Tutorial: Toon Shading – Car Tooning

Toon shade a car and familiarize yourself with the different shaders and their properties.
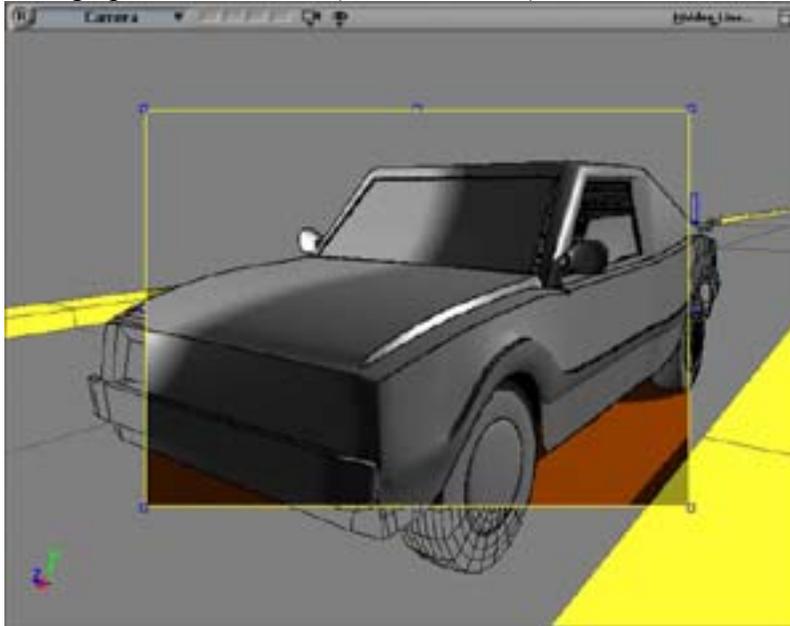
This tutorial shows how to:
- to apply the lens shader in different ways
- set the lens shader properties
- use the Simple Toon shader
- use the Toon Paint and Host shader
- toon shade clusters
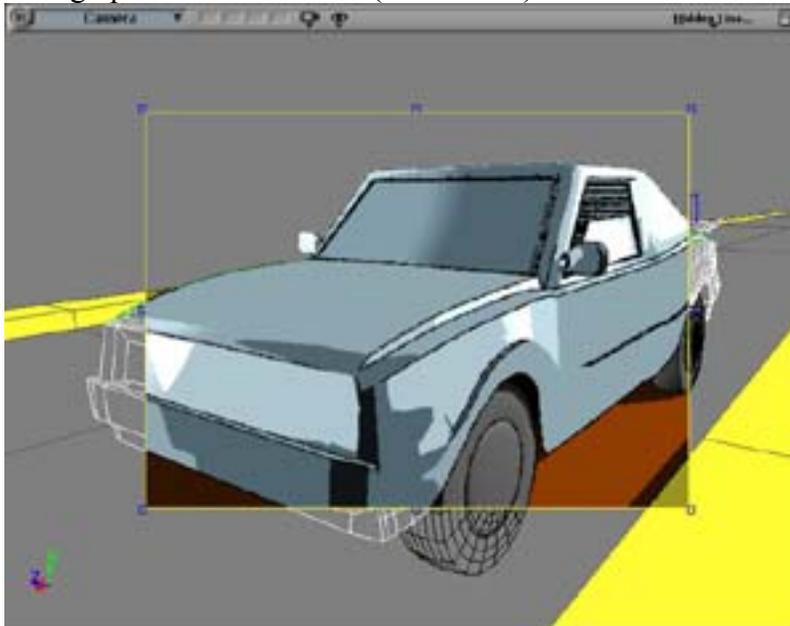- toon shade groups
- combine toon and image shading
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Overview:

