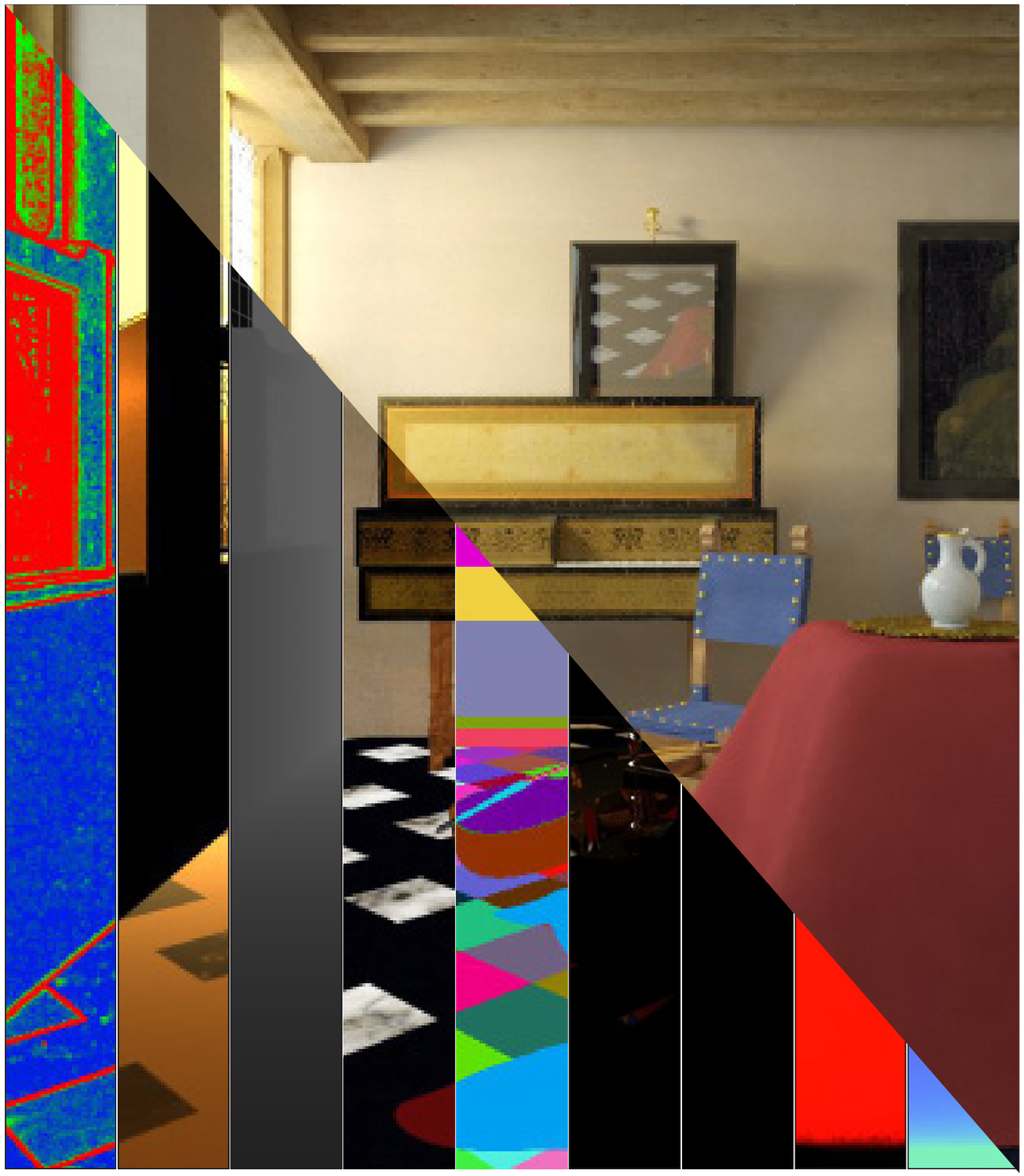
Adding characteristics to a material is like adding layers on a canvas: so, when creating a new one, start with the diffuse color (or map), then add reflection, refraction or any other feature that material owns.

Here I'll explain you how to properly manage those features.

The Music Lesson
Johannes Vermeer
1662-1665
oil on canvas
74.6 cm × 64.1 cm
Royal Collection, St. James's Palace, London

The Music Lesson #64 azimuth 4° (no Lady at the Virginals , no Gentleman)
FF

channels



Before going into detail on the necessary parameters to give a good level of verisimilitude to any kind of material, it's important to understand how visualization softwares translate those inputs into outputs.

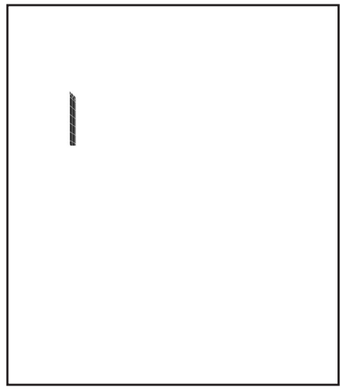
Any rendering produced by whatever visualization software - like Cinema4D, Vray and the most - are images generated by a computational process, where the rendering engine overlaps informations through a system of layers as a series of visual effects, including lighting, shadows, textures, reflections and so on.

These effectes are computed separetly and overlapped to the basic textures through a precise blending mode, thus returning the final image as an indivisible sum.

Through the Multipass function, it is possible to extract all the single channels contributing to the creation of the final image as separate layers. There are at least two advantages behind such operation:

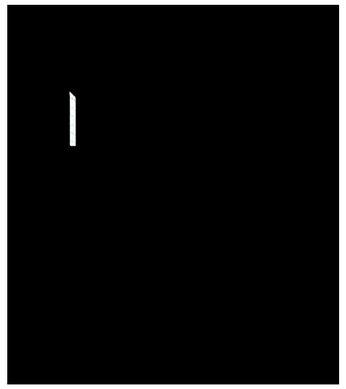
- every layer can be personally managed in post production, therefore giving the user the possibility to handle the image in a more personal way;

- users can isolate and check the behaviour of lighting and materials, so understanding what parameters to change in order to obtain the desired results before re-rendering.



