Mental Ray for BK5100

Practical guide: Global Illumination Interior and MIA Materials

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Technisch Ontwerp en Informatica

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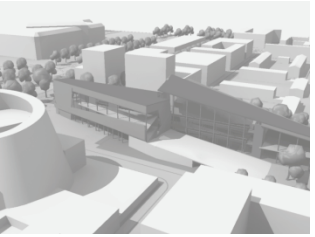
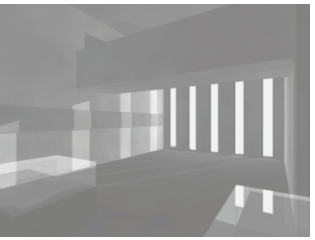
Technische Universiteit Delft

Lecture overview

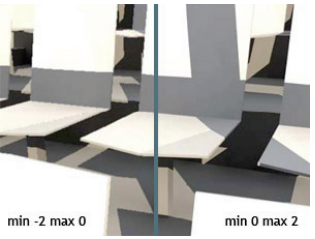


- Final Gather Exterior
  Lighting and rendering an exterior scene using the Physical Sun and Sky



- Final Gather Interior
  Lighting and rendering an interior scene using FG

- Global Illumination Interior
  Lighting and rendering an interior using photons



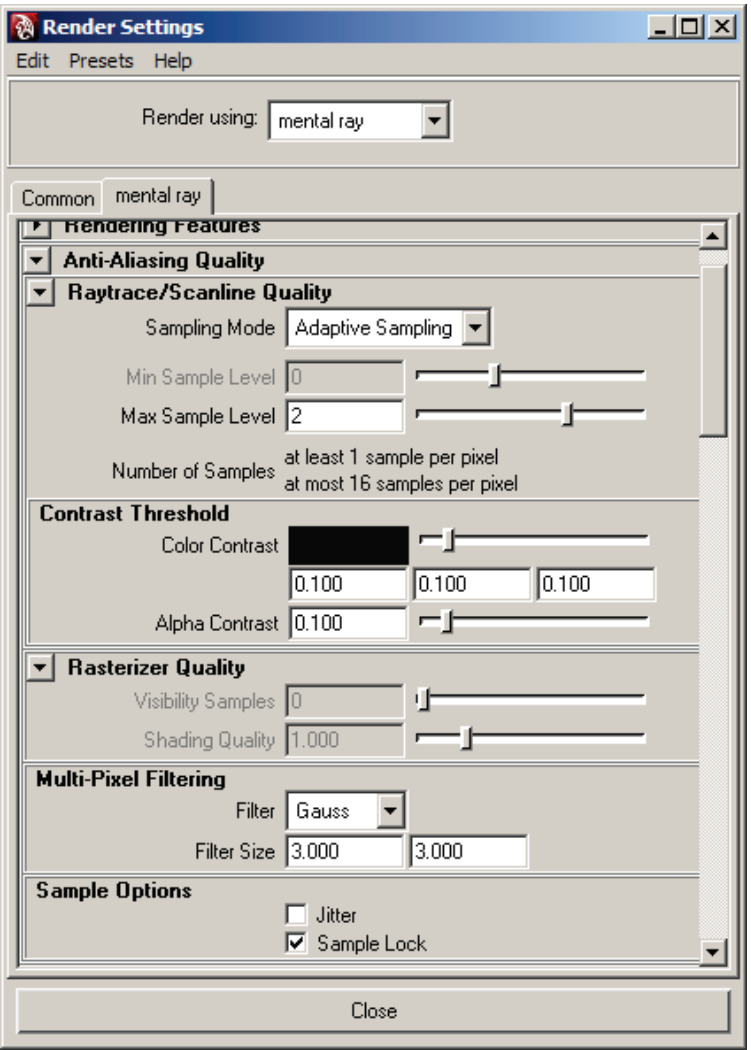
- Render Quality settings

- MIA Materials

Mental Ray

Quality Settings

Anti-Aliasing Quality



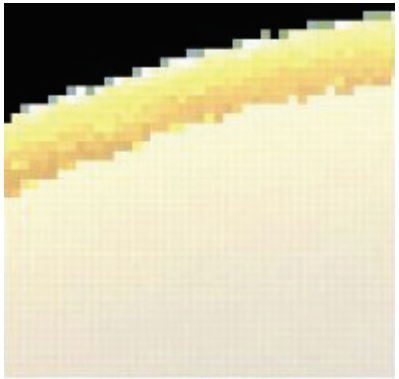
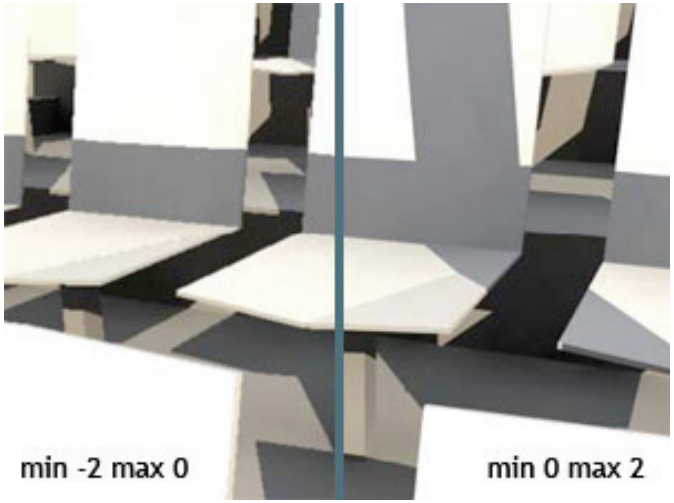


Image courtesy of the Art of Maya



Quality Settings

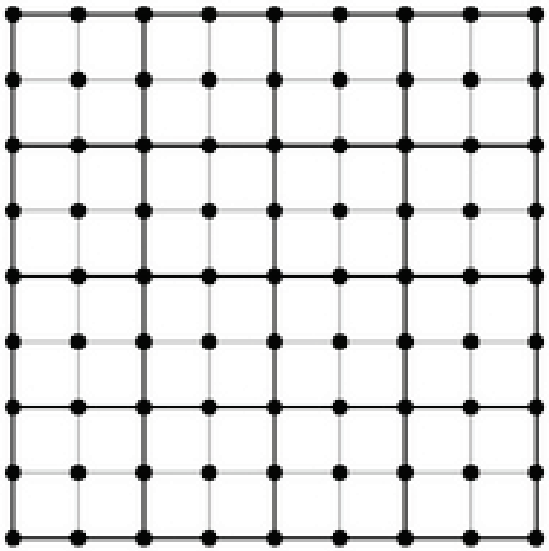
Anti-Aliasing Quality

It is all about sampling; the more samples the higher the quality, but also the longer the render time. Therefore selecting the right number of samples can save a lot of time. More samples are needed in area's with high contrast (like edges of objects)

