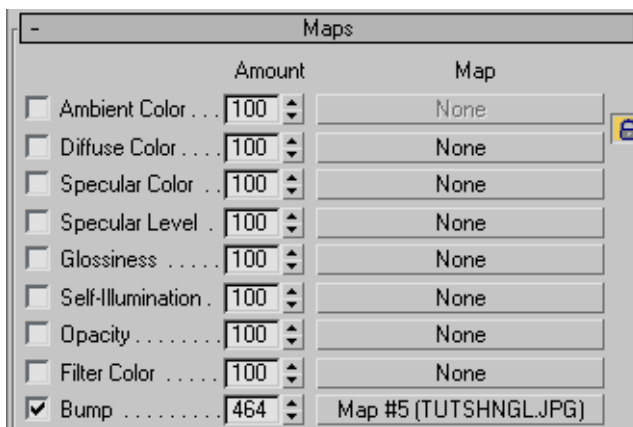# Bump and Normal Mapping

Bump Mapping and Normal Mapping are two methods to add realism to your scene geometry.

Bump Mapping

Bump Mapping gives the illusion of surface displacement without affecting the face count. Normal Mapping is a new type of bump mapping that uses 256 levels to define normal direction, so it allows for much greater detail for this type of effect.
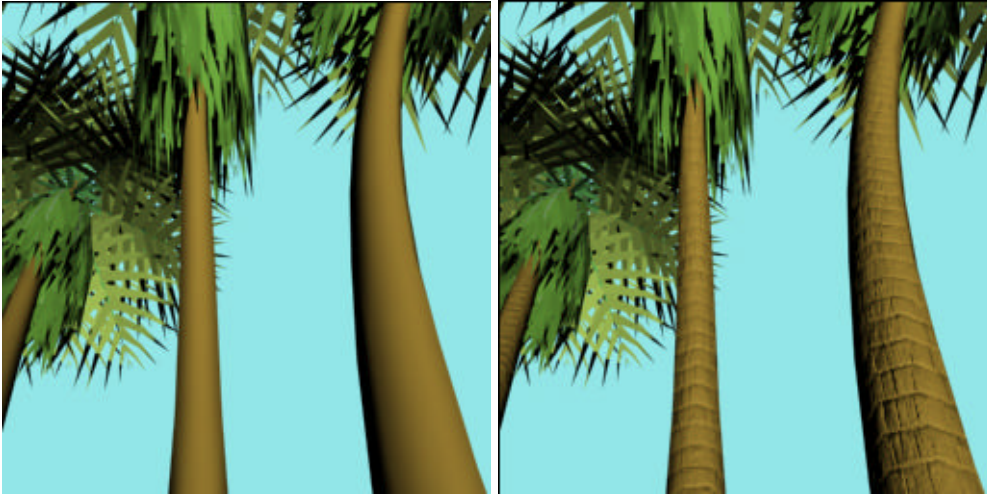
In the *Maps* rollout, add a map to the *Bump* channel and change the amount.

Here we'll use a photo of a shingled wall for the bump map.

The photo of the shingled wall looks like this.

Rendering without bump mapping and rendering with bump mapping.

Normal Mapping

3ds Max has the ability to do normal mapping. Normal maps are enhanced bump maps specifically designed to let game developers take advantage of next generation game engine support of DirectX shaders.

To define a normal map, go to the material editor —> *Maps* rollout and click the *Bump Map* button. Then choose Normal Bump as the type (instead of Bitmap as you've done before).
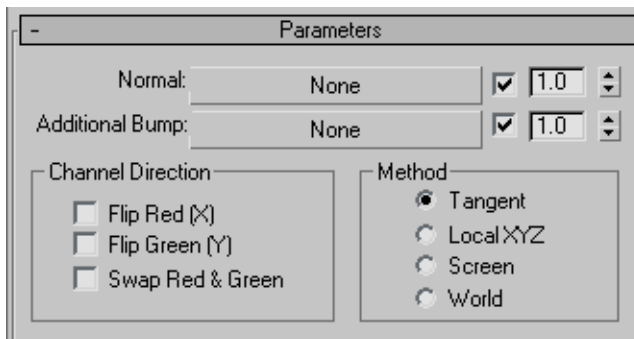
New Normal Bump map type has these parameters.