alpha

bump



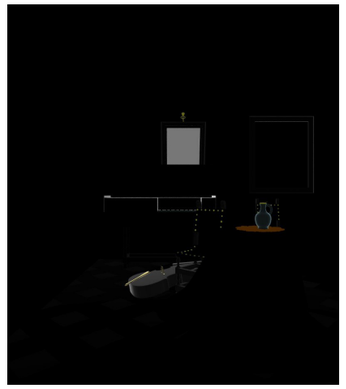
background

diffuse

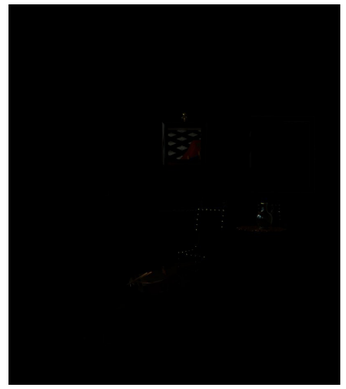
Global Illumination

lighting

raw total light

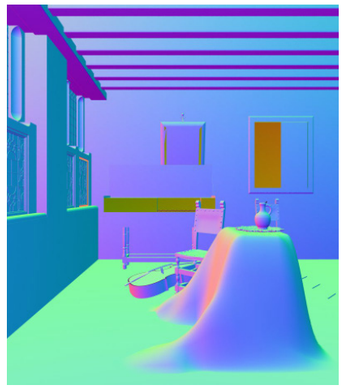


reflection filter



reflection

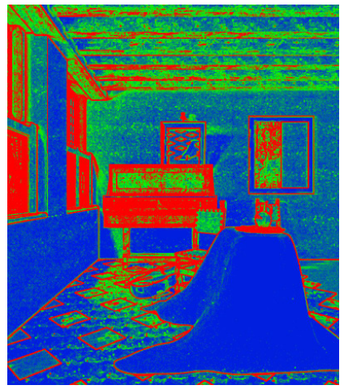
matte shadow



normals

raw GI

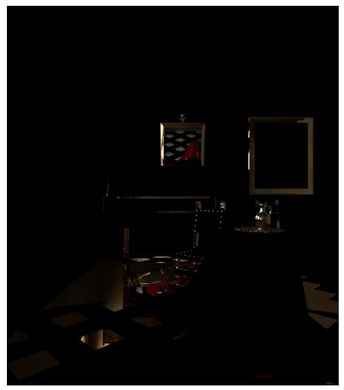
render ID



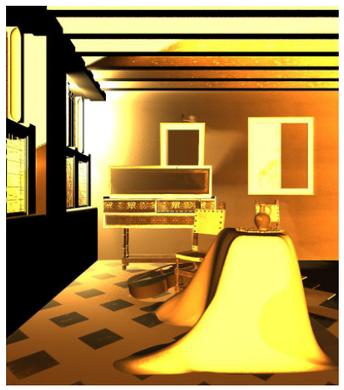
sample rate

shadow

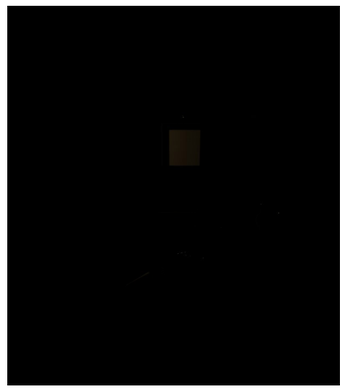
raw light



raw reflection

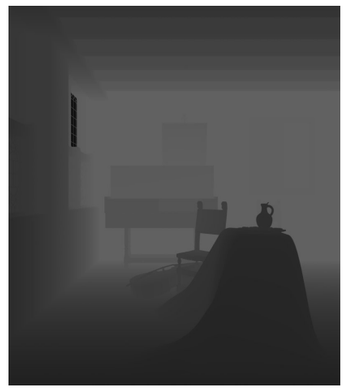


raw shadow



specular

total light



Zdepth

sample of channels

diffuse color, transparency

a basic, diffuse material means it only contains the *diffuse layer*, so it's not able to reflect, refract or emit light.

If you want to quickly test a color on an item in your scene, you can easily select the color of the diffuse layer. Normally, the settings provided for the diffuse layer are :

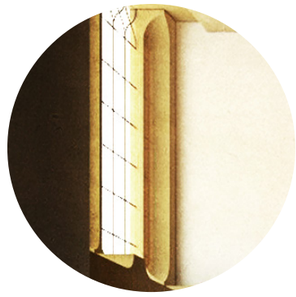
- *Color* : to attribute the base color of the material;
- *Mapping* : to select a texture or any other type of procedural mapping (we'll see this feature in the next pages);
- *Multiplier* : to increase or decrease the brightness of the mapping (personally I don't recommend this action: if you want your color to be brighter, pick a brighter tone of it instead);
- *Transparency*: to add transparency to the diffuse layer.

Even if my personal intent was to prepare this scene the way I had not to post-produce almost anything, after several trials, I decided not to give a texture to the carpet, leaving out this task for the post production instead. The rendering phase is an exhausting trial and error process: you'll figure out that, in some cases, there are situations, limits which is long more convenient - specially in fact of time wasted - to bypass and face in another moment.

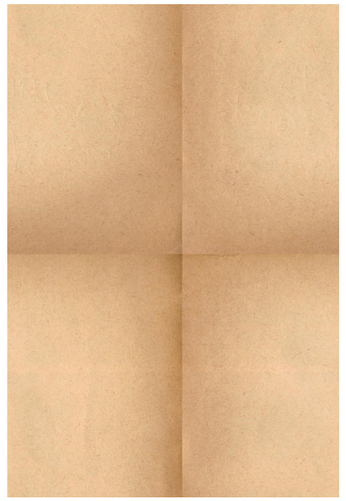
The *Transparency Swatch* works on a grey scale: when this color is 100% black (RGB value 0), it's 100% opaque. When it's 100% white (RGB 255), it's 100% transparent [i.e. If you want the material to be 50% transparent, change the transparency swatch to be medium grey (RGB value 128)].

N.B. In *Max* transparency white is opaque, black is transparent. In *Rhino*, black is opaque and white is transparent.

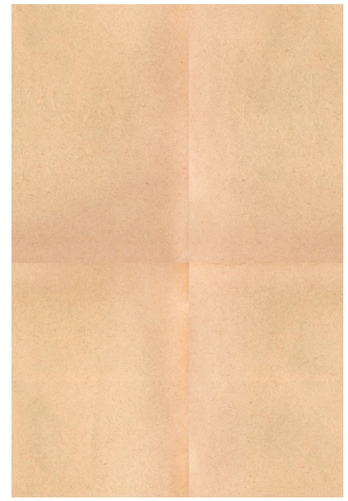
In the example which follows (the *Metal.net.Bunny*), I took advantage of applying a mapping to the transparency channel; by using a black&white version of the same image of the *mapping channel* applied to the diffuse layer, you can convert any item into a new one with only some parts of it set to transparent, according to the nature of its material or components.



to create a seamless texture in Photoshop open the desired image and choose: *Filter* > *Other* > *Offset*

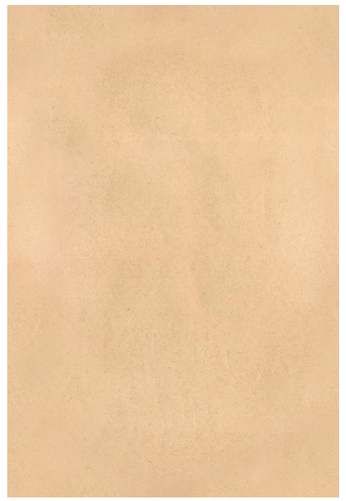


Check the *Wrap Around* method. As you can see, the tonal values change significantly from side to side in the original image, therefore the pattern will harly become seamless unless you decrease this shift before offseting.



Adjustments before offset *Camera Raw filter*: *Graduated Filter*, *Spot Removal* and *Adjustment Brush*; applying the *offset filter* to the evenly lit image, the seams are much less noticeable.

Healing Brush + *clone stamp* (round brush 30%hardness) tools to remove any noticeable seams.

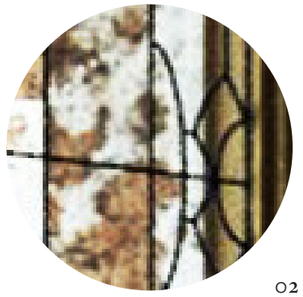


To verify that the pattern is actually seamless, run the filter again and again until you don't see any more seams.

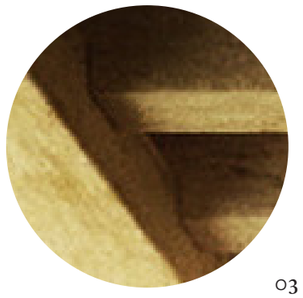
Once the file is seamless, choose *Select* > *Select All* and then *Edit* > *Define Pattern*; this way the Pattern created will be available to fill areas in Photoshop.