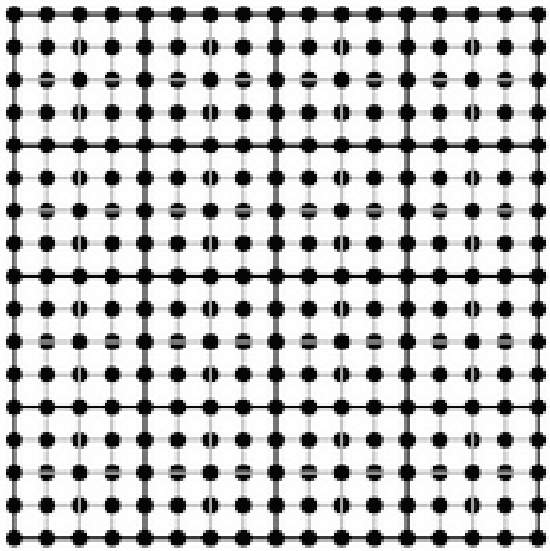
When using *adaptive sampling* the computer will select the appropriate samples levels for each rendered region.

Quality Settings

- Basic Sampling, not that smart….



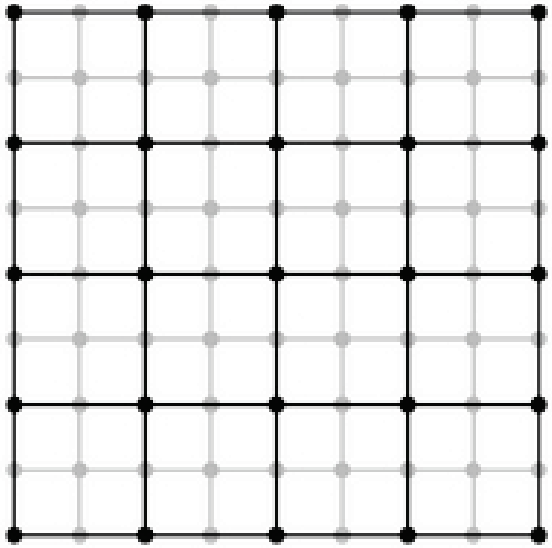
samples 1 1
4 samples per pixel.



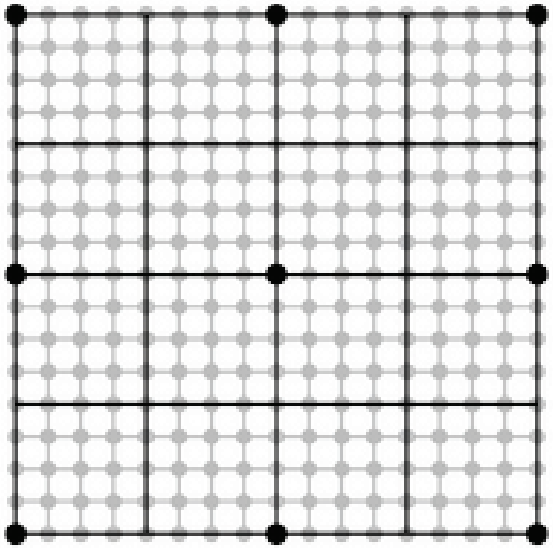
samples 2 2
16 samples per pixel.

Quality Settings

- Adaptive Sampling, more possibilities



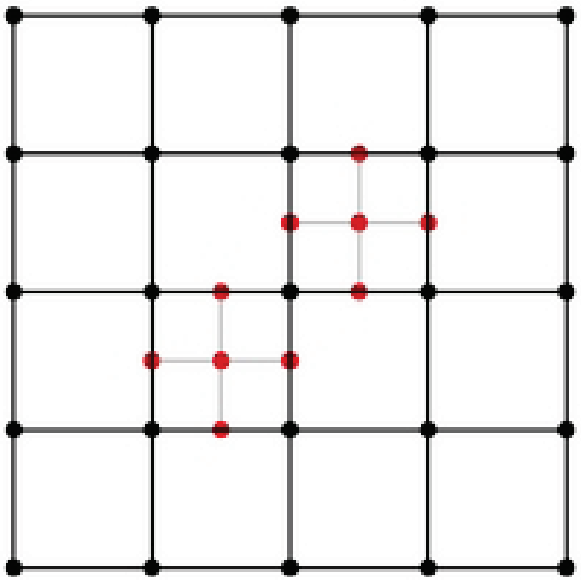
samples 0 (min) 1 (max)
Gray dots show possible samples.



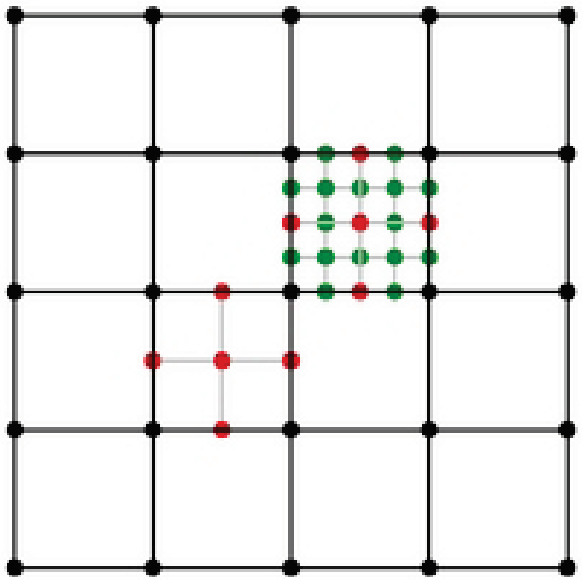
samples -1 (min) 2 (max)
Gray dots show possible samples.

