

Shaders

First let's examine a simple and common case - a non-reflective smooth opaque surface of a uniform color, maybe with just a touch of Specularity, like metal painted with matte or satin-finish paint. Let's say our rendering brings us really close to this surface, so we want to go for maximum realism. Whenever that happens we should map as many channels as possible - in this case the specularity channel, the Color channel and perhaps the Bump channel. Let's use Blinn, it has a satiny look to it, and has an extra parameter that Phong doesn't have (the Rolloff, makes the highlight light-direction dependent - Maya-users please note: the range on this slider has been inverted from PA, so when I write Rolloff 0.7, you should make it 0.3). Let's put a very low amplitude sFractal texture in the color channel. In Color Balance, make both Rgbmult and Rgboffset the same Hue, then flip them so that the top one, Rgbmult, is around 0.1, and the Rgboffset is around 0.9. You now have a barely discernable texture. To adjust the lightness of the texture fiddle with the Diffuse slider. The same texture can be reused in the specularity channel, only offset a bit, and both the Rgbmult and Rgboffset at about 0.1. Also, if your main Color is strong, add the complimentary (180 degrees from it on the Hue slider = opposite on the color wheel) color into the Spec texture - just enough to create a greyish highlight (about 50% purple if your main Color is 100% yellow etc), don't overdo it so you can actually see the opposite color in the highlight. This helps on anything not metal, especially when its strongly colored. You might also add a similar faint texture in the bump channel, make the Amplitude and the Amult 0.14. We have to get rid of the sterile cg look at all costs.



This first image is an example of untextured Blinn.



This second image has the Colormap mentioned above added.



Lastly, this the third image now has the Specmap added.

For extremely matte porous materials such as raw stone (Mount Rushmore), or earth, or vegetation seen from an airplane (it's darker not brighter where you'd expect the highlight to be), you should use not Lambert but Phong with a negative Specularity, like -0.1 or more.

Next - layers. This technique is most useful when you need to stretch the limits of what Phong and Blinn can do with their highlights, as in pearls, metallic car paint, wet, slimy or lacquered things etc. In this case I used it for the peculiar matte painted finish on the A10 Warthog, which I didn't seem able to get any other way. The lower layer is Blinn, Diffuse 0.8, Rollof 0.7, Eccentricity 0.7, Color and Spec maps like this:

This is the color map, the layer on top is Blinn, Rolloff 0.64, Eccentricity 0.34



This is the Spec map, and of course at full Transparency

Lastly, together they look like this:



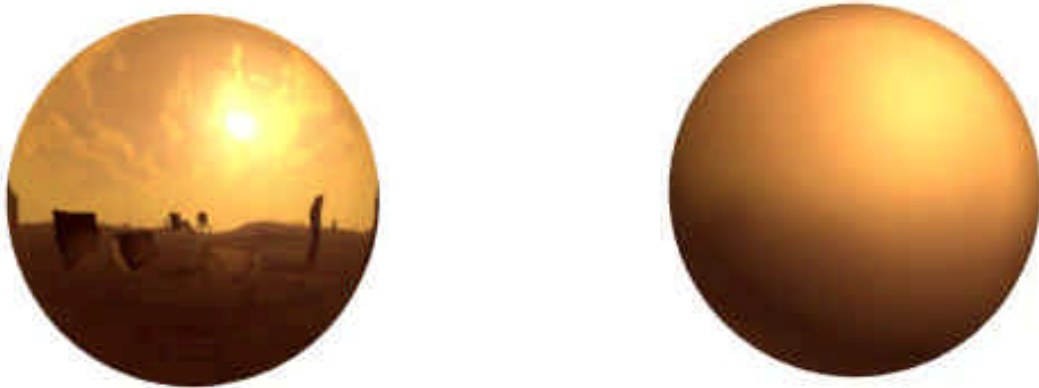
Now let's consider reflections, reflection-mapped ones (raytraced reflections shouldn't require any changes to these shaders). This is the formula for a basic car paint shader, lower layer is Blinn, Diffuse 0.56, Spec Value 0.4 (medium gray), Rolloff 0.14, Eccentricity 0.5, Reflectivity and Glow 0, and whatever color you like, in this case HSV 256 0.47 0.93. Again, if the main Color is strong, we put some of the opposite color in the highlight (not on metals!). That takes care of the highlight produced by the bright part of the sky near the sun - but for the sun itself we need a much stronger highlight, and keeping it on a separate layer also gives us the chance to easily add realistic starry glow to it: Layer this fully transparent Phong shader on top: Spec 0.6 (with some opposite color here as well if applicable), Shinyness 150, Reflectivity 0.14, the following file in a Ball Reflection map:



If the main Color is very saturated, tone this image in the same hue using its Rgbmult and Rgboffset. Make Glow 1. In the Environment, switch Glow to linear and Halo off, Quality 5, Threshold 0.38, Glow Color full white, Intensity 10, Spread 0.25, Eccentricity 0.005, Radial Noise 0.74, Star Level 1.16, in Radial Effects: Star Points 20. The result is on the left. On the right is a 'flake' finish car paint, the only changes are in the bottom layer, in the Spec HSV: 256 (change this value to any color you want, but it should be the same as the main Color), 0.57, 1 - Eccentricity 0.47, and Color Value darker, in this case down to 0.6.



