Poser Materials
Concepts & Elements
- the Basics -

Poser offers a lot of tools and options to shape, stage and animate the objects in my scene. But to turn them into an interesting and colorful image or movie, Materials are what I need.

This document discusses the buzzwords and the way things work (together) as far as the Poser Material Room is concerned, and for this Basics document: as far as the Simple interface is concerned as well. This makes it accessible for starting Poser users.

The FULL document instead is addressing Intermediate and Advanced users as well.

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Contents

Poser Material Concepts & Elements

This document discusses the buzzwords and the way things work (together) as far as the Poser Material Room is concerned, and for this Basics document: as far as the Simple interface is concerned as well. This makes it accessible for starting Poser users.

That's something, and for that reason the information is presented in various sections:

I Introduction.
The articles in this section discuss some terminology, and the various interfaces to the materials definitions:

- 01 WHAT'S A MATERIAL, A SHADER, A TEXTURE, A MAP?
- 02 HOW DO I ACCESS A MATERIAL?
- 03 MATERIAL ROOM OFFERS A SIMPLE INTERFACE. WHAT DO I MISS?
- 04 MATERIAL ROOM SIMPLE AND ADVANCED INTERFACE - HOW DO THESE RELATE?

II Simple Surface Definitions.
The articles in this section discuss material definitions for object surfaces, which can be handled through the Simple Interface, and do not require a deep understanding of Material Room principles. Each article however also presents the Intermediate approach to some extent, using the Advanced interface for the same subject at hand. This is to avoid multiple articles answering the same question.

- 05 WHAT'S THE DIFFUSE component intended for?
- 06 WHAT'S THE SPECULAR / HIGHLIGHT component intended for?
- 07 WHAT'S THE AMBIENT component intended for?
- 08 WHAT'S THE TRANSPARENCY component intended for?
- 09 WHAT'S THE REFLECTION component intended for?
- 10 WHAT ARE THE BUMP AND DISPLACEMENT components intended for?

The full document instead is addressing Intermediate and Advanced users as well. The chapters mentioned above are somewhat more elaborated, and it also contains:

III Intermediate Surface Definitions.
The articles in this section discuss some material definitions for object surfaces (the PoserSurface), which are handled through the Advanced Interface: the nodes from the Lighting group, and the nodes on image-maps and movies. It also discusses some principles on dealing with the PoserSurface root node.

IV Advanced Surface Definitions.
The articles in this section discuss all Material Room nodes required for either procedural textures, and the ones explicitly aimed at node-tree building.

V Materials for Non-Objects.
The articles in this section discuss properties for Atmosphere, Background and Lights. These are not objects with a surface, but do have properties which are handled in Material Room.

I Introduction

The articles in this section discuss some terminology, and the various interfaces to the materials definitions:

- 01 WHAT'S A MATERIAL, A SHADER, A TEXTURE, A MAP?
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Next section presents articles on defining the surface properties of objects, on a Simple level only:

- II SIMPLE SURFACE DEFINITIONS

01 What's a material, a shader, a texture, a map?

In real life, a **material** is the stuff something is made of. Rock, brick, sand, knitted red wool, thin leaded glass, anything. Real life materials not only have a look, they also have a feel, a smell, and a response to our actions determined by a weight, flexibility, and the like.

In virtual life, like a Poser scene, a **shader** refers to a set of object (surface) properties that mimics the looks of a real life material, when rendered. So we can have a rock shader, a knitted red wool shader, etcetera. Shaders do not have a feel, or a smell, they're inside the computer. But since everyone can tell real life from virtual, the word "material" is also used in these cases, at least in some software communities.
So, in Poser one has a Material Room, to make a "brick material" and to assign it to a wall in the Poser scene. In Poser communities, "shader" is rarely used.

In real life, **texture** relates to the feel of the thing at hand. The surface roughness of the brick when I rub it with my hand, the structure of the fish I feel with my tongue when tasting it.
In virtual life however, texture usually refers to the colors of an object surface. A texture then is an image used to assign such colors to elements in my Poser scene. However, since people are somewhat relaxed in their choice of words, they're happy to assign a "brick texture" to a wall; not only implying color but roughness and reflectivity as well. So in those cases texture means material means shader.

While texture usually refers to an image which is used to assign colors to a surface(property), a **map** refers to an image which is used to vary the amount of something. A bumpmap to vary the amount of roughness, a transparency map to vary the opaqueness, and so on. Maps in those cases tend to be black & white, which refer to 0% .. 100% and have greyscales for everything in between.

On the other hand, **mapping** (as in: UV-mapping) is the term for assigning images in general to an object surface whether it's for coloring or for determining roughness or reflectivity. So some people might use "map" while referring to the image driving the coloring process too.
Fortunately, there is some method in this madness: as shader is hardly used in the Poser community, material or texture is used instead. The people using material for the whole thing tend to use texture for the coloring images. The people using texture for the whole thing tend to use texture-map for the images. But be aware; without context or background info, "brick texture" still might mean either the whole thing or just the color-driving image.

02 How do I access a Material?

The straightforward way is to use the Material tab to enter the Material Room. An object or part of it already can have been selected, or can be selected from within the room itself. The Material Room offers a Simple User Interface, as well as an Advanced one. See 03 MATERIAL ROOM OFFERS A SIMPLE INTERFACE. WHAT DO I MISS? and 04 MATERIAL ROOM SIMPLE AND ADVANCED INTERFACE - HOW DO THESE RELATE? on them.
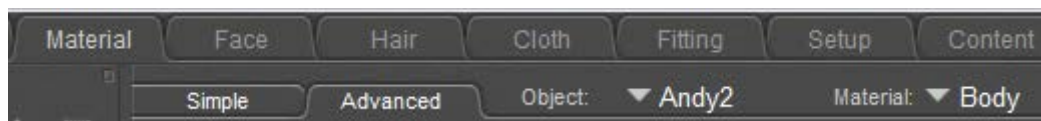
Intermediate

Next to that, there are some additional ways into Material Room, for the 'material properties' of Lights, Atmospheres, Backgrounds, and for some specific surface properties:

1) When a Light is selected, its Properties tab offers an [Advanced material properties] button which brings me into the Material Room, for the coloring properties of that light.