Quality Settings

- Combined with contrast, it works good



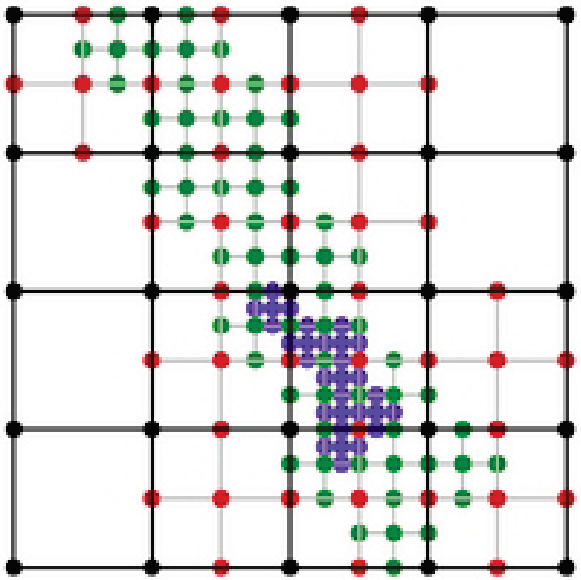
samples 0 (min) 1 (max)



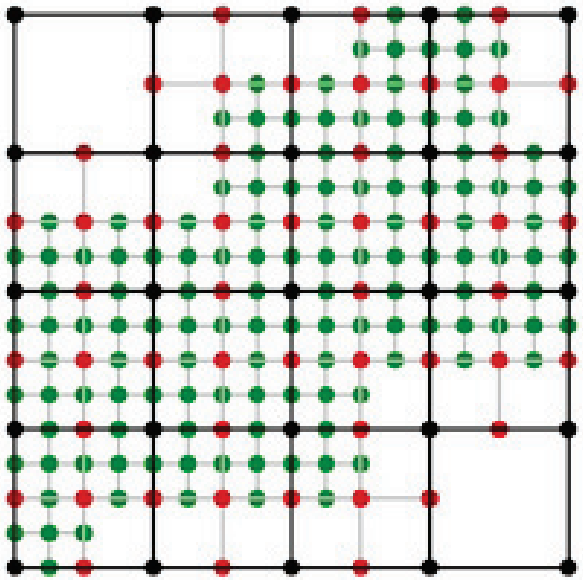
samples 0 (min) 2 (max)

Quality Settings

- And its possible to get high quality without the longer render times



samples 0 (min) 3 (max)



samples 0 (min) 2 (max)

Quality Settings

Filtering - Takes into account the neighboring pixels to get a smoother result.

- Box

The fastest way to get relatively good results.

- Triangle (default)

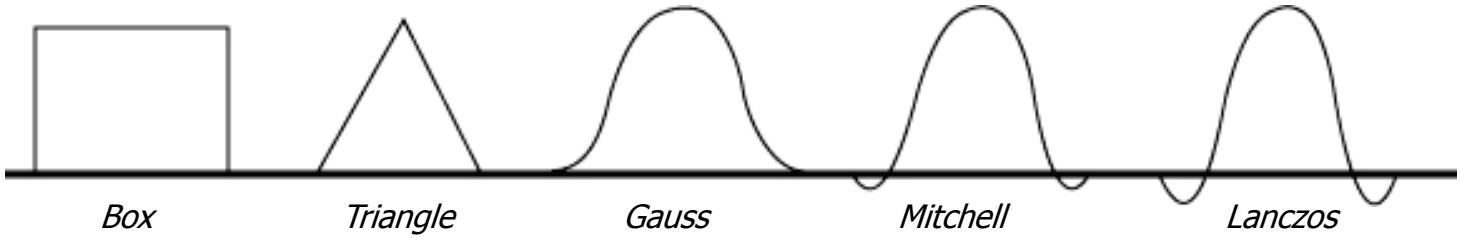
More processor intensive than box, but offers even better results.

- Gaussian

Produces the best results, but is the slowest to render.

- Mitchell, Lanczos

Mitchell (clip) and Lanczos (clip) are alternatives to Gaussian that offers slight variations in contrast (tends to increase). Mitchell increases less than Lanczos.