More in general, try to avoid obvious items in the texture that will easily be spotted when the pattern is repeated; to achieve it - still using the *Clone* tool - tide up any anomalies in the texture, or distinctive elements that appear more than once and give away the fact that the texture has been duplicated. To restore some of the texture's original quality and mask the Cloning, apply a *Sharpen filter* 1-2 times until desired effect is achieved.

01

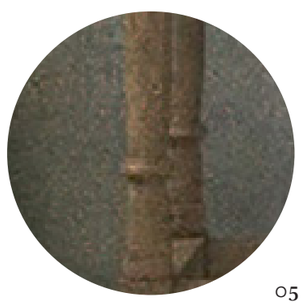


02



03

04

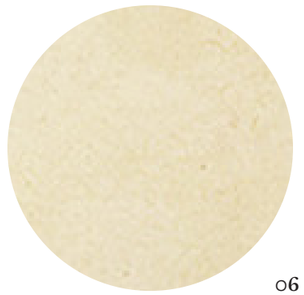


05

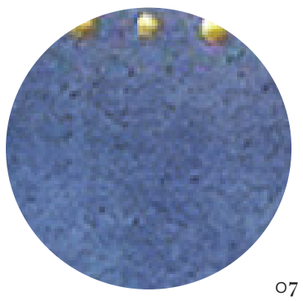
The choice of using different kinds of wood textures - although some of them might look the same at first sight - helps a lot to add realism to the image.

For the ceiling beams and the windows frames (fig. 01, 03) I used seamless textures with some roughness, avoiding any reflection in order to mimic the conditions of the painting.

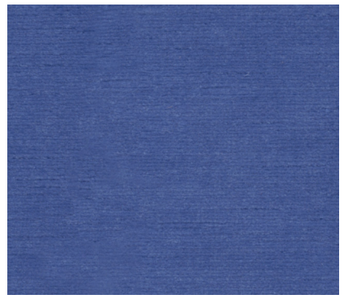
Notice that when a texture contains many imperfections with a high contrast (03 in particular), displeasing clones of those imperfections will happen because of the repetition of the texture; here I decided to let them happen, just moving the position of the texture - in order to make them less evident - and fixing anything later on in post production.

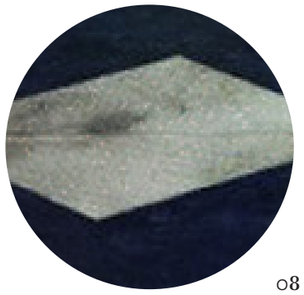


06



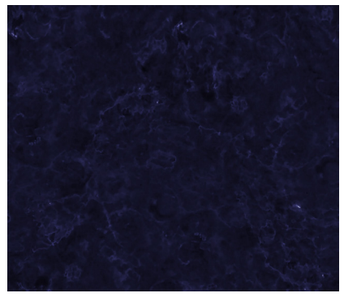
07

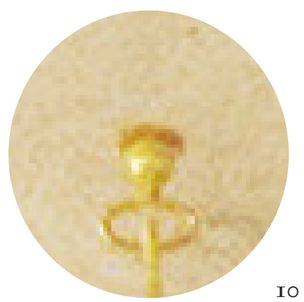




08

09





10

06. When it's about the *walls*, specially for interiors, I normally use an *old paper* sheet and directly stick it to the wall as it was a real wallpaper. This way you can avoid the excessive brightness of a perfectly white surface and make it look less fake.

07. the blue fabric covering the chairs is *Eroica Milano Velvet Ocean*, a medium weight poly backed velvet very similar to the one of the painting.

08. the Music Lession white marble looks totally fake, making it the weirdest material of the painting. A good compromise between reality and mimicry has been obtained overscaling the texture to the whole floor, as it was just one piece of marble.

09. Black marble is one of the hardest to render, since the lighter shades proper of the material tend to be absorbed by its overall darkness; once set up the exposure and lighting of the scene, I gradually augmented its brightness, thus adding a bit of fresnel reflection.

10. A golden leaf texture has been applied to the mirror pommer, the pitcher cap and the chair buttons, thus changing mapping in scale and position in order to perceive more gradients from a same texture.

Mapping channel

If on the one hand the creation of whatever textured material is very simple, the mapping process to make it fit to a particular solid may be a slightly more complicated task. Each object in the scene holds its own *mapping channel* (i.e. in Rhino you can check it from the *object properties*) and each mapping channel is identified by a number.

A mapping channel holds a set of texture mapping parameters; an object can have any number of channels and therefore can hold any number of textures mapping types. When the textures are applied to an object, the software is using the *matching channel number* on the object.

UVW mapping

Normally you need to adjust the way in which the mapping (a texture or any *.jpg* image) lies on the plane on which the material is applied. In order to achieve the desired result, you have to adjust the *UVW map* of the surface. UVW map is a coordinate system that is relative to the object that it's applied to, NOT world coordinates.

- as mentioned above, the *XYZ coordinates* refer to the way in which an object is situated in *world space*, hence *UVW* are similar coordinates, but related to the way the material is applied to the object (we may call them local coordinates).

- The *projection* literally manages the projection of the texture (imagine this feature like a video projector casting a frame on an object).

- The *UVW Offset* determines the position of the texture in relation to the position of the origin of the object itself.

- The *UVW Rotation* adjusts the degree of rotation of the mapping.

- The *UVW Repeat* controls how many times a map is repeated within a given space: this is the feature which affects the scale of the texture.

In the virginal, you may notice I built different surfaces (the different colors in the image beside) according to the diverse mappings I was supposed to assign to each one of them. The most efficient way to visualize that item was hence to prepare a collection of images directly extracted from the painting, which means to adjust them in Photoshop, correcting the perspective distortion and saving a precise bi-dimensional (with right dimentions for each side) image to paste in your 3D model.

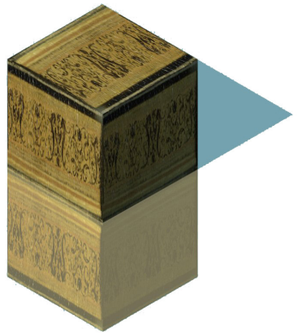
Texture, projections

Projection (Mapping types)

The default behavior for many softwares (i.e. Rhino) is to treat each surface as a separate object, stretching and orienting the assigned texture to fit. Unluckly, this is almost in any situation far from reality.

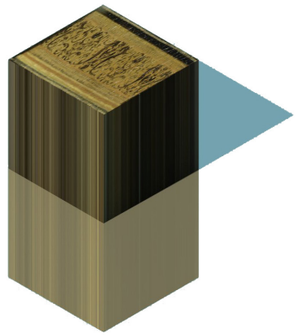
Every engine offers several mapping methods, the most common are the listed below:

- *Surface mapping* stretches the texture over the object.
- *Planar mapping* projects a 2D plane onto the side of an object, useful for planar surfaces, since it extrudes the pixels on the boundaries of the image along the thickness of the item.
- *Box mapping* projects a 3D box onto the sides and top of an object, in many cases it's the most useful method.
- *Box (sides only)* mapping sides of an object only, does not cap the mapping to the top and bottom surfaces.
- *Spherical mapping* wraps the object around a sphere. The top and bottom edges of the texture shrink into the top and bottom poles of the object.
- *Cylindrical mapping* an image around an object like a cylinder the left and the right edge will join each other.