2) With menus File > Import > Background Picture or … > Background Footage,
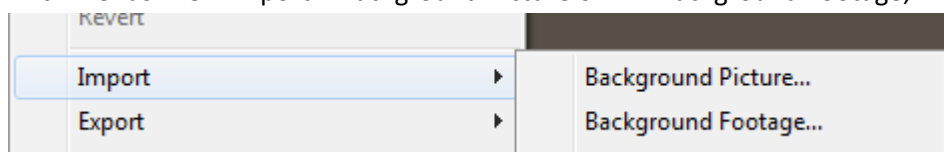
and with the Shadow Color picker just right/below the Document window one affects the contents of the background material.

3) From within Material Room some buttons on the right affect the object surface material at hand:
- Add Reflection and Add Refraction
- Add Skin Subsurface Scattering
- Setup Shadow Catcher and Setup Toon Render

The [Create Atmosphere] button however affects the Atmosphere material while the next buttons
- Setup Light Style
- Setup Ambient Occlusion
- IBL

affect the various coloring properties for Lights.

03 Material Room offers a Simple interface. What do I miss?

When using the Simple interface, I miss:

- About anything more advanced than assigning color and an eventual image map to any feature. As a result, my render will keep that artificial, hard plastic-like feel.

- The option to have Bump and Displacement both in one surface definition, and the option to use Normal maps.
  As a result, I cannot distinguish large scale (displacement) from small scale (bump) surface variations. And I can't use Normal maps, which are common in shading game characters and objects.

- Access to more real-life optical effects like Translucency and Refraction.
  As a result, creating believable glass and fluids will remain an issue.

- Access to the Preview / Diffuse / Specular split in direct light properties
  As a result, I'll keep on having issues with handling Indirect Lighting (IDL) in an appropriate way, in preview as well as in rendering.

- Access to advanced render features (Custom_output).
  Honestly, these are hardly used anyway and can be considered high-end pro stuff.

Intermediate

Generally, all features which remain unsupported by the Simple interface will also go unsupported when exporting Poser scenes and objects to other formats or programs. Exporting to OBJ, integrating Poser with LuxRender, Octane, Vue or you name it; all tend to lose the material properties which are not supported in the Simple interface. And even some of those might get lost in translation.

In other words: when Poser is just my scene building and posing tool but not my final renderer, I consider the Material Room Simple interface as the recommended one.

The question: what do I miss, can be inverted to: what elements from the Advanced interface go (un)supported by the Simple interface. This is addressed in 04 MATERIAL ROOM SIMPLE AND ADVANCED INTERFACE - HOW DO THESE RELATE?.

04 Material Room Simple and Advanced interface - how do these relate?

The Advanced interface to Material Room offers access to some more properties of the same material on one hand, and offers access to far more ways to define the details of all properties in the other hand. Creating and managing materials through the Advanced interface is considered Intermediate to Advanced level. While working from the Simple interface, one might wonder: "what do I miss?". That is addressed in 03 MATERIAL ROOM OFFERS A SIMPLE INTERFACE. WHAT DO I MISS?.

Intermediate
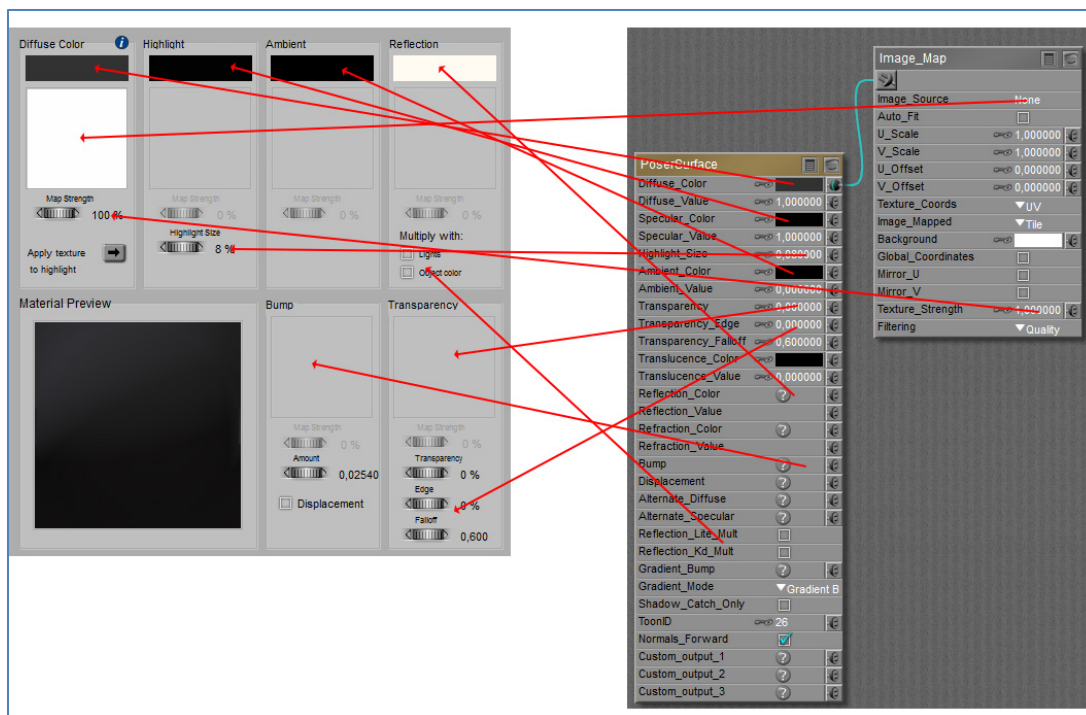
The following features are / are not supported in the Simple interface:

- **Supported**: Diffuse, Specular and Ambient Color, plus an eventual Image_Map or Movie node from which the Image_Source and the Texture_Strength properties are supported. For Specular, the Highlight_Size property is supported.
  Not supported: Neither the Diffuse/Specular/Ambient-Value properties, nor the Alt_Diffuse/Specular properties, nor any other node beside Image_Map and Movie are supported in the Simple interface. No Clay, no Subsurface Scattering (translucency). Translucency from the Advanced interface is not supported in any way.

- **Supported**: For Reflection, the Image_Map node as well as the Reflect (raytrace) node are supported, including the Color. Also the Light color and Object color multiplicators (Reflection Lite Mult and Reflection Kd Mult checkboxes) are supported.
  Not supported: Neither the Reflection Value property nor any other nodes beside Image_Map and Movie are supported.