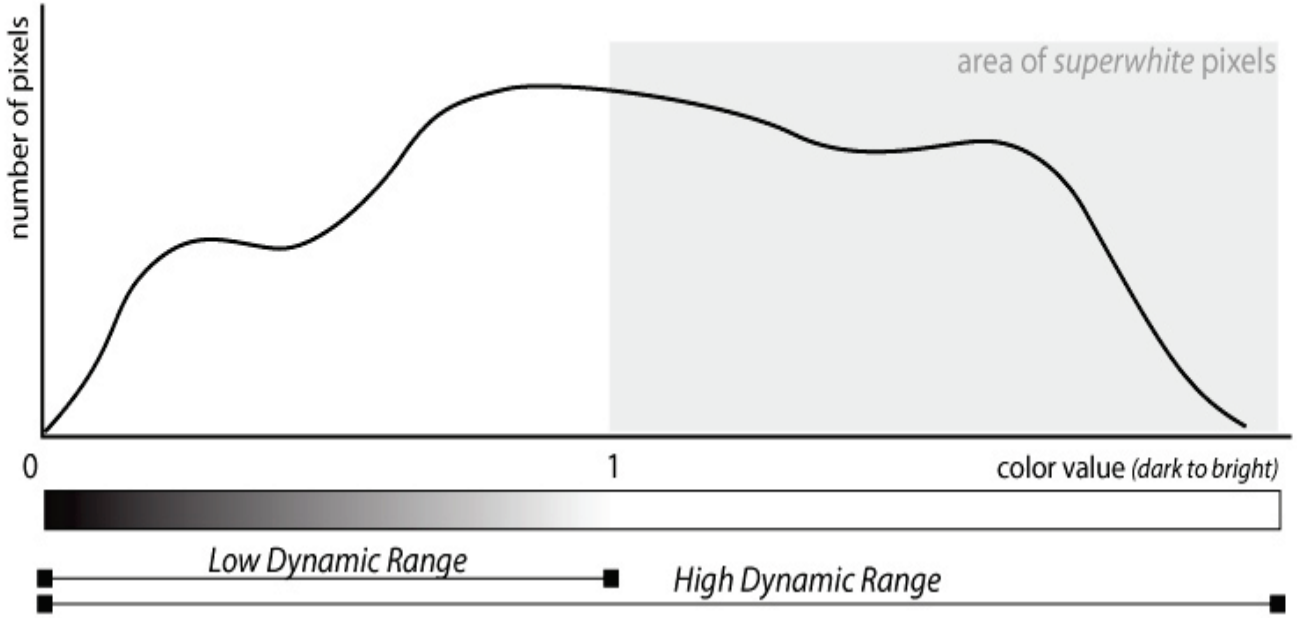


Tone mapping

MIA Exposure Control

» TOI-Pedia: Tone Mapping

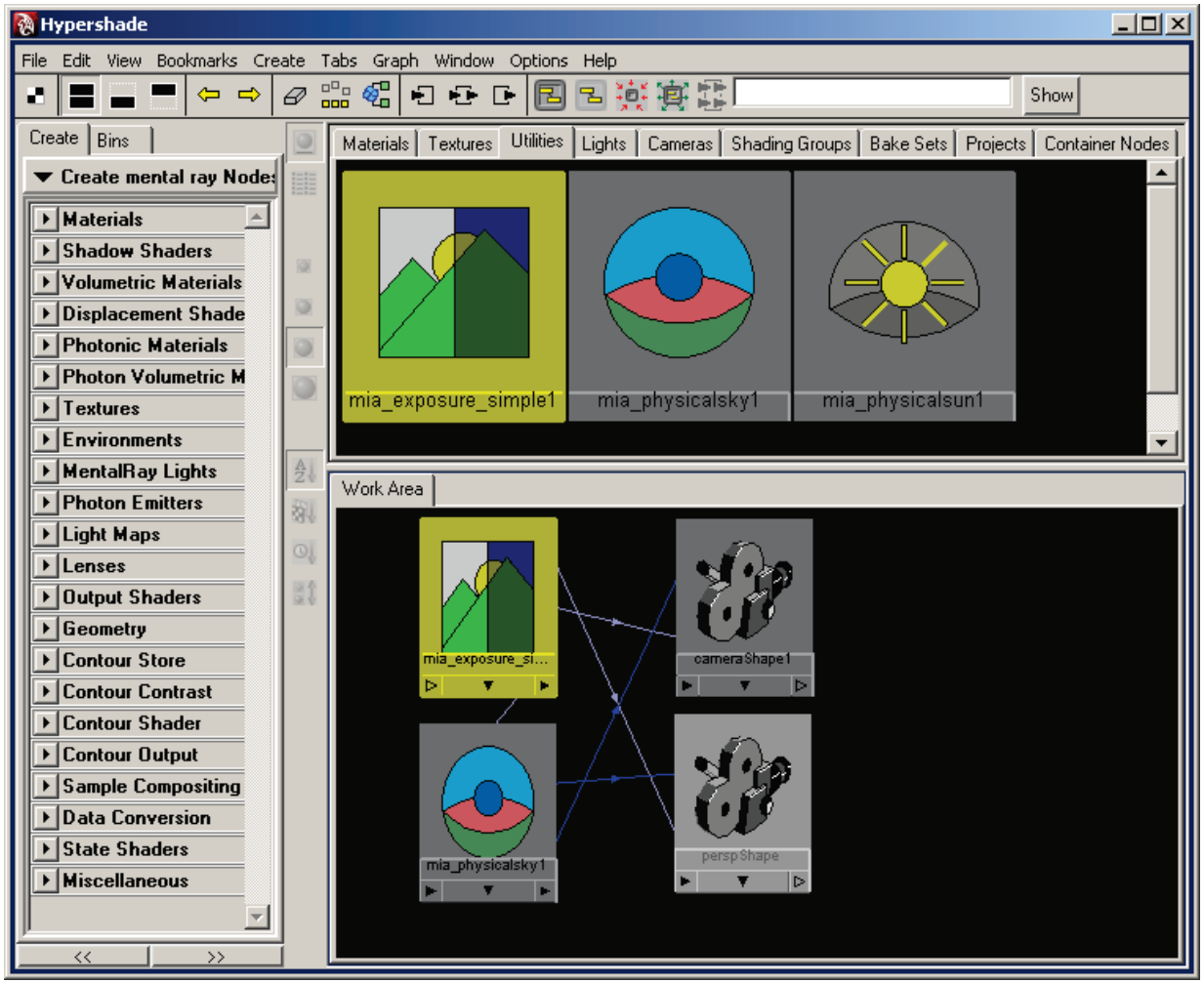
Mental Ray produces 'HDR' output. This often results in over-exposed images. Tonemapping helps to control this



