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How to Cheat in 3DS Max 2009
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HAVING GOOD TEXTURES is half the battle in making realistic materials. The other half is knowing how to create materials with the textures, and how to get them onto objects with the right orientation and size.

While a map is 2D and provides color information only, a material has a 3D aspect to it. Shininess, bumpiness, and transparency are all set within the material. You define a material with one or more maps, and then assign the material to a 3D object.

In this chapter, you’ll learn how to create materials and apply mapping to suit your scene.
The Material Editor is the heart of all materials and mapping. Here is where you specify the maps that will be applied to the object. This topic is a quick guide to the Material Editor tools you’ll use the most often.

When navigating the Material Editor, keep in mind that it works with a tree structure, where every map is considered a “child” of the main material.

1 Open the Material Editor by pressing the M key or clicking the Material Editor button on the toolbar. Note the sample slots across the top, which will guide you in the material creation process.

2 For a bit of quick gratification, click the Diffuse color swatch on the Blinn Basic Parameters rollout and change the color in the Color Selector. The Diffuse color is the main color of the object.

6 The rollouts are different because you are currently at a child level of the material tree. Click Go to Parent to get back to the previous level.

7 Experiment with the Specular Level and Glossiness values. The changes aren’t visible in viewports, only in the sample slot and renderings.
Now for the fun part--assigning a map for the Diffuse color. In the Material Editor, click the small box next to the Diffuse color swatch, choose Bitmap from the Material/Map Browser, and pick a bitmap texture.

The easiest way to assign the material is to drag from the sample slot and drop it on the object. Triangles appear at the corners of the sample slot to indicate that the material has been assigned.

Expand the Maps rollout and note the different types of attributes listed. Diffuse, Bump, and Reflection are the ones you’ll use most often.

Click the slot next to Bump and choose the Noise procedural map. Experiment with the settings and see how it affects your rendering.

To make the bitmap show up on the object in viewports, click the Show Standard Map in Viewport button on the Material Editor toolbar. In 3ds Max 9 and earlier versions, this button is called Show Map in Viewport.

HOT TIP
3ds Max comes with a wide variety of bitmaps. Look in Program Files/3ds Max/maps for a selection of folders.

You can also add a Reflection map. On the Maps rollout, set the Reflection value to 20 to keep it from overwhelming the material.
Mapping is a method of specifying the orientation and size of maps on an object. For mapping, 3ds Max uses a special coordinate system that works with both flat and curved sections of objects. When you apply a material to an object, the object’s own mapping coordinates determine the textures’ orientation and size.

Every primitive, and just about every other kind of object you can create in 3ds Max, has mapping coordinates assigned to it by default. You can change the default coordinates by applying a UVW Map modifier to the object, where you’ll have a selection of mapping types to choose from. In practice, you’ll use just two or three of them for the majority of your work.
To change the mapping coordinates, apply a UVW Map modifier. The default setting for this modifier, Planar, projects the map onto the surface. This is the mapping type you’ll use most often.

Cylindrical mapping looks good on curved surfaces, but warps at the edges of flat surfaces. This is the mapping type you’ll use occasionally, mostly for round surfaces.

On a lofted object, you can use the Apply Mapping option to apply custom mapping coordinates that follow the path.

When mapping coordinates from the UVW Map modifier don’t give you exactly what you need, you can use the Unwrap UVW modifier to fine-tune the mapping. See the Unwrapping the Mapping topic for details on this feature.

HOT TIP

3ds Max uses UVW as the letters for its coordinate system to avoid confusion with the XYZ coordinate system used to designate 3D space.
GOOD TEXTURE MAPS are the key to believability in your renderings. Realistic textures can bring a crude model to life, but it doesn’t work the other way around. If your textures aren’t up to par, your rendering will suffer accordingly.

Rather than paint your own textures, start with photographs as a base and do a bit of cleanup in Photoshop.

1 A straight-on photograph of an object makes an excellent basis for a texture map. In Photoshop, remove perspective with the Warp and Distort tools and clean up the image.

2 If the map doesn’t match the object exactly, the background color will “bleed” onto the object. Use Photoshop’s Smudge tool to push the edges of the image and make it larger.

5 If you need a Bump map, make a grayscale version of your texture map and increase the contrast so you have a range from black to white.

