stunning materials & finishes
from good to great

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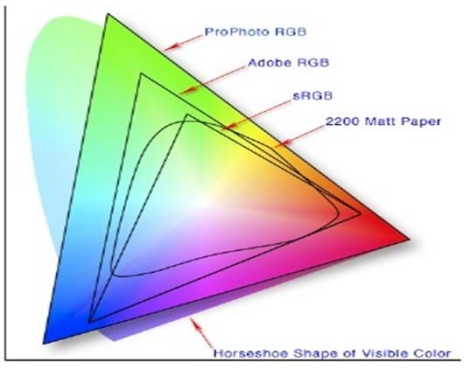
agenda

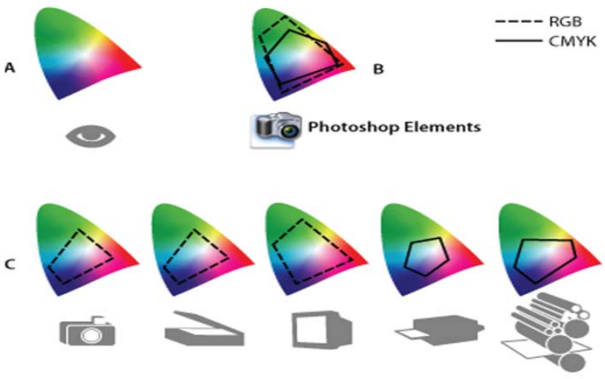
color management 101
colors & 3ds Max

measuring diffuse colors
measuring reflectivity

bring materials to life

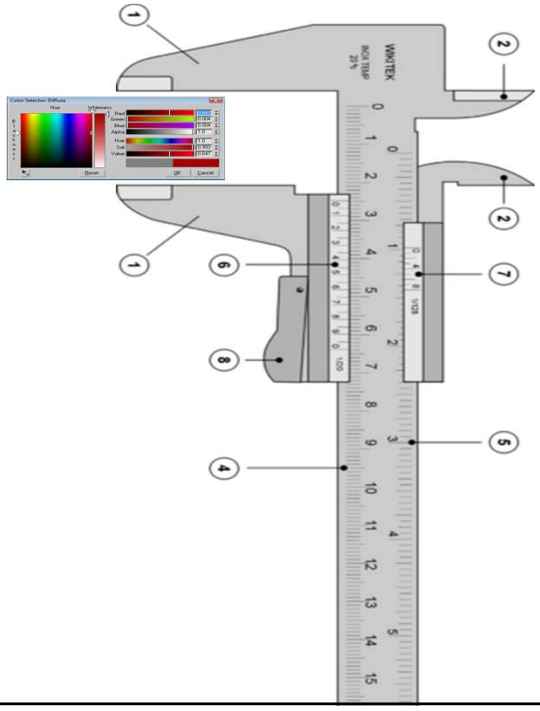
color management provides a solid foundation

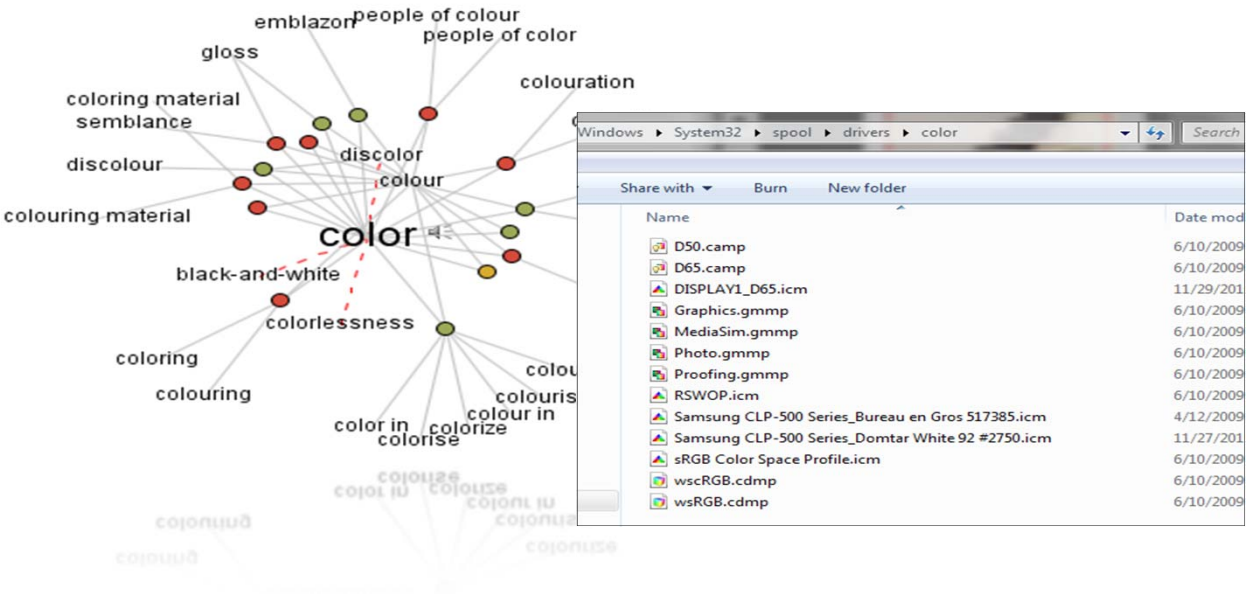




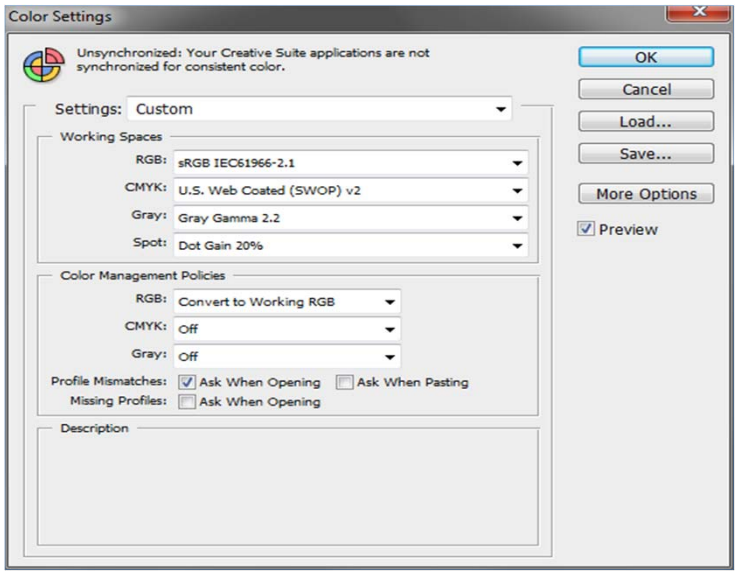
different devices implies various ranges of possible colors

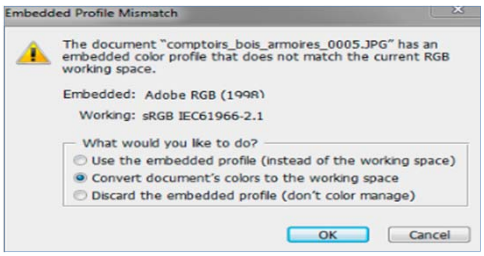
spectrophotometers are precision devices to **measure** colors





ICC profile: thesaurus for colors

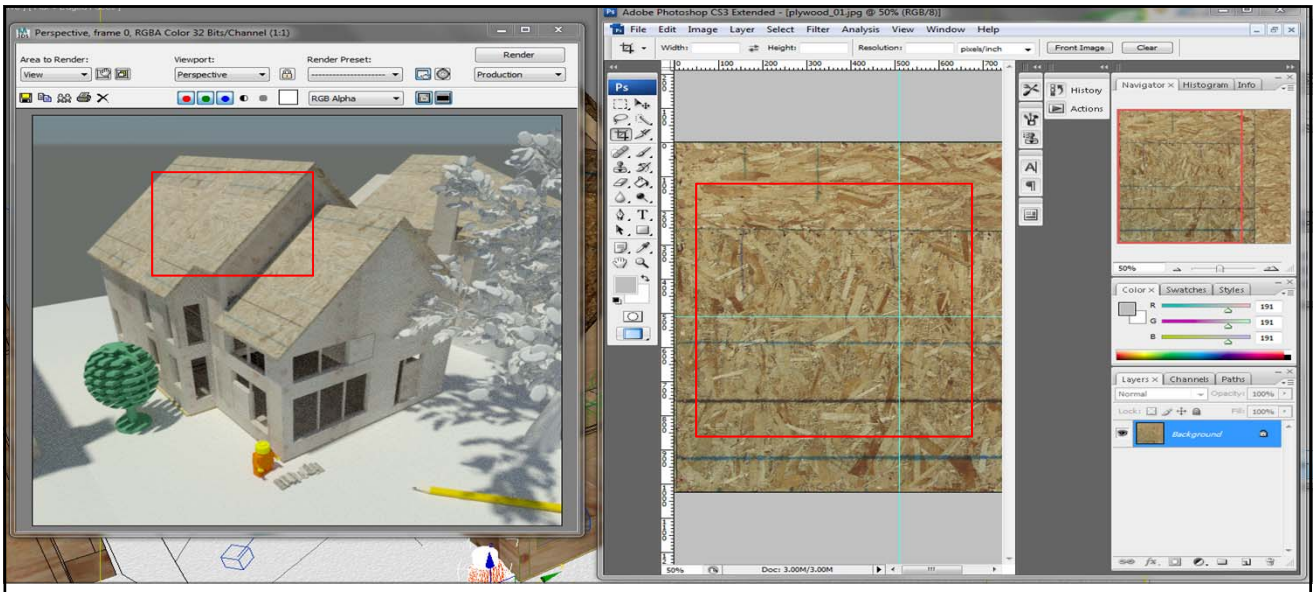




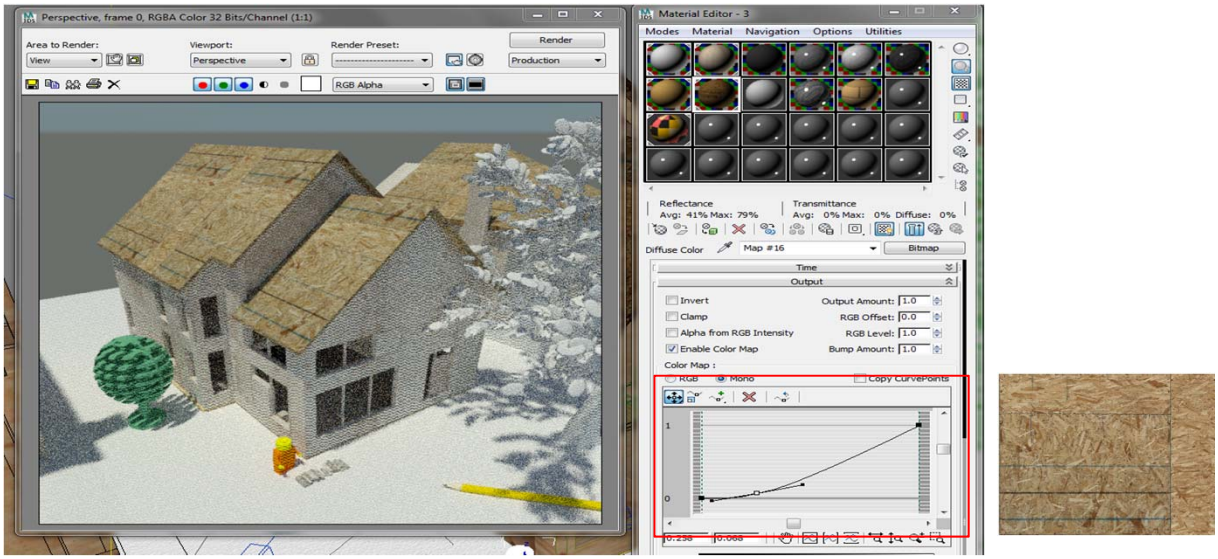
enabling color management in Photoshop

color management
&
3ds Max

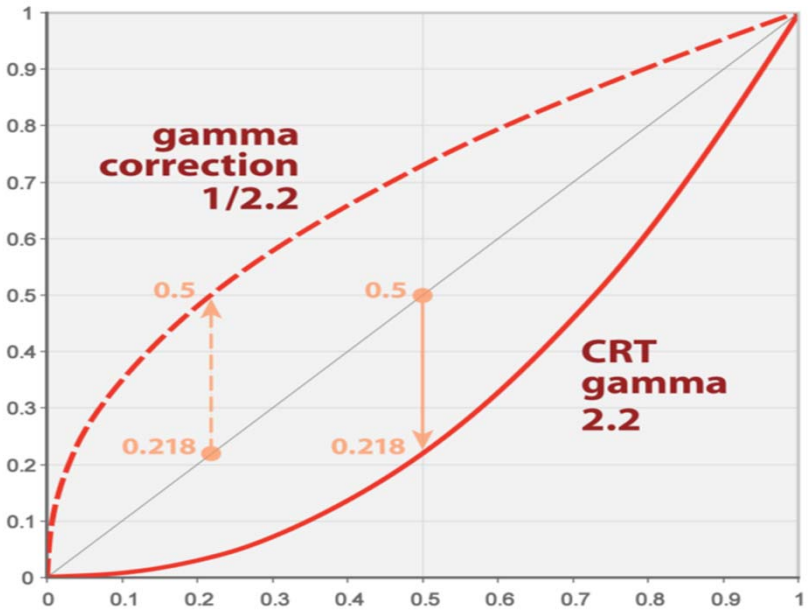
"the linear workflow"



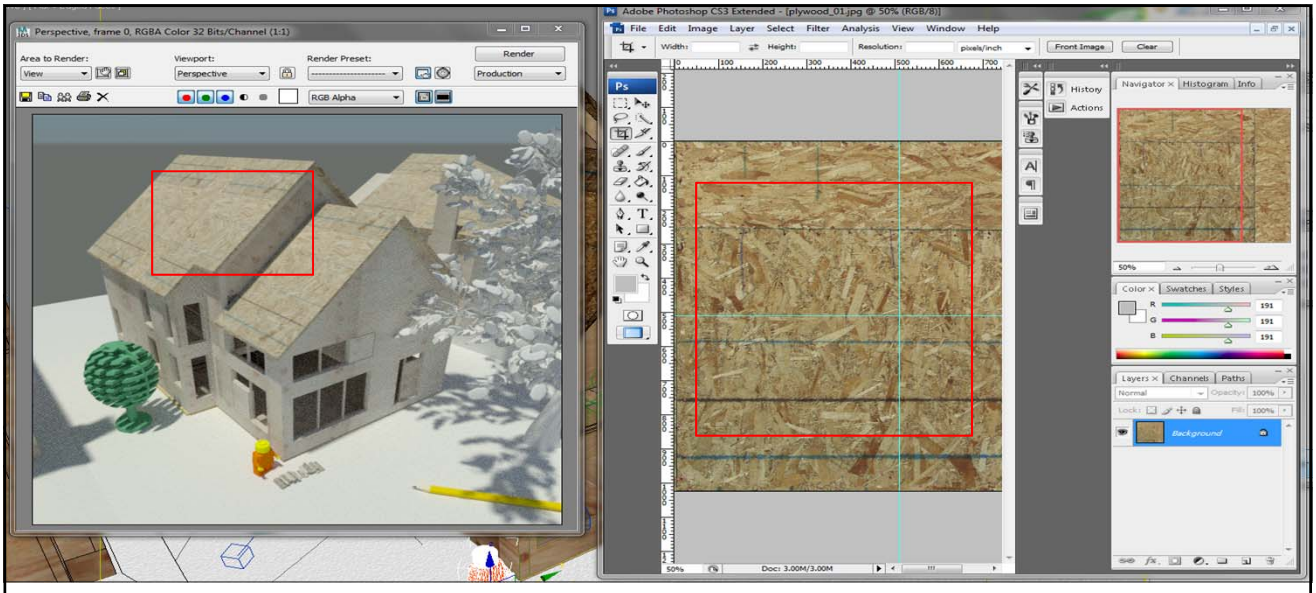
why colors don't match between Photoshop and 3ds Max?



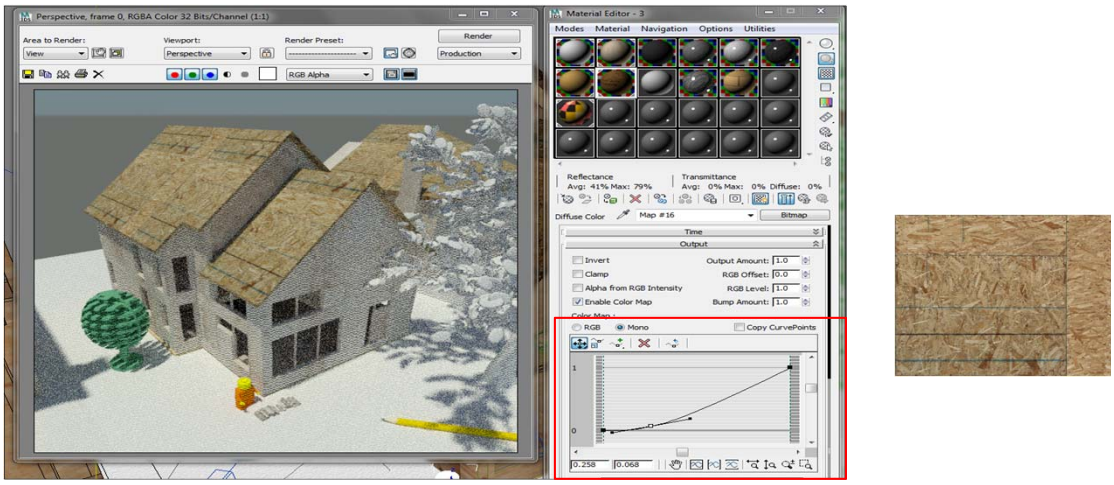
this is closer to what we want, done the wrong way!



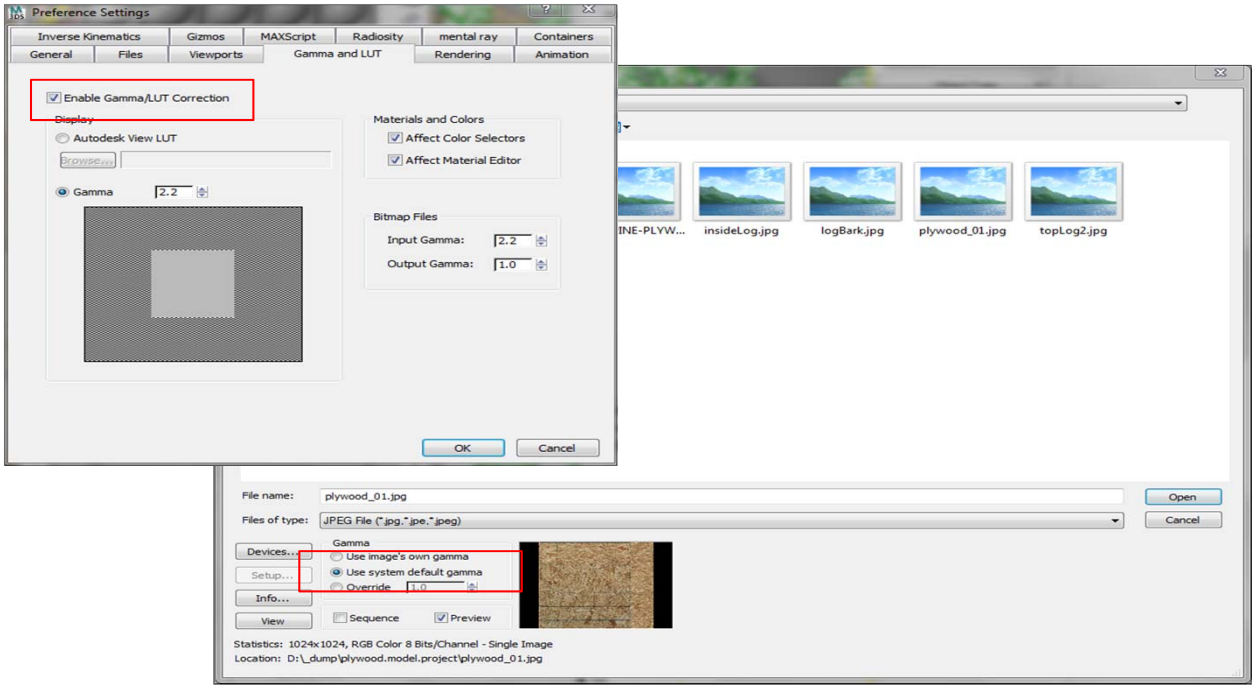
gamma correction is born: images looked better with it!



what was good for display…
made it wrong for rendering!



we end-up fighting gamma correction embedded in textures: they need to be “de-gamma” to maintain light physics.