Mental Ray

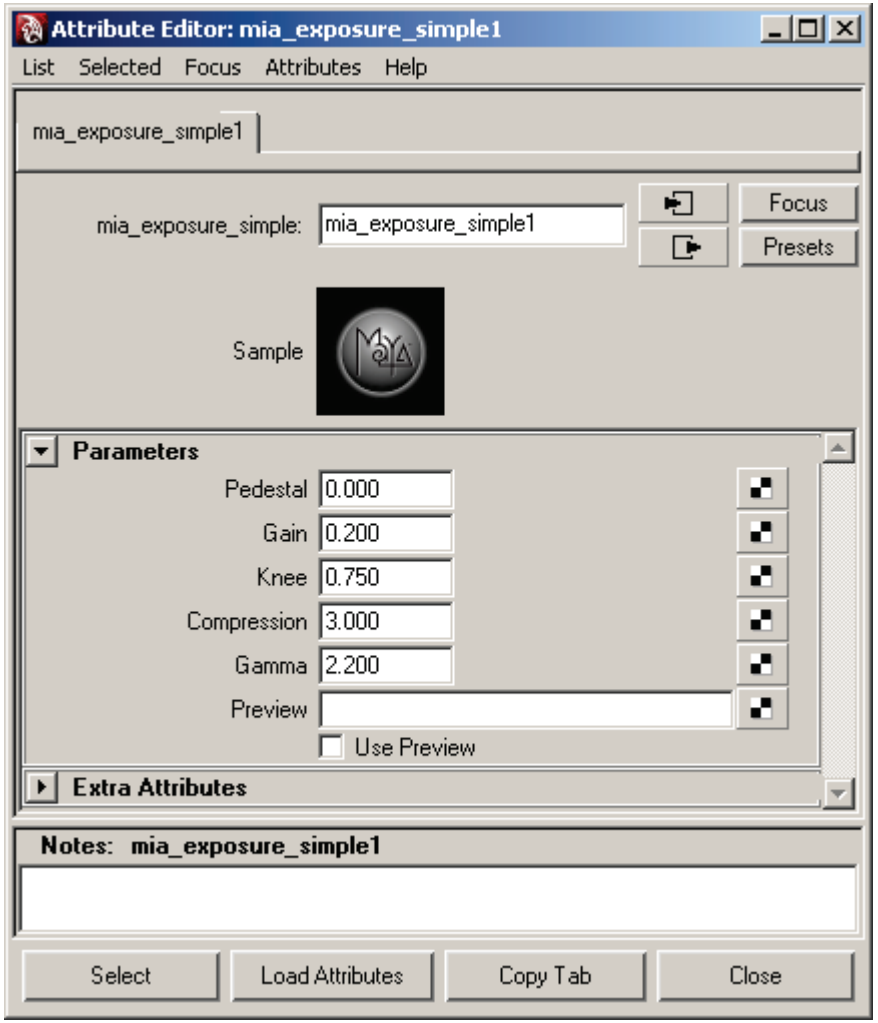
Tone mapping

Nodes in the Hypershade



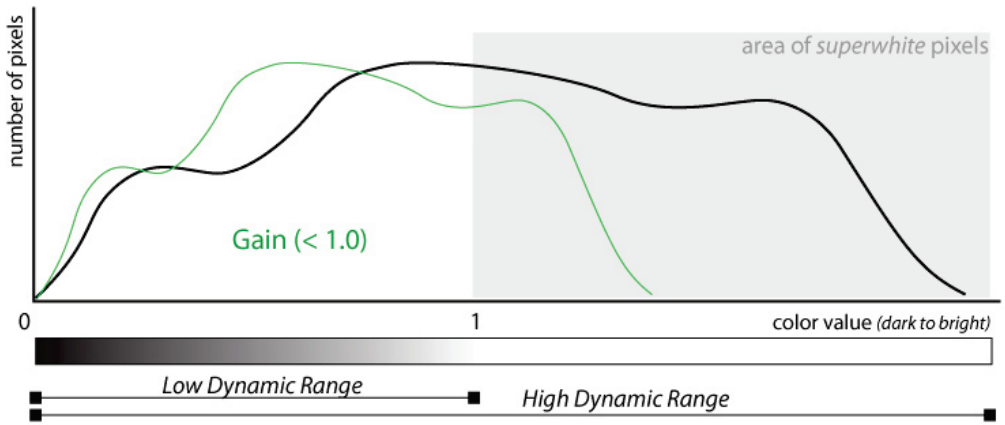
Tone mapping

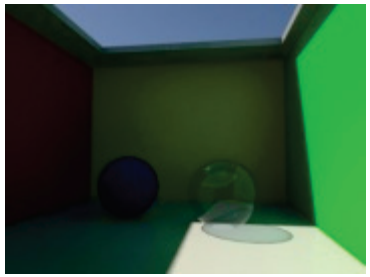
Mia_exposure_simple



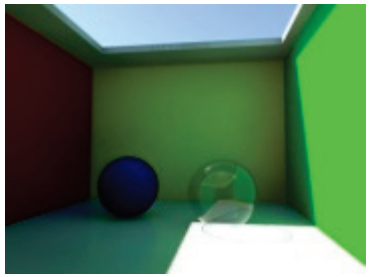
Tone mapping

Mia_exposure_simple: Gain

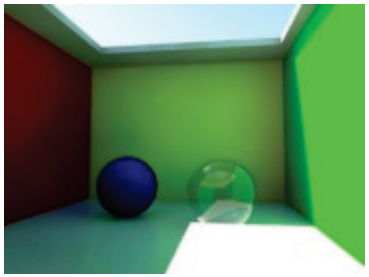




Gain = 0.1



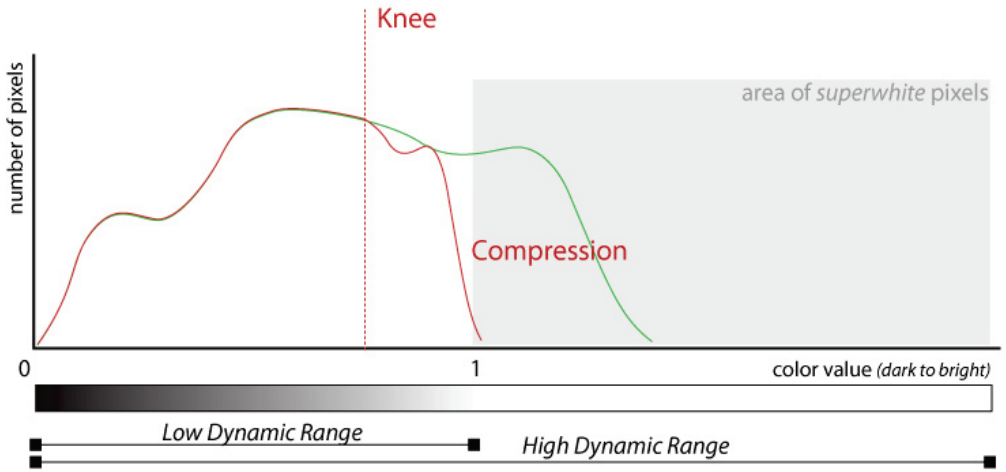
Gain = 0.3

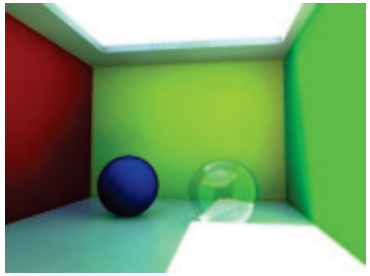


Gain = 0.5

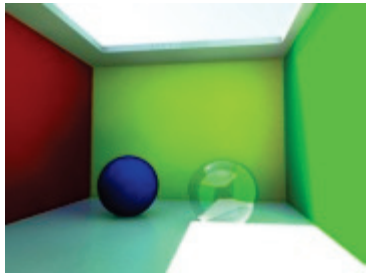
Tone mapping

Mia_exposure_simple: Compression and Knee

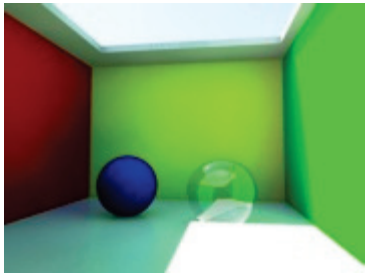




Compression = 0



Compression = 2.5



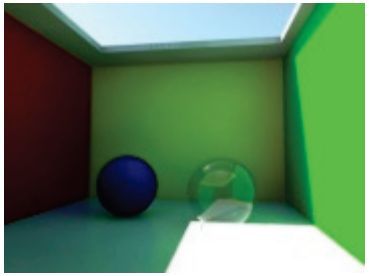
Compression = 0.5

Tone mapping

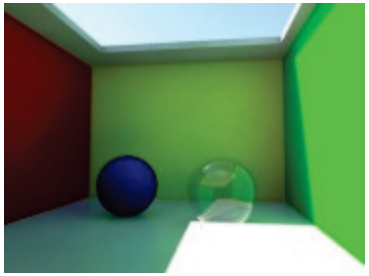
Mia_exposure_simple: Gamma

Mental Ray produces true linear color data with physical lighting. The problem is that humans don't *perceive* color values which are numerically twice as big, as twice as bright. Here is where gamma correction comes in.