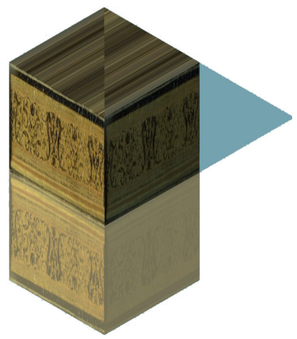
Box

Sphere



Planar

Surface



Box sides only

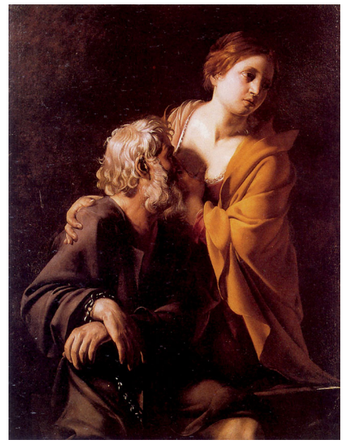
Cylindrical

Vermeer includes in the Music Lesson a small painting hanging on the wall, so introducing - like in many other paintings - the *painting within a painting* topic.

The painting is a Roman Charity (Latin Caritas romana; Italian Carità Romana), the exemplary story of a woman, Pero, who secretly breastfeeds her father, Cimon, after he is incarcerated and sentenced to death by starvation.

The story - recorded in by the ancient Roman historian Valerius Maximus - was presented as a great act of pietas (i.e., filial piety); therefore it is a valid hypothesis to interpret the whole painting as a masked allegory of an implicit love relationship, where the young man is a secret love prisoner.

The topic of the painting within a painting is very frequent in the work of Vermeer and other authors of the time, as an occasion to introduce parallel plots, lifting scene and characters to a higher level and so transforming genre scenes (and genre art in general) into allegorical, sophisticated masterpieces.



La Carità romana
Bartolomeo Manfredi

Lady Writing a Letter with her Maid, 1670 | J. Vermeer
National Gallery, Dublin

The Allegory of Faith, 1671-74
Johannes Vermeer
MoMa, New York

The Guitar Player, 1672
Johannes Vermeer
Kenwood House, London

The love letter, 1669
Johannes Vermeer
Rijksmuseum, Amsterdam

Lady Seated at a Virginal, 1673
Johannes Vermeer
National Gallery, London

The Concert, 1665-66
Johannes Vermeer
theft

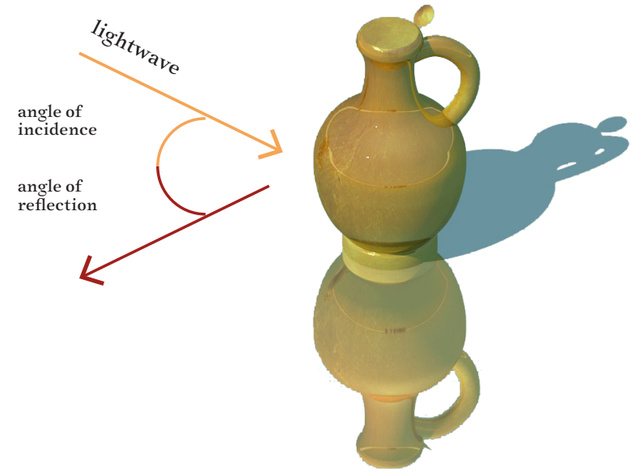
Reflections

The light wave comes from the light source and makes contact with the front face of the material at a given angle. This is known as the angle of incidence. The light wave then bounces off the material at the exact same angle, known as the *angle of reflection.*

the Reflection map

By default the reflection layer has a *fresnel map* which varies the amount of reflection based on the viewing angle (this is why the edges of a sphere seem to give the material a distortion that we come to expect from a reflective sphere) .

If that map is removed (or if the fresnel value is set to 0) then the reflection is constant over the whole material.

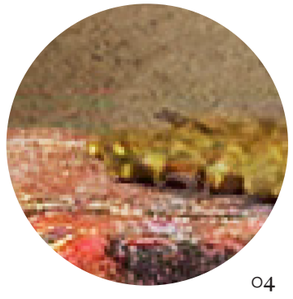


The images below show all materials in the scene owning some reflections; a particular situation occures with white marble (05), which normally is long more reflective, as it happens in the first image in the following page. The choice to almost completely avoid reflections has been taken in order to mimic the tiles in the painting, still looking like marble, but more flat, as if the pavement was very dirty and old.


01


02

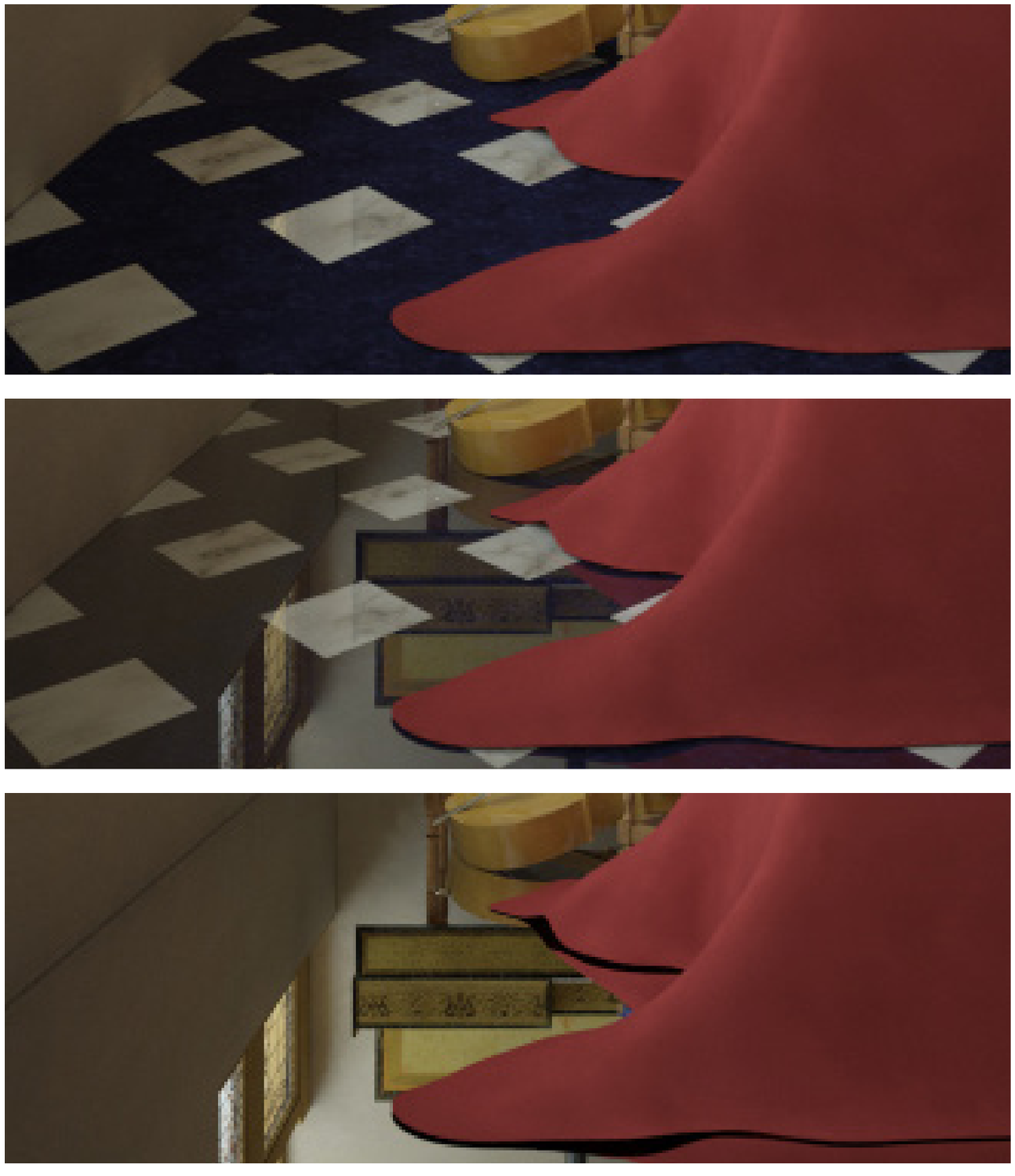

03


04


05


06

Reflections, Fresnel IOR and Glossiness



Fresnel IOR (Index Of Reflection)

The *Fresnel IOR* controls the reflection intensity; the *Fresnel reflections* are a naturally occurring phenomenon that states that an object becomes more reflective the greater the angle at which it is seen (i.e. think of how the reflection changes moving around a window).