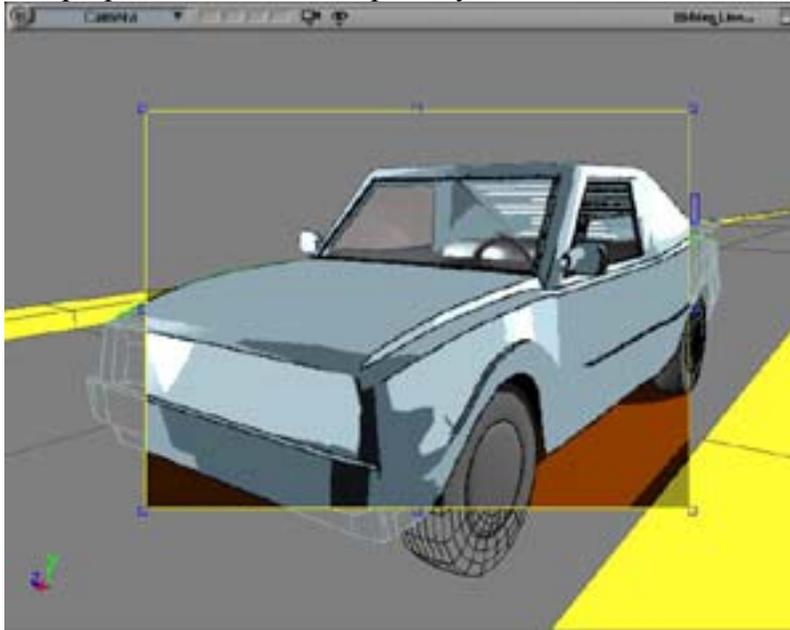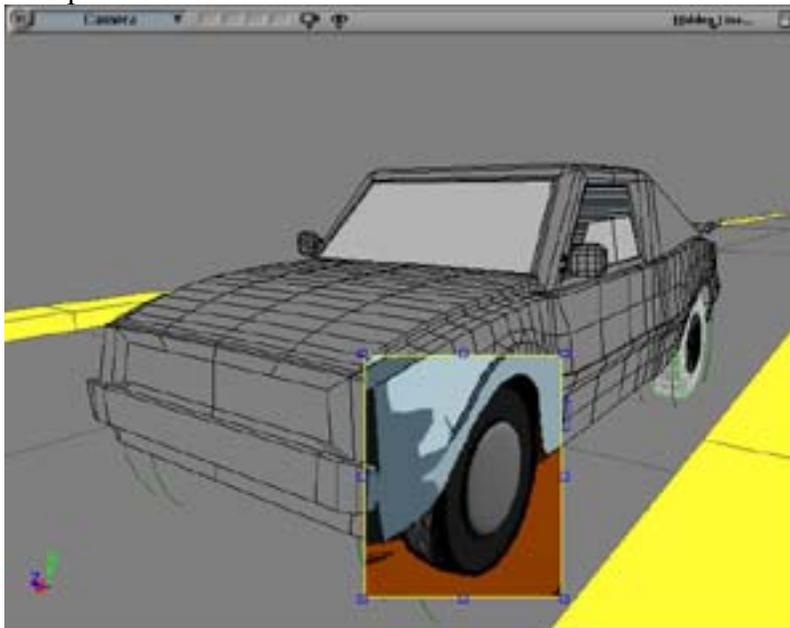1.   Seting up the lens shader (Toon Ink Lens)

2.   Seting up the surface shader (Toon Paint)

3. Use properties such as Transparency/Reflection

4. Add profile to the tire

What is Toon Shading:

Toon Shading is creating a cartoon effect, it's changing the look of your scene to a fully cel-animated look. By this we mean that objects get an outline, a contour, as if it were drawn with a pen or any other paint or drawing device and the surfaces get cartoony looking shades that look like paint. All the shades (base, ambient, highlight and glossy) are layerd on top each other. You can decide which of those you want to use (enable), how much of the surface gets covered by each enabled shade and how "hard" the edges between the shades are.

To acquire this look we have different types of shaders to our disposal. The one that is necessary for the ink or contours is the lens shader. Lens shaders are applied to camera's. Everything in a shot taken with a camera that has a lens shader connected to it, gets effected by that shader. So if we apply the Toon Ink Lens shader to our camera, everything shot with that camera gets contours.
Then there are the object shaders. These are applied to an object and therefore effect only that object. We have three toon object shaders.
1. The Simple Toon Paint shader. It only controls the surface shading of an object, not the contours.
2. The Simple Toon Host shader. It only controls the local contours, the transparency and reflections on objects and one shade of paint to give the transparent or reflective object a base color.
3. The Toon Paint and Host shader. This is a combination of the "Simple" shaders and does everything the other two do.

Lens Shader: (Controls the contours for the entire scene.)

1. Open de scene Toon_Start from the database. In the camera viewport drag a render region around part of the car.
2. In the same viewport click the camera icon and then select the camera from the drop down menu.
3. Tap 7 on the keyboard to open a floating Render Tree. If the camera node is not visible click update.
4. From the nodes menu in the Render Tree get the Toon ►Toon Ink Lens node and connect it to the Lens Shader slot of the camera node.