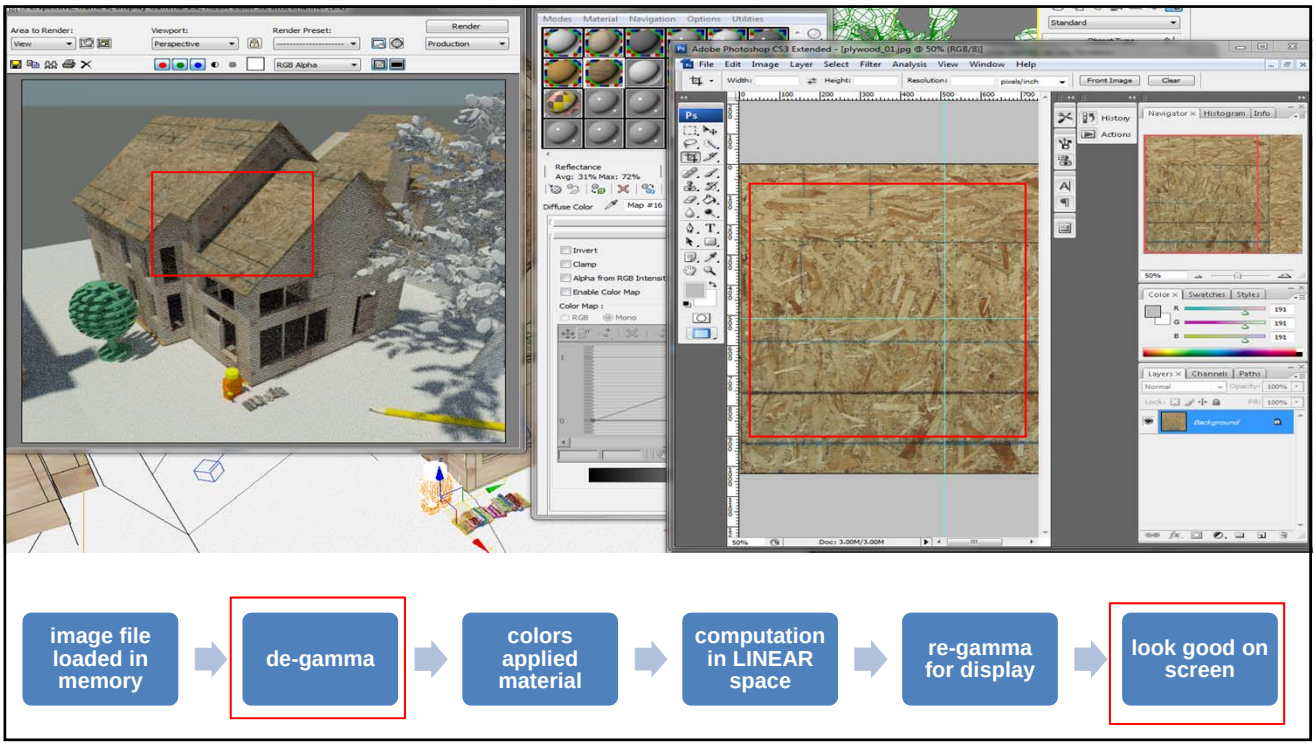
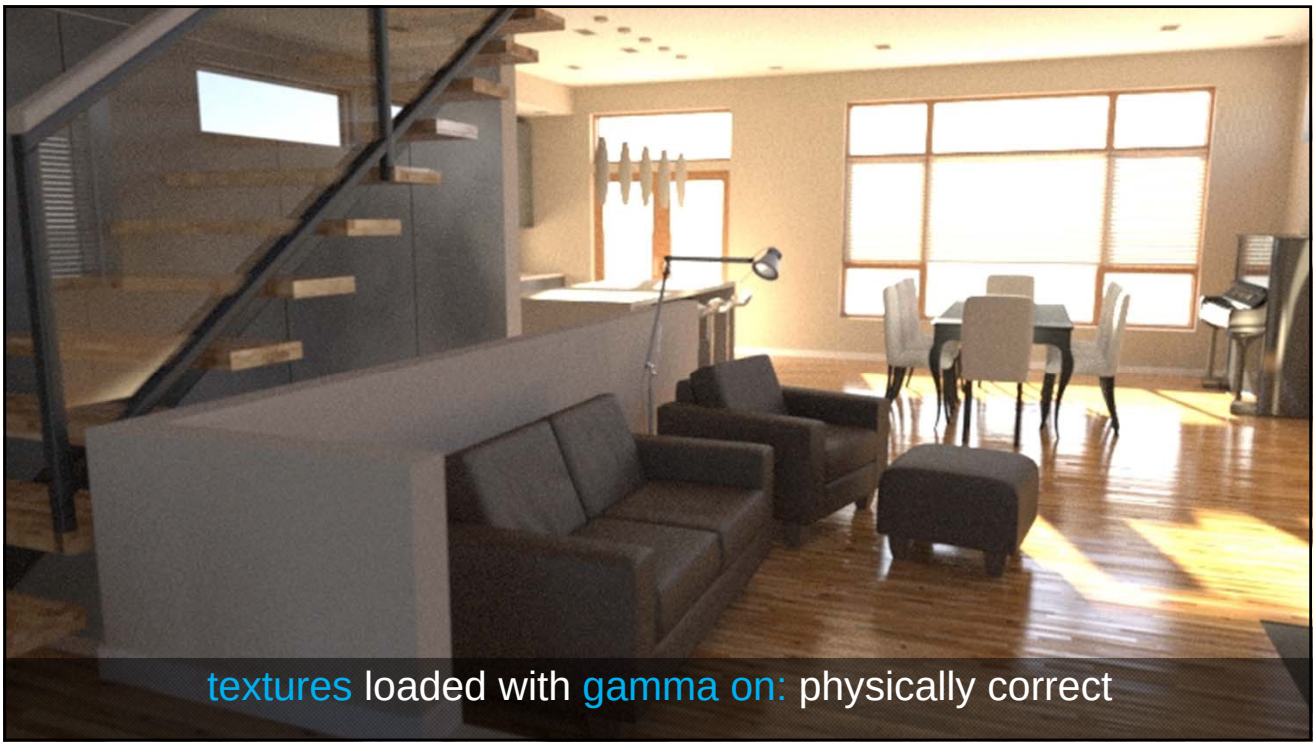
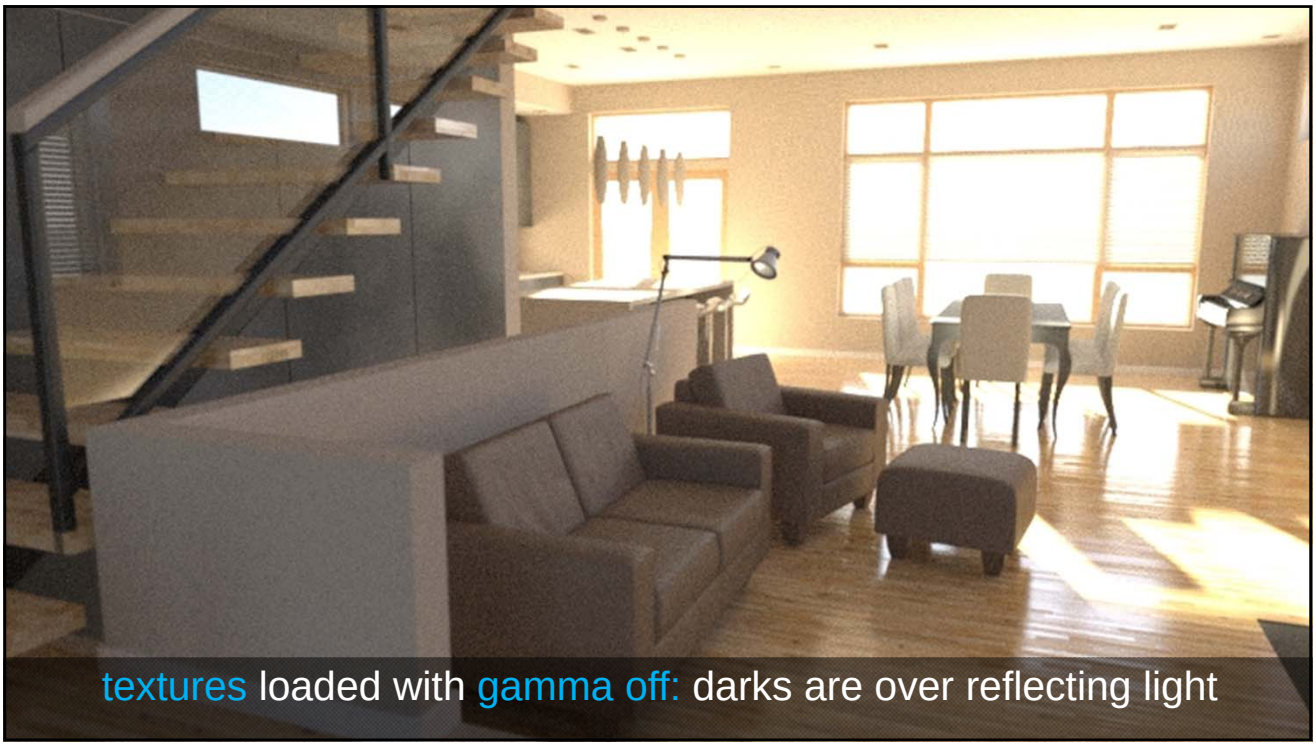
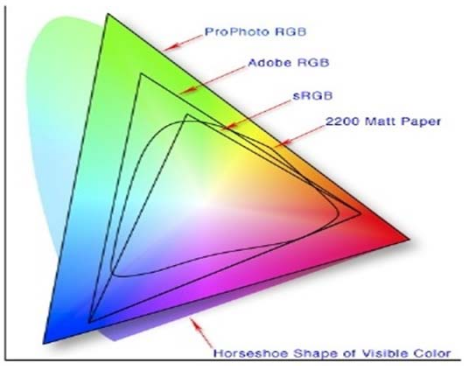


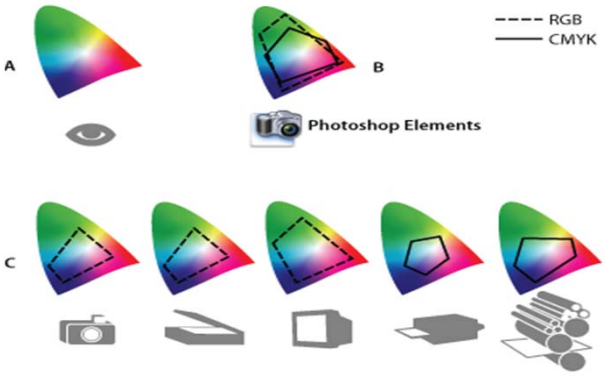
image file loaded in memory
de-gamma
colors applied material
computation in LINEAR space
re-gamma for display
look good on screen


textures loaded with gamma on: physically correct



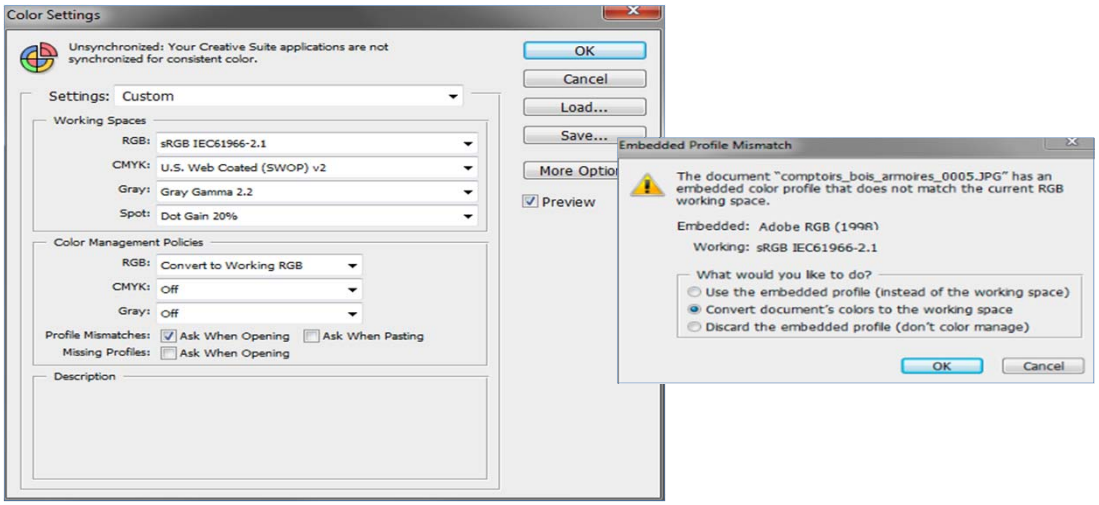
ICC profiles
&
3ds Max



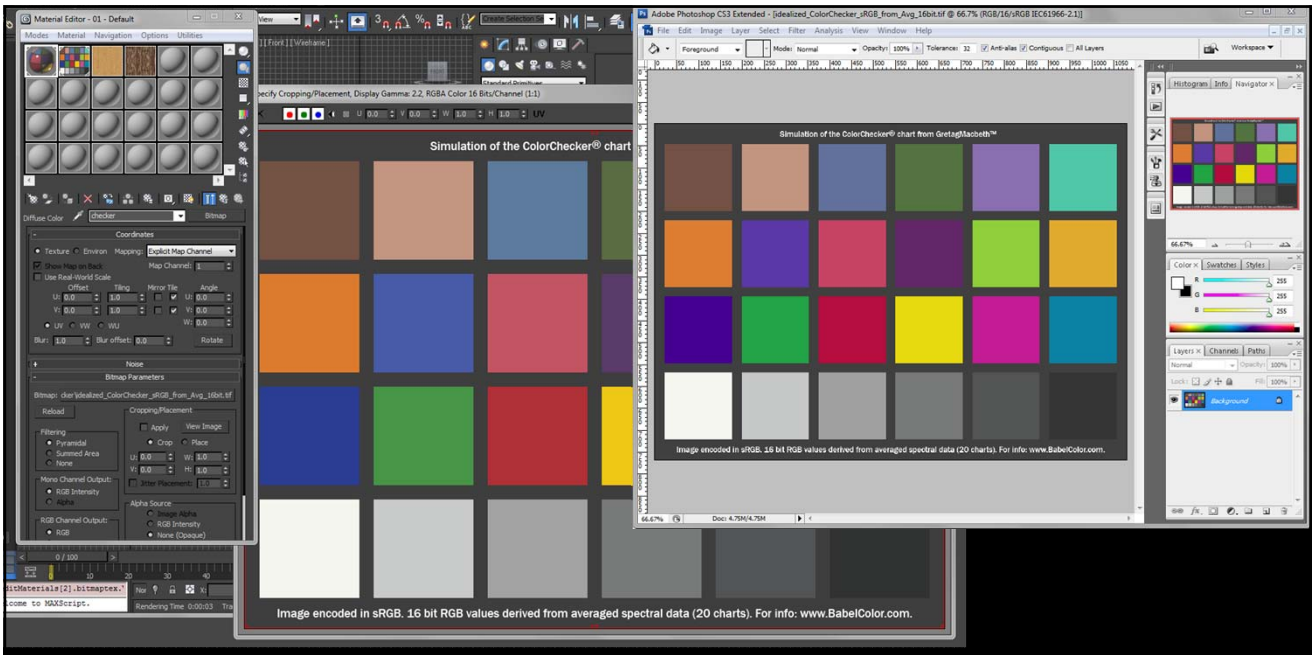


limitation: 3ds Max can't use color profiles

the closest to gamma 2.2 is sRGB

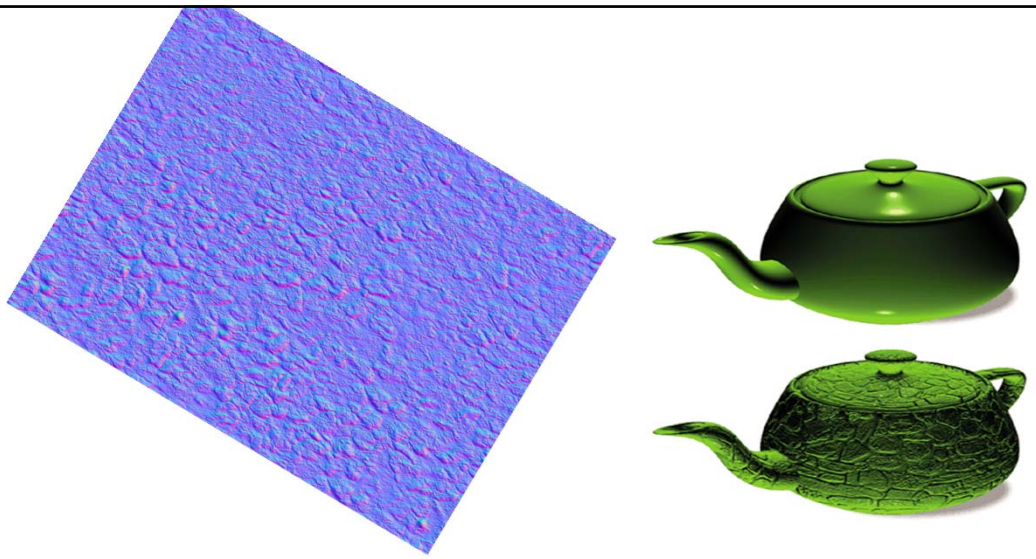


work with an sRGB profile
you will get the closest possible match in 3ds Max.

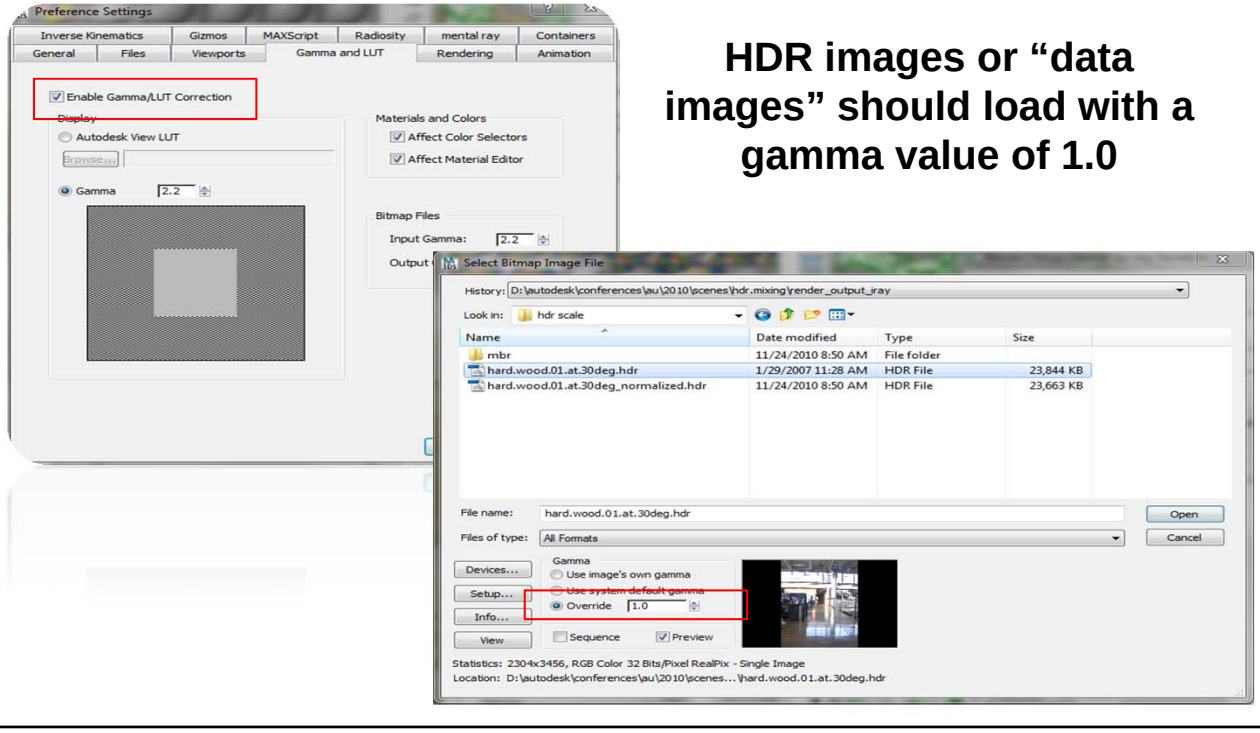


its not perfect but there is nothing you can do about it

gamma
&
pixels used as data



normal maps, displacement maps etc.