Each material owns its own *Fresnel value* [High IOR > smaller angle needed > less reflection]. A higher *Fresnel IOR* means that, at a slight angle, you can see reflections, while with a lower IOR at the same angle, you might not see the material as reflective.

A Fresnel IOR value of 1.2. has been given to the *black wood mirror frame* (view pitcher in this page), since my intention was to give a reflection of the light coming from the window and, at the time, not reflecting any item in front of it as the mirror does instead.

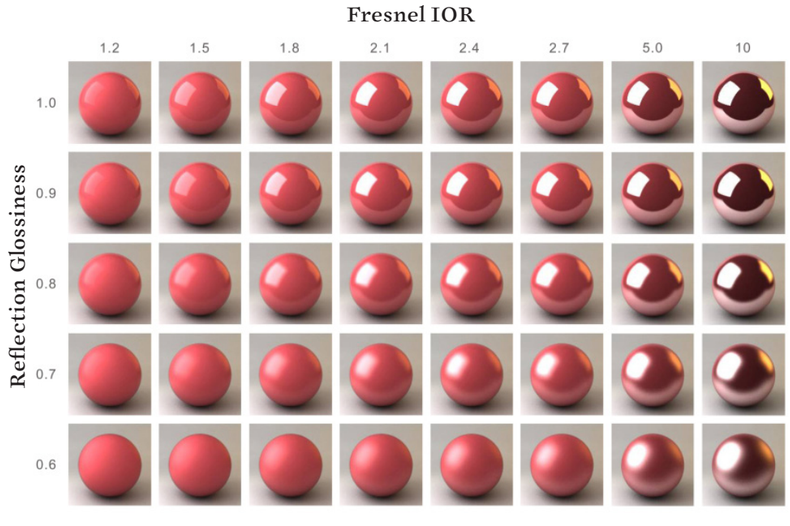
Glossiness

Similarly to the IOR, *Glossiness* is a parameter in both *Reflective* and *Refractive layers*. The difference between the two is that the *Reflective Glossiness* deals strictly with the amount of reflection dealing with the surface, while the *Refraction Glossiness* has an effect on what happens inside the material, therefore influencing its transparency (it's through this parameter that materials can appear frosted, the refraction will become blurrier as the *Refraction Glossiness* decreases).

The control over the uneven nature of a reflective material can be balanced with this parameter; the amount of reflection glossiness is actually a two-part equation that deals with the *Highlight Glossiness number* and the *Reflection Glossiness number*. When these are both set at 1, the material will be mirror like, while as these numbers are reduced, the material's reflections become much blurrier.

>>> Don't reduce these numbers to below 0.5/0.6, or it will cause highly increased render times and almost no reflections. You can increase glossiness subdivision instead, to improve the quality of the glossiness and remove the noise which most of the times occurs. Mind that this option will increase anyway the rendering time on this material. A good value for the subdivision could be something between 22 - 40 (32 is recommended).

above : Fresnel IOR 1.2
below : Fresnel IOR 10



Reflection, Filter and Mirror

Reflection Filter

While, by default, the color of the reflection is white, you can tint the reflection using the *Reflection Filter*: this function changes the color of the reflection producing different metallic like tints.

It can be useful when you want to achieve a precise chromatic result only on a given surface without changing the lighting parameters of the whole scene, which would affect the other materials too. (i.e. *Cello Metal* has a yellowish reflection filter.)

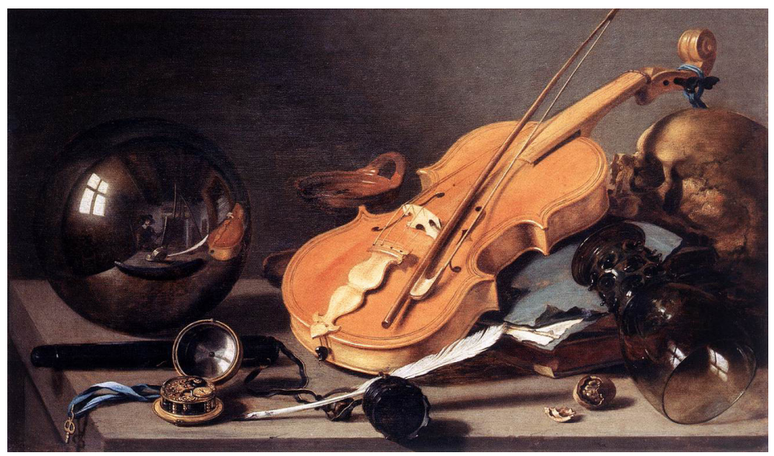
Mirrors

Similarly to what discussed about the painting within a painting, mirrors are another signature of the period; beyond being an expedient to show off the artists' skills, they allow painters to include parts of the space without changing the shot (see pictures below).

07 08

(07) cello metal includes a yellowish reflection filter to achieve that tone of color only in the reflective parts of the item.
(08) on the right a mirror like material: in order to be totally reflective, the fresnel map has been removed. Mind the pitcher: since there is nothing to reflect, it gives a black reflection because of the environnment settings of the scene.

The love letter, 1669
Johannes Vermeer
Rijksmuseum, Amsterdam



The Concert, 1665-66
Johannes Vermeer
theft

Refraction

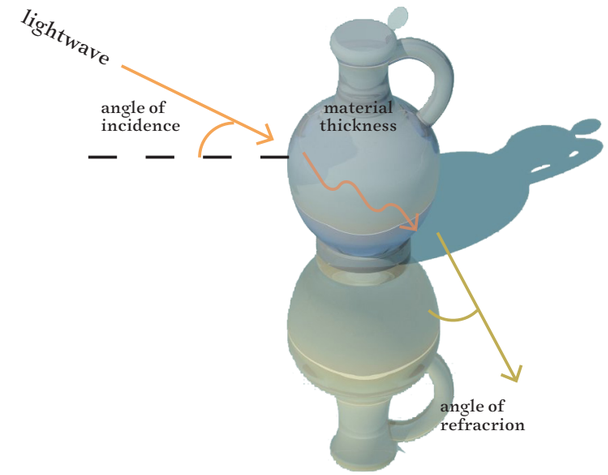
Refraction is the way that that the light wave travels through the material. Because of specific thickness and density, it is refracted in the thickness of the material as bounces off of the "substance". The angle of the light coming out of the material isn't the same as the angle of the light entering the material. This difference is measured by the *Index of Refraction* (*IOR*).

Refraction Fresnel (IOR)

As in the definition above, the angle of the light coming out of the material isn't the same as the angle of the light entering the material: this difference is measured by the *Index of Refraction (IOR)*.