Note: In the Render Region, the effect of the Lens Shader is visible right away. Since it's a Lens Shader it affects your entire scene.

Tip: After selecting the camera, you can also hit enter on the keyboard to open it's property page. In the Lens Shader tab click Add and select the Toon_Ink_Lens. This is just another way to get to the same thing.

Tip: Before you start adjusting the settings in the Lens Shaders property page, set the Render Regions anti-aliasing to something similar to your final render settings. This way you'll avoid surprises later on.

Note: This is a shading tutorial so watch what happens in the Render Region when you change setting, play with them a little bit to get exactly the look you want.

5. In the Render Tree double click the Toon Ink Lens node to open its property page.
6. *On the Basic Appearance tab you decide:* *Contour or no Contour, (Bypass) Contour only (Black contour on a black background doesn't look very exciting. Change either ones color.) Contour color Width of the* contour *line, (Spread)*
The only change I made on the Basic Appearance tab was setting the spread to 3.
7. *On the Tapering tab you decide:* *Minimum width of the contour,(Minimum Spread) How much the contours overlap the surface in a certain direction, (Anisotropy). There are different ways of changing the direction and amount of Anisotropy on this tab.*
The only change I made on the Tapering tab was setting the Minimum Spread to 1.5 and the Anisotropy to 0.5.
8. *On the Variation tab you decide:* *The variation in Spread. By changing the Amount the difference in spread between the thickest and thinnest part of the contour will change according. The Profile decides where the variations will occur. Tthe Frequency how many times it occurs in every direction.*
My settings on the Variation tab are: Amount 1.5, Profile 3, Frequency 8,8,8.
9. *On the Pressure tab alter the contours to become lighter, more saturated and more faded out, where they spread wider. Driven by the variation settings the contours will have become wider at some places and narrower at others. With the pressure properties you can have these variations influence the Brightness and Saturation of the color as well as the amount of Alpha, hereby simulating pressure differences like for instance from a spray paint device, a pen, etc.. So lets say for the Brightness properties, if you have an "Input Range" of 0 to 5 and an "Output Range" of 0 to 1, that means that where the contour has a spread of 0 (input) there will be a brightness of 0 (output), where the spread is 5 (input) the brightness will be 1 (output). Saturation and Alpha work in the exact same way.* The only property I have enabled is the Alpha. I set the "Input Range" to Min 1, Max 5 and the "Output Range" to Min 0.4, Max 1.

Tip: If you want to invert the effect of the Brightness and Saturation Pressure properties you can boost the Minimum Output, by typing a value that's greater than the Maximum even if that's greater than one. (See image)
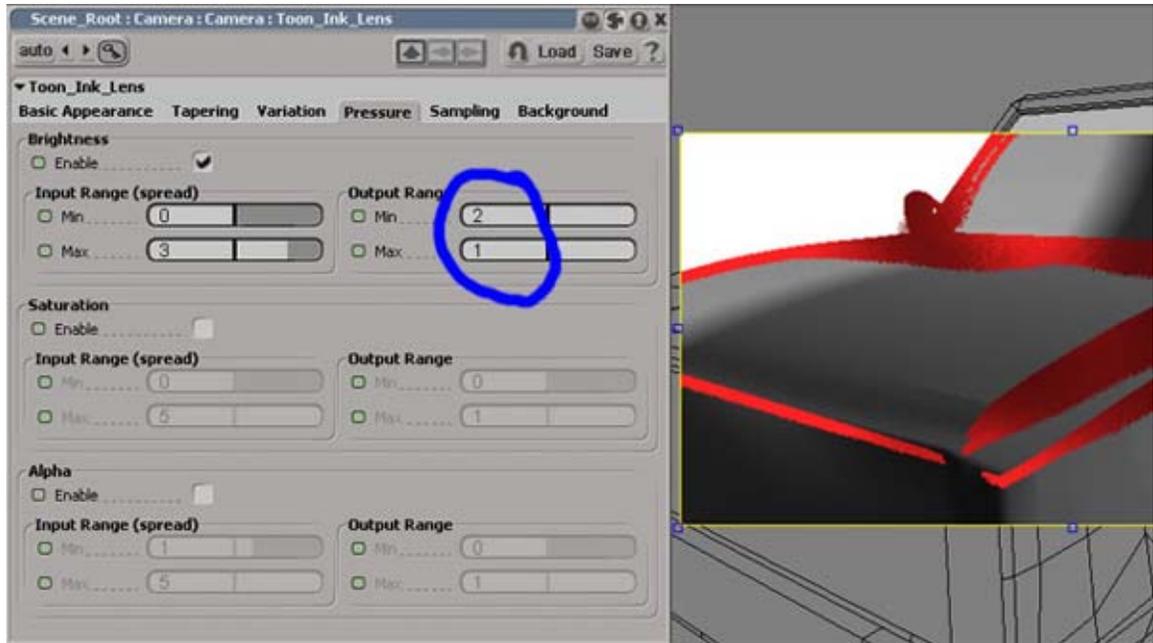
Note: Brightness and Saturation have no effect on black contours.
Note: None of the Pressure properties have any effect if the Anisotropy Amount is set to 0. Because it is the Anisotropy that varies the spread of the contour. Without that there can be no variation in Brightness, Saturation and Alpha.