6 Tiny shadows in crevices can be hard to produce with lighting and shadows alone. Build these shadows into the texture itself for a more realistic rendering.
3 You can also create textures right in 3ds Max by rendering an orthographic viewport. This is a great way to make animated textures for television and monitor screens.

4 To make a map tileable, cut it into four equal quadrants and swap each one with its diagonal counterpart. Clean up the visible edges in the middle, and the result is a tileable map. This technique is particularly good for landscape elements that need to be tiled over a large area, like grass, rocks, and sand. Use a texture like this with the Gradual Mix cheat to make a natural-looking landscape.

7 To create interesting shadows without having to model the objects, create a Projector map from a photo. See the Shadows chapter to find out how to use this type of map.

8 For quick people, cars, and trees, start with a photo and paint out the background to a transparent layer. Put the texture on a plane facing the camera. Create an Opacity map with solid areas as white and transparent areas as black, or use an alpha channel to hide the background. This technique is described in detail in the People, Trees, and Cars topic.
Applying a decal

Applying a Map in a single spot on the model is a common need in 3D presentation. Instead of applying multiple materials, you can create a decal by using a PSD texture map with a transparent background.

1. Prepare the decal bitmap in Photoshop with a transparent background, and save it as a PSD file. This automatically stores the transparency information as an alpha channel that you can use in 3ds Max.

2. Assign the material to the object, and turn on Show Standard Map in Viewport. The decal appears all over the object. In the Coordinates rollout, turn off the Tile option for both U and V to remove the decal from all parts of the object except the area designated by the UVW Map gizmo.
2. Apply a UVW Map modifier to the object, and leave the Mapping as Planar. Highlight the Gizmo listing at the UVW Mapping modifier sub-object level, and move and scale the gizmo so it roughly matches the desired decal size.

3. In the Material Editor, assign the PSD file as a Diffuse bitmap. Choose the Individual Layer option and pick the single layer available. Using this option, rather than Collapsed Layers, preserves the alpha channel.

5. In the Bitmap Parameters rollout, make sure Alpha Source is set to Image Alpha. This utilizes the alpha channel and makes the corners of the decal transparent. If your decal corners are black, choose the bitmap again. Take care to choose Individual Layer and highlight the single layer.

6. Click Go to Parent to return to the root level of the material. In the Blinn Basic Parameters rollout, change the Diffuse color swatch to the color of the rest of the object. Here, I’ve changed it to light green. Adjust the Specular Level and other parameters as you like.
EXTRA SCENE ELEMENTS like people, trees, and cars are time-consuming to create as models.

You can save a lot of time by creating these extra elements as textures and mapping each one onto a plane. For a more three-dimensional look, you can also model a simple low-polygon object, and let the textures do most of the work.

In 3ds Max, create a material with the PSD file as the Diffuse map. In the PSD Input Options dialog, choose the Individual Layer option and select the single layer. This ensures that the background area will be transparent. In the Bitmap Parameters rollout, make sure Alpha Source is set to None.

Place a shadow-casting light in the scene with Ray Traced Shadows. This will render shadows cast by transparent objects correctly, while a Shadow Map won’t.

The same can be done with trees. The base of the tree will give away the fact that it’s on a plane unless you hide it behind something, such as a mailbox.
1. Get together a few pictures of elements you want to use in the scene. Action poses work best for people, such as walking or sitting, rather than just standing there. For cars, get side and top photos, and back or front views as needed.

2. In Photoshop, paste the image onto a transparent layer, and erase the background. The Quick Selection tool can help with large areas, but you’ll need to do some custom cleanup around the edges. Save each image as a PSD file.

3. In the Maps rollout, drag the map from the Diffuse slot to Opacity slot as a Copy. Click the map in the Opacity slot, and set Mono Channel Output to Alpha. Change the Sample Type to a cube and turn on the Background option to check that the map background is transparent.

4. Create a plane in the scene and assign the material to it. Turn on Show Standard Map in Viewport to see the image in the scene. Assign a UVW Map modifier to the plane, and use View Align, Fit, and Bitmap Fit to ensure the mapping matches the PSD file’s aspect ratio.

5. To darken the shadowy area of the tree, use a Mix map and mix the tree with black, with a black-to-white Gradient map to determine the Mix Amount.