The *IOR* of air in a ideal vacuum is 1.0 (meaning the angle is the same coming in the material as exiting the material). As the IOR number increases, the more refraction occurs. Many materials have a well-characterized *refractive index*, but these indexes depend strongly upon the frequency of light. By definition, the perfect *vacuum* (you can approximate the air in any interior or exterior scene as it was that) IOR value is set to 1.0.

On the right, a chart sums up the main *IOR values* you can find yourself testing along your visualization process; at this link you can find a more complete description of the chart.



glass without refraction

glass with refraction

IOR VALUE CHART

MATERIAL	IOR	MATERIAL	IOR
Vacuum	1.0	Glass	1.517
Air	1.00029	Glycerin	1.472
Alcohol	1.329	Ice	1.309
Crystal	2.0	Ruby	1.77
Diamond	2.417	Sapphire	1.77
Emerald	1.57	Water	1.33

Refraction, fog

Fog

The *Fog* parameter allows to give any refractive material a tint of color. This can be useful when attempting to create a tinted glass, adding a lot of realism because, despite of giving a simple transparency map to a colored material, it takes care of the smoothing effect of refraction through the thickness of the object in which it is applied.

The chart at the end of this page shows how intense this setting becomes approaching a 2.0 value.

the Fog parameters (Vray)

- *Fog color*

Specifies the attenuation of light as it passes through the material. This option allows the user to simulate the fact that thick objects look less transparent than thin objects.

- *Fog multiplier*

Controls the strength of the fog effect. Smaller values reduce the effect of the fog, making the material more transparent. Larger values increase the fog effect, making the material more opaque.

- *Fog bias*

Changes the way the fog color is applied. Negative values make the thin parts of the objects more transparent and the thicker parts more opaque and vice-versa.

in the previous page, the pitcher materialized in different ways:

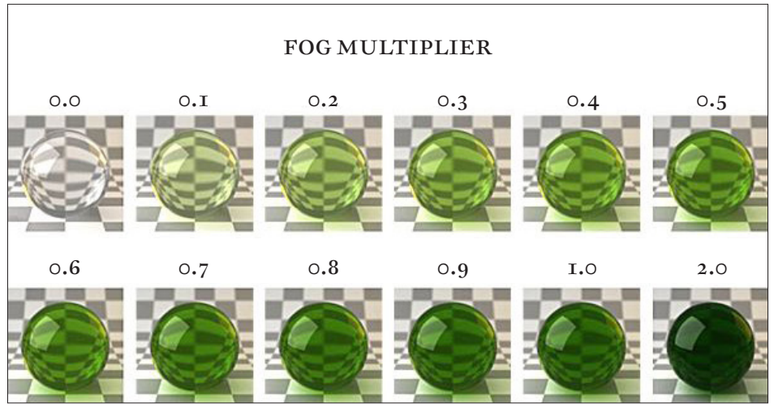
1. painting porcelain like, no refraction (the material has no transparency), fresnel reflection 1.55.

2. the surface has been offsetted of 3 mm, therefore a Fog light green color has been applied with a multiplier of 2.0 (see chart below)

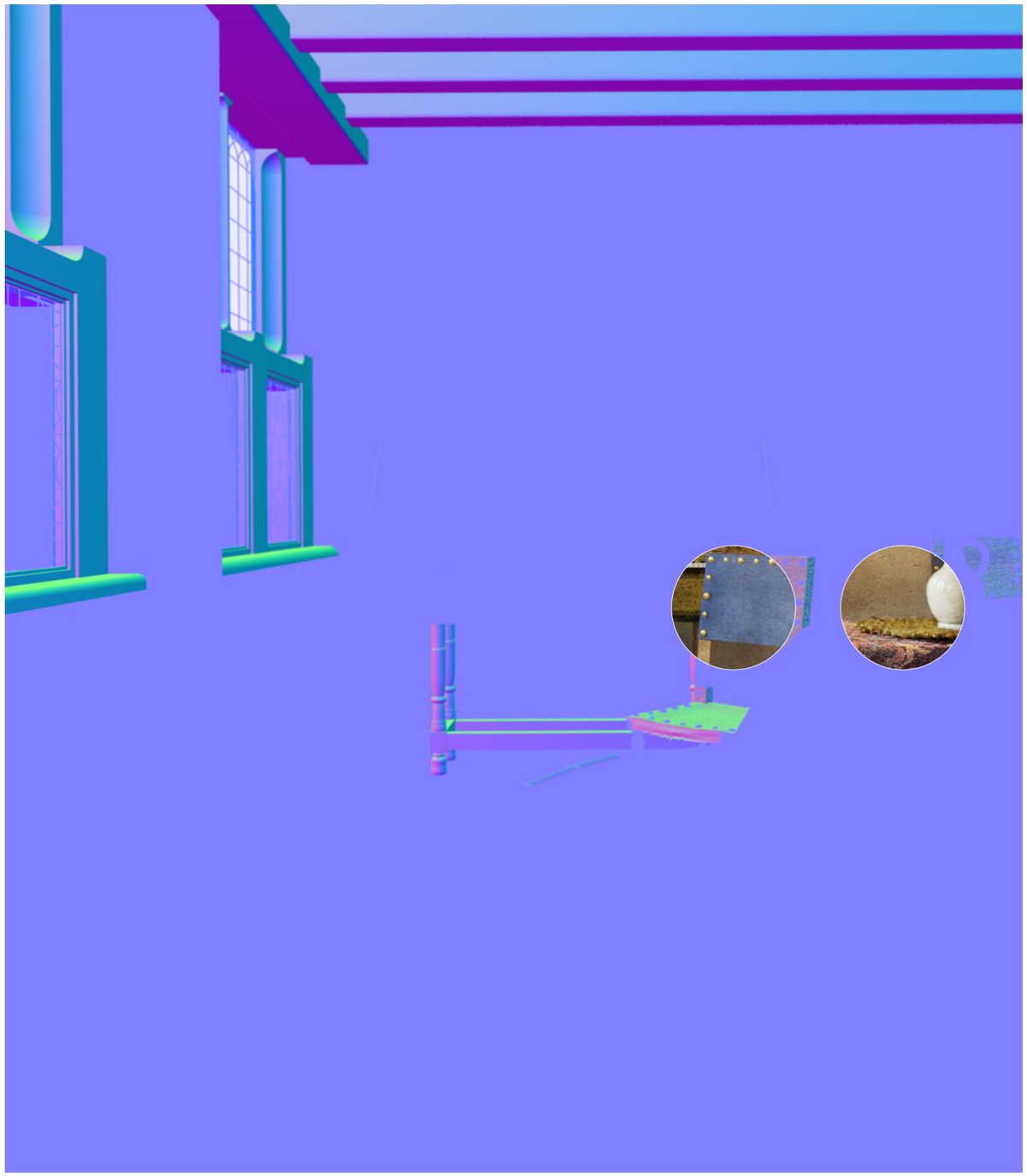
3. the fog multiplier has been decreased to 0.5, same color.

refraction

refraction with cyan fog



Bump and Displacement



Bump layer

Visually, a *bump* is a part of surface owning a slightly different orientation in space than its neighboring surface. Instead of modeling a bulge in the geometry - which would require a bunch of polygons for each bump, slowing down all related operations - you can reach the same result through the bump layer.

Changing the bump and displacement maps will help you add depth to your materials. *Bump maps* will create the illusion of depth (while displacement will actually create a 3D geometry. *Displacement maps* will take longer to render but will create much better shadows for close up renders).