Gamma = 1.8



Gamma = 2.2



Gamma = 2.6

Global Illumination - Interior

Lighting and rendering an interior scene using photons

Mental Ray

Global Illumination - Interior

Hands-on demonstration!

Mental Ray

Global Illumination - Interior

A quick overview of the main points

Mental Ray

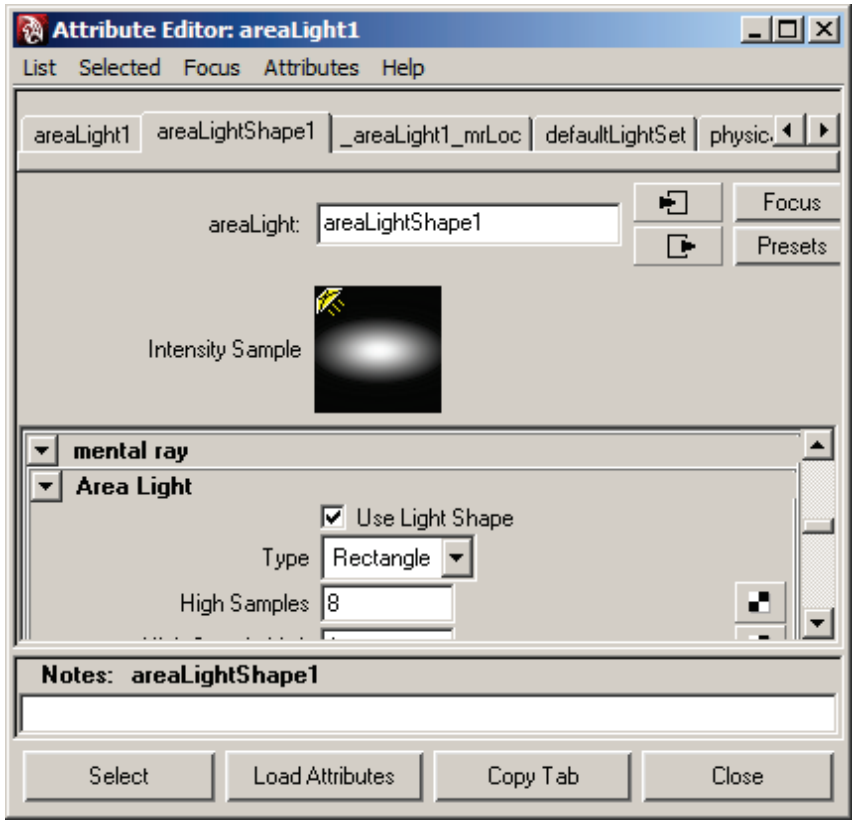
Global Illumination – Lights

- Use normal Maya lights
  - Enable Raytrace shadows
  - Enable Photon Emission
  - Attach the Mental Ray Physical Light shader
  - Leave the regular intensity at 1.0

- Use exposure control (Tone mapping) to scale down the HDR results to LDR range and for fine-grain control of your image

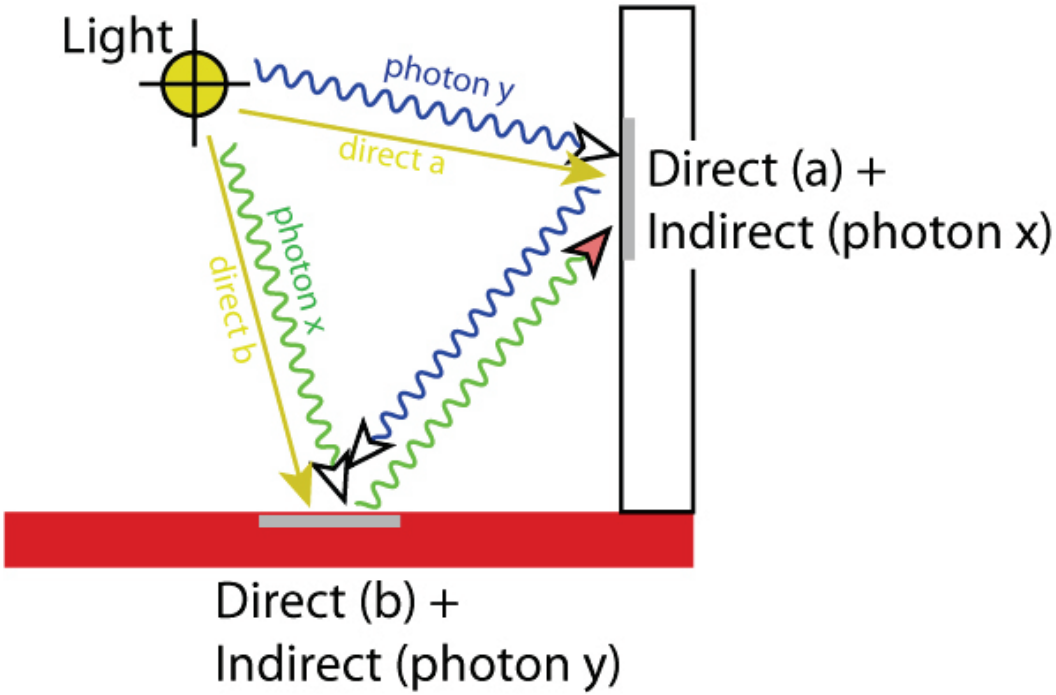
Mental Ray and arealights

- You **must** enable 'Use Light Shape' in order for Mental Ray to use the arealight properly.