6. A car can also be mapped onto a plane or created as a low-polygon object. Although it won’t hold up to close scrutiny, it’s fine as an auxiliary element.

HOT TIP

If there are no shadows cast upon the plane in the scene, you can set the Self-Illumination value in the Blinn Basic Parameters rollout to 100 to get the full range of color in the image regardless of the scene lighting. However, self-illumination will also prevent the plane from receiving shadows from other scene elements.
YOU WILL OFTEN NEED to map several different textures onto one object. There are many ways to do this, but the one shown here is the quickest.

The key is to assign both materials and mapping to selected polygons at the same time. This technique automatically creates a Multi/Sub-Object material for you with exactly the right materials in the right places.

1. Assign a material with a plain color to the object. Drag the material to another slot to make a copy, and give it a different name. In this second material, assign the texture map you want to apply as the Diffuse map.

4. Choose the Bitmap Fit option on the UVW Mapping modifier, and pick the texture map. This will resize the gizmo to the same aspect ratio as the bitmap.

7. Access the main level of the UVW Mapping modifier, and right-click it. Choose Collapse All to collapse the modifier stack. This embeds the mapping in the selected polygons.
At the Polygon sub-object level, select the polygons to which you want to apply the texture map. Assign the material to the object while still at the Polygon sub-object level. This assigns the material to the selected polygons only.

While still selected at the Polygon sub-object level, apply a UVW Map modifier to the object. Use the View Align and Fit options to line up the gizmo with the approximate size and orientation.

If the texture needs to be moved or scaled, access the Gizmo sub-object level of the UVW Mapping modifier, and move or scale the gizmo.

If the map is a decal (meaning it’s not meant to be tiled), turn off the Tile checkbox for both U and V in the bitmap’s Coordinates rollout in the Material Editor.

Select another set of polygons and repeat the process: Assign a material, apply a UVW Map modifier, adjust the gizmo, collapse the stack. Repeat this as many times as needed to map the entire object.

After assigning multiple materials, click an empty sample slot in the Material Editor and use the eyedropper to pick the automatically-generated Multi/Sub-Object material from the object.

**HOT TIP**

Turn on the Show Standard Map in Viewport option on the Material Editor toolbar to see the bitmap on the object after assigning the material.
YOUR RENDERINGS can get a lot of mileage out of a photograph used as a background. The bitmap can be shifted or tiled within 3ds Max to match your camera’s perspective.

3 Open the Material Editor. Drag from the Environment Map button in the Environment and Effects dialog to an empty material slot. When asked to choose the copy method, choose Instance. This will enable you to change the background map from within the Material Editor.

4 Select the background image slot in the Material Editor. Experiment with the Offset and Tiling values to eliminate stretching, or to make the parts you want to see show up in the viewport and rendering. You can also change the Mapping to Cylindrical or Spherical Environment, or use the Mirror option to get more sky at the top and trees at the sides.
1 To set up the background for the rendering, choose Rendering > Environment, click the blank Environment Map button, and choose a Bitmap. You won’t see the bitmap in viewports; you need to render to see the background.

2 To display the background in a viewport, activate a camera or Perspective viewport and choose Views > Viewport Background. Turn on the Use Environment Background and Display Background options and click OK. If the image’s aspect ratio differs from the viewport’s, the image will appear squashed.

3 In the Coordinates rollout, the mapping type is set to Environ by default. This means the background will stay still even if the camera moves. If the camera is animated, you’ll need to put the background texture on an actual 3D object in the scene. Create a giant sphere or cylinder around the scene, and apply a material to it that uses the background image as a Diffuse map. Turn on the 2-Sided option and set Self-Illumination to 100. With this type of setup, the background will pan appropriately when the camera moves.
PROCEDURAL MAPS use algorithms (a series of equations) to generate an individual color pattern. You change the pattern not by painting pixels, but by adjusting parameters.

Although 3ds Max comes with many procedural maps, I use the Noise map and Gradient Ramp map more than all the others combined. With the examples here, it’s easy to see why.

1. The Noise map makes a random pattern of black and white blobs. This type of map makes a great Bump map to give an object a bit of texture. Change the Source to Explicit Map Channel and turn on Show Standard Map in Viewport to see how the map lies on the object. A Bump map only shows up on a somewhat shiny material, so be sure to turn up the Glossiness and/or Specular Level to see the bumps in the rendering.

