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SL – Sampling Level.
- Rendering stops once a particular SL is reached or the allocated time runs out.
- The time it takes to render each successive SL is about 1.5 times longer than that of the previous SL.
- Noise in the rendered image starts to clear up above SL 15 - 20. Difficult caustics may require SL 25 - 30.

Benchmark –
- The benchmark number is a scene-dependent parameter where a higher value signifies faster rendering.

Layer – Material Property Layers contain the parameters that control the optical properties of a material.
- Layers can be stacked one upon another much like the Layer system in Photoshop.
- Blending of layers is controlled via the Layer Weight, Transparency, or Blend modes (Additive or Normal).
- No more than one Layer should be set to Additive mode, otherwise the material could become too bright.
- If a material is not meant to be transparent, the bottom most Layer Weight should be 100%.

BSDF – Bidirectional Scattering Distribution Function.
- You can have multiple BSDF components in a layer, each with it's own Weight contribution.
- The total Weight of all BSDF components in a particular Layer should always add up to 100%.

Reflectance 0 – Object's diffuse colour (surface perpendicular to camera).
- Practical maximum should be 230 – 240. (White paper is about 225)
- This colour will dominate when you have high Roughness values.

Reflectance 90 – Object's specular or Fresnel colour (surface at a glancing angle to camera).
- For most materials this will be a white colour.
- For metals this will be a brighter version of the "Reflectance 0" colour.
- If using a texture map for a metal material, it should be lighter than the "Reflectance 0" texture. You can do this by adjusting the brightness in the Texture Picker dialog box.
- This colour will dominate when you have low Roughness values.
- To get a good Fresnel curve, the Reflectance 90 colour should be at least 15 units brighter than the Reflectance 0 colour, particularly when using textures.

Transmittance – Brighter colours result in clearer transparency.
- This is the colour of light when it reaches the attenuation distance.

Attenuation – Distance light travels through an object before loosing half it's energy.
- Transmittance colour should be greater than 0 for attenuation distance to become active.
- In general, attenuation distance should be comparable to the thickness of the transparent object.
- Attenuation distance for common glass should be about 3cm and going up to 40cm for high grade glass.

Nd – Index of Refraction as measured at a wavelength of 589.29 nm.
- Higher Nd weakens the Fresnel effect so that the amount of reflection becomes equal at all angles.
- Nd has less influence on the reflectance of an object the higher you set the Roughness.
- Think of Nd as a brightness multiplier for "Reflectance 90".
- Transparent materials like Glass should be about 1.5.
- Opaque materials should be about 3.
- Reflective Metals should be about 15 – 20.
- When using SSS, Nd must be between 1.0 & 2.5

Force Fresnel – Reflectance of object will be affected entirely by Nd and NOT by the "Refl 0 & 90" colours.
- Turn on Force Fresnel when working with simple colours in the Reflectance 0 & 90 channels.
- Turn off Force Fresnel when working with textures in the Reflectance 0 & 90 channels.
- Used to create more realistic metals or shiny materials.
- Generally the object will be brighter and less grey.
- The higher the roughness, the less influence "Force Fresnel" will have.

K – Extinction Coefficient. Amount of absorption loss as an electromagnetic wave propagates through a material.
- Relevant for metals, ignore for most other materials.

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Dispersion – As white light travels through a refractive medium, different wavelengths are refracted differently and thus disperse to form a rainbow of colours.

- Turn this property ON in the “Material Properties” section of the Material Editor.
- Turning this ON will increase the render time.
- The Abbe number controls how much Dispersion you have.

Abbe – The amount different wavelengths (colours) of light disperse as they pass through a refractive medium.

- Low values such as 5 result in a lot of dispersion whilst high values such as 60 or 70 result less dispersion.

R2 – Allows the 90º colour to be visible at high roughness values.

- Parameter 1: Fall off angle (0º – 90º) determines how much “Reflectance 0” colour comes through.
- Parameter 2: Amount of virtual Roughness (1 -100) that will be introduced.
- When working with R2, try not to set the Roughness parameter over about 50.
- You might use this with a two toned car paint or velvet which has a sheen of a different colour.

Roughness – Amount of Specular (0) vs Diffuse (100) reflection.