To create a shader for shiny metal, say gold for example, you could try the following: Blinn, Rolloff 0, Eccentricity 0.46, Color should be dark fully saturated red, Diffuse 0.1, (the color of a colored metal comes mainly from the Spec and the Reflections). Specularity HSV 37 0.47 0.56, Reflectivity so it looks like a colored mirror - in this case 1 (note that Refl. is dependent of Spec). Be careful not to create a "super-mirror" that has reflections brighter than the environment - it'll look like some weird incandescent plastic. Tone the image in the Ball Reflection map with a bit of yellow in the Rgbmult, and a bit of dark fully saturated red in the Rgboffset. No glow. Layered on this is the same one as on the previous two.



The matt gold on the above right image has no layers, it's Blinn Diffuse 0.5, Spec slightly higher S and V, Rolloff 0.13, Ecc 0.58, Refl 0.44, Reflection map blurred with Bluroffset at 0.1, Color HSV 28 0.5 0.7. In order to look shiny, an object needs areas of contrasts, areas of smooth transitions and areas of sharp transitions - the sharper those transitions and the stronger the contrast, the shinier it looks. If raytracing remember to put a full "interesting" environment around your table, maybe just a sphere (with shadows turned off) with an image mapped in a Lightsource shader. (If that sphere then becomes visible in your background, place and scale a rectangular plane with the same proportions as your view and your choice of shader, so that it just barely hides all of the sphere in that camera.) To raycast (using Dmaps) put a Ball reflection map on the shader. To make your own Ball reflection map, build a whole room, raytrace a perfect mirror-sphere in the objects place in a camera with Zoomangle 2 from the same direction (but much further away) as your main camera, crop it close to the sphere, retouch it and use that as a reflection map in a Ball Environment texture. As yourself this -- is your object composed of totally flat surfaces with sharp angles between them? (Flat shiny surfaces are much harder to light and shoot nicely.) If so, maybe introduce a slight curve, bulge or bevel.

About refractions

In a close-up of a water drop the reflection matters much less than the refraction. The image below shows a raytraced drop shape with a water-shader applied to it, in front of a background image. What you see inside the drop is the refracted background (the drop acts as a lens). This is controlled by setting the water-shaders Refractive Index (RI) to it's appropriate amount, roughly 1.3 (although this is flexible - remember it's the result that counts, not physical correctness).

To create the image for the background I used the clients reference shot of a water drop, and his description of what the setup had looked like in the studio. Keep in mind that the image you put there will have to extend far outside the borders of the image, and that it will be reversed when it's refracted.



Burgundy velvet shader

Here is how you might approach creating a Burgundy velvet shader: base: Blinn, Diffuse 0.5, Spec HSV 170 0.1 0.72, Rolloff and Refl 0, Ecc 0.51, Color HSV 350 0.95 0.7, optional bumpmap. Layer 1: Phong, Spec -0.7, Shinyness 3, Transparency 1. Layer 2 (top): Lambert, Diffuse same as base, Color same as base, Transparency mapped with sCloud, same settings as the skin layer below.



Pearl shader

Here's how I would create a pearl shader, using 2 layers. The base layer is Blinn, Diffuse 0.36, Spec RGB 85/87/89, Rolloff 0.3, Ecc 0.337, Refl 0.58, Reflection mapped with sFile with a pic like this:



Color RGB 255/228/179, Incandescence RGB 18/14/9, (optional low amp. low freq. Water bump map), Translucency 0.17. A slight glow (Halo only, with no threshold) is also nice sometimes.

To create a black pearl, use this base: Diffuse 0.093, Spec V 1, Ecc 0.283, Refl 0.4, same refl.map but RGBmult 0.3, Color 0.1, incandescence 0, translucence 0.4. Top layer: Phong, Diffuse 0, Spec RGB 119/119/119, Shinyness 500 (to hide the highlight), Refl 1, Transparency RGB 188/178/161. Reflection map: Ball environment with image of mirror-ball raytraced in typical setup for shooting shiny small objects: white backlit tent or box with a hole for the camera (check photo-books or jewelry photos for reference).

In the screenshots below, the original rendering is on the left, next is a version blurred (Gaussian in Photoshop®, better than Bluroffset) for the Pearl shader, and last is a test rendering of the 2 Pearls.