2. The Gradient Ramp map makes a gradient from a series of colors. The Radial type creates concentric circles, and the Solid Interpolation setting makes great cartoon-style eyeballs.

3. The Gradient Ramp map makes a gradient from a series of colors. The Radial type creates concentric circles, and the Solid Interpolation setting makes great cartoon-style eyeballs.
The Noise map, like many maps, can be nested. In other words, the black or white channels in a Noise map can lead to another Noise map, or any map for that matter. Here, a Noise map is used as a background. The Size parameter is turned down low and the Noise Threshold: Low value is increased to reduce the amount of white. This produces a field of white stars on a black background. Then the black channel holds another Noise map made up of larger blobs of dark blue and purple, creating a rich background for a space scene.

You can also use a Gradient Ramp to generate rings of varying colors. Here, the Gradient Ramp map in the Diffuse channel is coupled with a Noise map in the Opacity channel to create the semi-transparent rings around a planet.

HOT TIP

If a Noise pattern is still too large with a small Size setting, increase the Tiling values in the map’s Coordinates rollout.
A large landscape might call for gradual changes from one kind of ground cover to another. Examples would be grass and dirt on a forest floor, or rocks and snow on a mountaintop.

There are a number of ways you could create the texture map for such a landscape, such as mixing two maps using a Noise map to vary it across the surface. But with that type of setup, it would be hard to control where each map appears on the terrain.

Instead, you can use vertex painting to put different maps on specific areas. This technique gives you fine control over the final look of the landscape while retaining natural-looking variations from one map to another.

1. Create a terrain object with any method and apply a VertexPaint modifier to it. In the VertexPaint dialog, turn on Vertex Color Display - Unshaded. By default, all vertex colors are white. You’ll use the VertexPaint tool to paint some of the vertices black.

2. In the Material Editor, create a Standard material with a Mix map in the Diffuse map slot, and assign it to the terrain. Select a Color 1 map for the black areas and a Color 2 map for the white areas. As you assign each map, display it in the viewport with the Show Standard Map in Viewport option so you can adjust tiling appropriately.
2 Make sure the color swatch in the Paintbox is black. Click the Paint tool and move the cursor over the object to see the disk-shaped paintbrush tool. Drag the cursor over the object to paint areas black. Here, I’ve painted the peaks black and left the valleys white.

4 For the Mix Amount map, choose a Vertex Color map. This will use the vertex colors to determine the amount by which the two maps are mixed. Since you can see only one map at a time in viewports, you’ll need to render the image to see the result. You can also paint some of the black vertices back to white to change the effect.

HOT TIP
To see the ground cover bitmap on the object without the vertex colors, turn on the Disable vertex color display option in the VertexPaint dialog.
Mapping a vertical surface like a mountain presents specific difficulties that can be solved only with the Unwrap UVW modifier.

This powerful tool can be used in a variety of situations. Here it’s used to clean up mapping artifacts on a vertical surface.

Learning to visualize how the Edit UVWs dialog relates to the object takes some practice, but it’s well worth the time spent. Once you know how to unwrap your UVWs, you’ll be able to map any object with ease regardless of its size or shape.

Planar mapping works fine for the top of the mountain, but you’ll get stripes on the sides due to the map pixels going straight down.

For extreme vertical areas, you can also reduce the striping further by scaling selected vertices so they use more of the map. Vertices selected in the viewport are automatically selected in the Edit UVWs dialog, and vice versa.
2. Apply an Unwrap UVW modifier and click Edit, and you'll see why. The vertices in the vertical areas are all bunched up around the center of the mapping coordinates. You'll use the Relax tool to fix this.

3. Select all the points and choose Tools menu > Relax. Choose the Relax by Centers option with the Keep Boundary Points Fixed option turned on, and click Apply several times until the distribution evens out.

5. If the bitmap is displayed on the object in the viewport, you'll see it change interactively as you move vertices around in the Edit UVWs dialog. The result is a mountaintop with an evenly distributed texture and no obvious stripes due to mapping.