Use the Normal button to assign the Normal map. If you have DirectX 9.0 and Pixel Shader 2.0 installed and selected as your video display driver, you will be able to see the Bump in the
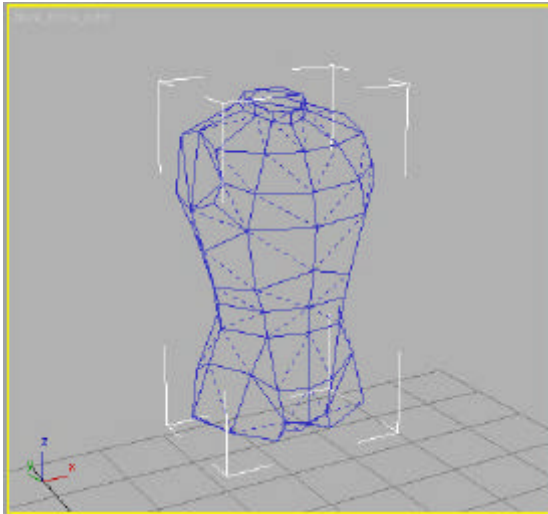
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viewport. In the DirectX Manager field, you'll need to turn on DX Display of Standard Material. You'll also have to turn on *Show Map* in viewport to see the DX material correctly.
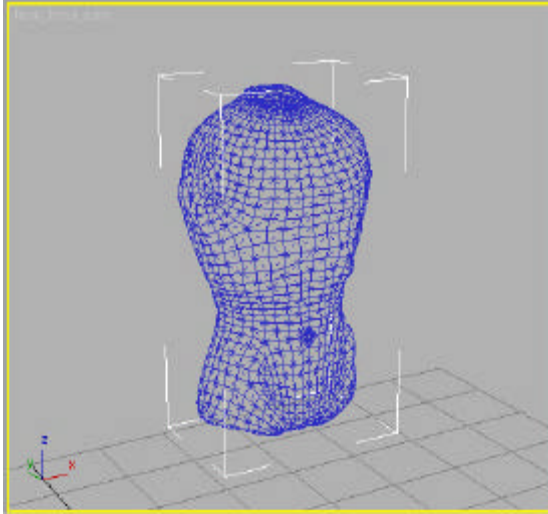

Show Map in Viewport for DirectX

To Create the Normal Map follow these steps:

1. Create the low-poly mesh that will receive the normal bump map.

Low-Poly Mesh

2. Make a high-resolution version that is a bit larger than the low-poly target object.

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Higher-resolution mesh.

3. Sculpt all the detail you need into the high resolution version.

4. Add a *Projection* modifier to the low-poly mesh. Click the *Pick* button and select the higher resolution mesh object. The *Projection* modifier will display a cage.
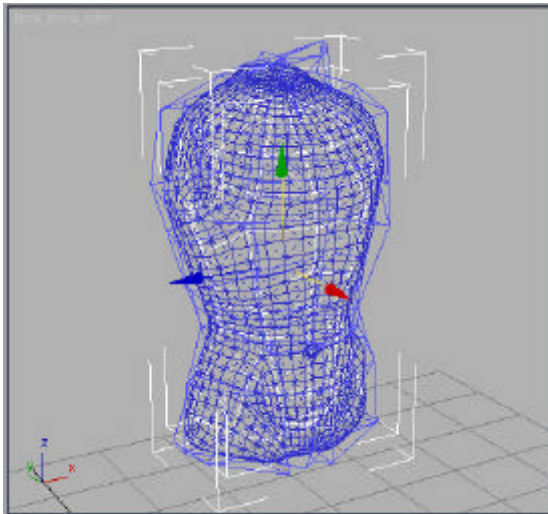