10. *On the Sampling tab the most important thing is the amount of Samples the contours are built from. You will want to keep this as low as possible. Check out what happens to your render speed when you up the number of Samples. Furthermore you can decide where you want to have boundaries/contours in numerous ways.*
    Leave everything at it's default and also put the Samples back to 6 for now.
11. On the background tab you can change the background color to something other than black if you want. I just enabled it and made it white.
12. Now that the contours are set exactly as we want them we can go back to the Sampling tab and temporarily set Samples to 3, in order to speed up previewing. Don't close the property page but minimize it and move it out of the way. Also lower the anti-aliasing for the Render Region to something suitable for previewing.

You have now set the global contours. So in general you have the contours that you like. The next step is to add the toon surface shading to get that paint, cel-animation type look going. This is done on an object basis with the use of the three object shaders. We should keep in mind that we don't want to use the Toon Paint and Host shader all the time if we only need to add surface shading or local contour refinement. This way our render time will not grow unnecessarily fast. So for our next step we'll use the Simple Toon Paint shader to shade the surface of the car.

Simple Toon Paint Shader: (Controls only the surface shading of objects, not the contours.)

1. With the Render Tree still open select the Car_Body and update the Render Tree.
2. From the Render Toolbar, Get ►Material ►Simple Toon Paint. Notice the difference in the Render Region.
3. On the Base tab set the Color to H 0.55, S 0.300, V .0440. Also check the Ambient enable box and the Shadows Only. This limits the Ambient coverage to the shadow areas, which gives a very "toony" effect.
4. On the Highlights tab change the Diffuse Color to H 0.550, S 0.100, V 0.500, A 0.600.
5. The Illuminance option, when switched on, takes the specifications of all the lights in your scene into consideration, if it's off it only considers the Toon Paint property settings you make in this property page. Try it out. I chose to leave mine on.
6. Compositing Mode is the same thing as in Photoshop. Coverage influences the percentage of the surface that gets covered by the Diffuse. Softness gives you hard or smooth/soft edges between the base and diffuse color. Again try it out, but I left them at their default.
7. Glossy works the exact same way as the Diffuse. I only switched it on.
8. Move on to the Rimlights tab and enable Layer 1. Rimlights simulate lighting the rims of a Toon shaded object, but because they are by default inverted they actually light everything but the rims. If you want the rims lit, uncheck the Invert option. I left mine on and set the softness to 0. The incident vector decides in which direction the light will "point". If you choose anything else than "Camera Direction" you can set a reference in the Coordinate System drop down menu. There also is a second Layer of Rimlights that can be enabled.
9. In the top right corner of the property page click the "Save" button and save your shader settings as a preset, for later use. Save it in the Illumination folder and name it Car_Toon_Paint.
10. We're done with this property page. Let's close it.

In the previous steps we have applied the Simple Toon Paint shader to the entire object. We used the simple shader because we didn't want to add any local contour attributes. Now that the whole surface of the Car_Body is shaded we want to add some detail, like transparency to the windows of the car.
Instead of having separate objects for each shader we can now very easily apply multiple shaders to one object. We are going to do this by shading polygon clusters on our car. We'll choose the lightest shader available for the job. That is the Simple Toon Host shader.
The Simple Toon Host shader controls only the local contours, the transparency and reflections on objects and one shade of paint to give the transparent or reflective object a base color. This is all we need. We can give the windows a glass type color, transparency and reflection. We'll leave the local contour attributes disabled and keep using the global contours generated by the lens shader.