- **Supported**: Transparency, with an eventual Image_Map, and including Edge and Falloff, is supported.
  Not supported: Refraction, Fresnel nodes and similar are not supported.

- **Supported**: Bump / Displacement, with a required Image_Map (no map, no effect), plus the Amount option are supported.

But: the checkbox in the Simple interface forces me to choose between either Bump or Displacement, I cannot have it both.

- **Not supported**: Features like Gradient Bump/Mode which give access to Normal maps, and like ToonID and Custom Output for advanced render pass handling, are not available in the Simple interface. The Custom_Outputs are available in Poser Pro only, by the way.

II Simple Surface Definitions

The articles in this section discuss material definitions for object surfaces, which can be handled through the Simple Interface, and do not require a deep understanding of Material Room principles. Each article however also presents an Intermediate approach as well, using the Advanced interface for the same purpose. This is to avoid multiple articles answering the same question.

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05 What's the Diffuse component intended for?

For short: Diffusion is equivalent to Object Color. This is the place to turn an object simply green, and/or to assign an image to it for a detailed coloring of the surface. The color swatch then works as a filter: when I assign an image as well as turn the swatch to green, it's like I'm looking at the image through green glasses or through a sheet of green transparent plastic. A white swatch means: no filtering, and is generally recommended when images are used.

 makes
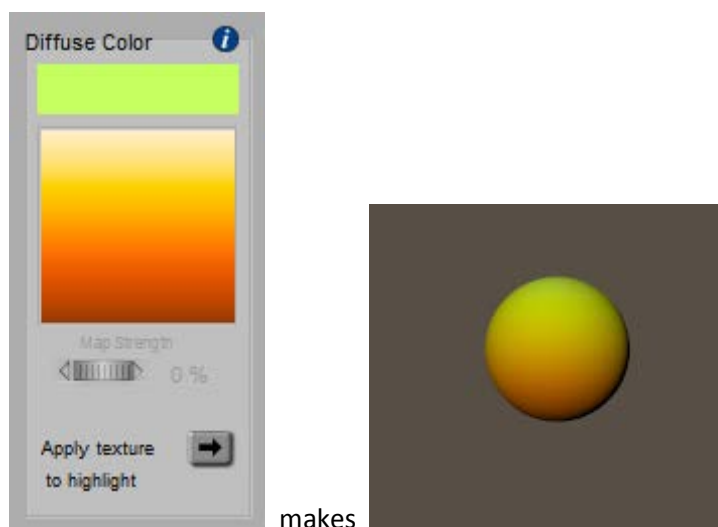
Clicking the larger area opens the Texture Manager, which offers the option to import an image.

More in detail

In nature, objects get their color by scattering back some of the light that falls upon them, and do so in a color-filtered way. So white light shining on a plants leaf will make it look green because the leaf scatters back the green portion out of the white light, at the place and time the light hits the leaf. When the light is pure red without any green in it, then the leaf cannot scatter anything back and

hence will look black instead. This "scattering back" is called Diffusion, not to be confused with Reflection as discussed in 09 WHAT'S THE REFLECTION COMPONENT INTENDED FOR?.
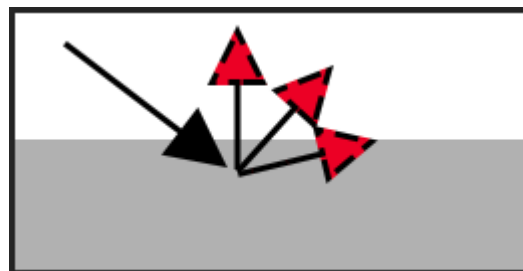
The amount of light which is received by a "unit of surface" (say 1 cm^2 or in^2) depends on the angle the light makes with the surface. Perpendicular lighting makes high intensities; skew angles make low intensities as the same amount of light has to shine on a larger area.

Also, the diffuse response to light usually will not be equal in all directions: the response perpendicular to the surface might be stronger than that parallel to it, making objects look darker at skew angles towards the camera. That is: at their edges.

Both effects are referred to as: shading, in contrast to shadowing which includes blocking the light by other objects, or other parts of the same object. In Poser all this is understood in the Diffuse part of the material definition.

Intermediate

The Advanced interface into Poser Material Room offers a
Diffuse_Color which makes it the equivalent of Simple interface, and
offers a **Diffuse_Value** next to it which acts as an extra filter. Intensities
are reduced by that factor, and it can be driven by a (greyscale) image
map as well. This way one can easily make dark stains on a surface.
See 04 MATERIAL ROOM SIMPLE AND ADVANCED INTERFACE - HOW DO THESE RELATE?

Recommendations:
- To prevent artefacts in rendering when applying the Gamma mechanism (recommended,
  available in PoserPro and Poser 10 and up) the Value setting should be kept to 1.0 only (or
  0.0 but no intermediate values).
- To prevent overlighting when combined with other aspects of lighting and material
  definitions, it's recommended not to exceed an 80% brightness in the Color-swatch and maps
  (or in the Value setting when not applying Gamma).

Anyway, the diffuse light is scattered outward, that is: with following the surface normal, which is a
vector perpendicular to the surface which generally should be pointing outward. For various reasons
the latter is not always the case, depending on the way the object is made and imported into Poser.
If not, it can make the scattering go in the wrong direction, causing black spots in the render. The
solution is to force Poser to reconsider the surface normals, and I can make it doing so by ticking the
Normals_Forward checkbox. It's in the node, as well as at the bottom end of the PoserSurface
definition itself. It's not available in the Simple interface.

On top of all this: in nature, **non-metallic objects** get their color from diffusion, while **metals** get
theirs from reflection. Especially when I'm into photorealism, it will be good to understand – and to
implement – this difference. Metals don't diffuse, they reflect only.

06 What's the Specular / Highlight component intended for?

For short: specularity makes highlights on an object surface, representing the (blurred) reflections of the direct lights (infinite, spot, point) in the scene. Although color and an eventual image map both work as an extra filter, such a coloring filter should be applied to make believable metallic surfaces only (metallic car paint included). In the vast majority of cases, the color swatch should be a shade of grey. Small highlight sizes represent hard, smooth surfaces.

Note that in Poser IBL (image based lights) and IDL (indirect lighting) cannot make highlights themselves; I do need regular direct lights in my scene to do so.