HOT TIP

You can display a bitmap in the Edit UVWs dialog to help you visualize how the map will fall on the object. If a material with a Diffuse bitmap has been assigned to the object, you can pick the bitmap from the dropdown list at the top of the dialog. You can also choose Pick Texture and pick a new one.
Mapping a character

Mapping a character requires a few special techniques. The use of the Unwrap UVW modifier makes it possible to put all the textures into one image, making a game-ready character that uses as little memory as possible.

Wrapping your head around the Unwrap UVW modifier takes a little practice, but will open up a new world of texturing to you.

1. Put all the various textures for the character in one square image. Create a material with this image as the Diffuse map.

2. Apply the Unwrap UVW modifier, and click Edit. The mesh displayed in the Edit UVWs dialog represents the skirt flattened out. Choose the texture map from the dropdown at the top of the dialog to display it in the window.

3. Select all the vertices in the window. Using the transform tools at the upper left of the dialog, move and scale the vertices to fit the part of the texture they correspond to. In this case, it’s the rectangular patch of green at the upper right of the texture image.
2 Select a body part to start mapping. In this case we'll start with the skirt. Select the polygons that make up the skirt, making sure you get all the ones around the back.

3 Apply the material to the selected polygons. The material won't look right, but that's okay at this stage.

4 With the polygons still selected, apply the UVW Map modifier. Choose an appropriate map type, in this case Cylinder. Use View Align and Fit to fit the gizmo.

5 Choose Thick Seam Display in the UVW Map modifier panel to see where the gizmo's seam is. At the Gizmo sub-object level, rotate the gizmo to put the seam at the back.

HOT TIP
To make the map easier to see and work with in the Edit UVWs dialog, Choose Options > Preferences and turn off Tile Bitmap, and use Views > Show Grid to turn off the grid display.

8 Collapse the modifier stack to set the mapping. Repeat the process for each part of the body, selecting polygons, choosing an appropriate UVW Map type for that section, and applying an Unwrap UVW modifier to align the mesh with the texture in the Edit UVWs dialog. When you select a vertex in the Edit UVWs dialog, it turns yellow on the mesh. You will see the mapping change on the character in the viewport as you move and scale vertices in the Edit UVWs dialog. Collapse the stack after aligning each part of the mesh in the Edit UVWs dialog.
MENTAL Ray comes with a number of preset materials that work “as is” in your scene. Materials that are difficult to create with the Standard type take just minutes when you use the Arch & Design material’s presets.

Mental Ray materials are available only when Mental Ray is selected as the renderer. These materials are designated in the Material/Map Browser by a yellow sphere icon.

Note that if you switch back to the default renderer after you assign Mental Ray materials, you will need to reassign non-Mental Ray materials to make the scene render properly.

In the Render Scene dialog > Common tab, change the renderer to Mental Ray. Open the Material Editor, and click the Standard button on the Material Editor toolbar. Choose the Arch & Design (mi) material, one of the Mental Ray Materials in the Material/Map Browser.

Experiment with more templates, and note how they change the Diffuse, Reflectivity, and Transparency settings. Also, look for the Bump and Displacement settings in the Special Purpose Maps rollout. Many templates automatically assign textures to these parameters.
2 On the Main Material Parameters rollout, you’ll see some of the same types of parameters you are accustomed to, such as Diffuse and Transparency. To get started, choose a template from the Select a Template dropdown and assign the material to an object in the scene.

3 Choosing a template sets the material parameters to appropriate values, but the preset name doesn’t stay with the material. Try a new template, change the Diffuse color swatch, apply it to an object, and render. Set the output resolution low to keep the rendering time reasonable.

5 Where Mental Ray really shines is with hard-to-get-right materials like glass. Here, I’ve applied the Glass (Physical) template to the bottle. At any time, you can change the parameters on any rollout to change the object’s color or appearance.

6 The Water, Reflective Surface template gives you instantly believable water. With just a quick change of the Diffuse color, you can make it match your scene. In the next topic, Custom Mental Ray Materials, you’ll learn how to use your own maps with these templates.

HOT TIP
To keep the rendering time to a reasonable length while getting the benefits of Mental Ray, turn on Enable Final Gather in the Indirect Illumination tab of the Render Scene dialog, and set the Preset to Draft.
While preset materials can get you through some of your projects, to really make use of Mental Ray you’ll need to use your own bitmaps and textures. To create a 3D version of this 17th-century ornamental carving, I used Mental Ray to make all those nooks and crannies really pop.