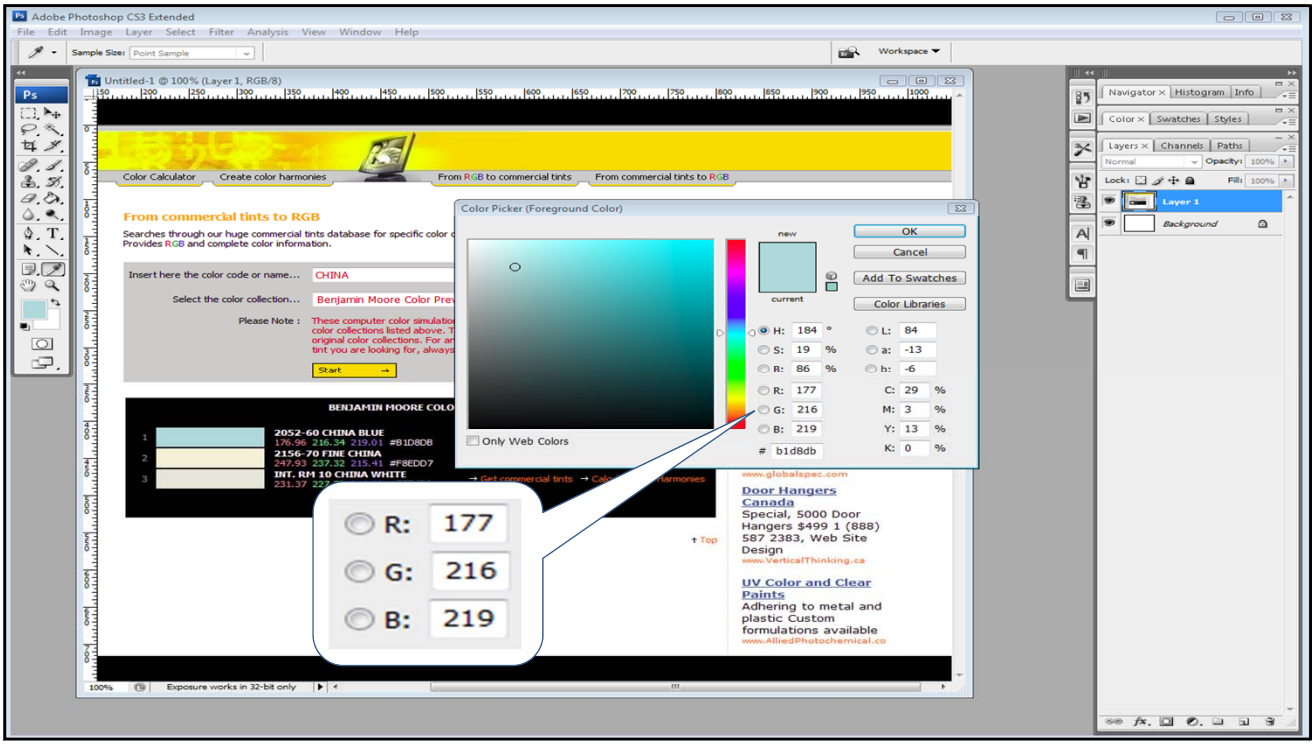
HDR images or “data images” should load with a gamma value of 1.0

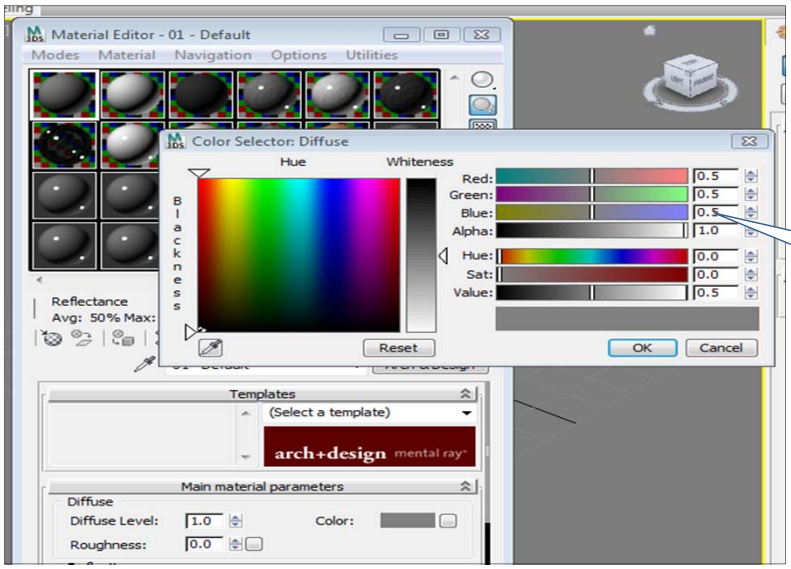
short note about the 3ds Max color picker

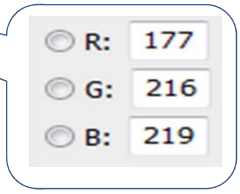
"paint 'china blue' is RGB:176.96 216.34 219.01"

- the manufacturer

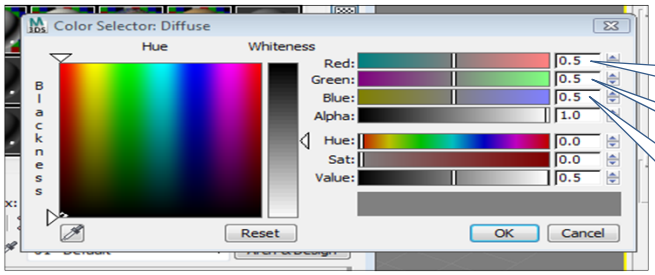

EasyRGB
Color Calculator
Create color harmonies
From RGB to commercial tints
From commercial tints to RGB
From commercial tints to RGB
Searches through our huge commercial tints database for specific color codes or names.
Provides RGB and complete color information.
Insert here the color code or name...
CHINA
Select the color collection...
Benjamin Moore Color Preview
Please Note :
These computer color simulations only approximate the real color cards, fandecks or color collections listed above. This site can NOT perfectly represent or substitute the original color collections. For any practical purpose, once you get an idea about the tint you are looking for, always refer to the original tint supplier.
Start
BENJAMIN MOORE COLOR PREVIEW
2052-60 CHINA BLUE
176.96 216.34 219.01 #B1D8DB
2156-70 FINE CHINA
247.93 237.32 215.41 #F8EDD7
INT. RM 10 CHINA WHITE
231.37 227.78
Get commercial tints → Calculator → Harmonies
Top
BENJAMIN MOORE COL
1
2052-60 CHINA BLUE
176.96 216.34 219.01 #B1D8DB

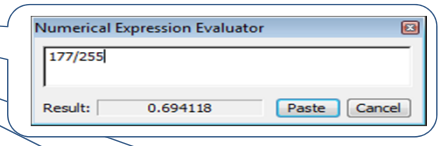

Adobe Photoshop CS3 Extended
Color Picker (Foreground Color)
OK
Cancel
Add To Swatches
Color Libraries
Only Web Colors
R: 177
G: 216
B: 219
2052-60 CHINA BLUE
2156-70 FINE CHINA
INT. RM 10 CHINA WHITE
Door Hangers Canada
Special, 5000 Door Hangers $499 1 (888) 587 2383, Web Site Design
UV Color and Clear Paints
Adhering to metal and plastic Custom formulations available

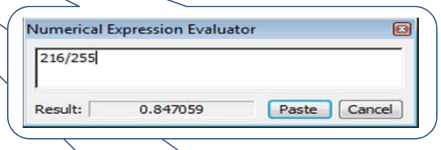


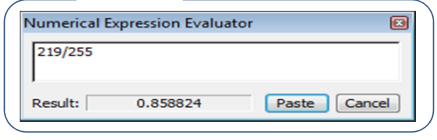


3ds Max expects
float colors!

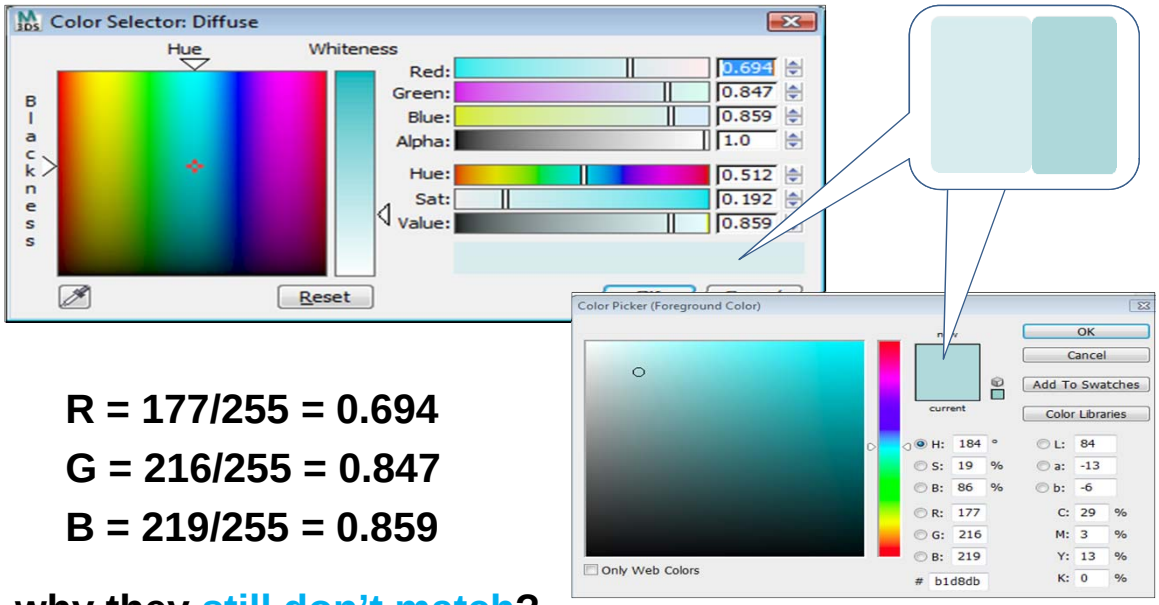








R = 177/255 = 0.694
G = 216/255 = 0.847
B = 219/255 = 0.859

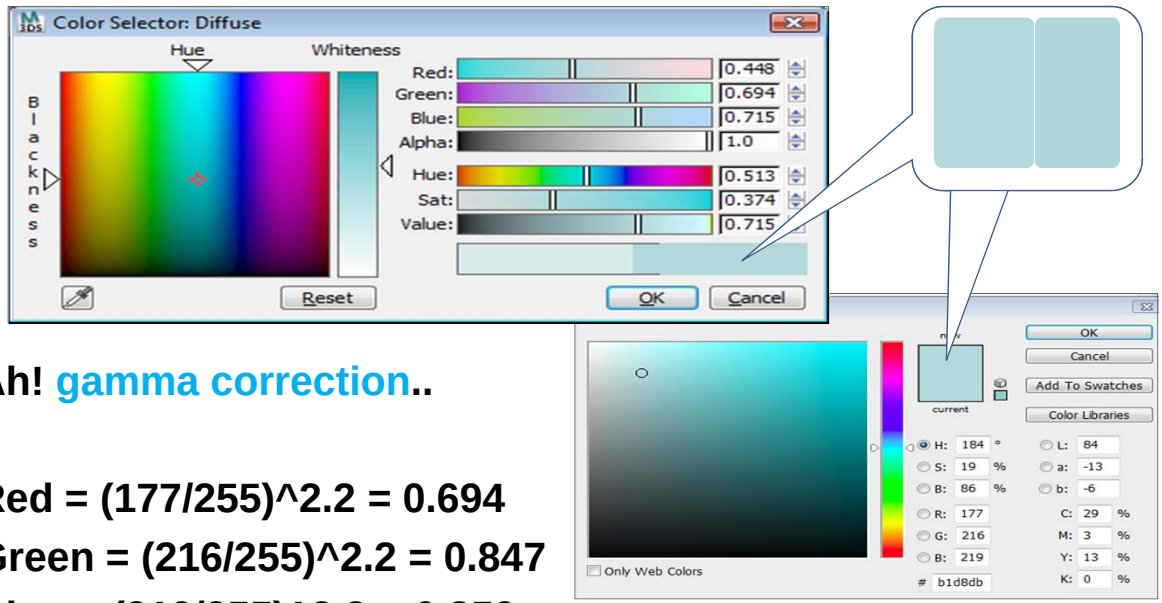


R = 177/255 = 0.694

G = 216/255 = 0.847

B = 219/255 = 0.859

why they still don't match?



Ah! gamma correction..

Red = (177/255)^2.2 = 0.694

Green = (216/255)^2.2 = 0.847

Blue = (219/255)^2.2 = 0.859

color management recap

profile your monitor regularly (~every month)

profile your printer each time you change paper

enable gamma correction in 3ds Max

save your images with a widely used ICC profile (ex: sRGB) to overcome limitations of 3ds Max

color management recap

use a gamma correction set to 2.2 for LDR images

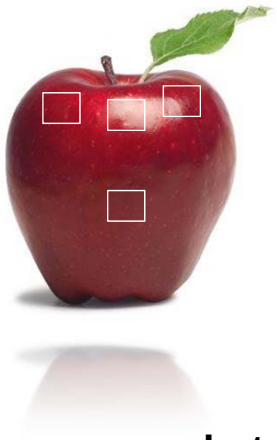
use a gamma correction of 1.0 for HDR images

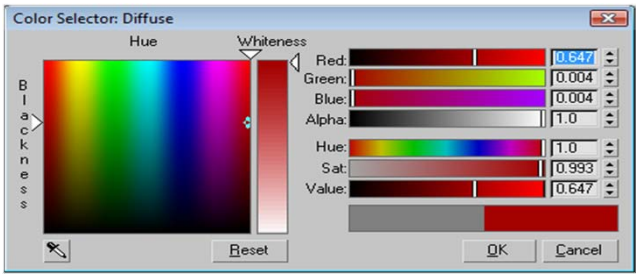
use a gamma correction of 1.0 for “Data” images

3ds max color picker expects color in “linear/physical” space

Photoshop color picker expects color in “screen/perceptual” space

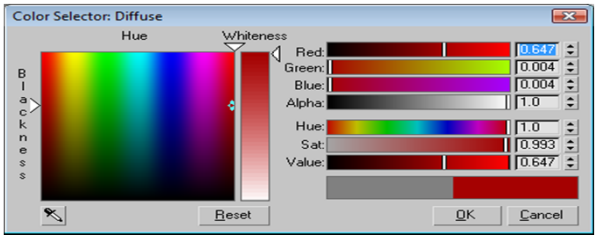
color measurement

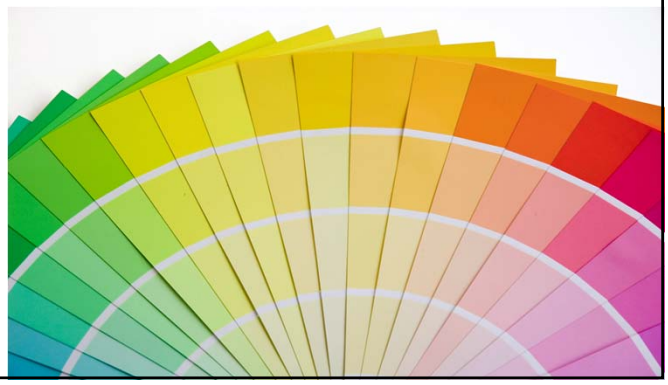




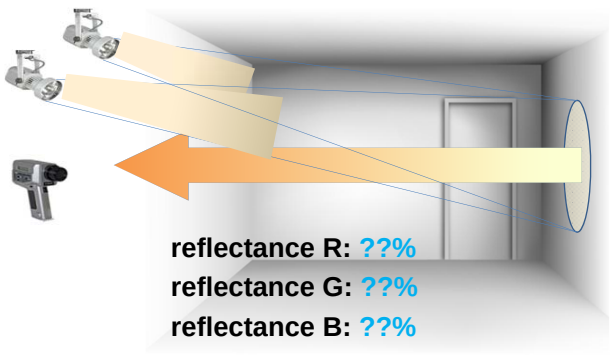
what is the right color to choose?

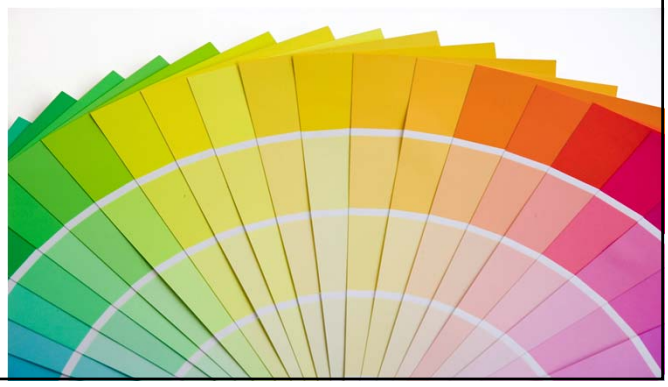
the COLOR of the wall?