More in detail

When light hits an object surface, some portion of it might get reflected. In the good old days, when computers were short of raw CPU power, this handling of reflecting light rays was something to be avoided in order to get industrial render projects done in due time.

Faking reflections by using images of the surrounding scene ('reflection maps') was one way to get out (see 09 WHAT'S THE REFLECTION COMPONENT INTENDED FOR? on details), and another one was to concentrate on the – usually blurred – highlight producing reflections of the direct lights in the scene only. The latter is referred to as specularity.

In nature, as well in modern ray-tracing based renderers like LuxRender or Octane, there is reflection only, handling all sorts of light. But Poser supports the easy to calculate Specularity for direct lights and the more computational intense Reflection for the indirect light bouncing (or emitted otherwise) from objects in the scene. Two sides of the same coin, served separately for convenience especially aimed at reducing time and resource requirements at rendering. The downside is that I have to cater for both aspects separately in my material definition.

Intermediate

The Advanced interface into Poser Material Room offers a **Specular_Color** which makes it the equivalent of Simple interface, and offers a **Specular_Value** next to it which acts as an extra filter. Intensities are reduced with that factor, and it can be driven by a (greyscale) image map as well. This way one can easily make non-reflective stains on a surface. See 04 MATERIAL ROOM SIMPLE AND ADVANCED INTERFACE - HOW DO THESE RELATE?

Recommendations:
- To prevent artefacts in rendering when applying the Gamma mechanism (recommended, available in PoserPro and Poser 10 and up) the Value setting should be kept to 1.0 only (or 0.0 but no intermediate values).
- To prevent overlighting when combined with other aspects of lighting and material definitions, it's recommended not to exceed a (100% - Diffuse) brightness in the Color-swatch and maps (or in the Value setting when not applying Gamma). So with Diffuse set to 80%, Specularity should not exceed 20%.

Highlight_Size, available in Simple as well as in Advanced interface, is a straightforward parameter: small values make small, intense highlights representing hard, smooth, shiny surfaces while larger values make larger, blurred highlights instead.
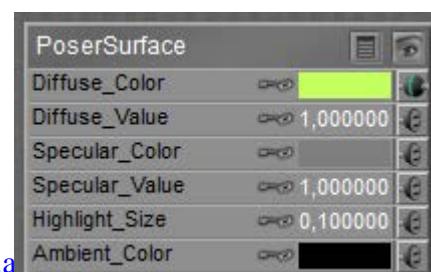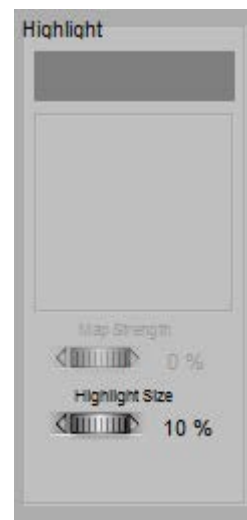
Making Highlights

As said, Poser discriminates between Reflecting (diffuse) light from objects, and Specular light from direct light sources in the scene. To do so, direct lights in Poser offer a diffuse as well as an independent specular component. The first component will trigger responses from the Diffuse part in the material definition (and similar parts as well) while the second component of the direct light will trigger responses from the Specular part in the definition.
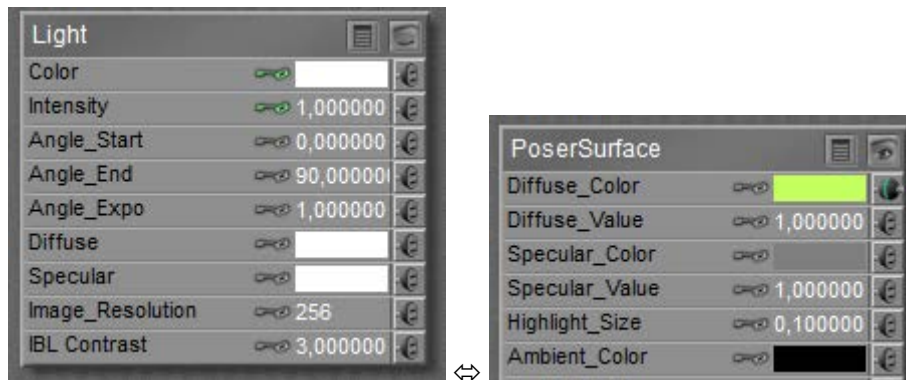

The Diffuse and Specular components in the Light relate to the Diffuse and Specular components in the Material definition of an object.

The shape of Highlights

Although Poser is not raytracing to derive the specular highlights, the blurred highlights are still decently described by the "angle in equals angle out" concept as is the case with mirrors. This implies that the outgoing light intensity is highest in a direction determined by the angle of the surface with the incoming light. Around that "angle out" range the intensity drops - depending on the highlight size.

07 What's the Ambient component intended for?

For short: ambient make objects glow, and emit light independent of any lighting sources in the scene. This is to represent led-lights, or some phosphorescence of fluorescence effects.

 =>
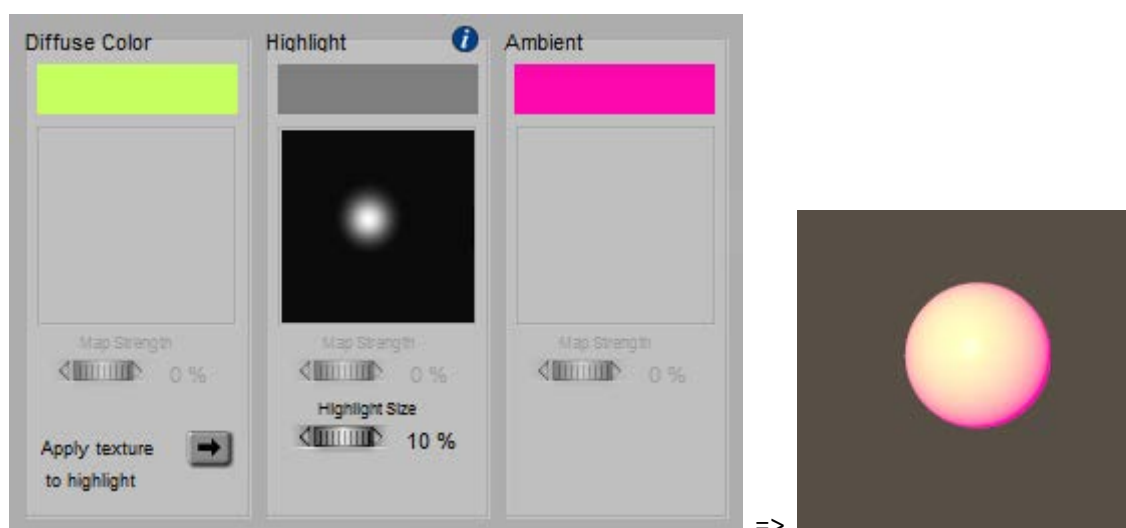
Note that light, and hence ambient glow as well, serves the visibility and presence of objects in the scene while shadows serve shape and surface structure details of an object. So, when using ambient glow, I will gain object visibility but I will lose some of the shape and surface details, and hence I'll "flatten" the image. In other words, I should not overdo.