The *Bump* texture maps are generally black and white, high contrast images you will add as a separate layer to a given material, like in the following example.

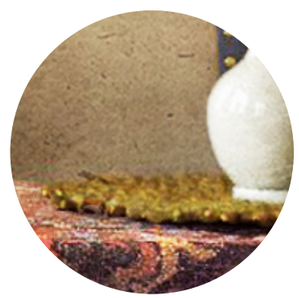
blue velvet covering the chair has as bump mapping which is the same texture applied to the material, but black and white.

Displacement mapping

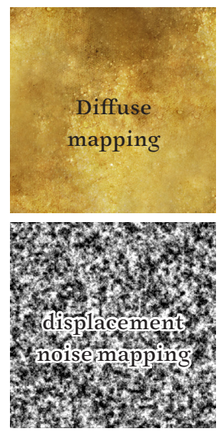
Displacement is a technique for adding detail to your scene's geometry without the need to model it first, the concept is very similar to bump mapping. However, bump mapping is a shading effect that only changes the appearance of a surface, while displacement mapping actually modifies the surface. You can use your current bump b/w map as displacement maps. The main parameter which influence the final size of the displacement is the *multiplier*; this will reference the *Amount value* in the Displacement rollout.

[N.B. In the *V-Ray Options* there is a rollout containing the parameters for displacement: these are global controls for all of the displacement throughout the scene. In order to manage each object or material's displacement you must use texture multiplier .

To mimic the frosted effect of the plate, a noise image has been assigned as displacement map in addition to the diffuse golden texture; when not rendered, the plate looks (and it is) absolutely flat.



blue velvet covering the chair has as bump mapping the same texture applied to the material, but black and white.



Fur

V-Ray Fur is a very simple procedural fur plugin. The fur is generated only during render time and is not actually present in the scene.[1]

Fur parameters (Vray)

Lenght : length of single hair

Thickness : thickness of the hair

Gravity : value of gravity; negative values will attract hair upwards.

Bend : value that determines the curvature of the hairs

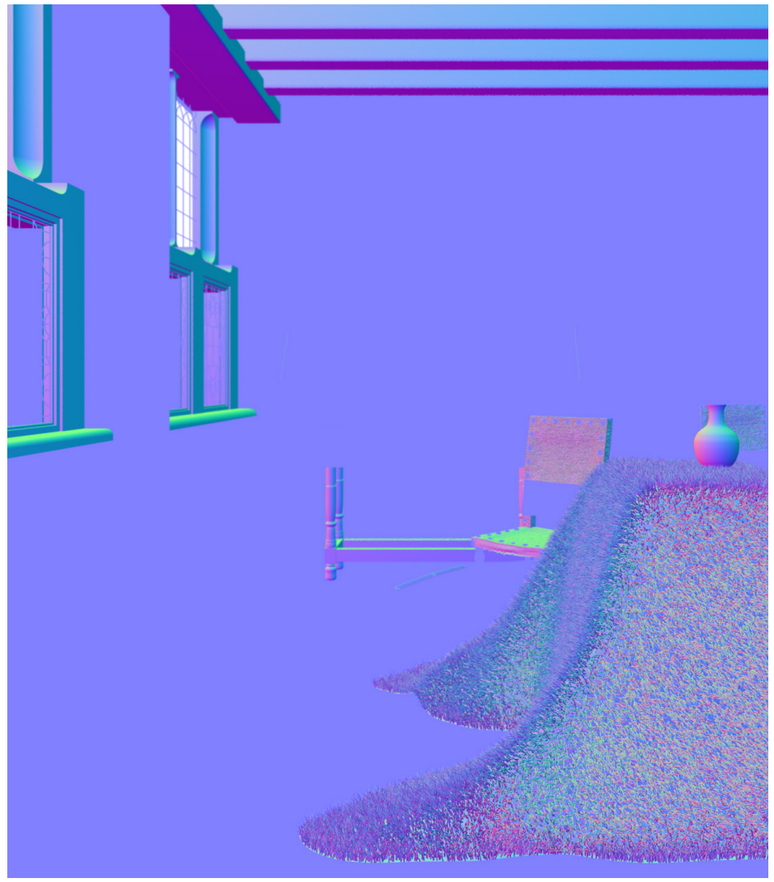
Taper : amount of tapering of hair from root to tip

Sides : indicates the number of sides of the polygon that generates the fur (3 means that the hair has a triangular section, 4 square). Even if you leave this parameter to 3 the results are still good, unless your camera is very close to the hairs.

Knots : determines the number of stitches (and consequently the number of segments) in which the hair is divided; with high values you will obtain hairs with a more rounded curvature, with low hairs with more "angular" curvature.

Moreover, through the *Variation* option group it is possible to set a variation of these parameters to make the final result more irregular and therefore more likely.

1. chaosgroup.com



as very evident in the *bump normals channel*, the surface on which it has been applied a Fur (here the carpet) generates in the rendering phase a considerable quantity of surfaces - depending on the distribution parameter amount - , each of which has its own orientation and consequent set of normal vectors.

The yield times are slightly shorter when compared this technique to those of the method *Hair + MoGraph + VrayProxy*. In the end, among the available techniques, Vray Fur is without any doubt the most efficient one to create fur/grass like textures in terms of easiness, but also as a matter of memory used by the software in both phases of modeling (the plugin doesn't affect the scene) and rendering.

In the previous page, a fur has been generated with the following parameters:

Length : 3
Thickness : 0.5
distribution : 1
bend : 0.8

Then a seamless grass texture has been applied to the fur item and to the carpet below. No post-production was needed.

Emissive materials

Emissive materials are self-illuminated materials, that is they can emit light across their surface. When an emissive material is used in a scene, it is rendered as a visible light source, and depending on its intensity, its glow can light up the surrounding area. These types of material can be used to create effects such as a neon sign, a glowing lamp shade, a tv/ computer screen or a candle.

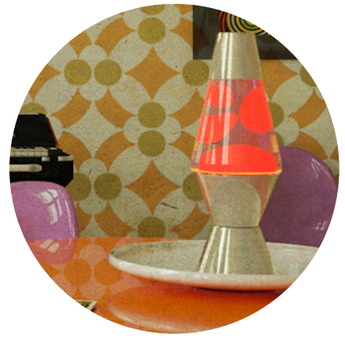
These materials belong to the *global illumination* calculation (we'll see this more in detail in the light handbook, anyway, in general when light hits a surface bounces all around and, with *GI* algorithm enabled, these bounces result as an indirect light, which illuminates areas otherwise dark in the scene); emissive materials are part of, meaning they emit indirect light.

Mind that emissive materials may considerably increase render times, up to extreme amounts (even 100 times); do not use these materials as the sole lighting for a scene. It's suggested instead, for best results, to use an artificial (i.e. point light, we'll see this in the light handbook) and only use emissive materials for the glowing that they're meant for. The changes that you make in the *Emissive layer* will affect the light emitted from the material, not the underlying color itself.