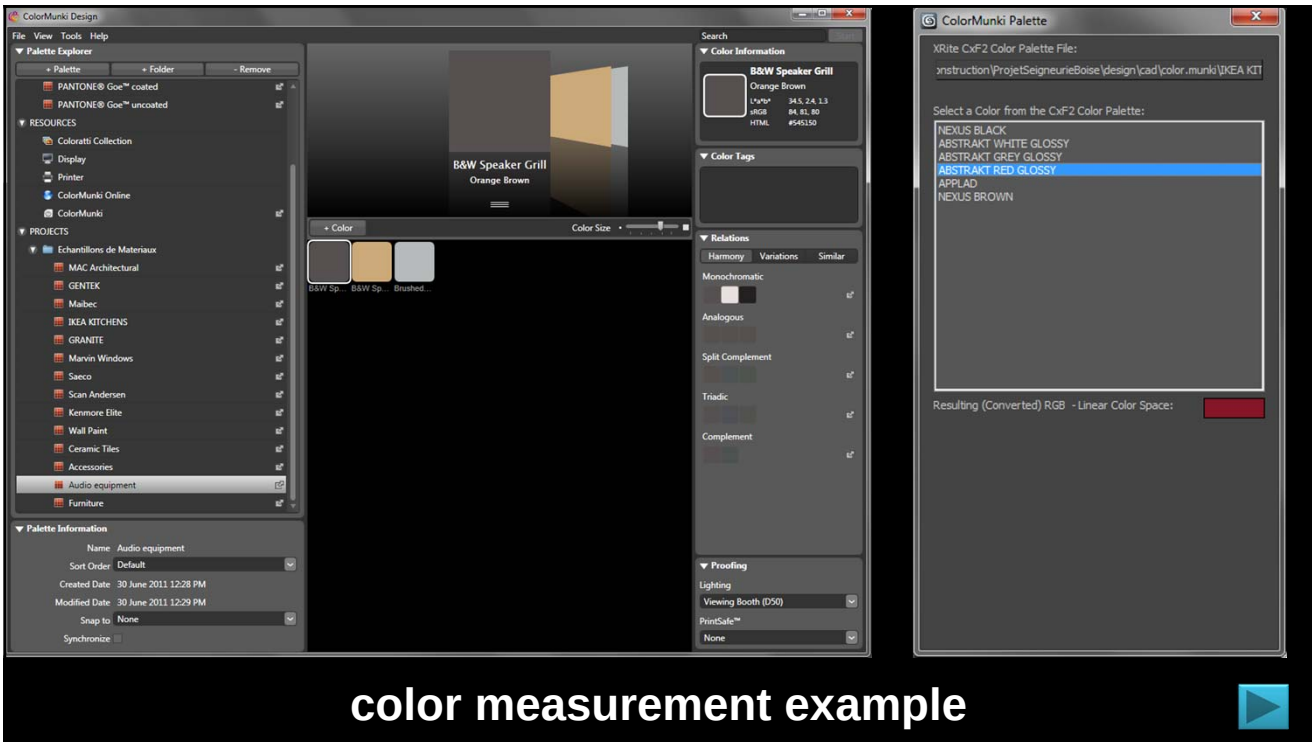


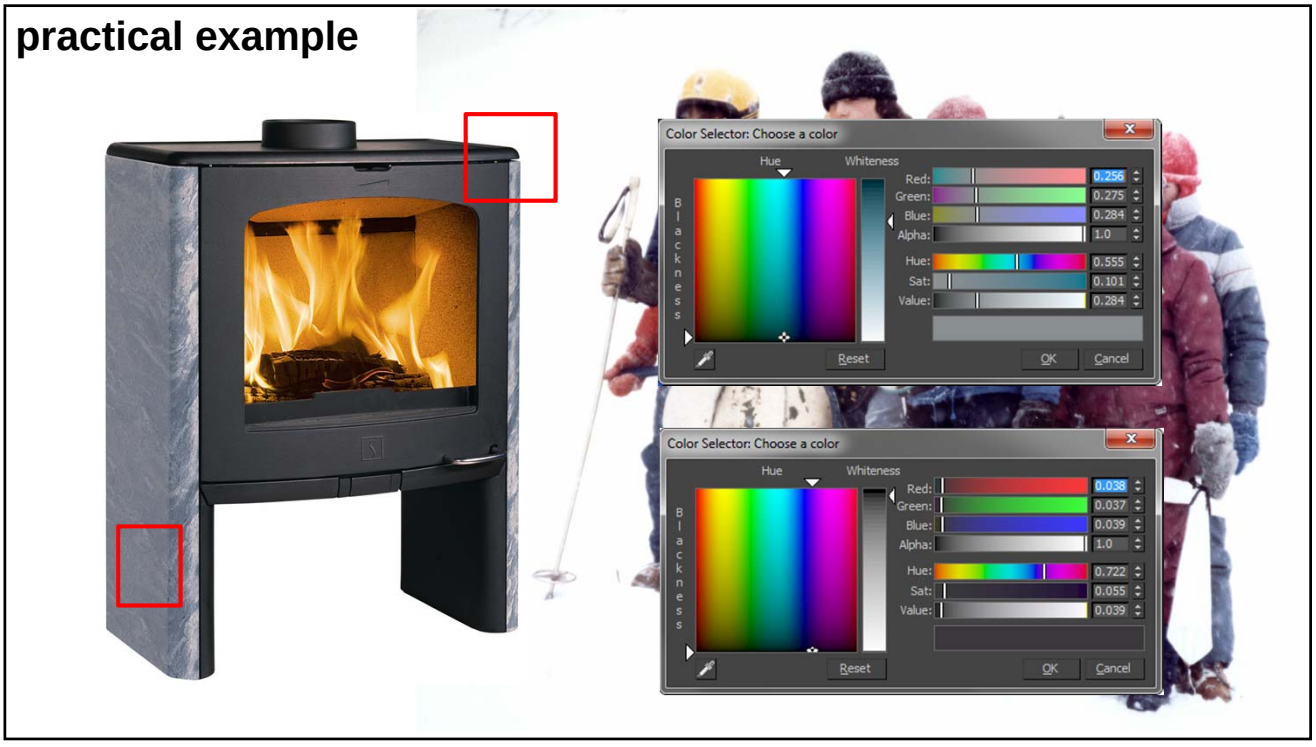


the reflectance of the wall

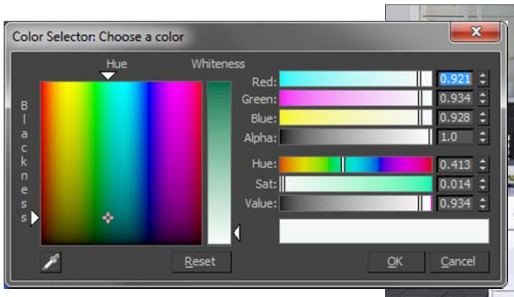


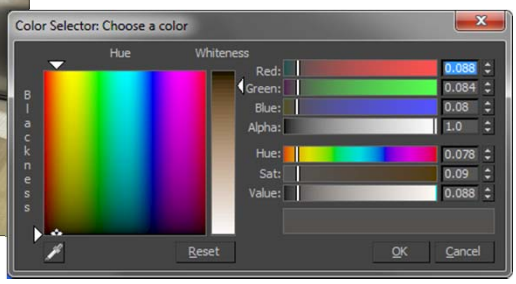



ColorMunki Design
File View Tools Help
Palette Explorer
+ Palette
+ Folder
- Remove
PANTONE® Goe™ coated
PANTONE® Goe™ uncoated
RESOURCES
Coloratti Collection
Display
Printer
ColorMunki Online
ColorMunki
PROJECTS
Echantillons de Materiaux
MAC Architectural
GENTEK
Maibec
IKEA KITCHENS
GRANITE
Marvin Windows
Saeco
Scan Andersen
Kenmore Elite
Wall Paint
Ceramic Tiles
Accessories
Audio equipment
Furniture
Palette Information
Name Audio equipment
Sort Order Default
Created Date 30 June 2011 12:28 PM
Modified Date 30 June 2011 12:29 PM
Snap to None
Synchronize
B&W Speaker Grill
Orange Brown
+ Color
Color Size
Search
Color Information
B&W Speaker Grill
Orange Brown
Color Tags
Relations
Harmony
Variations
Similar
Monochromatic
Analogous
Split Complement
Triadic
Complement
Proofing
Lighting
Viewing Booth (D50)
PrintSafe™
None
ColorMunki Palette
XRite CxF2 Color Palette File:
onstruction\ProjetSeigneurieBoise\design\cad\color.munki\IKEA KIT
Select a Color from the CxF2 Color Palette:
NEXUS BLACK
ABSTRAKT WHITE GLOSSY
ABSTRAKT GREY GLOSSY
ABSTRAKT RED GLOSSY
APPLAD
NEXUS BROWN
Resulting (Converted) RGB - Linear Color Space:
color measurement example


practical example
Color Selector: Choose a color
Hue
Whiteness
Blackness
Red: 0.256
Green: 0.275
Blue: 0.284
Alpha: 1.0
Hue: 0.555
Sat: 0.101
Value: 0.284
Reset
OK
Cancel
Color Selector: Choose a color
Hue
Whiteness
Blackness
Red: 0.038
Green: 0.037
Blue: 0.039
Alpha: 1.0
Hue: 0.722
Sat: 0.055
Value: 0.039
Reset
OK
Cancel

practical example





practical example

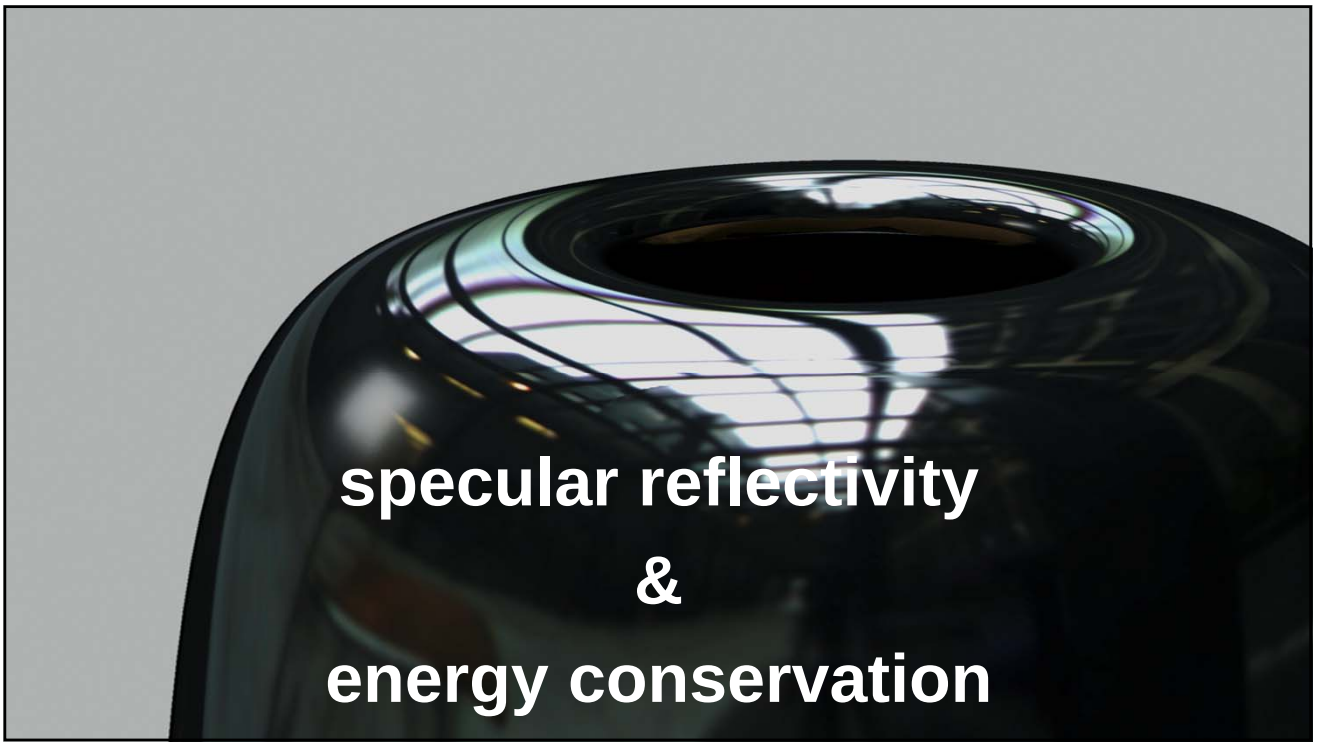
diffuse color recap

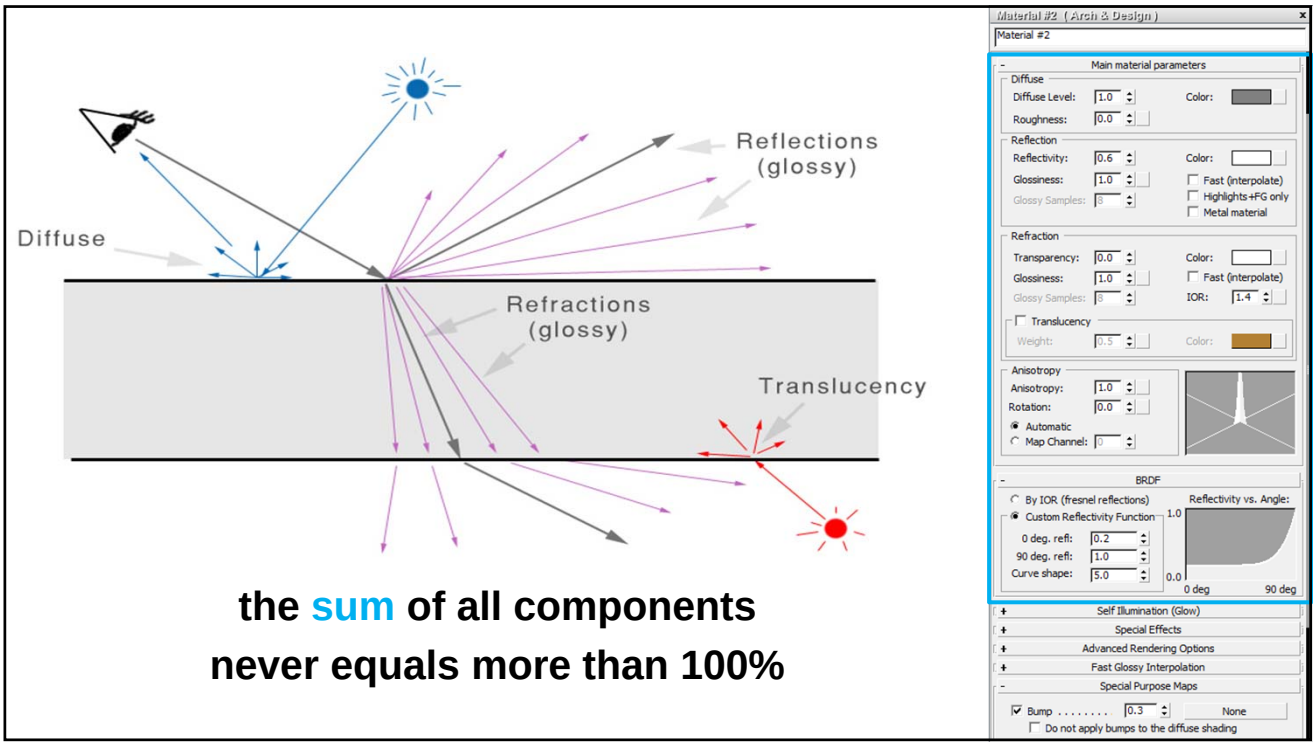
the diffuse color of a material represents the amount of reflectance

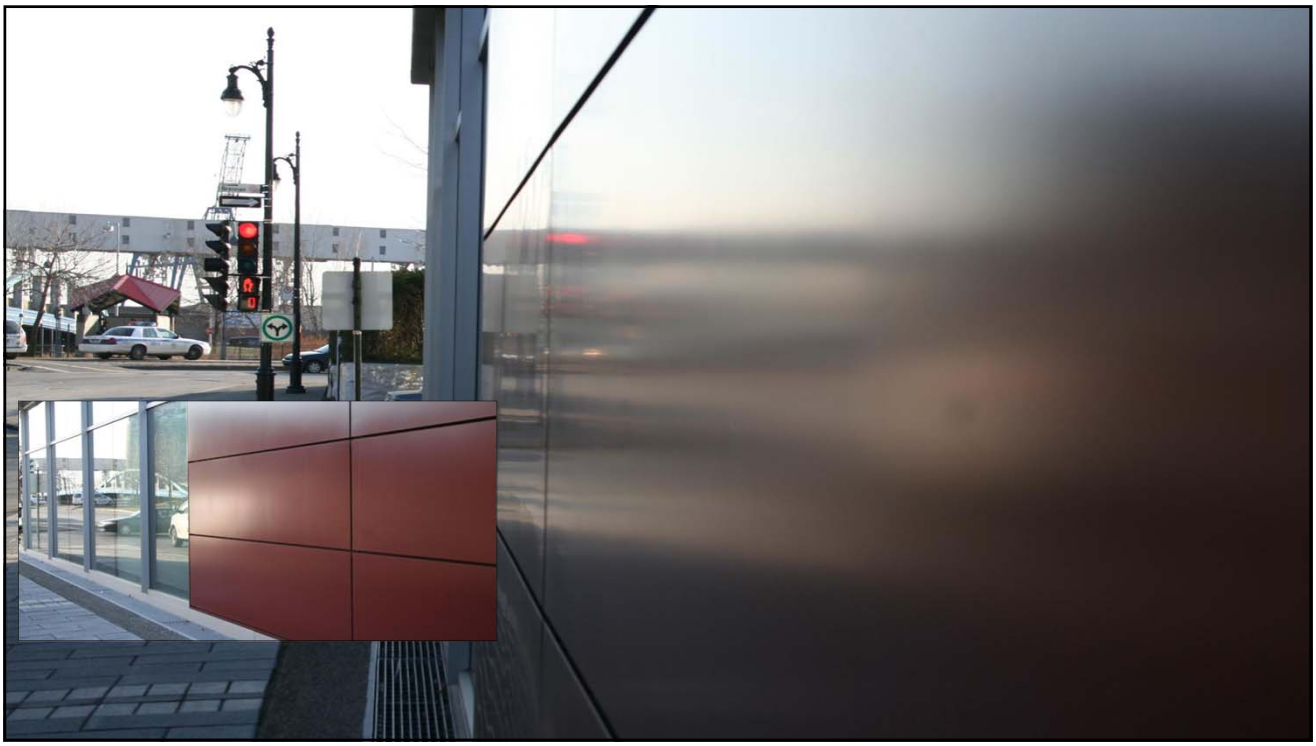
typically, we over estimate the reflectance of materials

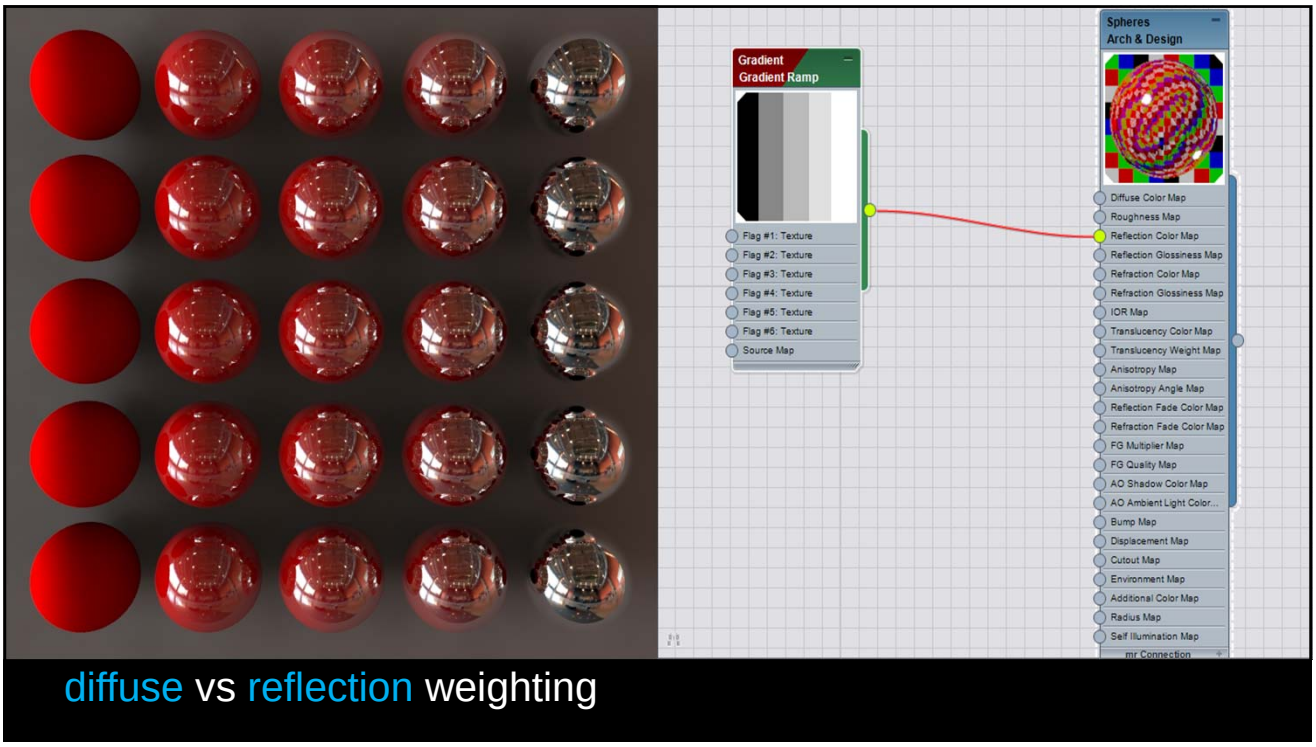
100% reflective materials don't exists

100% absorbing materials don't not exists



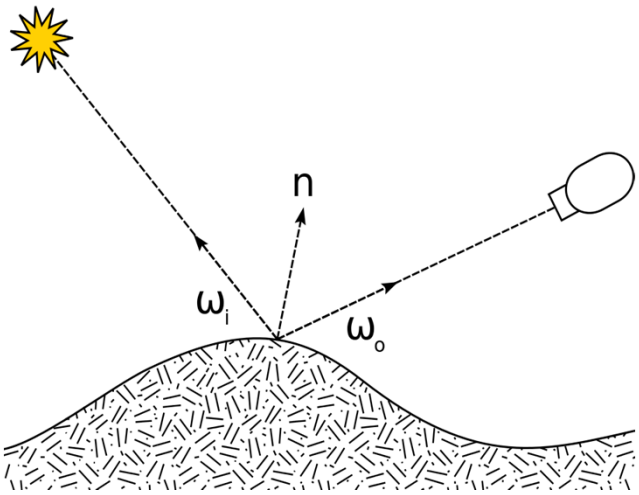

Diffuse
Reflections (glossy)
Refractions (glossy)
Translucency
the sum of all components
never equals more than 100%
Material #2 (Arch & Design)
Material #2
Main material parameters
Diffuse
Diffuse Level: 1.0
Color:
Roughness: 0.0
Reflection
Reflectivity: 0.6
Color:
Glossiness: 1.0
Fast (interpolate)
Glossy Samples: 8
Highlights+FG only
Metal material
Refraction
Transparency: 0.0
Color:
Glossiness: 1.0
Fast (interpolate)
Glossy Samples: 8
IOR: 1.4
Translucency
Weight: 0.5
Color:
Anisotropy
Anisotropy: 1.0
Rotation: 0.0
Automatic
Map Channel: 0
BRDF
By IOR (fresnel reflections)
Custom Reflectivity Function
Reflectivity vs. Angle:
0 deg. refl: 0.2
90 deg. refl: 1.0
Curve shape: 5.0
1.0
0.0
0 deg
90 deg
Self Illumination (Glow)
Special Effects
Advanced Rendering Options
Fast Glossy Interpolation
Special Purpose Maps
Bump 0.3
None
Do not apply bumps to the diffuse shading