- Practical maximum should be 90 – 95. (A perfect Lambertian material is 100)
- Higher Roughness – “Reflectance 0” colour will dominate.
- Lower Roughness – “Reflectance 90” colour will dominate.

Anisotropy – Directionally polished Materials display anisotropic reflection (as opposed to isotropic reflection).

- Values range from 0 (isotropic) to 100 (full anisotropic).

Angle – Specifies the anisotropy angle, the main direction of the reflected light.

- 0º Angle causes reflections to be smeared out vertically.
- 90º Angle causes reflections to be smeared out horizontally.

Bump – Grey scale image that simulates the Up/Down direction of grooves.

- Can be a sensitive parameter, standard values should be about 1 - 25 but sometimes 200 is required.

Normal Mapping – Colour coded image that simulates the actual gradient on the surface of grooves.

- Maxwell supports three Normal map protocols: Flip X, Flip Y, & Wide.

Displacement – Grey scale image that displaces a surface to create 3D grooves.

- Higher Gain values create surfaces with greater fidelity but render times become significantly longer.
- When using Displacement, try to use a mesh with more subdivisions.

Subsurface Properties – Puts particles inside a medium so that SubSurface Scattering can occur.

- Up to Maxwell 2.1 - This works best with Image Based Lighting (IBL).
- Scattering colour value has the same limitation as Reflectance 0, it should not go over about 225.
- Coefficient could start at about 250 and shouldn't go above 500 for translucent materials.
- Coefficient should go above 500 for more opaque materials.
- Asymmetry: (Forward scatter - more transparent) -1 < 0 < 1 (Back scatter - more opaque)
- Nd should be between 1.2 & 1.7
- Turning on “Force Fresnel” will cause the material to be more reflective at higher Nd values.
- Single Sided -
    - Much quicker than normal SSS.
    - Used for leaves, paper, light weight cloth, etc.
    - Usually set the Transmittance & Scattering colours to be the same.
    - To help reduce noise, don’t make the colour too bright or too saturated (Keep it below 225).
    - Attenuation distance should be quite small (about 3mm) and not much more than the SS thickness.
    - Roughness has a slightly different effect in that it makes the material look more like frosted class.
    - For a leaf texture the Coefficient might go as high as 50000.
    - Single Sided thickness can be defined with a grey scale texture map, the Min/Max values define the thickness that the Dark/Light pixels represent.

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Emitters - User defined light sources.

- A light source can be any colour you like but to match daylight, the temperature should be about 6500 K.
- Always use a small sphere as the emitting geometry for IES lights.
- When doing Multilight rendering, use the Custom light type settings.
- When setting a light source by Temperature, Multilight rendering will behave slightly differently because of the way that power in defined in the Kelvin scale.

Environment – Atmosphere

- **Sun** – Solar strength multiplier.
- **Sun Temp** – Warm **<** Neutral (5777 K) **<** Cool.
- **Planet Reflection** – Average planet Albedo = 26-32%. Snow = 80%. Forest = 5-10%.
- **Ozone** – Yellow **<** Neutral (0.4cm) **<** Blue.
- **Water** – No effect on sky at midday. Raising water value makes the sky look less saturated.

Environment – Aerosol Properties

- **Turbidity Coefficient** – Clear sky (0.01) **<** Normal sky (0.04) **<** Hazy (0.1).
- **Wavelength Exponent** – Desaturated sky **<** Default sky (1.2) **<** Saturated sky becoming green/orange.
- **Reflectance** – Rate of energy scattering & absorption by the Aerosols.
- **Asymmetry** –
    - Negative values = Light scattered back towards the sun.
    - 0 = Light scattered equally in all directions.
    - Positive values = Light scattered in same direction as incoming light rays.
    - Positive values produce a halo effect around the sun.
    - Keep values between -0.85 & +0.85 to reduce amount of noise in the rendering.

Optimisations –

- Make sure emitter surfaces are as low-poly as possible.
- If possible, do not completely enclose an emitter inside a dielectric object.
- Make sure an emitter does not intersect other geometry.
- Do not include very white or fully saturated materials. For a white wall, an RGB of 220 is sufficient.
- Where you can, use the AGS glass material for windows. This will create reflections but not caustics.
- When using the Additive mode with material Layers, do not use more than two Layers.