Intermediate

In Poser, Ambient (both Simple and Advanced interface) as well as its equivalent Translucence (Advanced interface only) will make an object glow. There are various reasons to have an Ambient component in the materials definition.

First, the truly legitimate reason, is to implement the objects glow as it appears in real life. Led-lights, or some phosphorescence of fluorescence effects, were already mentioned above.

Second, considered a half-legitimate reason, is to represent translucency as can be found in skin, wax candles and alike, in a render setup which is poor on raytracing and hardly supports sub-surface scattering. Early Poser versions, PC's with less computing power, or the requirement for a massive output stream as in animations might be the reason for this. A resource intensive process is then replaced by a much faster process with – sometimes slightly – less realistic results.

Third, nowadays considered almost an illegitimate reason, is to compensate the object for poor lighting conditions at the spot. Adding some local point- or spotlights, and especially switching to indirect lighting (IDL) conditions supported by modern Poser versions, resolve the lighting issue the way it should be.

Some additional notes:
- In contrast to Diffuse and Specular, there is no angular distribution of the light send towards the camera. Edges are as intense as areas in the middle part of the object, which makes it harder to distinguish shape details. This is the way nature works too, by approximation.
- Ambient (and/or Translucency) generate some local lighting levels which are independent of the intensities of external sources of light. Hence, when I decide to dim the lighting levels in my scene to avoid overlighting, I've got to dim those Ambient aspects of the materials as well to keep the balance.

- Ambient (and/or Translucency) are proper candidates for turning an object into a light source under indirect lighting (IDL) conditions. This is the way to make an all surrounding dome object lighting the entre scene. I may have to pump up the intensities though.

Recommendations:
- To prevent artefacts in rendering when applying the Gamma mechanism (recommended, available in PoserPro and Poser 10 and up) the Value setting should be kept to 1.0 only (or 0.0 but no intermediate values).
- To prevent overlighting when combined with other aspects of lighting and material definitions, it's recommended not to exceed a (100% - (Diffuse+Specular)) brightness in the Color-swatch and maps (or in the Value setting when not applying Gamma). So with Diffuse set to 70% and Specularity set to 20%, Ambient should be limited to 10% at most.

08 What's the Transparency component intended for?

Although I'll grasp transparency from my own experience, and although most characteristics of it are available through the Simple interface into Material Room, its implementation in Poser is not the easiest to comprehend. That turns the presentation of this topic into a mixture of Simple, and Intermediate elements, plus some Advanced issues too. Sorry for that.

Formally stated, transparency is the ability of a surface to let light to pass through. Transparency is a number, 0-100%. When that number has different values at various spots on the subject, a (greyscale) image can be used. Note that – in Poser – the image is used **in an inverted way**: 100% or **black** means: fully transparent, while 0% or **white** means: fully opaque.
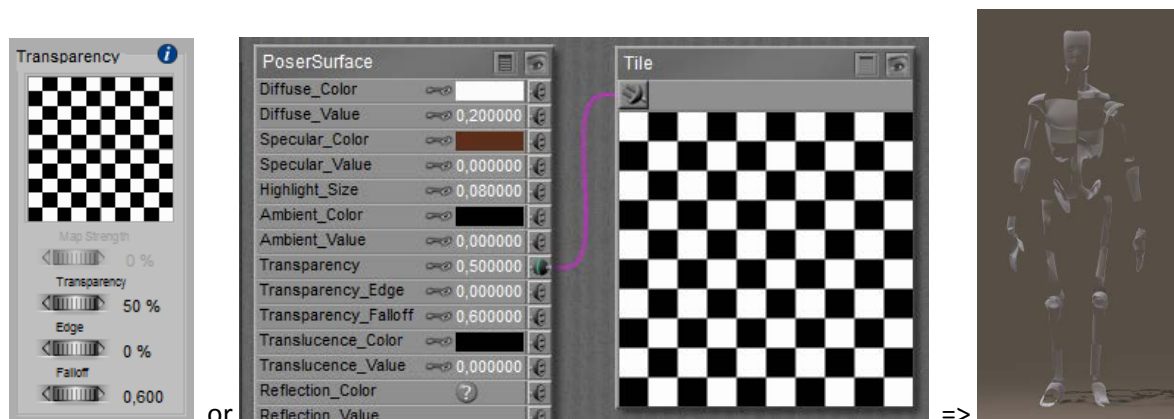
See on both interfaces.

The behavior of Transparency can also be stated in another way:
- When it's just a value, then that value represents transparency (100% is fully transparent)
- When an image is attached to it (or any nodes are attached to it in Advanced interface), its meaning flips and the value is a multiplier for the resulting image_map which represents opaqueness instead: 1 (white) is fully opaque and 0 (black) is fully transparent.

More in detail

There are three different reasons surfaces can let light pass through:
- Because of lacking material. This is a **lace-like transparency**, usually supported by an image (the transparency map) representing the pattern of this materials presence or absence. This is the way to drill holes in a wall or in a jacket, and let the background (or an underlying shirt) shine through. White means presence of material and black means absence.
For very fine – and hence almost invisible – patterns (e.g. nylon stockings), a uniform grayscale or just a transparency value can be used instead.
- Because a perfectly clear object is covered with a thin layer which filters all the light upon it. This is what's meant by setting an intermediate value for transparency, or using an image (greyscale) map instead. Like the lace-like variant just mentioned, this **thin-layer transparency** is a pure surface effect. And in Poser, all object materials are surface properties.
- Because the material filters and colors the light passing through, as is the case in liquids and glass; it's a **glass-like transparency**. In this case, using a transparency value is the common way to represent the amount of light which can pass through.
Any colors from an image map will be ignored, and the (volumetric) effect has to be translated to a surface effect. For instance, a surface transparency set to 90% will represent an object transparency of 90% x 90% = 81% regardless of local thickness and shape, as the

light passes through the front and back surfaces.