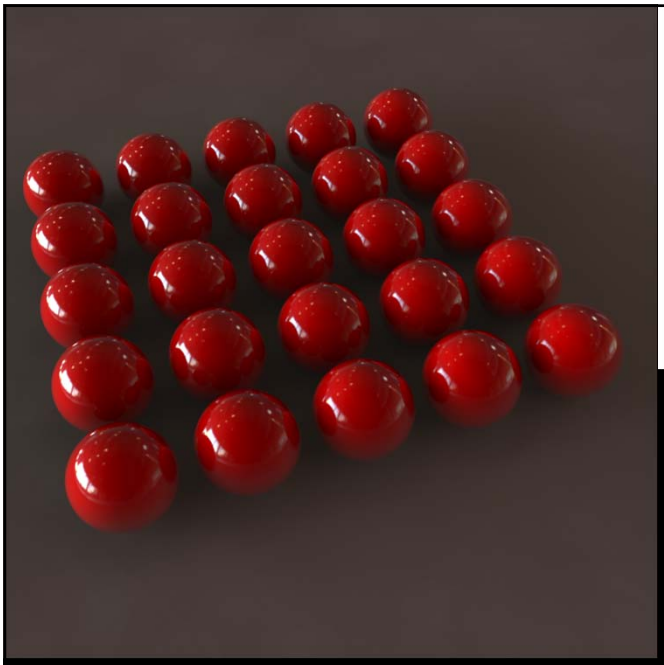


diffuse vs reflection weighting

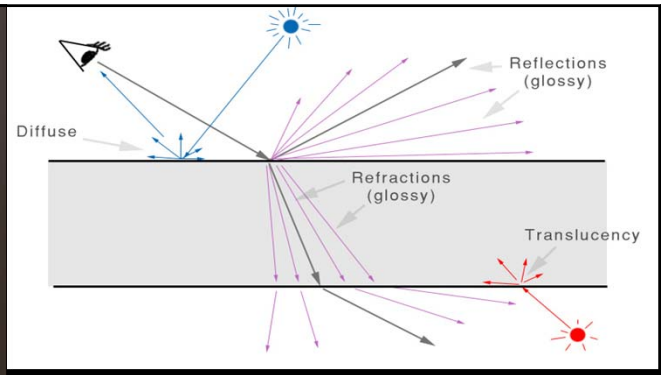
BRDF

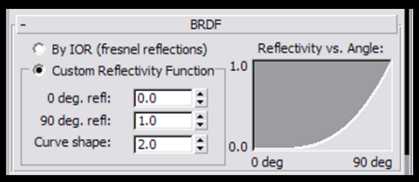


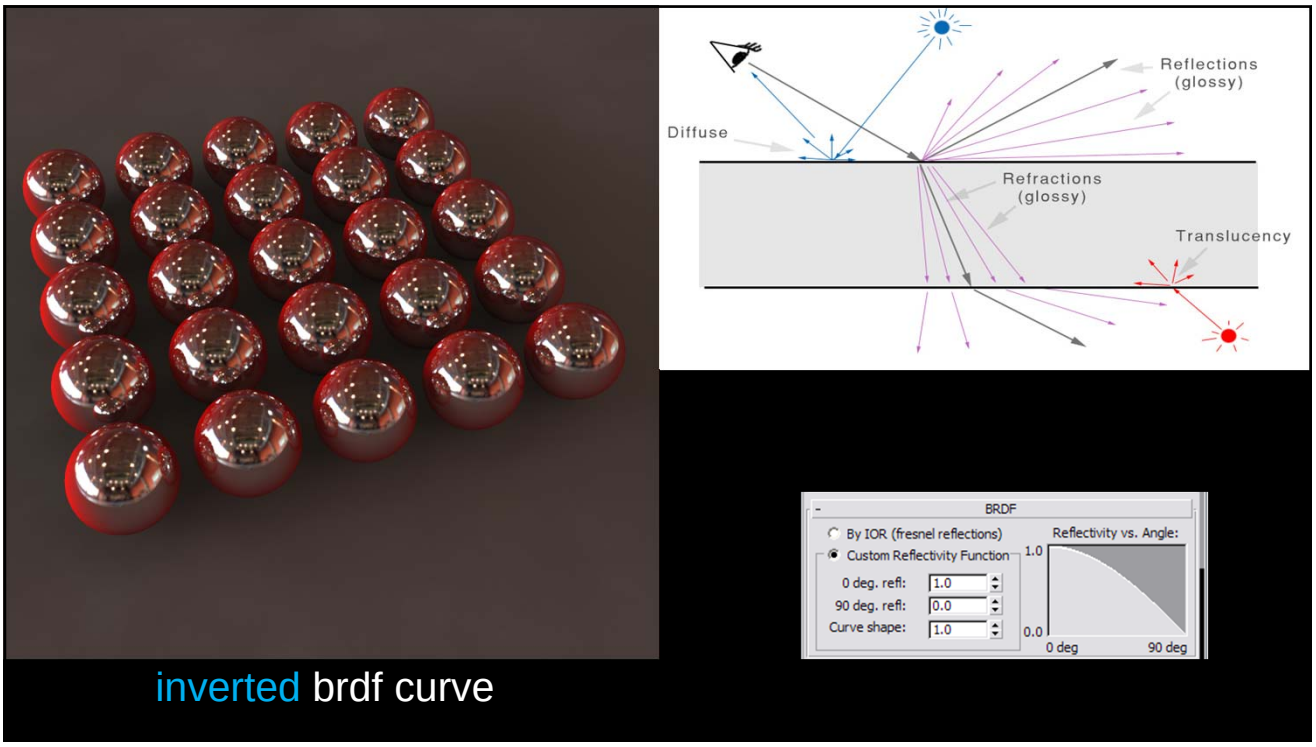
The **bidirectional reflectance distribution function** (**BRDF**) is a four-dimensional function that defines how light is reflected at an opaque surface



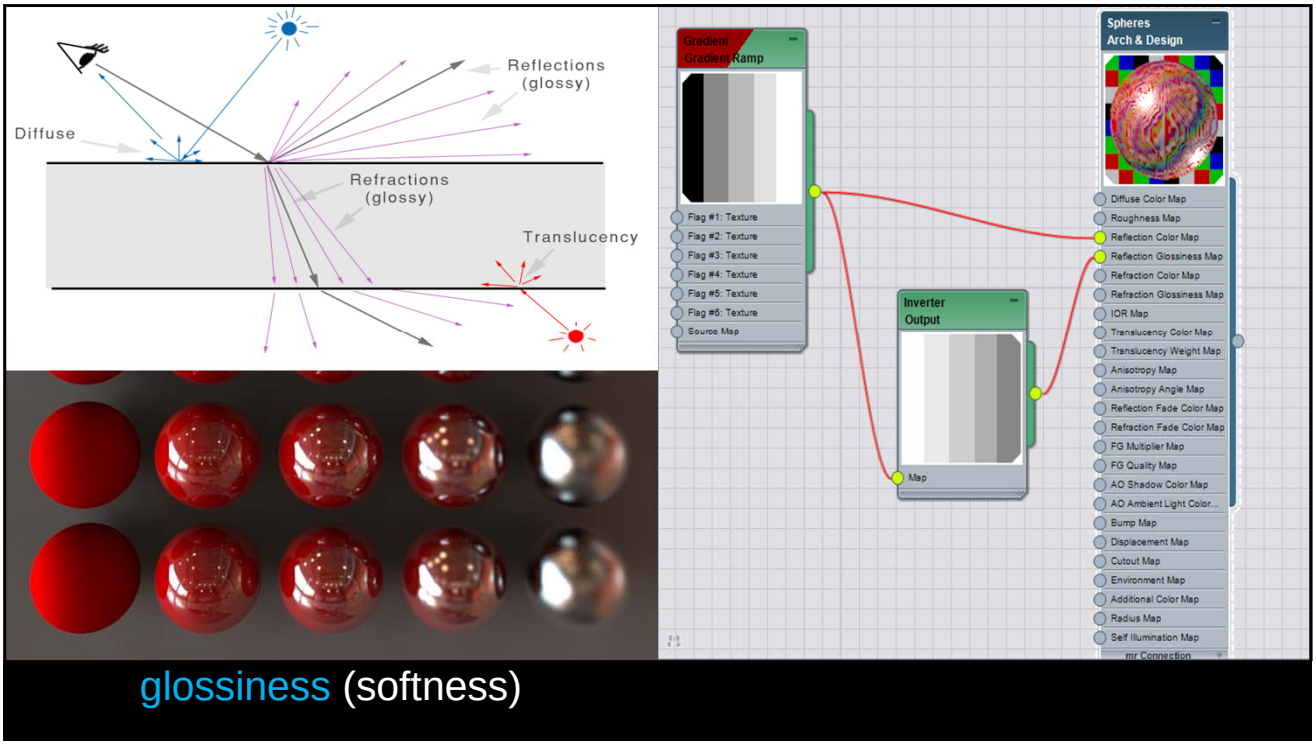
typical brdf curve



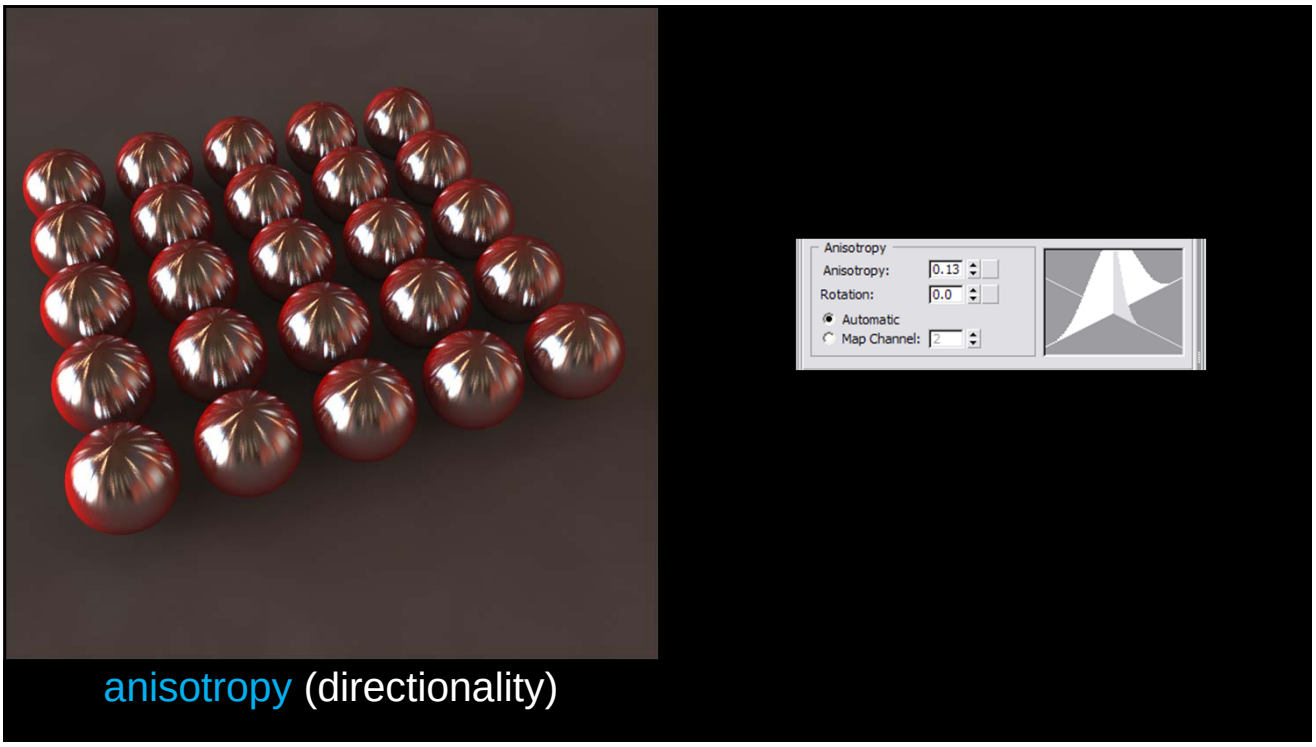




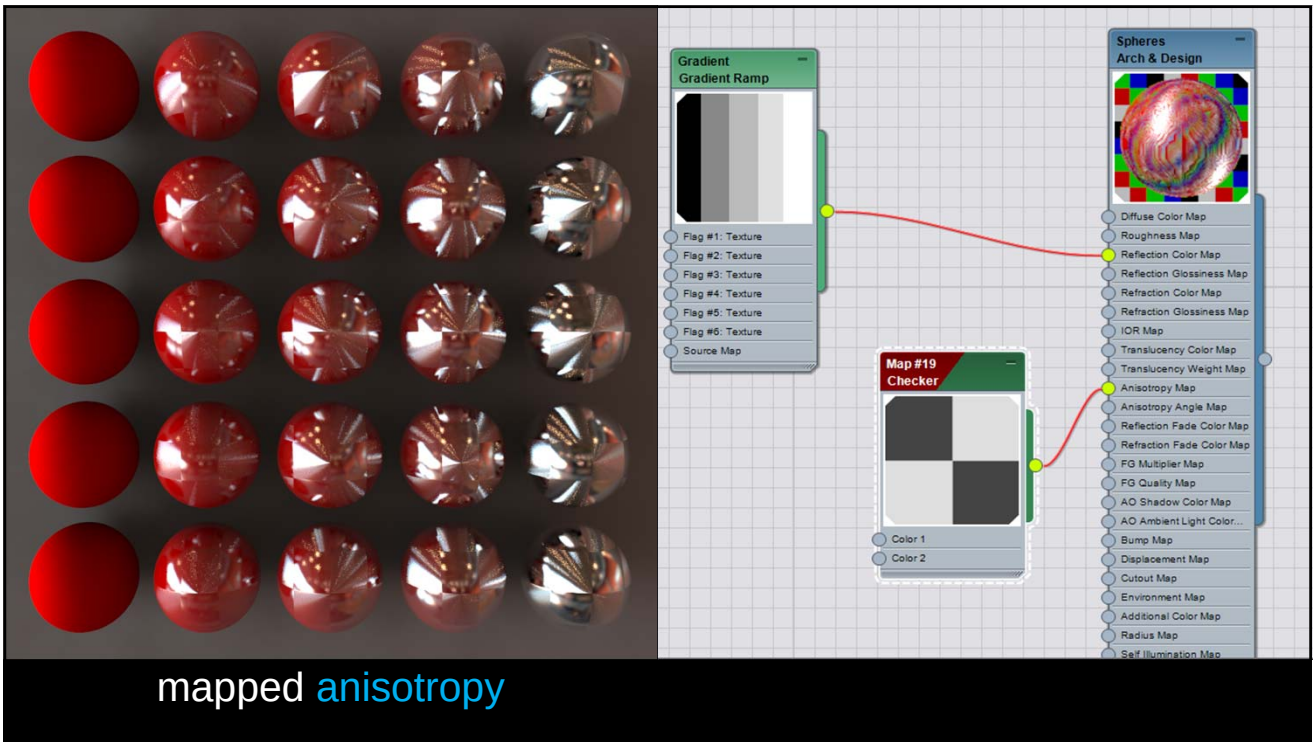
inverted brdf curve



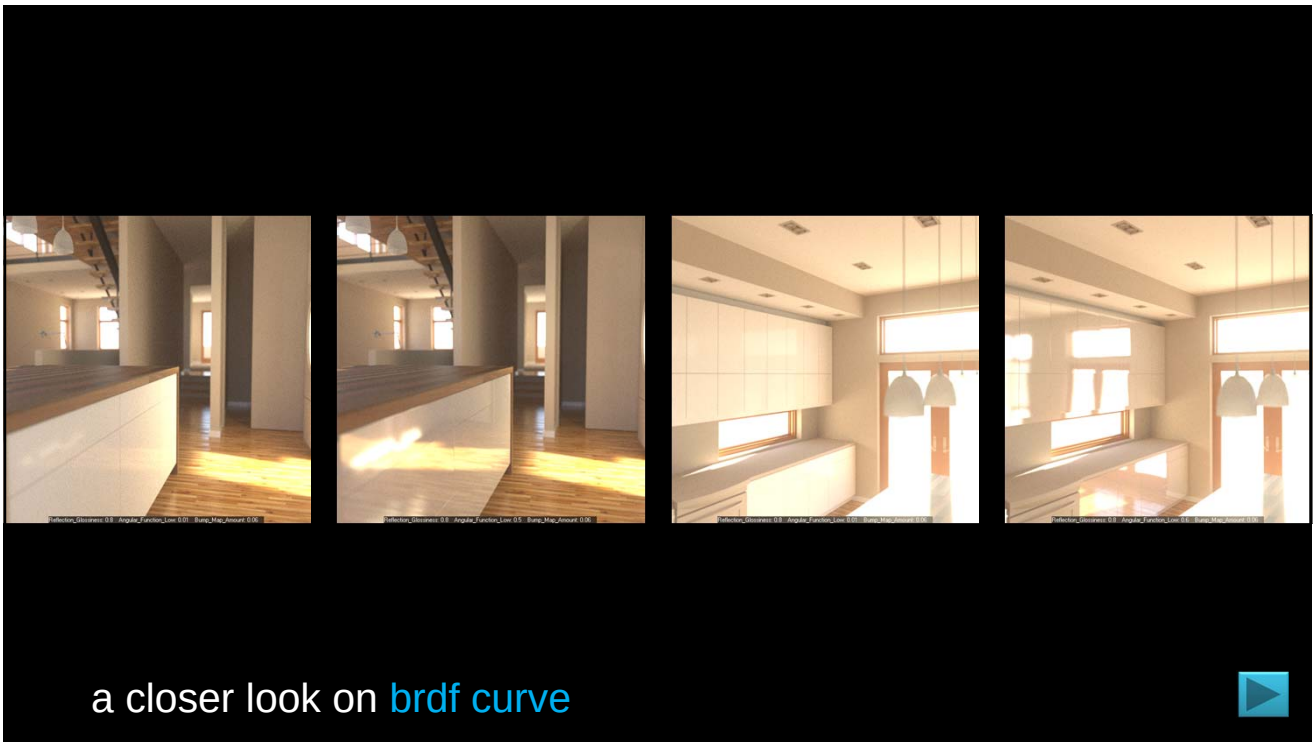
glossiness (softness)



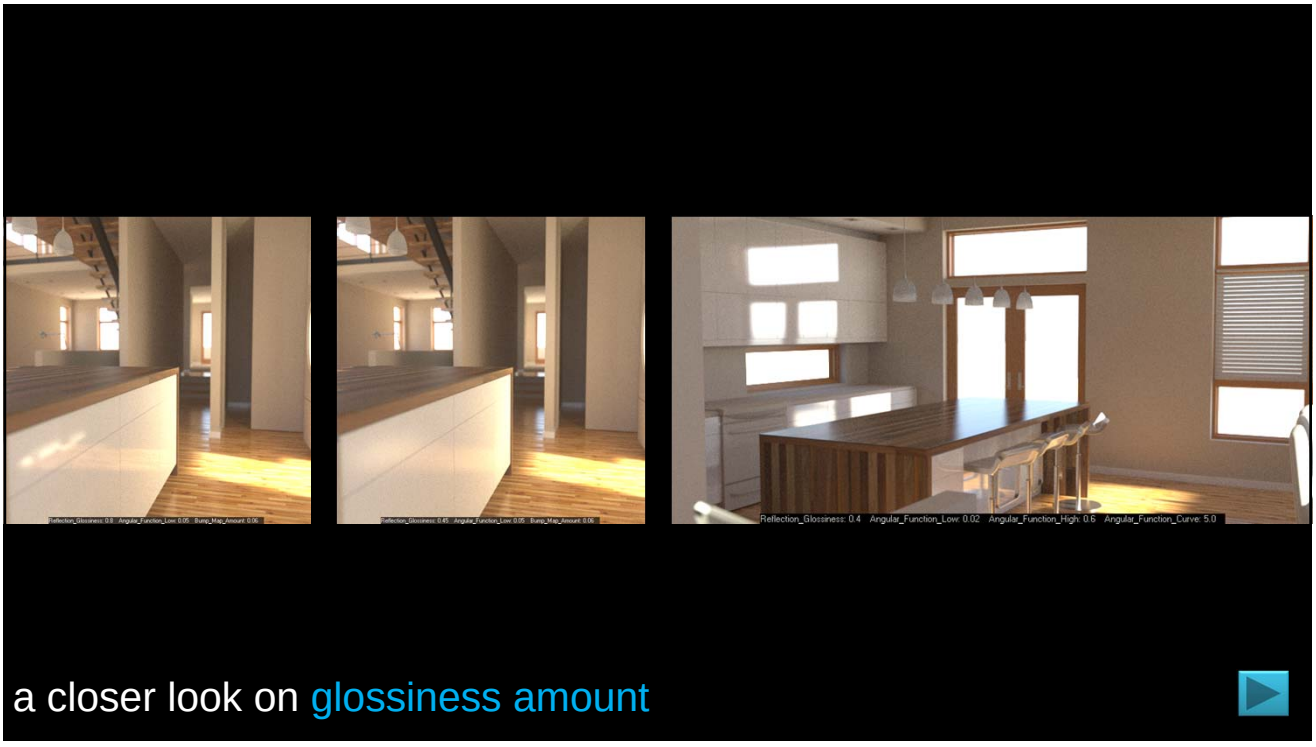
anisotropy (directionality)