Global Illumination – Lights

- When using GI, every light has two intensities that are used:
  - Direct light (intensity)
  - Indirect Light (photon intensity)



Global Illumination – Lights

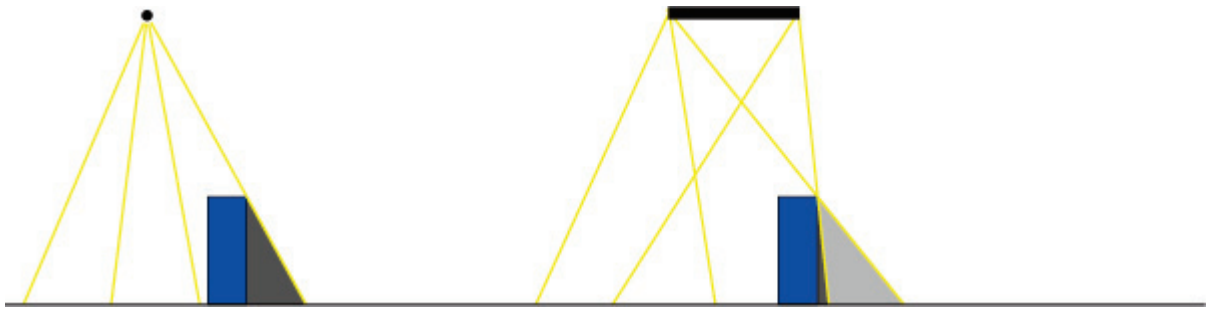
- When using the Physical light shader, the regular 'intensity' is ignored and replaced by the 'value' of the Physical Light color.

- It's up to you to get both intensities to match (or not)
  - To be physically correct:

Physical Light value = Photon intensity / PI

Physical Light Shader

- To get 'soft' light borders while using a Physical Light shader, the light source **must** have an area. Pointlights and spotlights are not suitable, because the light originates from a single point



The 'soft borders' of a spot light, using the Penumbra angle, are 'faked'. The light is still a point source. When using a Physical Light shader, this 'faking' is ignored (it's physical, not fake)

Global Illumination – Render Settings

Mental Ray

- Set your Render Settings to basic settings for quick rendering
  - Anti Alias Quality: -1 1 (triangle filter)
  - GI Accuracy: ~100
  - Photon radius: ~ 1.0
  - Raytracing: ~ 2 2 4 **(depends on scene!)**
  - Photon tracing: 3 1 4 **(depends on scene!)**

  - Resolution: 320 x 240

Global Illumination – General Workflow

- Start with one light
- Get the intensity about right
- If that's OK, add more lights (not too many at a time)

- Keep the total number of lights as low as possible:
  - Are the lights really necessary?
  - Are they visible at all?
  - Can you aggregate lights?

- Enable Final Gather

Global Illumination – Production

Mental Ray

- Increase Resolution
- Increase number of photons
- Increase Photon Accuracy
- Increase FG settings
  - Point density (~ 0.6 - 1.0)
  - Accuracy (~ 30-100)
  - Interpolation (~ 20-50)
  - Filter? Only when needed
- Anti Alias Quality
  - Samples: 0 2 with gauss/mitchell filtering

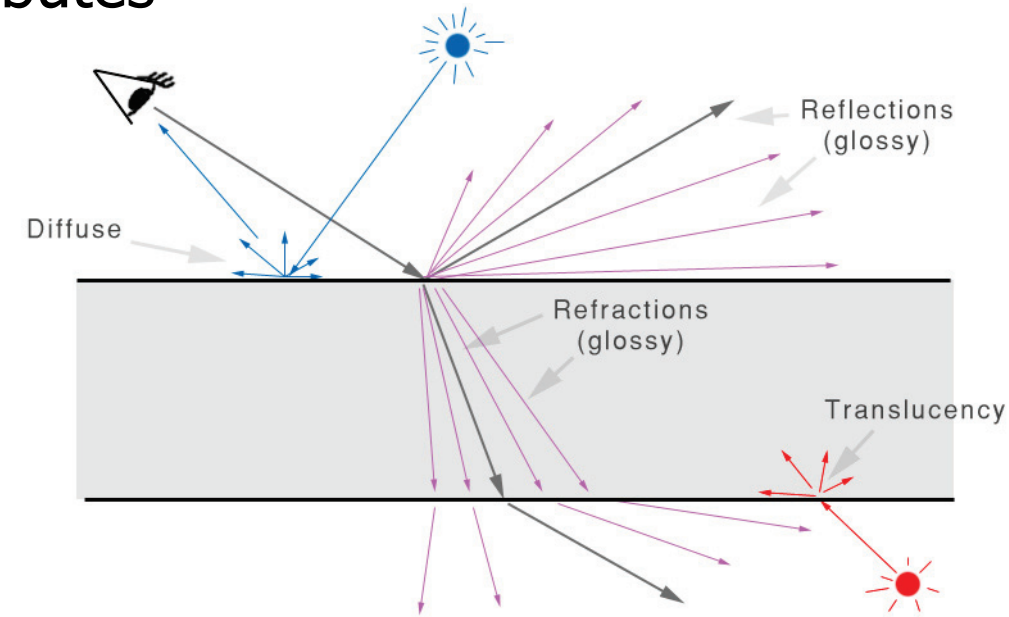
Mental Ray Materials

© Nisus

Mental Ray Materials

From Maya 8.5 we have the Architecture and Design material (MIA material)

Compared to the default Maya materials (lambert, blinn and phong) this material has a lot of extra attributes



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Mental Ray Materials

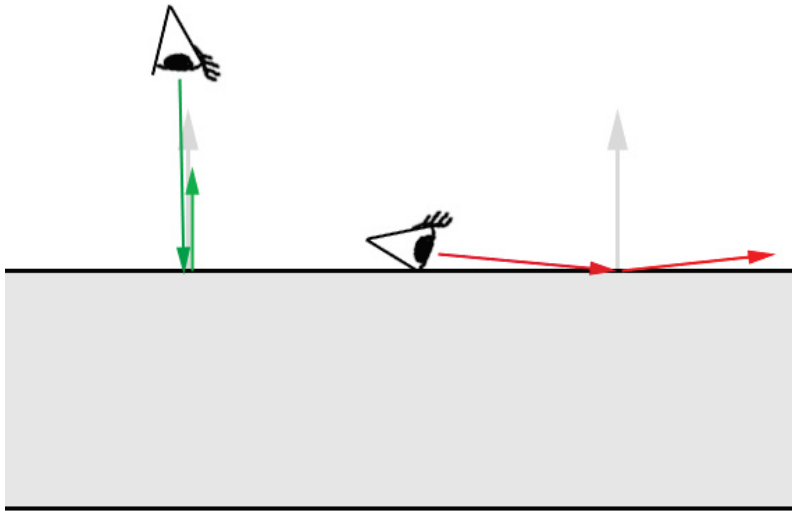
One of the most important features is that this material is automatically energy conserving, which basically means that energy is not magically created. So physically correct!