Poser can't handle thickness and shape but presents some tricks for escape, see Edges & Bends below. When I want to color (filter) the light passing through I've got to use the Refraction_Color or the Alternate_Diffuse component, which is available through the Advanced interface only. Then things get complicated.

Note:

When the material has a diffuse (surface coloring) component too, then this will show as far as the material is non-transparent. The diffuse material will not show in the holes in the surface, as driven by the transparency-map. Do note that the more transparent a surface becomes, the less it gets colored as the color is a property of the non-transparent portion of the surface.

The specular component however is not affected at all by the transparency settings, so transparent areas on the surface can be as shiny as less (or non-)transparent ones. This is good for thin-layer and glass-like transparency. But for lace-like transparent surfaces, the holes should not be shiny at all, as there is no material in place to reflect the lights. Hence, for such material the transparency patterns should be copied to the specular settings.
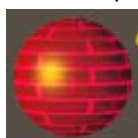
 glass-like (highlights overall) ⇔ lace-like (highlights on substance only)

The same holds for Ambient, Bump, Displacement, and Reflection: when there is no material then there can't be a surface response to light. But I have to tell Poser myself, as Poser does not distinguish the various interpretations of transparency (lace-like vs layer/glass-like).

When using the Advanced interface: Transparency also does affect Alternate_Diffuse but does not affect Translucence, Refraction or Alternate_Specular.

Edges and Bends

When I look at, or through, a (semi) transparent object with various curves and bends, I will note that the frontal view differs from the sides. For hollow objects, light rays passing the front and back might meet less material underway compared with rays traveling through the sides. For solid objects this might be the opposite.

On top of that, various causes for light-bends (called Refraction), absorption and scattering will reduce the transparency of objects at the edges.

Next to all this, in real life transparency depends on the angle towards the camera: perpendicular angles have a much higher transparency than skew ones; for the latter, light rays just bounce off, and transparency decreases while reflectivity goes up. This advanced effect (known as Fresnel) is supported by recent versions of Poser, at the cost of serious prolongation of render times and increased memory requirements.

So when one wants an improvement over just transparency, without requiring the high level of photorealism that comes with Refraction, Poser offers a way to cheat to compensate for its inability to handle any kind of volumetric effects:

- **Transparency_Edge** defines the transparency at the edge, while
- **Transparency_Falloff** defines the thickness of the edge.

As Transparency 1.0 means fully transparent, the Edge should have a (much) lower value to mimic the mentioned effects in a believable way. The default is 0.0, completely opaque at the edges. When

I do it the other way around however, and set the edges to a high value like 1.0 (combined with a low value for transparency), the edge will fade away like I'm presenting a gaseous, cloudlike object.

Small values for Falloff make a fast transition from edge to regular surface, and hence make a thin "surface" layer for the object. This surface thickness seems proportional to the size of the object; the Falloff is a percentage of something, it's not an absolute value. And although results can become quite unnatural, high values like 10 and up are possible and allowed.

Note:
> Although Edge and Falloff make some sort of skin or surface layer for a transparent object, there is no sharp boundary at the inside. As a result, these parameters cannot make a hollow object.

Raising Awareness

One image says it all: in Poser, yellow light passing through a **red** patterned-transparent ball will cast a patterned **black** shadow onto the object behind it, mixed with the yellow of the light. In nature, such a shadow would be red (as the passing light gets filtered).

Transparency won't handle color at all, but it does make the pattern in the shadow.
Diffuse will filter the light shining onto the ball and bouncing towards the camera.
Refraction will sort filter the light passing through the ball from behind towards the camera. It's objects only, and does not handle direct light at all but produces dark shadows instead.

Neither transparency, nor a diffuse or a refractive color will color-filter the lightrays passing through the ball as such, and no reddening of the shadowed area will occur in any way.

Poser Firefly does have its limitations, and this is one of them.
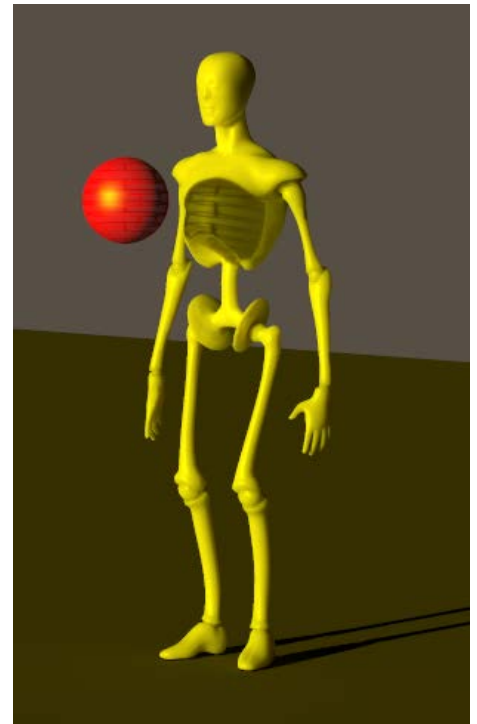
09 What's the Reflection component intended for?

Well, I know about reflections in nature, from mirrors, metal balls, glass, and water surfaces. So the answer can't be that difficult.

Unfortunately, it can be quite complicated in a 3D program, because the proper handling of reflections requires a full fletched use of raytracing, with an infinite number of bounces. In the old days this required so much computing power that rendering took about till infinity. From this recent past, which is just one to two decades away, three approaches remain which are discussed below:

- Reflection maps
- Specularity
- Raytracing

Although most characteristics of these are available through the Simple interface into Material Room, the implementations in Poser are not always the easiest to comprehend. That turns the presentation of this topic into a mixture of Simple and Intermediate elements. Sorry for that.