mapped anisotropy

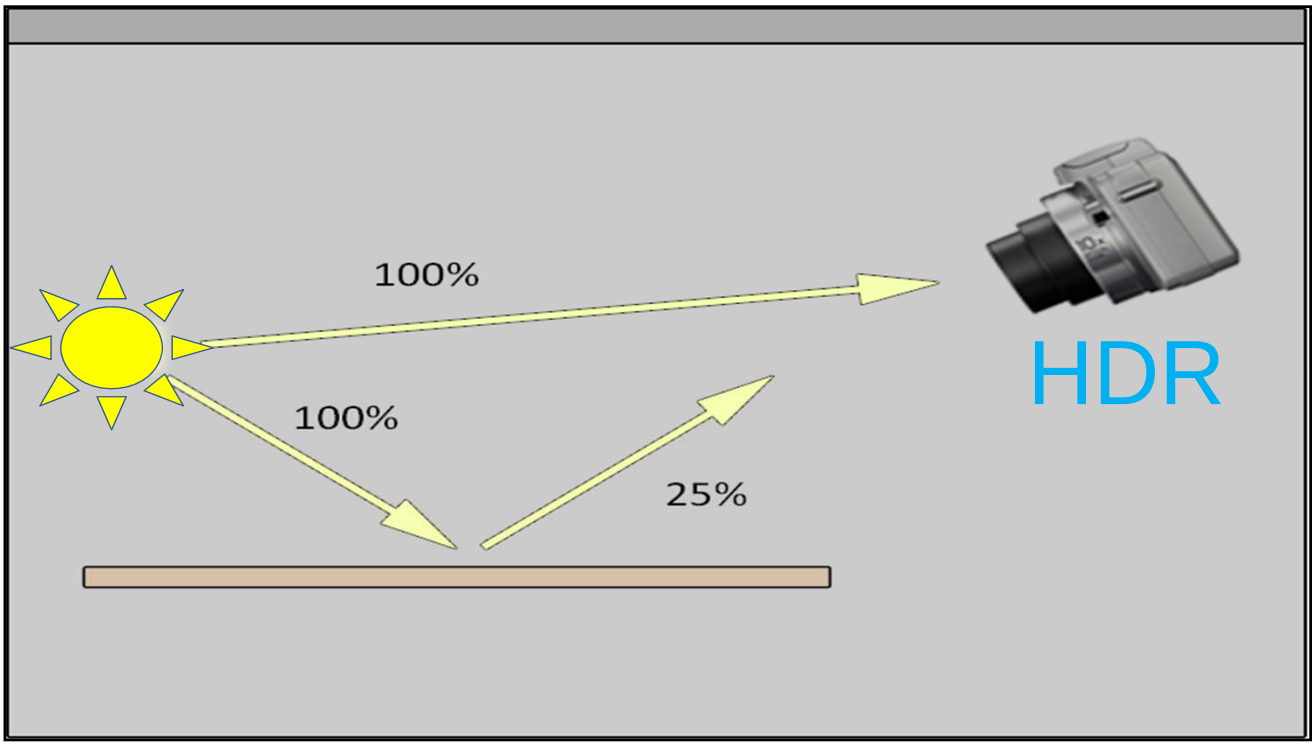


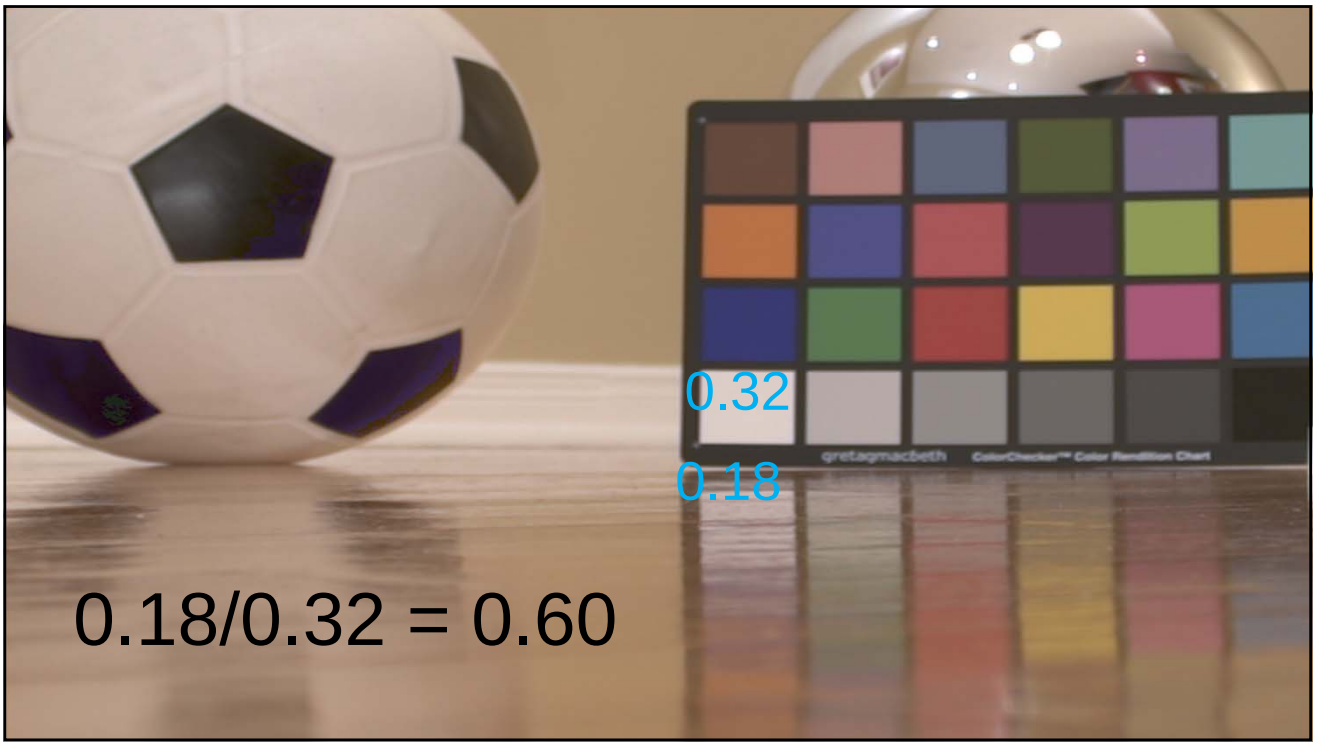
a closer look on brdf curve

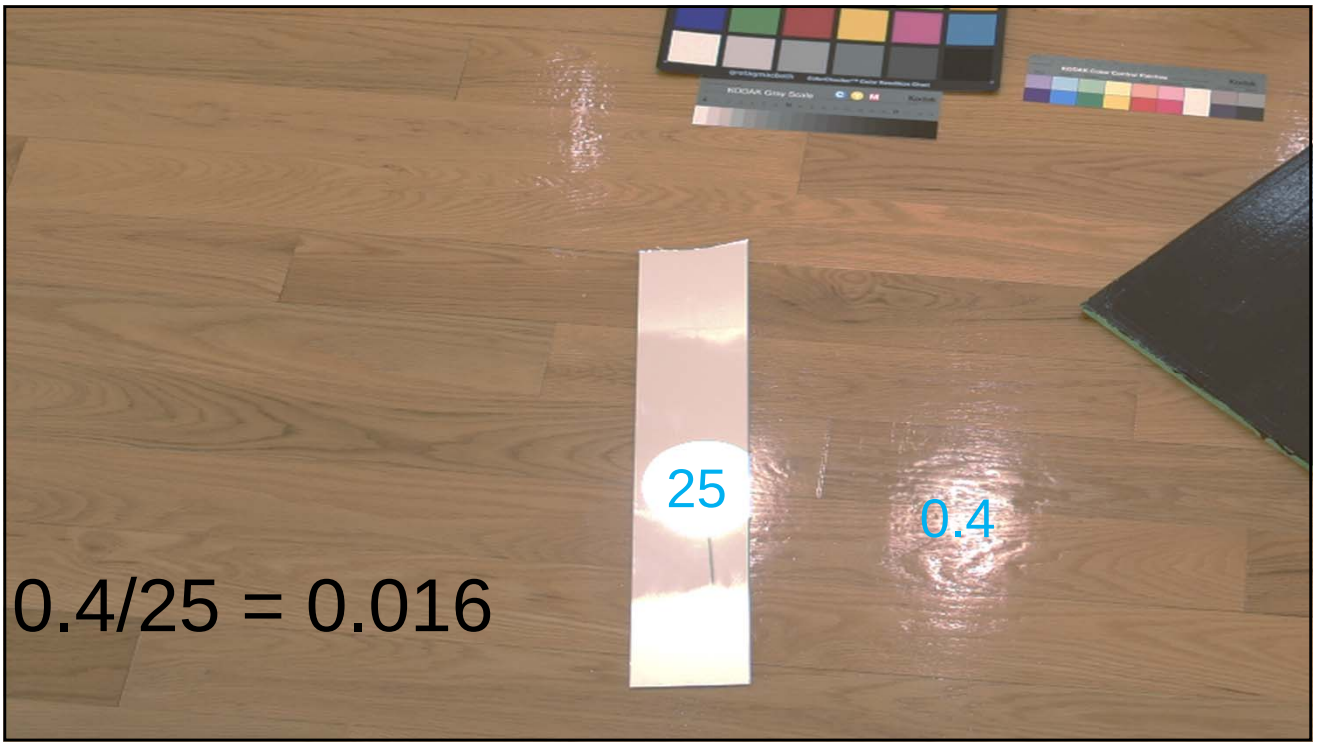


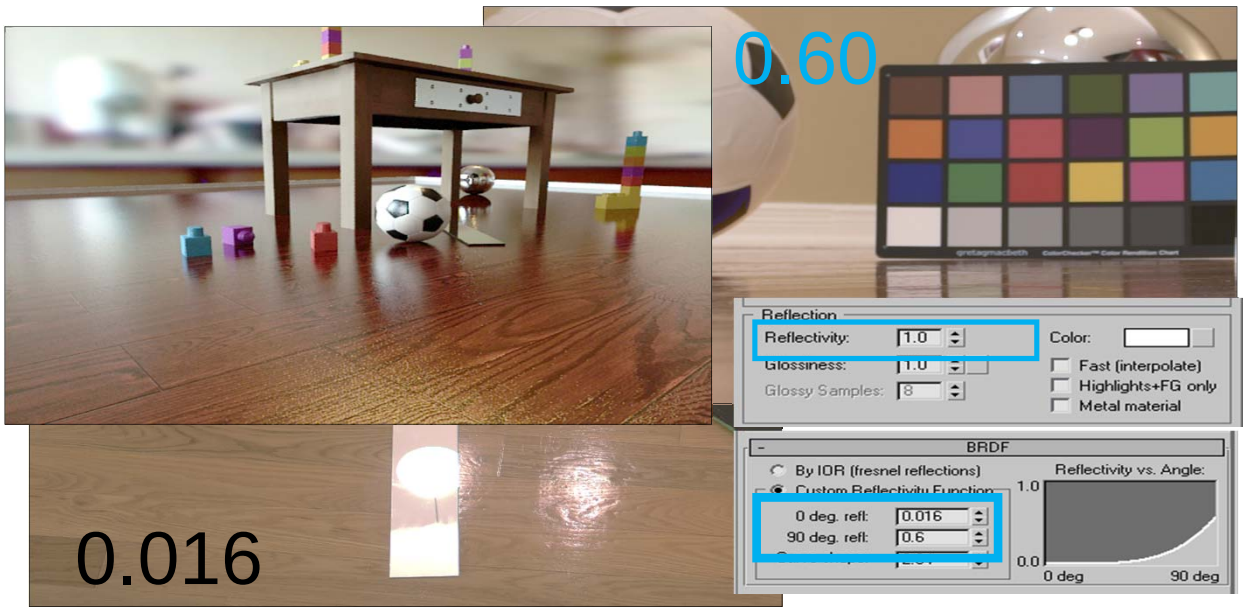
a closer look on glossiness amount

estimating BRDFs

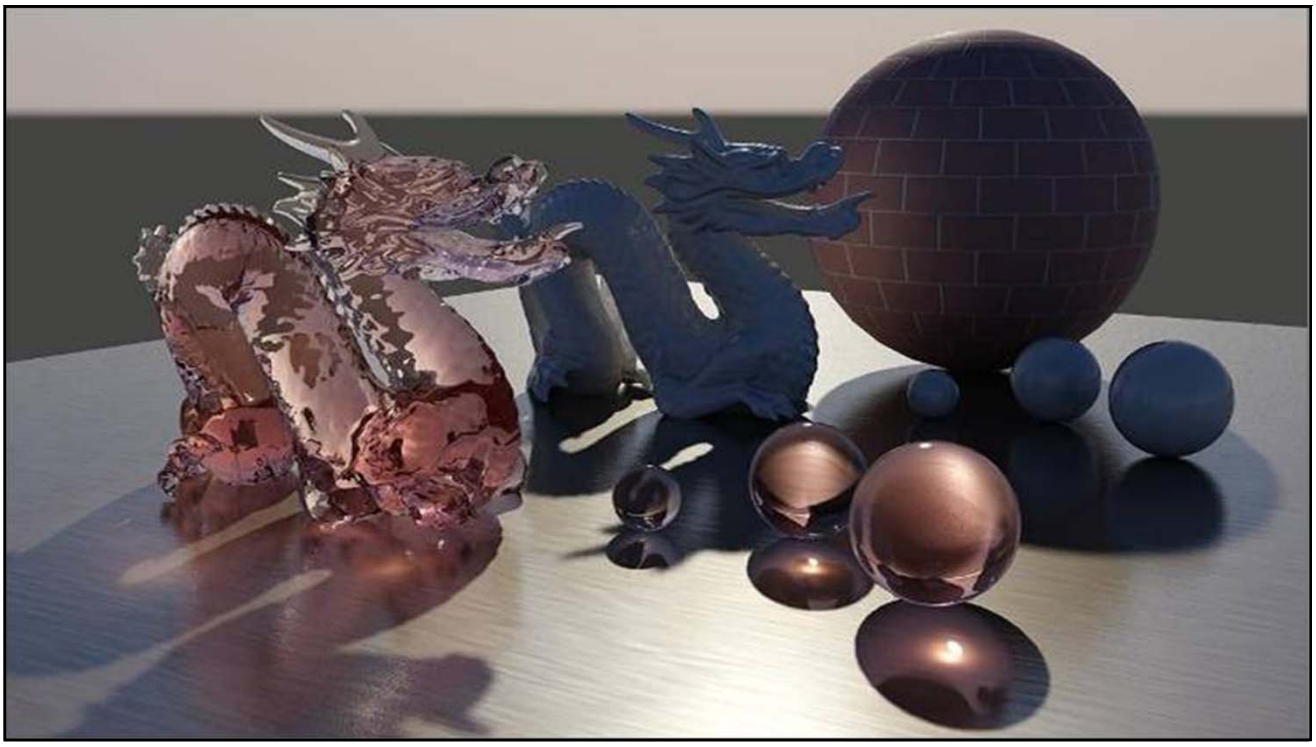


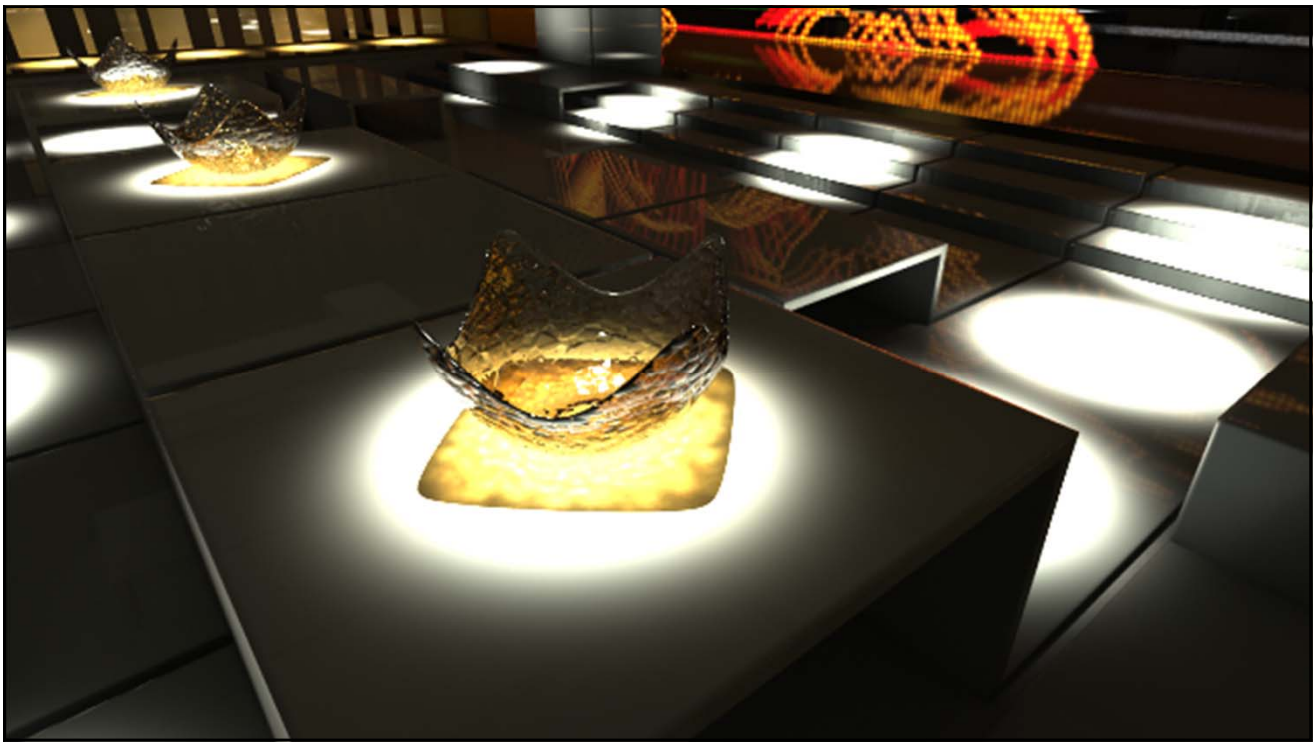

0.32
0.18
0.18/0.32 = 0.60

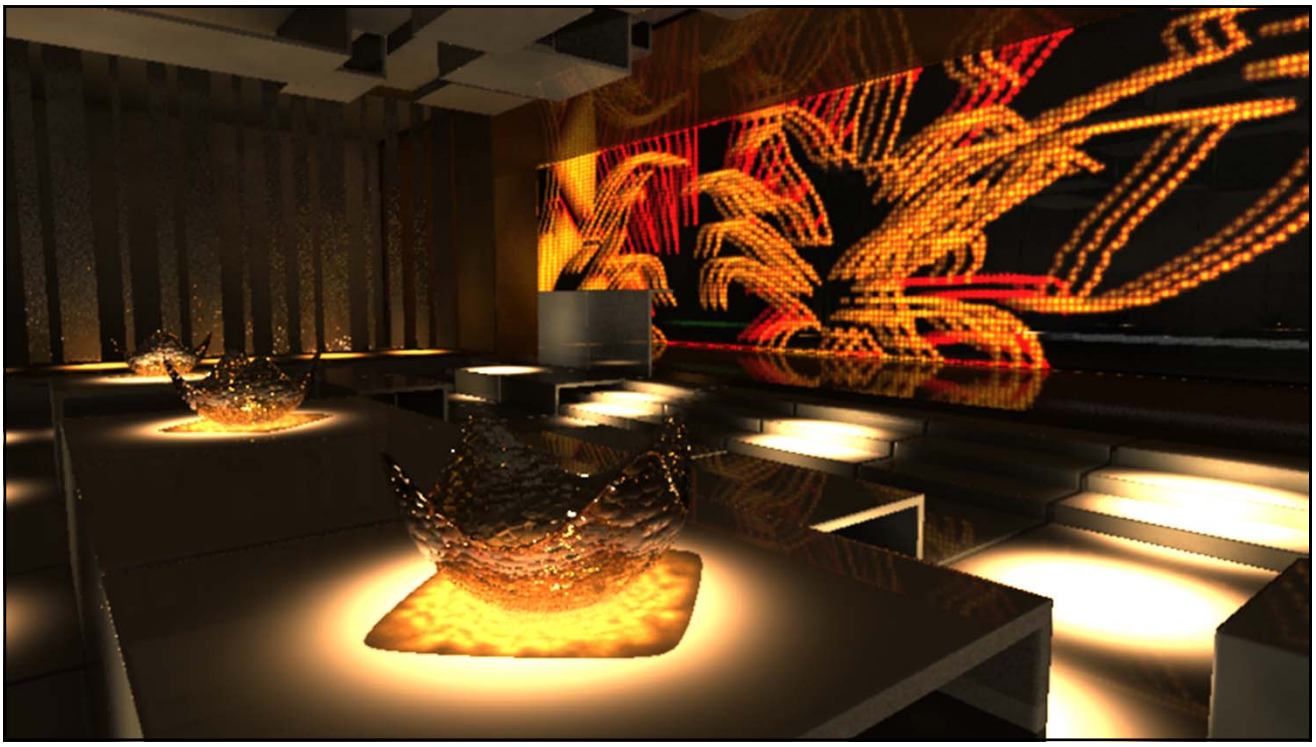

25
0.4
0.4/25 = 0.016

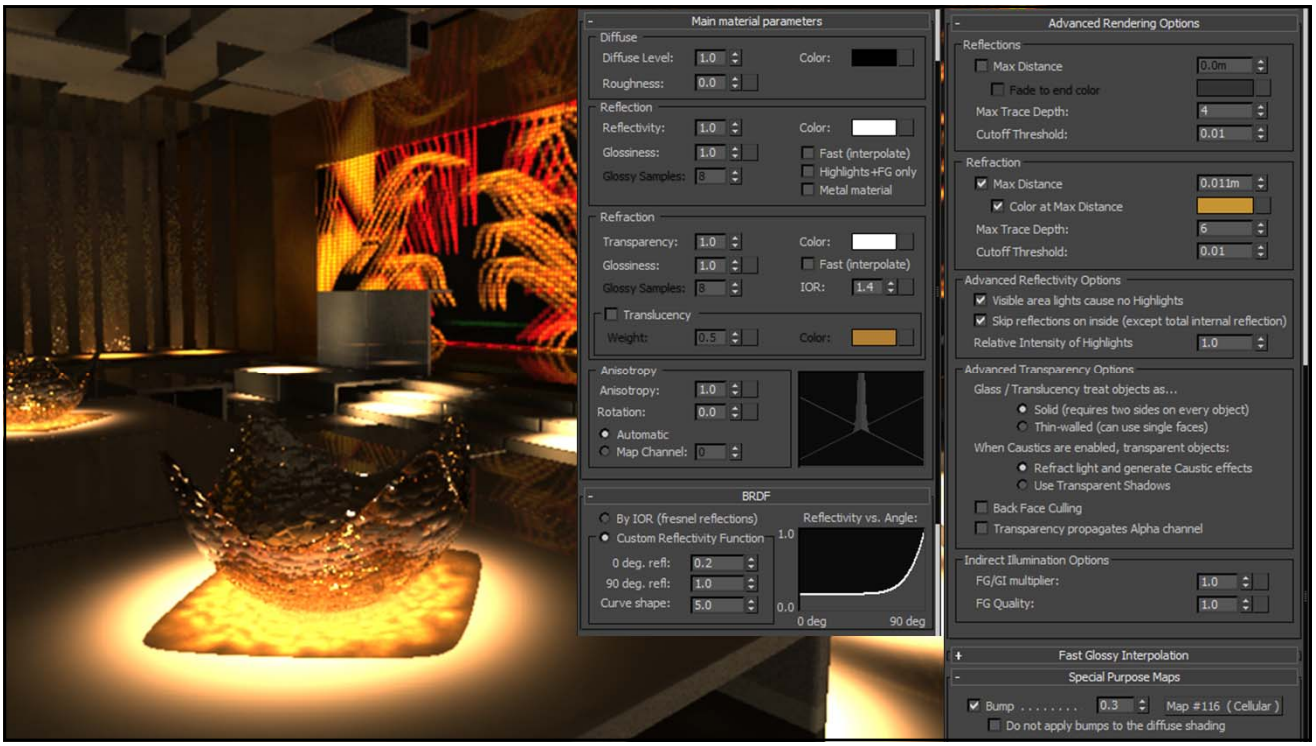

0.60
Reflection
Reflectivity: 1.0
Glossiness: 1.0
Glossy Samples: 8
Color:
Fast (interpolate)
Highlights+FG only
Metal material
BRDF
By IOR (fresnel reflections)
Custom Reflectivity Function
0 deg. refl: 0.016
90 deg. refl: 0.6
Reflectivity vs. Angle:
1.0
0.0
0 deg
90 deg
0.016

glass








Main material parameters
Diffuse
Diffuse Level: 1.0
Color:
Roughness: 0.0
Reflection
Reflectivity: 1.0
Color:
Glossiness: 1.0
Fast (interpolate)
Glossy Samples: 8
Highlights+FG only
Metal material
Refraction
Transparency: 1.0
Color:
Glossiness: 1.0
Fast (interpolate)
Glossy Samples: 8
IOR: 1.4
Translucency
Weight: 0.5
Color:
Anisotropy
Anisotropy: 1.0
Rotation: 0.0
Automatic
Map Channel: 0
BRDF
By IOR (fresnel reflections)
Custom Reflectivity Function
0 deg. refl: 0.2
90 deg. refl: 1.0
Curve shape: 5.0
Reflectivity vs. Angle:
1.0
0.0
0 deg
90 deg
Advanced Rendering Options
Reflections
Max Distance 0.0m
Fade to end color
Max Trace Depth: 4
Cutoff Threshold: 0.01
Refraction
Max Distance 0.011m
Color at Max Distance
Max Trace Depth: 6
Cutoff Threshold: 0.01
Advanced Reflectivity Options
Visible area lights cause no Highlights
Skip reflections on inside (except total internal reflection)
Relative Intensity of Highlights 1.0
Advanced Transparency Options
Glass / Translucency treat objects as...
Solid (requires two sides on every object)
Thin-walled (can use single faces)
When Caustics are enabled, transparent objects:
Refract light and generate Caustic effects
Use Transparent Shadows
Back Face Culling
Transparency propagates Alpha channel
Indirect Illumination Options
FG/GI multiplier: 1.0
FG Quality: 1.0
Fast Glossy Interpolation
Special Purpose Maps
Bump . . . . . 0.3 Map #116 (Cellular)
Do not apply bumps to the diffuse shading