In practice this means that when the reflectivity value is increased, the diffuse and transparency are decreased because:

Diffuse + reflection + refraction <= 1

Mental Ray Materials

BRDF – Reflection depending on the view angle



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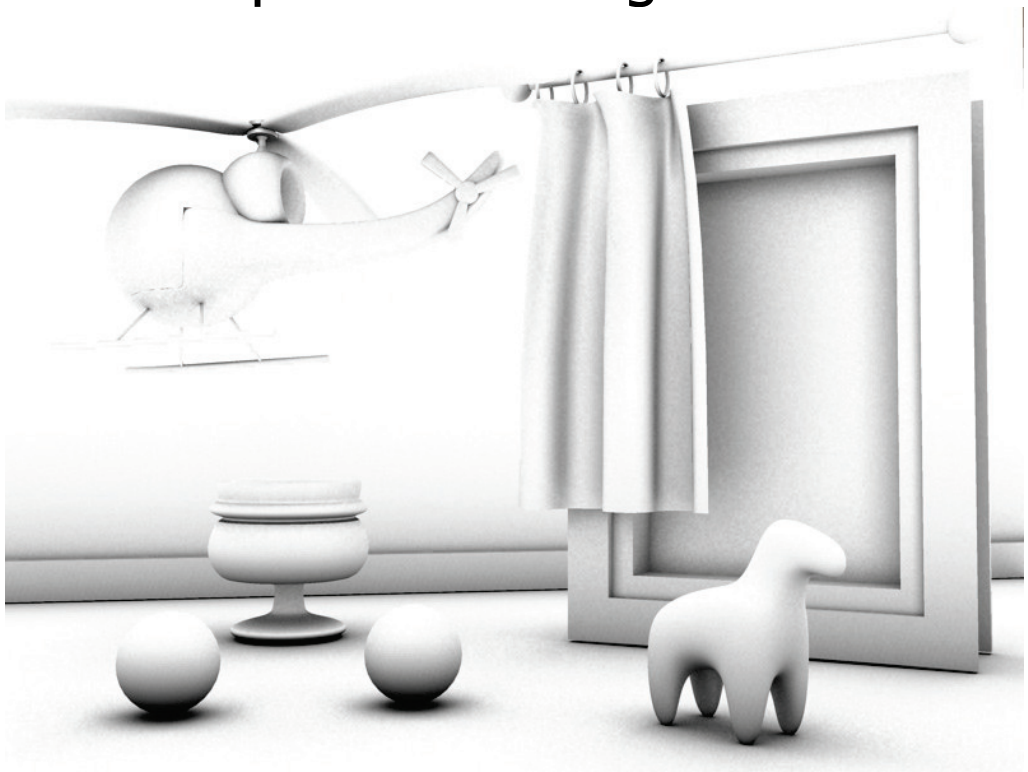
Mental Ray Materials

Ambient Occlusion – Simulates the "look" of Global Illumination by mimicking areas of blocked light. Very useful for getting a greater sense of depth in an image



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Mental Ray Materials

Glossy Reflections – Creating glossy reflections by simulating micro-facets in the surface.

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Mental Ray Materials

Refraction – Light refracting when passing an object.

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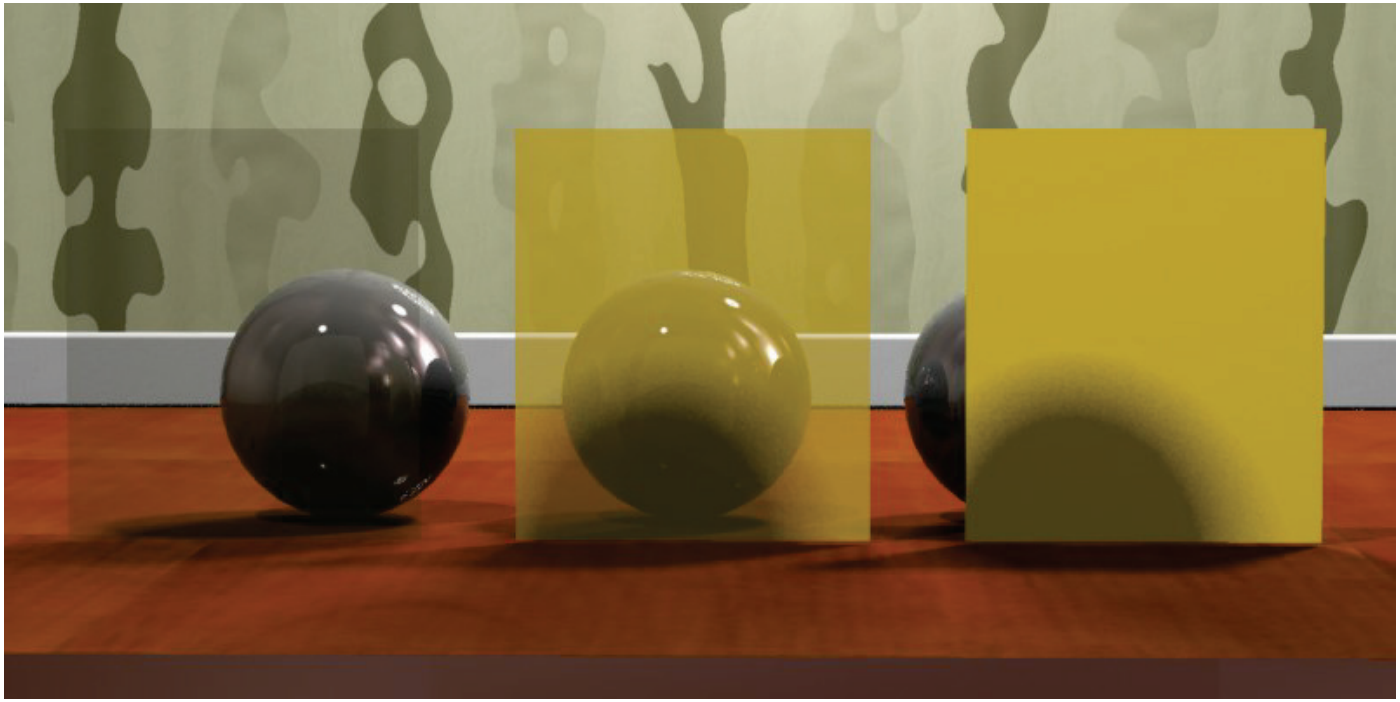
Mental Ray Materials

Translucency – Different kind of transparency where the view trough is blurry or distorted.

To simulate: rice paper room dividers etc.



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Mental Ray Materials

Anisotropy – Size and direction of the materials highlight.

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Mental Ray Materials

Some examples of this material

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Mental Ray Materials

More information is in the TOI-Pedia!

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