Cage appears in blue

5. Adjust the position of the high-poly version so it over laps the target completely.
6. Enlarge or edit the cage as necessary so the overlap is correct.
7. On the *Rendering* menu choose *Render to Texture*.
8. Turn on *Enable* in the Projection Mapping group.
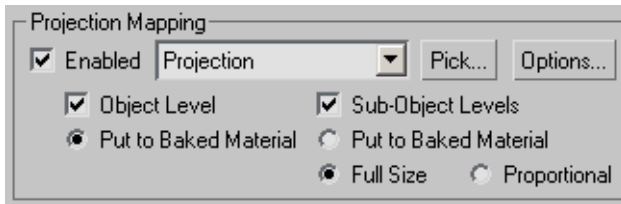
9. In the *Output* rollout of the *Render to Texture* dialog, click the *Add* button and choose *NormalsMap* from the list.
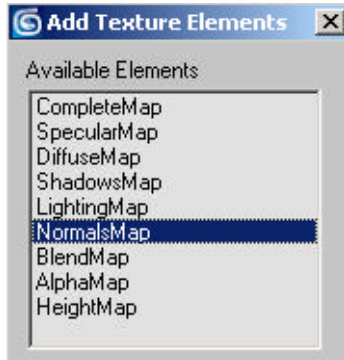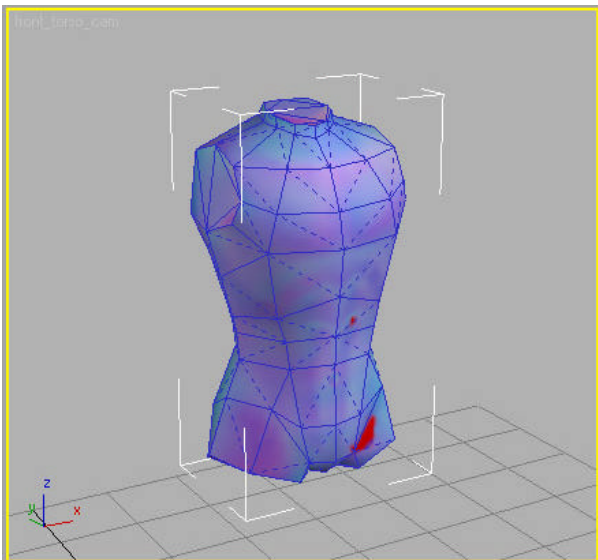

10. Click *Add Elements* to add the *NormalsMap* element.

11. For the *Target Map Slot* choose Bump from the dropdown list. In the Selected Element Unique Settings group, check *Output* into Normal Bump.
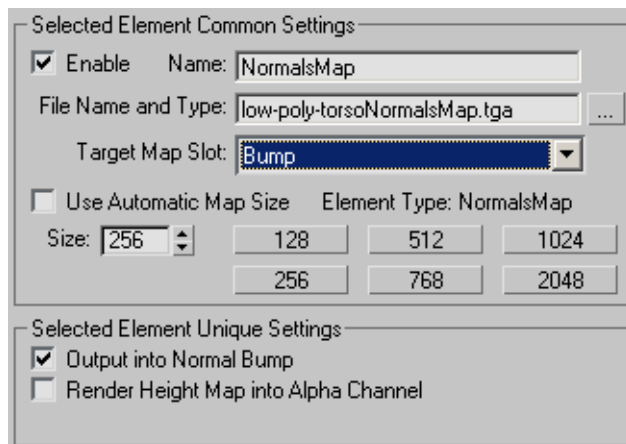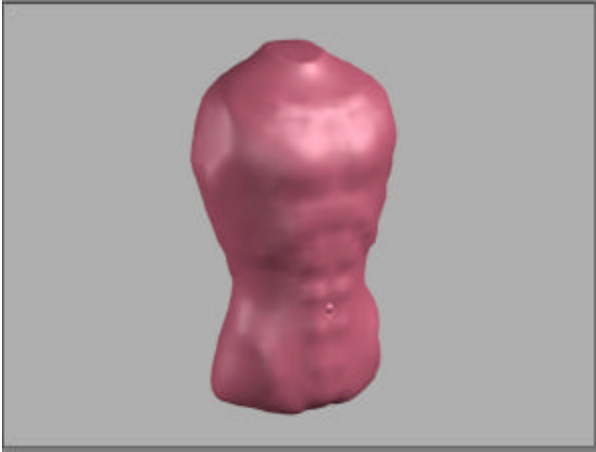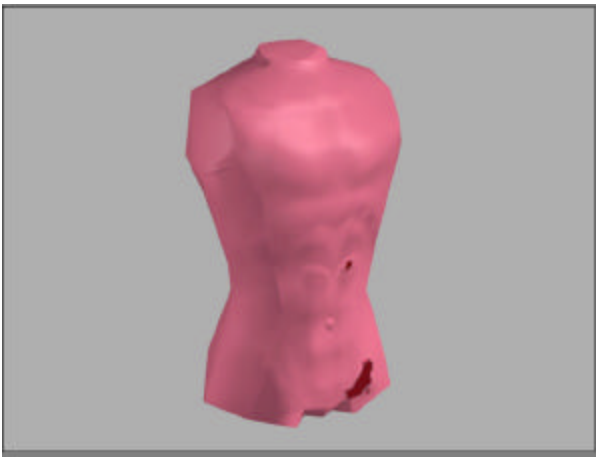