In the Main Material Parameters rollout, click the Diffuse map button, then click the Bitmap button on the Material Editor toolbar (just under the sample slots). In the Material/Map Browser, choose Mtl Editor under Browse From. Pick the Diffuse map you used for the original material, which you named so carefully earlier so it would be easy to find. Render it to see how it’s coming along. Here I’ve assigned the material to the leaves only.

Replace the Reflectivity map with the same map as the Diffuse map. In the case of Masonry, this will put soft reflections on the object. Scroll down to the Special Purpose Maps rollout, and replace the Bump map with your original material’s bump map. By now, I’m sure you understand why I had you name your maps in the first step! For my model, the bumpiness was a bit high for the leaves, so I reduced the Bump value from 1.0 to 0.6.

Before you start using Mental Ray, create standard materials for the object as usual. Name all your maps and materials with highly descriptive names. This will become very important when you create your custom Mental Ray materials.
2 Get the maps and materials to the point where the rendering looks pretty good with the default renderer, then assign Mental Ray as the current renderer (Render Scene dialog > Assign Renderer rollout). In the Indirect Illumination tab, turn on Enable Final Gather and choose the Draft preset. Render the scene to see if it looks any different. Shown here are renderings with the default renderer (top) and Mental Ray renderer (bottom). Aside from slight differences in shadows, you won’t see much of a change until you assign Mental Ray materials.

3 In an empty sample slot, click the Standard button and choose the Arch & Design (mi) material. This type of material, which is available only after you have set the renderer to Mental Ray, comes with a number of presets that make it easy to get a particular look for your materials. Click the Templates dropdown menu and choose a template. For my carving, I chose Masonry. Choosing a template changes the material parameters, and assigns default maps automatically. You will make your custom material by replacing the default maps.

6 Use the same method to create Mental Ray materials for all other parts of the model. Use an appropriate preset as a base for each material, and replace the maps with your Standard material maps as necessary. Assign each material to a Polygon sub-object selection to automatically create a Multi/Sub-Object material made up of Mental Ray materials. Here, I’ve used the Vertex Paint method to make a messy wall with the Gradual Mix technique.

7 You can also use the bump map as a Displacement map. This causes the bumps to look as though they are physically modeled, so they show in profile in the rendering. Note the difference in the circular center of this model, where the ridges stand out and prevent it from looking perfectly round. I also made it look like an old relic by mixing a bit of the Speckle map with the original bump map, and by applying a Noise modifier to the model.
Lumps, bumps, and dainty curly stuff

WHEN YOU’RE MODELING an object that has lots of creases, crevices, and curlicues, a question arises: what parts do you model with polygons, and what parts do you represent with maps?

To answer this question, we’ll look at an ornate mirror that I photographed at my friend’s house. (Yep, that’s me in the mirror with the camera.) My friend has a lot of cool antique stuff, and when I saw this mirror I knew I had to model it in 3ds Max.

The first step, of course, was to remove the background (and my face) and make a nice, clean texture map. Since the mirror frame is white, the image can work as both a texture map and a bump map. Then I painted over the frame with white to create an opacity map.

Rather than model each curlicue in the mirror frame, the texture/bump map can provide this detail. But what about the outer edges? The easiest approach is to map the image onto a box using the opacity map. However, the result is a flat-looking object. While the curlicues themselves look fine, you can tell from the edge of the object that it’s flat.
To get some thickness around the edges, I took a plane with 20x20 segments and pushed and pulled the vertices to make the mirror frame outline, then applied the Shell modifier to make it a 3D object. The TurboSmooth modifier with Iterations of 2 smoothed out the mirror frame nicely. (To understand why I didn’t just draw a spline and extrude it, see How to Make a Mess with Modeling in the Modeling chapter.)

I also modified the opacity map to be solid (white) around the edges of the mirror frame. With this setup, the model has a bit of thickness around the edges, and all the curlicue detail is still provided by maps.

The same rules can be applied to any object. Interior detail: use maps. Exterior edges: use modeling.
Simple lighting is usually the best. A few lights placed at actual light sources, plus an extra fill light or two, is usually all you need.