Simple Toon Host Shader: (Controls only the local contours, one shade of paint and the transparency and reflections on objects.)

1. With the Car_Body selected, select the "Windows" cluster from the Clusters menu in the Main Command Panel. Then from the Render Toolbar, Get ►Material ►Simple Toon Host.
2. In the property page, on the Paint tab, set the Color to H 0.520, S 0.140, V 0.900.
3. Skip the Ink and Seams tabs and move straight to the Transparency/Reflections tab. Enable Transparency, set the Color to H 0.520, S 0.140, V 0.800.
4. The Mode option lets you choose between a Standard Blend and Preserve Color. The first one is similar to the Transparency in other shaders, the Preserve Color one blends more of it's own color (Set in the Paint tab) into the surface. Leave it at Standard Blend.
5. Set the Index of Refraction to 0.99.
6. Also enable Reflection, leave the Mode in its default again and set the Color to H 0.000, S 0.000, V 0.600. Close the property page.

   Note: The Reflection option in the Toon Shader doesn't reflect the "Background Color" specified in the Toon Ink Lens Shaders properties, it reflects black.

We can keep going in the same way and add as much detail as we want, by creating new clusters and applying all sorts of shaders. They don't have to be Toon shaders, you can use any type!
The thing we're going to do next is use a constant shading on a part of the car that's supposed to have a bit of a non-shiny plastic look anyway. So why use more rendertime consuming shaders if we don't have to.

Combining with Non Toon Shaders:

1. Now select the "Window_rear" cluster and put a Material ►Constant on it. Change the color to H 0.550, S 0.155, V 0.200 and disable everything in the other tabs of the "Constant" property page, then close it.

   Note: Combining Toon and Constant shading might be a good way of saving valuable render time. This is useful for background objects etc.

Now that we have explored different types of Toon and non-Toon shaders to add detail to our object, we'll take a look at how we can make a more interesting look by creating contours, still without using any local contour attributes from the Toon Paint and Host shader.

Get contours between materials:

1. Select the Car_Body once more and go into Polygon Selection Mode by hitting U on the keyboard. You'll notice that there are two polygons selected on the front of the car.
2. Now create a cluster by clicking the cluster button on the bottom part of the Main Command Panel. Hit enter on the keyboard and name it "Front".
3. Get a Material ►Simple Toon Paint and update the Render Tree.
4. In the top right corner of the Toon Paint property page click the "Load" button and select the Car_Toon_Paint preset, from the Illumination folder. Close the property page.

   Note: A contour was created without doing anything to the surface because the Toon Ink Lens Shader was set to create contours in between materials.

The Car_body part is done. We'll now focus on the Car_Inside. This is an area in which we are going to use the Toon Paint and Host shader, because we want to change the surface shading of this object (with the use of ambient and highlights) as well add local contours in a matching color.

Toon Paint and Host Shader: (This is a combination of the Simple Toon Paint and the Simple Toon Host. It has all their properties)

1. Select the Car_Inside and Get ►Material ►Toon and update the Render Tree.
2. On the Base tab set the Color to H 0.000, S 1.000, V 0.370, enable the Ambience and turn on Shadows Only.
3. On the Highlights tab set the Diffuse Color to H 0.000, S 0.530, V 0.750, A 0.500 and Softness to 0.2.
4. *On the Ink tab you decide to:*   *Ink or no ink (Bypass)*
                                          Render surface one sided (Back Cull)
                                          Change contours locally (Local Attributes)
   We are only going to enable the Local Attributes and change the Color to H 0.000, S 1.000, V 0.200, A 0.500. Close the property page.