12. Click *Render to Texture*.
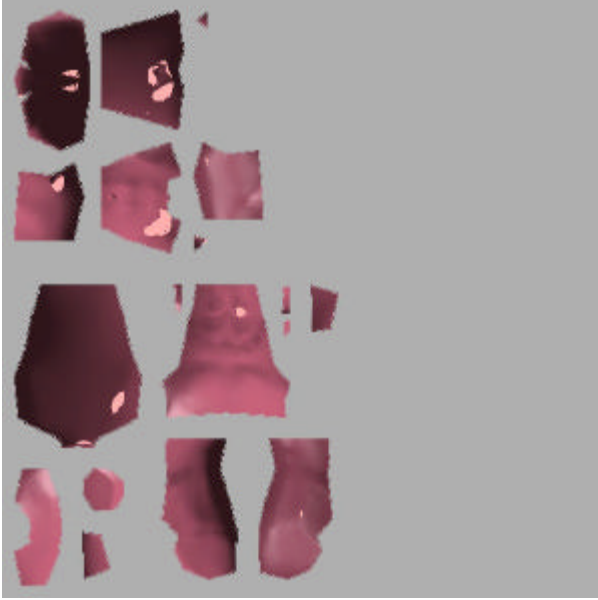
The red spots indicate areas that have a problem with the cage. Moving individual cage points will fix this problem.

Normal Mapping bump map applied to low-poly mesh.

Render of high-poly mesh.

Render of Normal Mapping applied to low-poly mesh.

In addition to using high-poly meshes to generate normal maps, it is also common practice to use a grayscale image to generate normal mapping. The concept is similar to bump mapping, where white values represent the highest point in the map and black areas represent the lowest point in the map. However, normal maps are not as simple as height maps and actually represent a normal's vector in 3d space. Thus you will need a Photoshop filter to convert a grayscale image to a normal map. You can get this filter from nVidia's Web site:

http://nvidia.com/object/photoshop_dds_plugins.html

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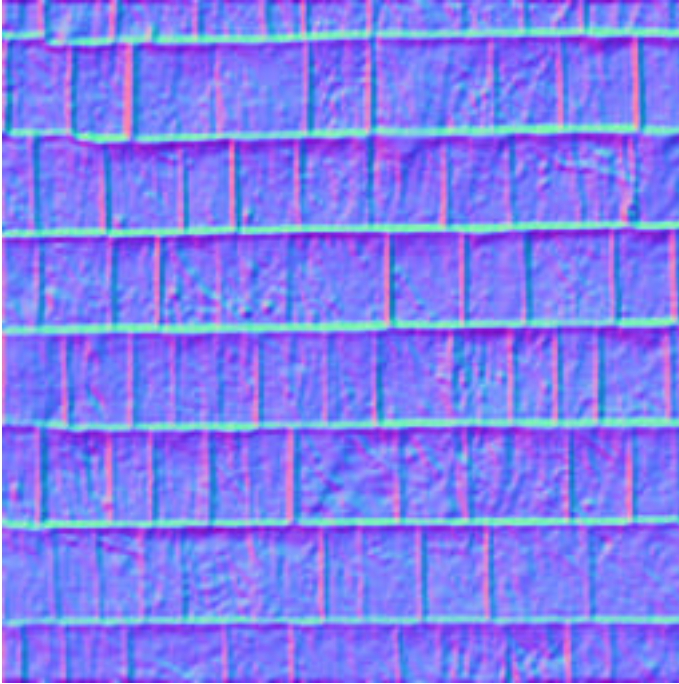
The shingles image converted to a normal map using nVidia's normal map filter for Photoshop.

Using grayscale images to create normal maps can often be quicker than modeling a high-resolution mesh. However, this method may not provide as accurate results.

Low Polygon Modeling and Animation

Guest Lecture—Why Be Normal?

The main concern is which way the normal faces, which deals again with shading and whether a polygon is facing toward or away from the camera. Once more, if an engine draws double sided faces there is less concern, but if single sided faces the normal must be facing toward the camera for it to be drawn.

On the sports title I had worked on, one artist was in the habit of assigning a two sided texture to meshes that he was working on in Max, but when he put his objects in the engine there were missing faces everywhere. I had to get him into the habit of assigning single-sided textures, and turning on backside culling just to make sure that his work didn't have missing faces.

Something else to note when building faces in either Max or Maya. When creating faces if you create the face by drawing out the vert points in a clockwise manor the face is created with the normal facing away from you. For the normal to be facing you, the polygon should be created by building in a counter clockwise fashion.

Mike Dunhour
- 2D and 3D Expert