Reflection Maps

First, the reflections can be faked by assigning just an image to it. For quite blurred reflections and an image which matches the surrounding scene quite well, this might work and will speed up rendering tremendously, which is a serious advantage in lengthy animations. It's used often on chrome car accessories.

 or
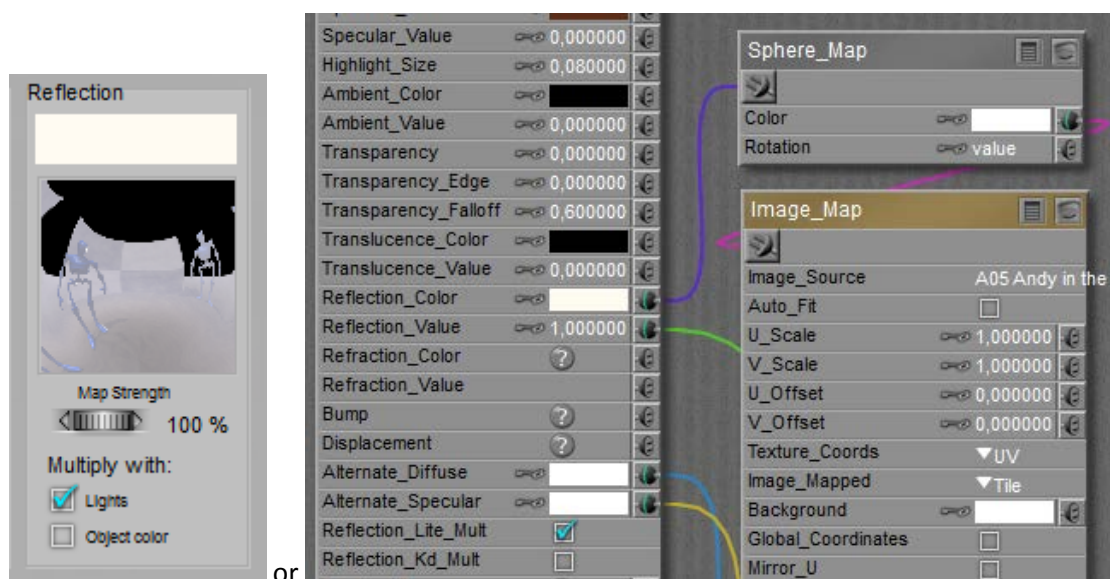
Note however that the brightness of such reflections is autonomous, independent of the surrounding lighting levels. So when the lights dim, or the object resides in a shadowy area, the intensity of this material property should be adjusted accordingly. Poser supports this, by multiplying the reflections by the brightness (and color) of the (diffuse) light on the surface of the object. The **Reflection Lite Mult** option (or **Multiply with Lights** in the Simple interface) caters for this, and is ON by default.

So, when I animate a car driving through a sunny lane with shadowy trees, and the shiny chrome wheels are made pseudo-reflective by using just images, then the reflectivity is dimmed when a wheel passes through a shadow.

The option should be OFF however when actual raytracing (see 'third' below) is used to handle the reflections because then the amount of reflected light is properly derived from the surroundings themselves.

Specularity

Second, specularity was introduced to create highlights (see 06 WHAT'S THE SPECULAR / HIGHLIGHT COMPONENT INTENDED FOR?), representing blurred reflections from direct light sources only. In Poser, an active specular channel of a direct spot-, point- or infinite light in combination with an active specular part in the objects material, are both required for getting such highlights.

Note that indirect (IDL) lighting schemes as well as image based (IBL) lights deal with diffuse light only, and will not produce any highlights.

Raytracing

Third, real raytracing can be implemented by plugging the raytrace node into the PoserSurface definition. This is directly available in the Advanced interface only. In the Simple interface, just choose the Raytrace option:
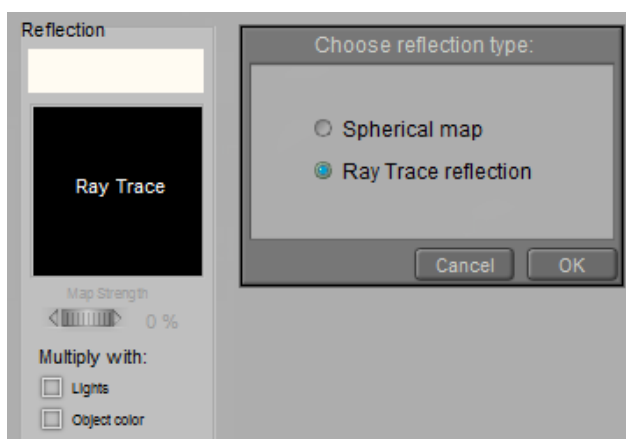

Note that in his case, those 'real reflections' will only consider the objects in the scene, and not the direct light sources around. To get the shine of lamps in the render, I either have to include some additional glowing objects in the scene, or I have to use specularity for this purpose.

Also note, as said above, that the **Reflection Lite Mult** option (or: **Multiply with Lights** in the Simple interface) should be OFF for raytraced reflections as it serves the brightness

adjustments of image based reflections (reflection maps). Raytracing makes the adjustments itself automatically, and having the option ON will then enforce the adjustments twice.

Plus… raytracing has to be enabled in the Render Settings, and the (maximum) amount of raytrace bounces has to be set high enough. That is: the highest value is the best as nature does not have any maximum at all, but some people report that lower values speed up their renders without a recognizable loss of quality. See the notes on Transparency below.

 or
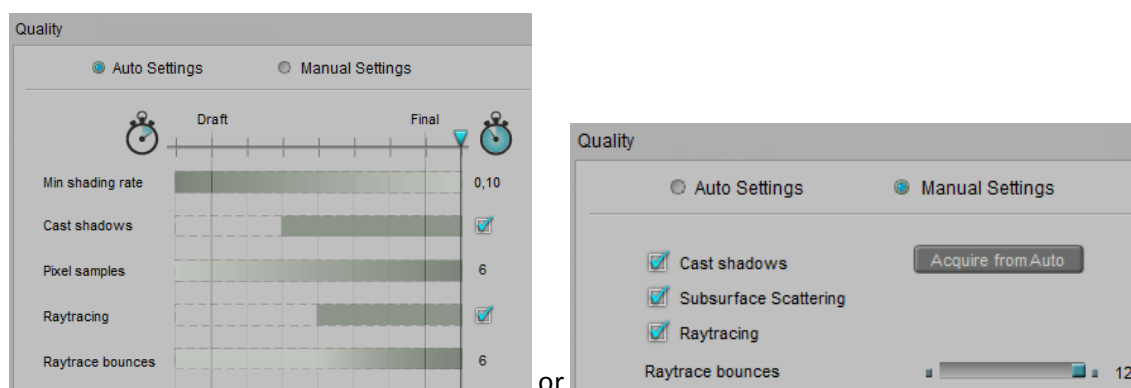
Poser offers **Reflection Color**, and in the Advanced interface **Reflection Value** as well. These are well documented in the Full document.