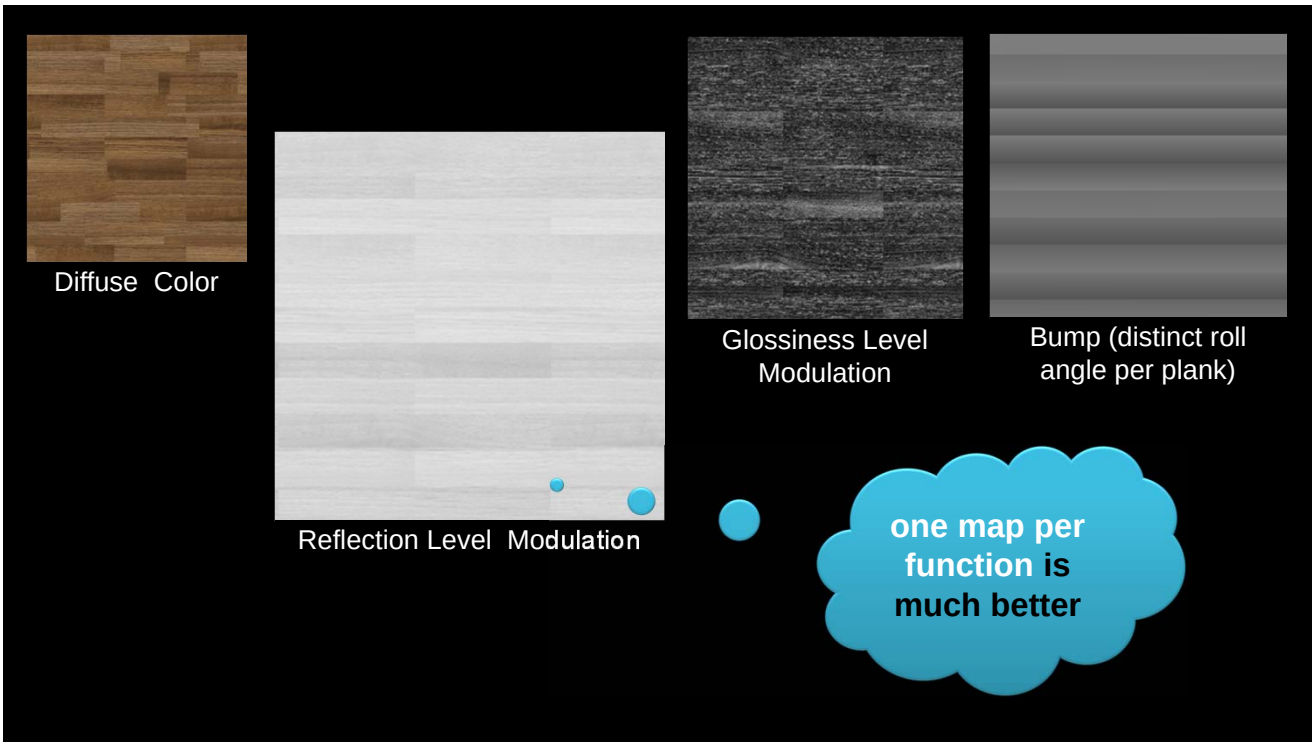
a closer look on glass

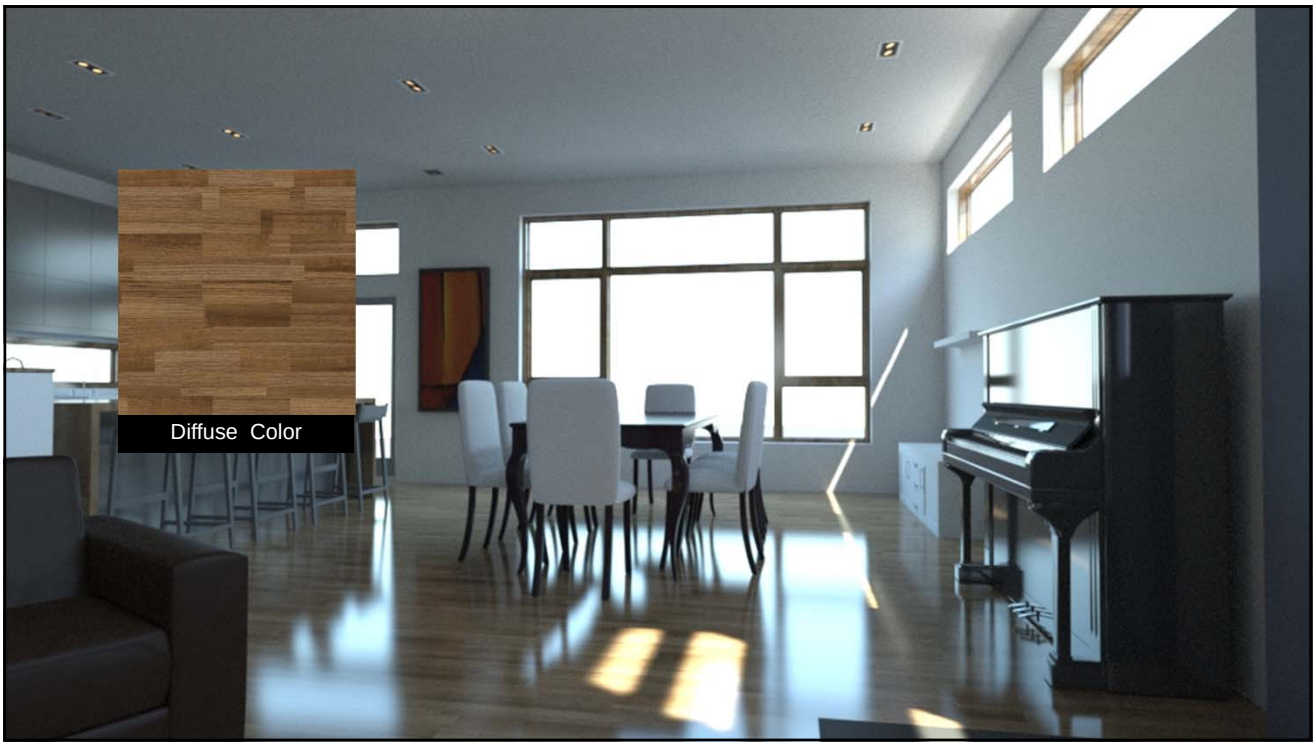
bring materials to life

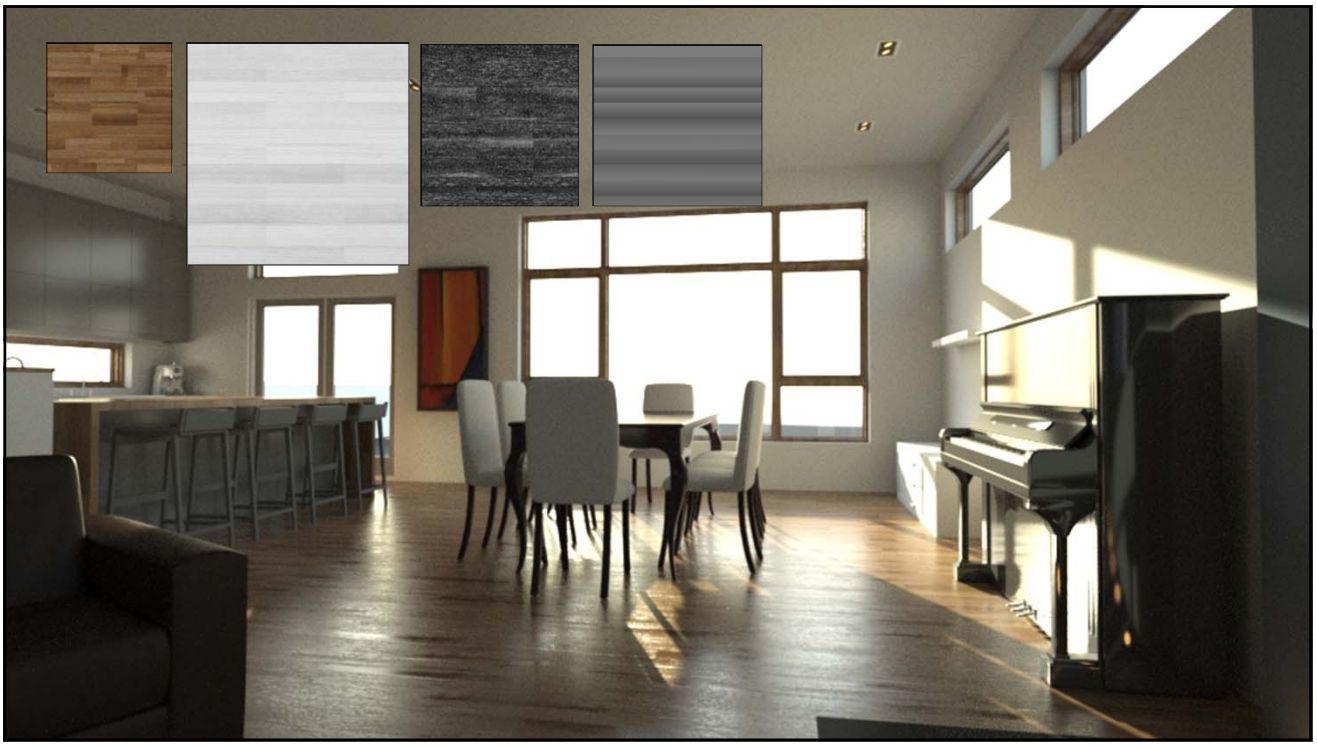

Diffuse Color
if they don't have defects, wood floors look like plastic

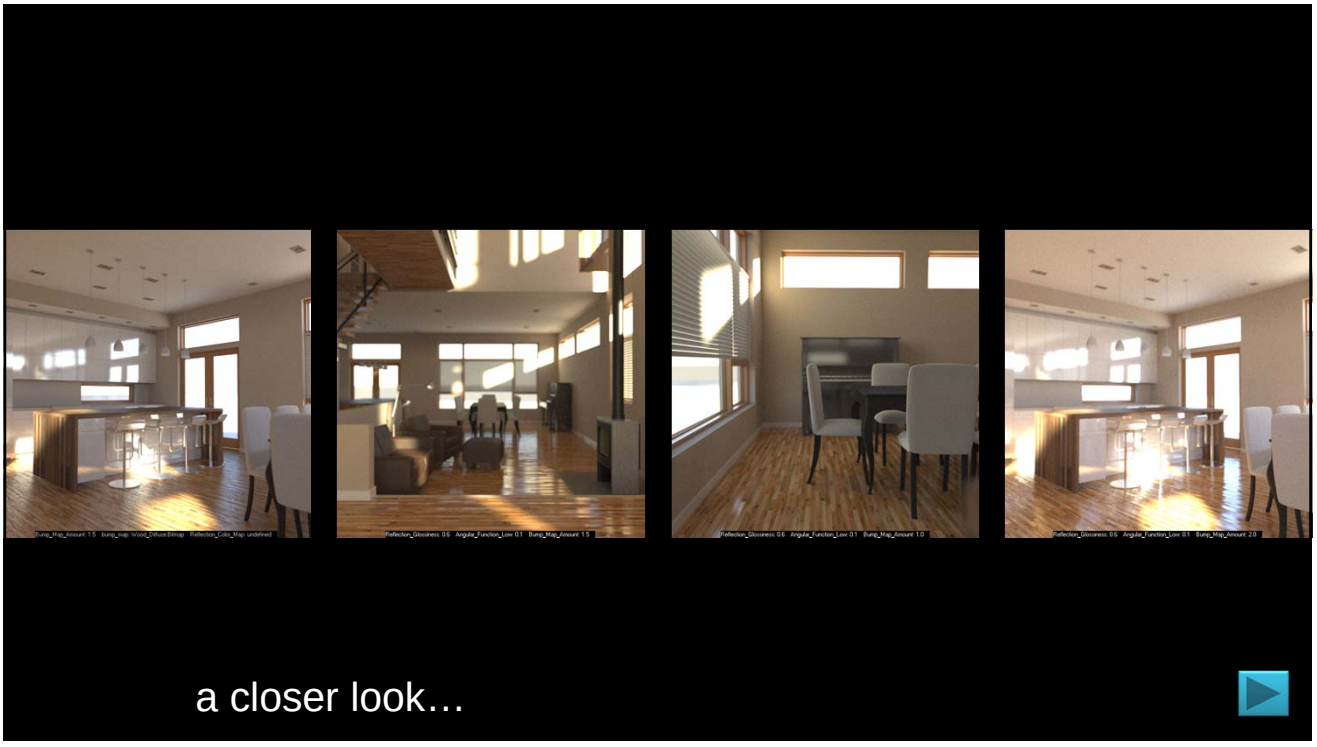

wood floors have scratches and defects.
not perfectly flat, disjointed reflections

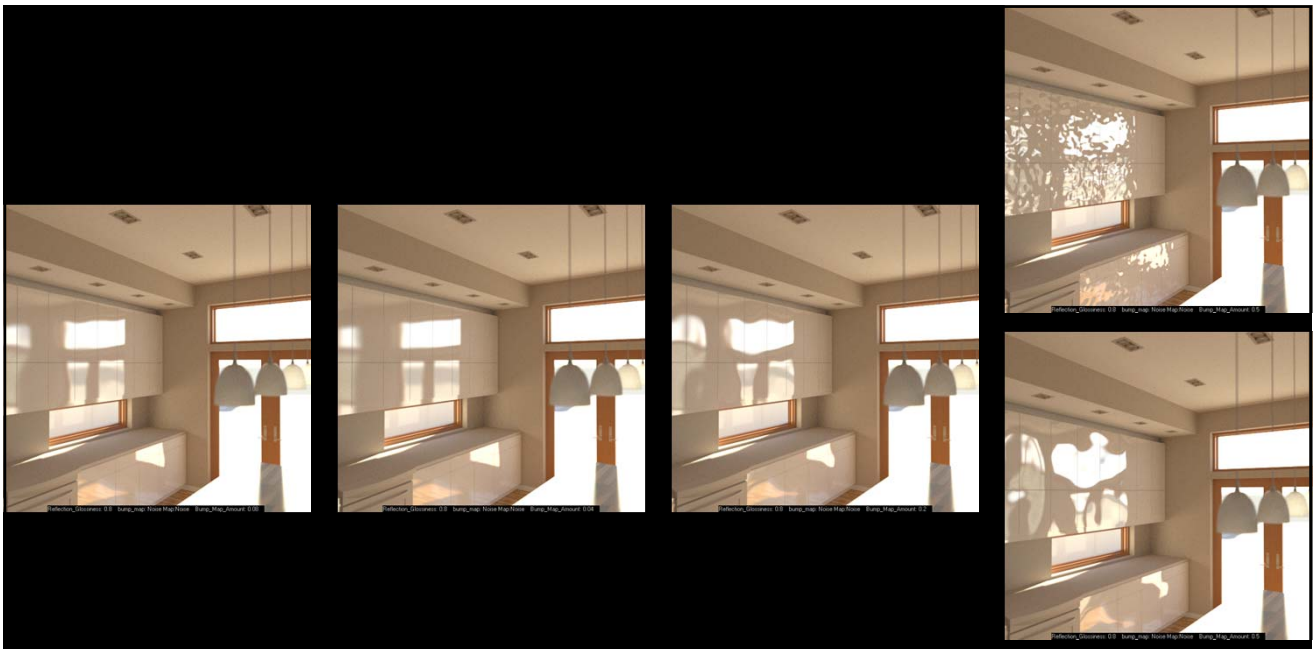

Diffuse Color + Bump
diffuse map as bump is not better…
Bump_Map_Amount: 0.8 bump_map: Wood_Diffuse:Bitmap Reflection_Color_Map: undefined
Bump_Map_Amount: 0.5 bump_map: Wood_Diffuse:Bitmap Reflection_Color_Map: undefined


Diffuse Color
Reflection Level Modulation
Glossiness Level Modulation
Bump (distinct roll angle per plank)
one map per function is much better