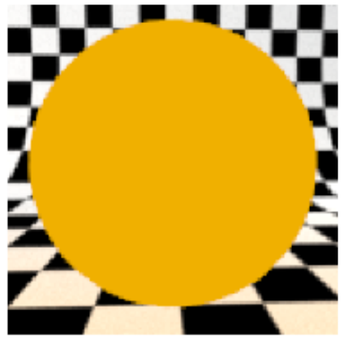
Sometimes emissive materials can be noisy and cause an effect known as *fireflies*; in case you may encounter this problem, decrease the brightness of your emissive surface and increase the point light associated.

how to make a lava lamp

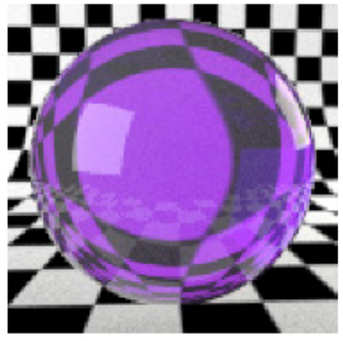
lava lamp is a very fascinating item, specially when it's about finding a good way to visualize it, since its content features phenomena such as reflection, refraction (both with fresnel IOR peculiar properties) and emittivity, therefore combining many aspects analized in the previous pages.



1. lava-like red plasma bubbles of different shape and dimension (although part of the difference between them is a consequence of the glass distortion) with emissive layer to let them glow;



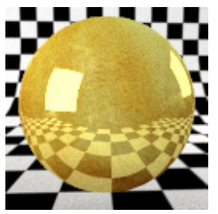
2. an emissive yellow surface has been placed below the magma bubbles, in order to create a gradient of fire-like light within the lamp and play with internal reflecions;



3. a transparent shell to enclose the magma; the glass like material has a reflective layer (with a fresnel IOR 1.55 value like normal glass would be) and a refractive layer tinted with purple fog

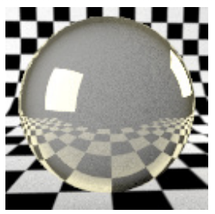
Marble white tiles

- diffuse map white marble texture (scaled to fill the whole pavement, miming the painting)
- reflection 0.1 (white)



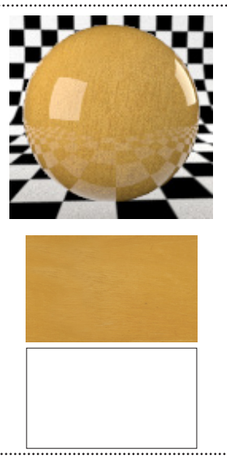
Golden buttons

- diffuse map golden leaf texture
- reflection 0.3 (dark grey)
- reflection filter (RGB 251,251,142)
- reflection glossiness 1.0 (same map of diffuse)



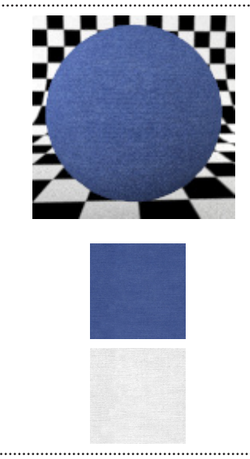
Metal cello component

- diffuse grey
- reflection 5.0 (white)
- reflection filter (255,248,208)
- reflection glossiness 1.0 (Fresnel IOR 1.0)



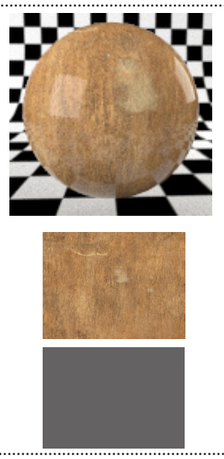
Wooden cello

- diffuse map wood texture 01
- reflection white



Blue velvet chair

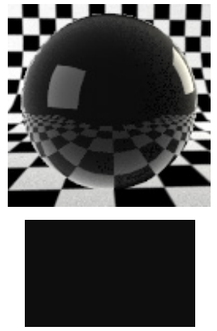
- diffuse map blue velvet texture
- bump map 1 (same texture)



Wooden chair parts

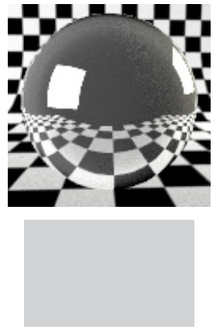
- diffuse map wood 02 texture
- reflection 2.0 (dark grey)
- reflection glossiness 1.0

the Music Lesson materials



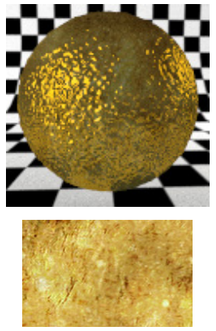
Black mirror frame

- diffuse black (0,0,0)
- reflection 1.5 (fresnel IOR 1.2)
- reflection glossiness (fresnel IOR 1.2)



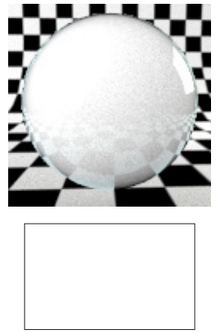
Mirror reflection

- diffuse black (0,0,0,)
- reflection 10 (Fresnel IOR 1.55)
- reflection glossiness 1.0 (Fresnel IOR 1.55)



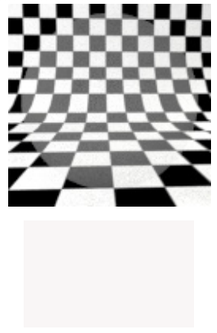
Golden crispy plate

- diffuse map golden leaf texture (box mapping)
- displacement map (TexNoise, size 1.0, ampl. 2.0)
- reflection 1.2 (grey)
- reflection filter (160,121,11)



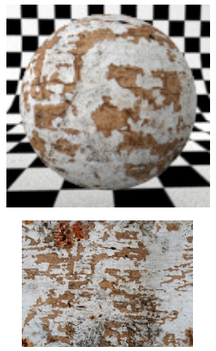
White Porcelain pot

- diffuse color white 100%
- reflection 2.0 (fresnel 1.55)
- reflection filter 1.0 (160,121, 11)
- Fresnel IOR 1.2 on reflection layer



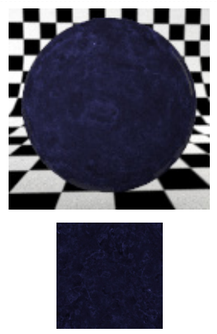
Semi-transparent glass

- diffuse white color.
- transparency 1.0 (light grey 245)
- no reflection, no refraction



Grunge window wood exterior

- diffuse map grunge wood texture

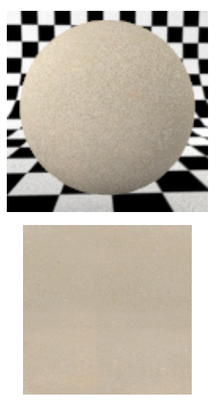


Black marble tiles

- diffuse map dark marble texture
- reflection 0.05 (white 100%)

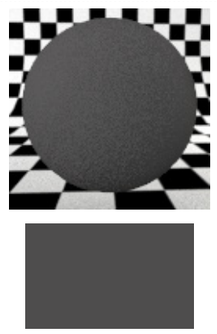
Virginal Seahorse frieze

- diffuse map set of textures extracted from the painting and applied as surface mapping on the faces of the virginal.



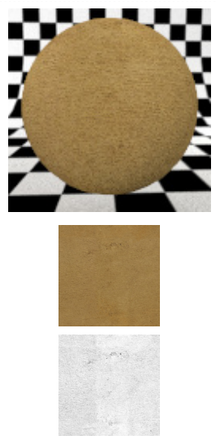
Dirty Plaster Walls

- diffuse map texture dirty plaster



Lead window frames

- diffuse color dark gray



Wooden window

- diffuse map wood texture 03 (mix of box mapping and surface mapping)
- roughness map wood texture 03 (black and white version)
- reflection 0.1 (black 0,0,0)

Beams wood

- diffuse map wood texture 04 box mapping mapping)
- roughness map wood texture 04 (black and white version)