# 10 What are the Bump and Displacement components intended for?

Each object surface – except for the hard and smooth ones – has some irregularities, like pores in the skin. On a large distance, these details don't show in the render at all, or can be embedded as shady areas in the color texture at most. At a somewhat shorter distance, but still away from the camera, those regularities can be faked, saving a lot of render time and memory resources. That is what Bump is for. The magic is done by the texture (Bump-map) alone; no surface elements are actually moved.

When the object surface comes closer to the camera, surface elements actually do have to move a bit in order to make believable results. Those displacements still can be image driven, which is where the Displacement-map kicks in. This way of work actually saves a lot of detailed modeling. For instance, terrains are generated this way.
But again, its effects are limited, so when the object surface comes really close to the camera, it pays off to actually adjust the object mesh actually, and to model in the details themselves.

So, the other way around: I can either put the details into the object mesh which takes a lot of my modeling time, or I can apply a displacement map which requires memory and render time, or I can apply a bump map faking the displacements, or I can leave it the way it is. The best choice depends on the distance of the object to the camera. Additional considerations on this are required in animations, where this distance can vary over time.
In general, a serious difference between Bump and Displacement is that Bump does not distort the object itself, and hence leaves the edges intact. So a bumped ball still will be a perfectly round object in the render. A displaced ball will not.
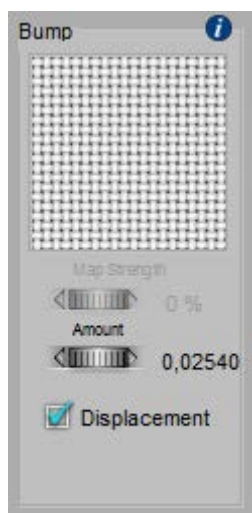
 makes
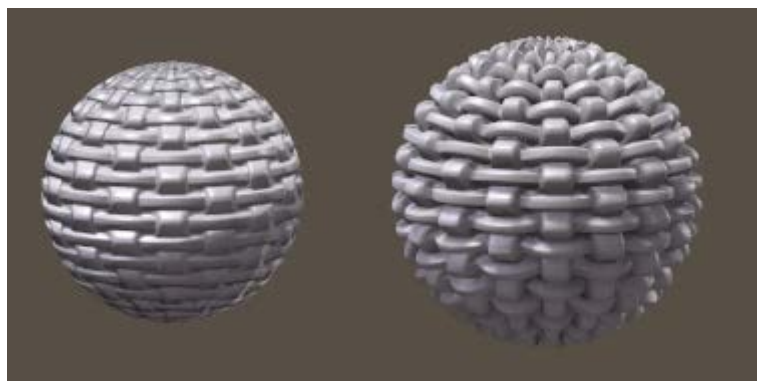
And notice the difference between Bump (left) and Displacement (right). Not only the bumped one still is a perfectly round object while the displaced one has got a roughed up edge, the bumped one also is smaller, for the same amount used. This is why:

- In Bump, white gives maximum effect outward, while black gives maximum effect inward, so 50% grey is the neutral / no effect value. The Amount indicates the total difference between black and white, so the effect is half of the amount outward, and half the amount inward. Using a negative amount will reverse the effect: black will simulate an outward effect, while white will dent inward.
  And… bump is not modifying the object mesh, and hence cannot alter its size.
- In Displacement, white gives full outward growth of the object while black gives no growth at all. So, for displacement, black is the neutral / no effect value, and any displacement will

grow the ball. When displacements should be made inward, then negative amounts must be used.

Hence, displacement will actually grow the ball, and its visual effect is twice as strong as for bump.

Notes:

- Via the Simple interface, using the **Displacement** option one can choose between Bump and Displacement, it's either the one or the other. Via the Advanced interface, one can have both. For instance to drive large adjustment by a displacement, and small details by a bump.
- The **Amount** is measured in the unit I've set in my Global Preferences.
  The screen grab above was made on a system using Meters, so 0.0254 indicates 2.54 cm. Which by the way is about 10% of the balls diameter; quite a lot. When the units are changed to inches, the value will change to 1.0. I have to take this into account when using data from examples. (And… python scripts have to use inches by all means).
  This 1" value is the default, which actually is quite a lot for say skin details, but quite small for outdoor terrain surfaces.

Intermediate

The PoserSurface material definition offers a few additional options for compatibility:
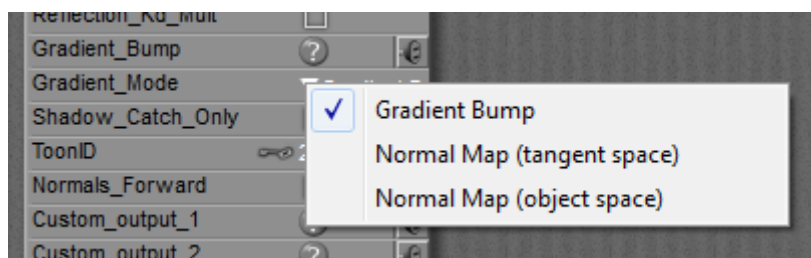
- Gradient_Mode = Gradient Bump offers compatibility with old Poser versions, I can plug the existing *.bum file into the Gradient_Bump slot, as an image
- Gradient_Mode = Normal Map offers compatibility with Game Characters. If my figure comes with normal maps instead of bump/displacement maps, I can select the correct type, and plug the map into the Gradient_Bump slot as an image.

Important note: in Poser Pro and Poser 10 and up, when using image maps for Bump and/or Displacement, these should have the Gamma set to 1.0 explicitly. Otherwise, the images will get dimmed considerably before application, especially in the mid-grey areas. This will result in dimming the Bumps / Displacements themselves as well, which is wrong.