Diffuse Color

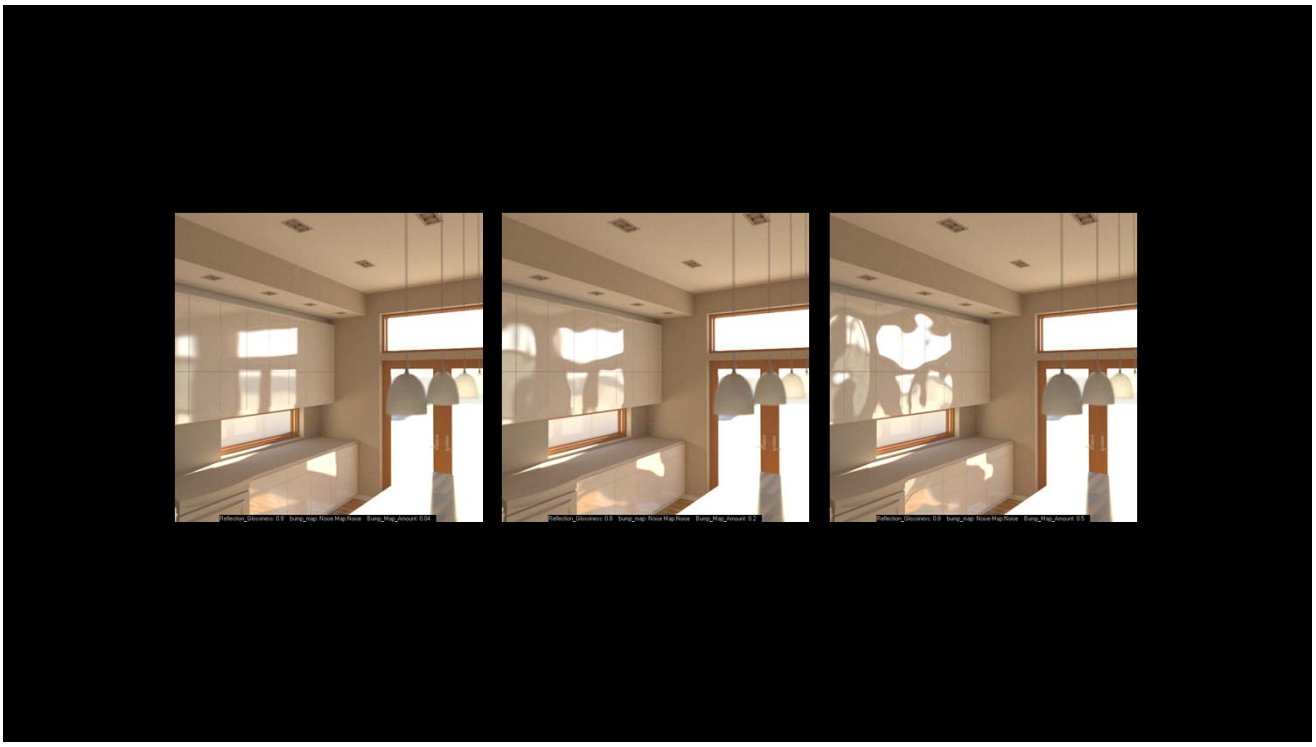


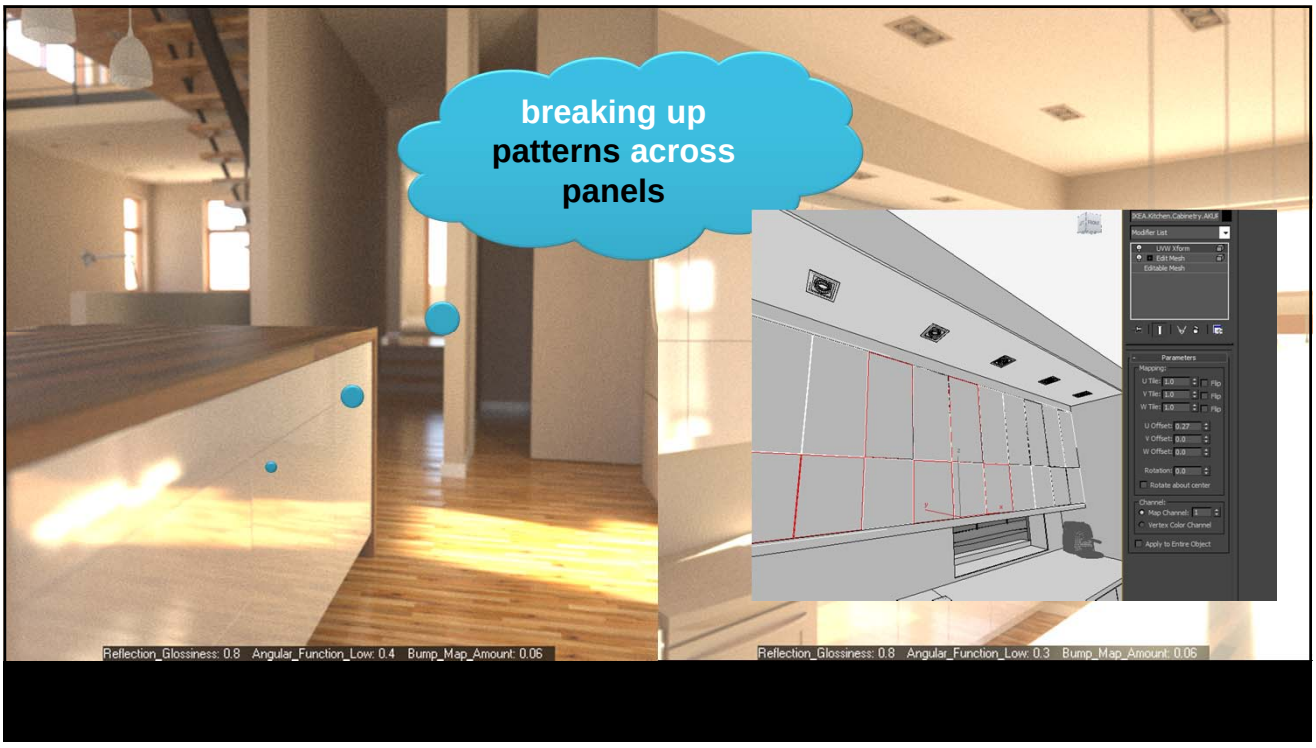

a closer look…



other types of variations…

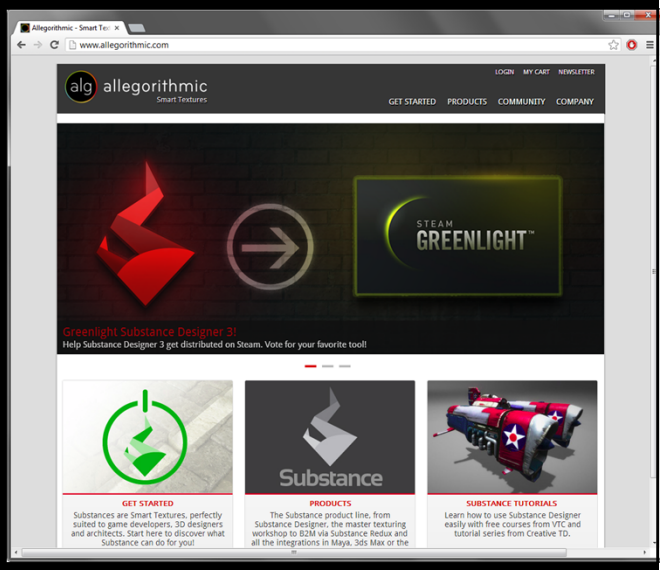
break out reflections

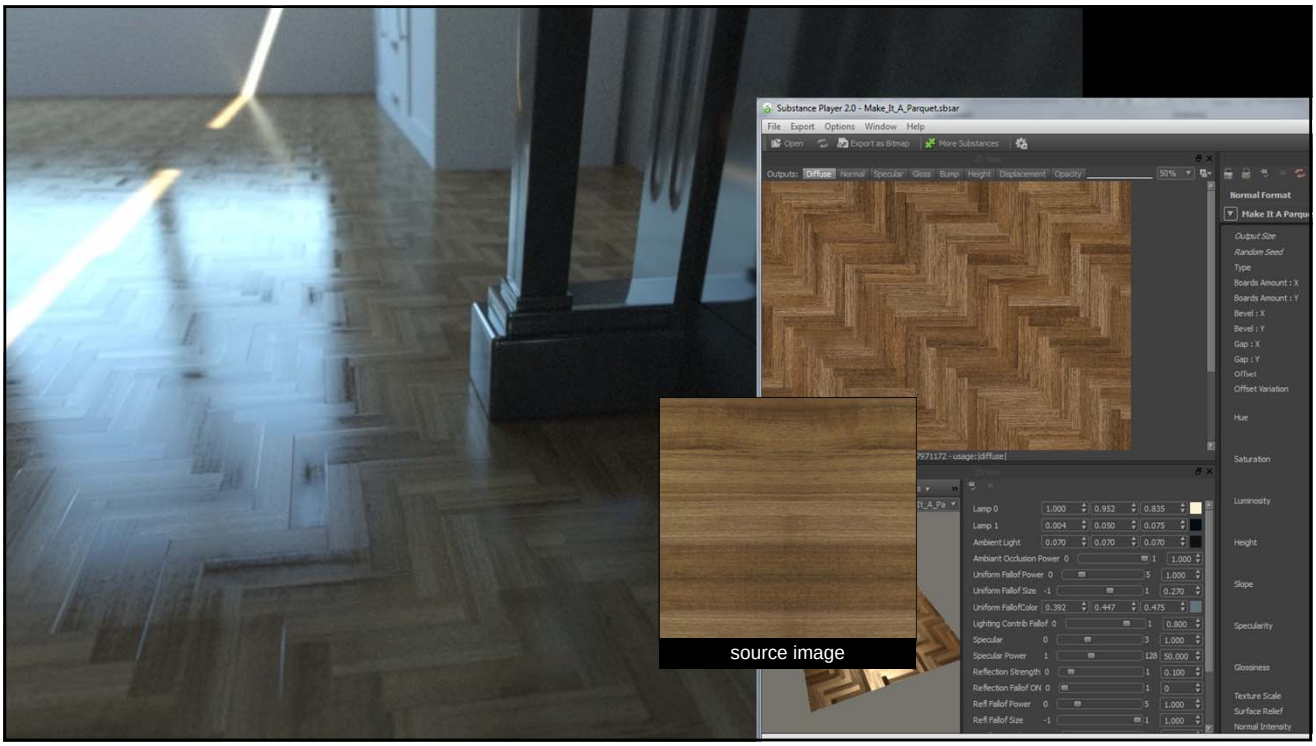



breaking up patterns across panels
Reflection_Glossiness: 0.8 Angular_Function_Low: 0.4 Bump_Map_Amount: 0.06
Reflection_Glossiness: 0.8 Angular_Function_Low: 0.3 Bump_Map_Amount: 0.06

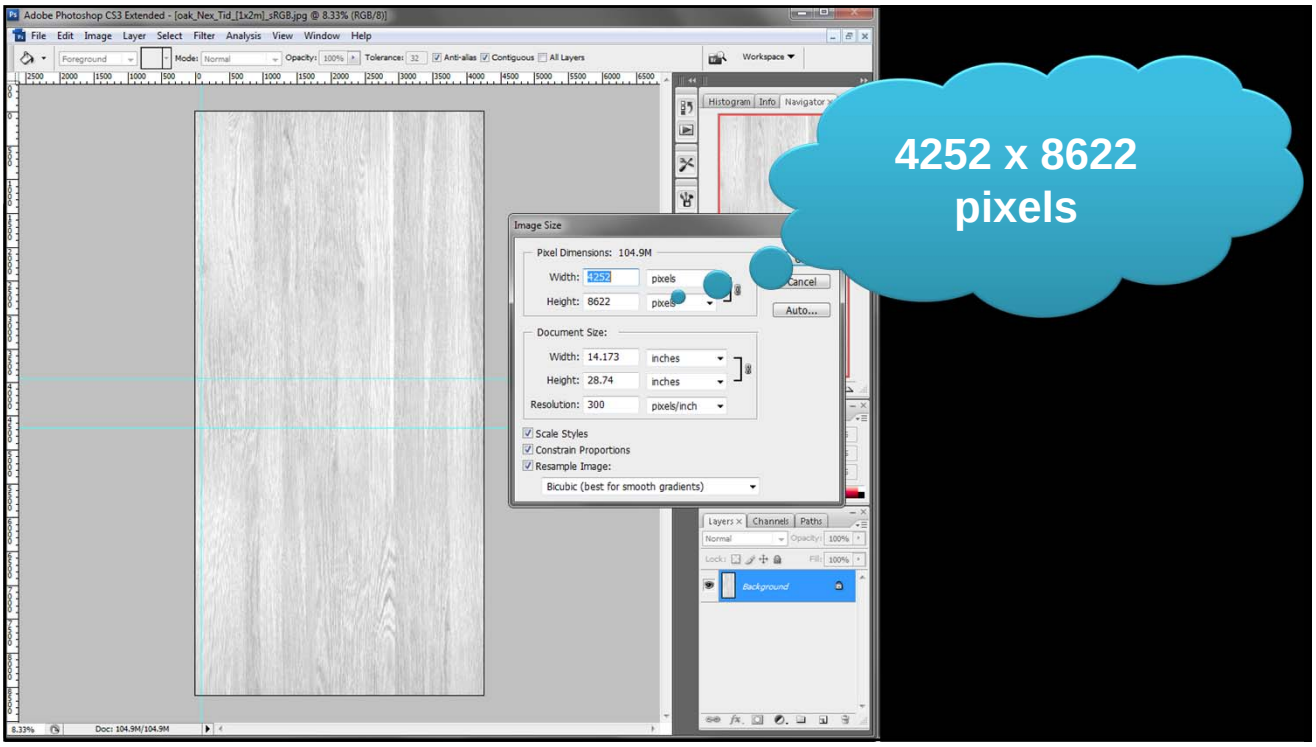
allegorithmic

substances



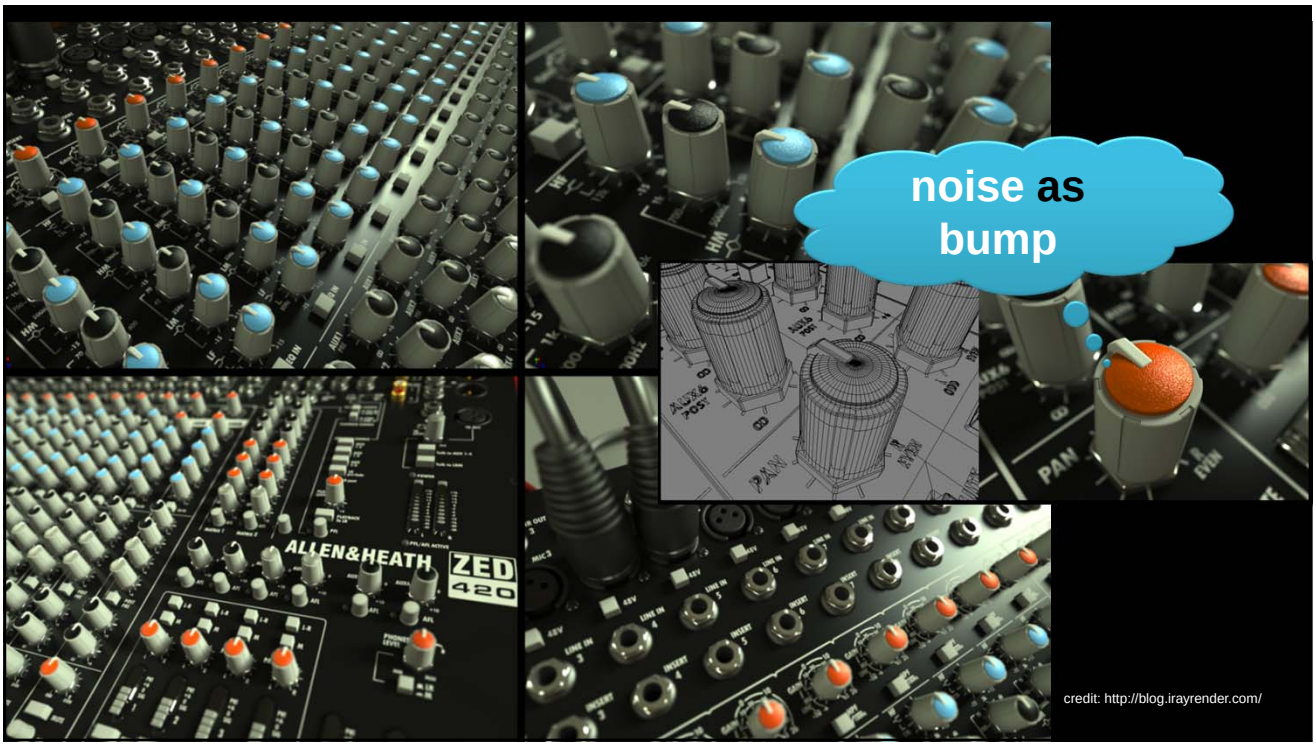


micro details

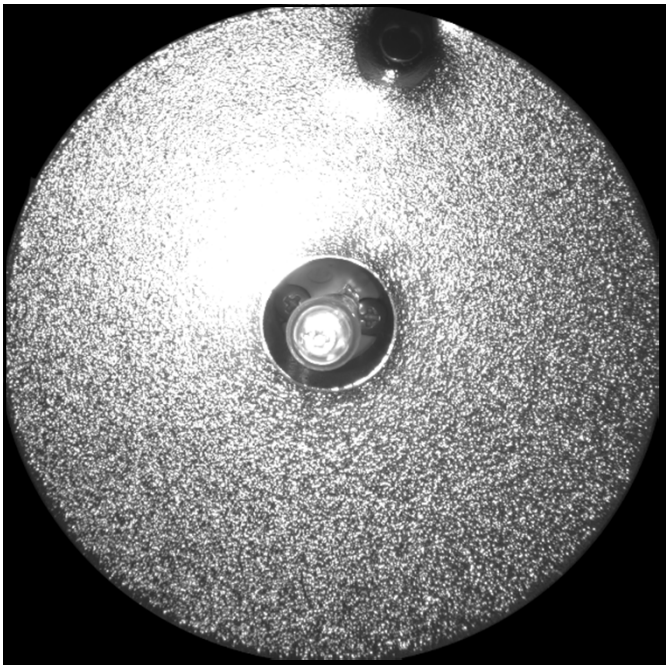

Adobe Photoshop CS3 Extended - [oak_Nex_Tid_[1x2m]_sRGB.jpg @ 8.33% (RGB/8)]
File Edit Image Layer Select Filter Analysis View Window Help
Image Size
Pixel Dimensions: 104.9M
Width: 4252 pixels
Height: 8622 pixels
Document Size:
Width: 14.173 inches
Height: 28.74 inches
Resolution: 300 pixels/inch
Scale Styles
Constrain Proportions
Resample Image:
Bicubic (best for smooth gradients)
OK
Cancel
Auto...
4252 x 8622 pixels


4252 x 8622 pixels
high texture resolution will enhance details

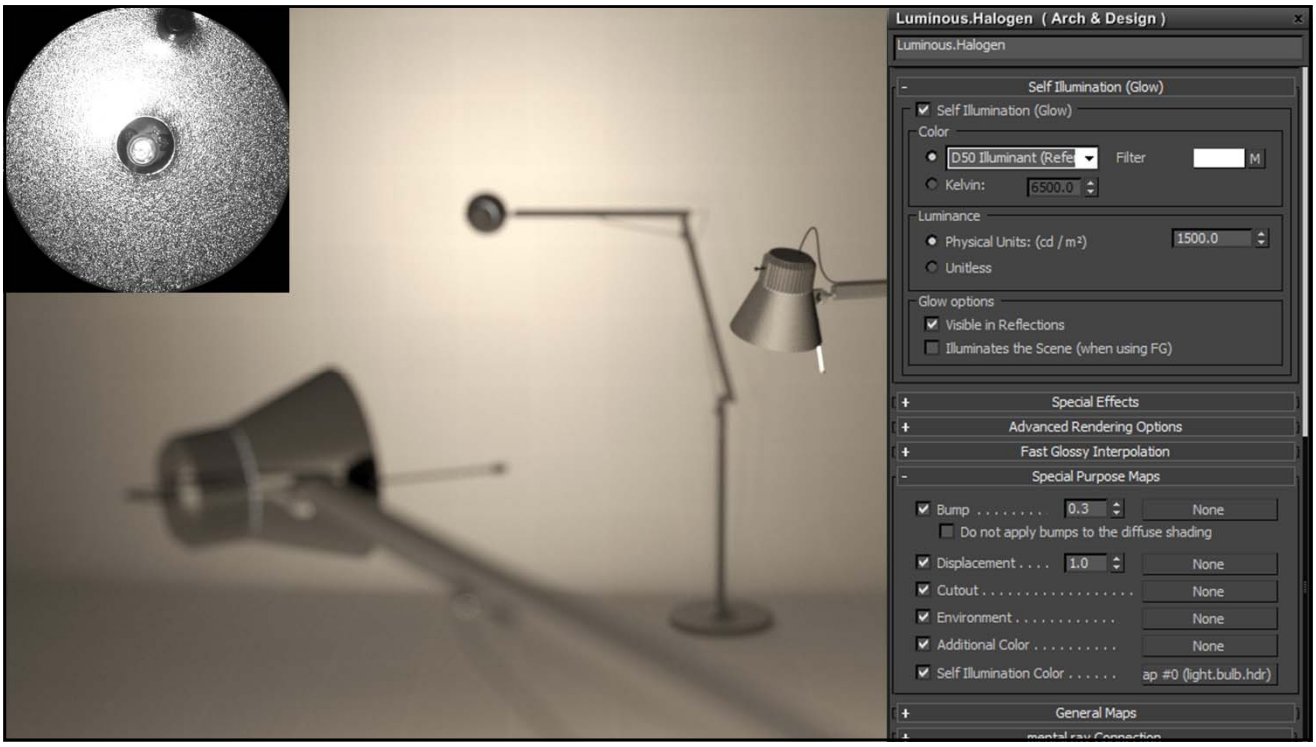

ALLEN&HEATH
ZED
420
micro details
add realism
credit: http://blog.irayrender.com/


noise as
bump
ALLEN&HEATH
ZED
420
credit: http://blog.irayrender.com/

self illumination



hdr image of a lamp reflector


Luminous.Halogen (Arch & Design)
Luminous.Halogen
Self Illumination (Glow)
Self Illumination (Glow)
Color
D50 Illuminant (Refe
Filter
M
Kelvin:
6500.0
Luminance
Physical Units: (cd / m²)
1500.0
Unitless
Glow options
Visible in Reflections
Illuminates the Scene (when using FG)
Special Effects
Advanced Rendering Options
Fast Glossy Interpolation
Special Purpose Maps
Bump . . . . . 0.3 None
Do not apply bumps to the diffuse shading
Displacement . . . . 1.0 None
Cutout . . . . . None
Environment . . . . . None
Additional Color . . . . . None
Self Illumination Color . . . . . ap #0 (light.bulb.hdr)
General Maps

class recap

use a gamma correction

3ds max expects colors in “linear/physical” space

we tend to over estimate material reflectances

a diffuse map is only for diffuse color

use high res images for fine details

use high bit depth images for fine variations