   Note: All the Toon Shaders can also be found in the Render Tree ►Nodes ►Toon. (See image)
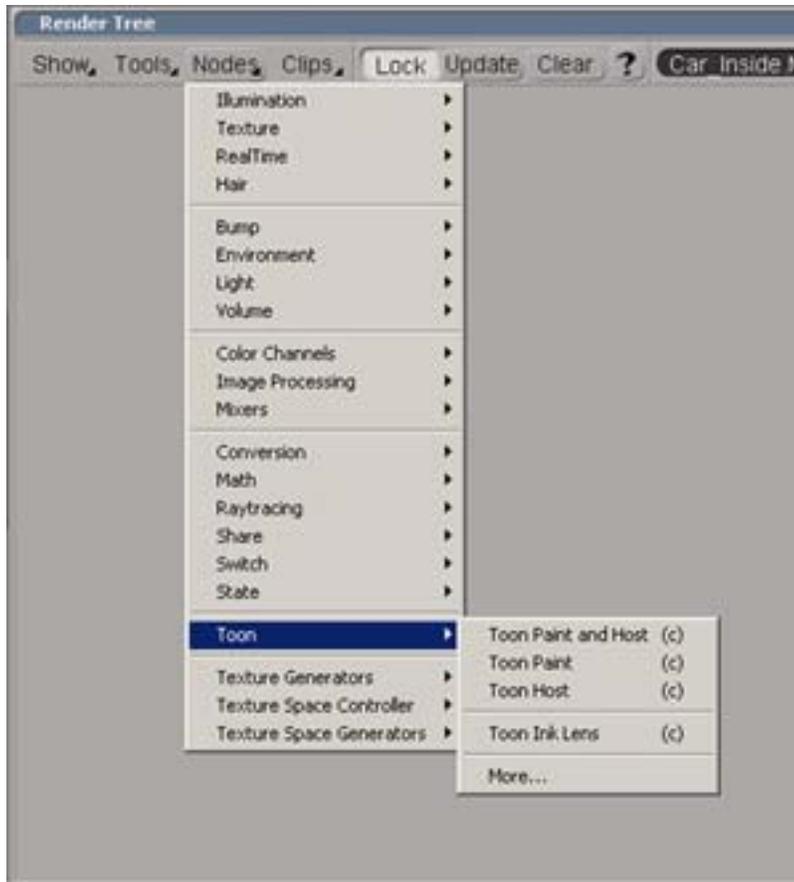
Now that we know the differences between al the shaders we can look at how we can add
more detail by combining Toon shading with Image shading. If an objects surface is
Toon shaded we can still texture that same surface. The textures will inherit the Toon
shaders characteristics. In other words, you get the texture but you keep the "cartoony"
look.

But there is more in this next section. So far we have shaded objects and clusters. The
next thing to do is applying Toon shaders and textures to multiple objects at the same
time. The way to go is with "groups"! Let's see what I'm talking about….

Groups & Textures:

1. Select the Tires Group from an explorer. Get ►Material ►Toon.
2. Update the Render Tree and move the Render Region to a "tire area".
3. Base tab: Enable Ambience and Shadows Only.
4. Ink tab: Enable Local Attributes and set Spread to 5.
5. In the Render Tree, get the Nodes ►Texture ►Image and a Nodes ►Image
   Processing ►Intensity.

6. Connect the Image node to the Intensity (input) and then the Intensity node to the Surface slot of the Toon_Paint_and_Host node. (See image)

7. Dubbel click the Image node to open its property page. On the Texture tab click the "New" Button to load an Image and choose "New From File", select the "TireProfile.jpg" and hit "OK". Now for the Texture Projection, click "New" and choose Cylindrical from the dropdown menu. Don't forget to update the Render Tree.
8. Open the Intensities property page and set the Factor to something that suits your scene. Mine is set to 0.3. Close the property page.

Note: All the elements of the group got Toon and Image shaded!

9. Select the Caps Group and Get ►Material ►Simple Toon Host. Update the Render Tree.
10. On the Paint tab set the Color to H 0.000, S 0.000, V 0.850.
11. On the Transparency/Reflection tab turn on Reflection, choose Mode: Preserve Color and set the Color to H 0.000, S 0.000, V 0.800. Close the property page.

Tip: Use the Preserve Color option, in the Reflection properties, to fake the reflection of a background with a different Color than black.

12. Last but not least, restore the minimized Toon Ink Lens property page and reset the Samples (in the Sampling tab) to 6. Close the property page.

Note: If an object or group with a Simple Toon Host or Toon Paint and Host shader attached to it doesn't cast a shadow, open the shaders property page and go to the Transparency/Reflection tab. Enable Transparency, set the "Value" to 0.000 and disable it again.

Conclusion:

The XSI Toon Shader is very flexible and extensive. The separation of properties in different shaders gives you a very high level of control to make global and local adjustments without adding unnecessary render time. The fact that you can apply shaders to groups increases workflow. Combining toon shading with any other type of shading is extremely powerfull. The Toon Shaders rocks!