Chapter 16

Shields Up, Captain

In the last four chapters, we saw the effects of offensive science fiction weaponry, such as tachyon torpedoes and laser beams. Now it's time to turn our sights on defensive weaponry, such as forcefields.

As you saw when you previewed the outer space battle scenes, when the battlecruiser comes out of warp drive, it's protected by a science-fiction staple: a forcefield. Like the shield technology portrayed in the "Star Trek" universe, the forcefield that surrounds the battlecruiser is a protective bubble that protects it from asteroid impacts, or from hostile alien spaceships (That is, up to a point, as the storyboards seem to indicate.)

We can create this effect quite easily in 3D Studio MAX. In this chapter, we'll see how you can use variations of the shiny Nebula materials we created in Chapters 6 and 7 to create a glassy sphere. We'll also see how applying an animated reflection map enables us to create an interesting "soap bubble" effect.

Note: they could apply a noise texture as a reflection map, and then adjust the colors of it by applying a noise controller to the 2 colors! Mention this at the end of the chapter!

The Initiation of Forcefields

As you saw in the five space battle scenes, the forcefield surround the battlecruiser is a simple and subtle effect. The forcefield itself is a Sphere primitive (actually, an oblate spheroid), scaled non-uniformly on its Z axis to flatten it. After scaling the sphere, I linked it to the battlecruiser model.

I then used Edit\Properties to turn off Shadow Casting and Shadow Receiving for the sphere, and assigned it a largely transparent material. The transparency is set to Additive, the material has a high shininess and shininess strength setting, and a bitmap sequence has been loaded in the Reflection map slot. This creates the illusion of a "swimming" texture on the surface of the forcefield object.

The reflection map consists of a 320 x 200 flic file I created in James Gleick's Chaos program, from Autodesk. (Note that this program is no longer available.) This colorful and looping animated texture is reminscent of the oily rainbow sheen that flows across the surface of a soap bubble. As it stands, it provides an interesting quality for our forcefield effect.

Here's how we can simulate this effect in 3D Studio MAX. We want to create a very simple scene consisting simply of a sphere, an omni light and a camera. The sphere will act as our test forcefield, or shield, object.

1. Press the S key on your keyboard to activate 2D Snap, then from the Create Panel, select Geometry\Standard Primitives. Under Object Type, select Sphere. Activate your Top viewport, place your cursor in the center of the screen, then click-hold and drag outward to create a sphere with an approximate radius of 100. (If you want, you can go into the Parameters section for the Sphere rollout and enter 100 to create the exact values.)

2. In the Create panel, change the sphere's default Segment setting from 16 to 36 and press Enter. Then, click on the Generate Mapping Coordinates checkbox to activate it. Finally, underneath name and color, highlight Sphere01 and type in Forcefield.

3. From the menu bar, select Edit\Properties, and toggle off Cast Shadows and Receive Shadows for the Forcefield object. (You don't want the Forcefield to cast or receive shadows, especially if it's surrounding another object, such as a spaceship.) Then, click on the Zoom Extents All button to center the Forcefield in your viewports.

4. From the Create Panel, click on Create/Lights. Under Object Type, click on Omni. Change the value from 180 to 255, or pure white. Since the Top viewport should already be activated, press Shift-Z on your keyboard to zoom out from the Forcefield object. Then, move your cursor to approximate XYZ coordinates X -200, Y -200 and Z 0, and click to place the Omni light.

5. Click on the Zoom Extents All button to center both the Forcefield and the Omni01 light in your scene, then click on the Select and Move button. Activate the Front viewport, then move the Omni light up on the Y axis approximately 100 units.

Note: to perform transforms on an element in your scene, just right-click on the selected object(s). A dialog box appears, enabling you to Move, Rotate or Scale the selected objects, without having to click on the Select and Move, Rotate or Scale buttons.

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7. From the Create Panel, select Create/Camera, and pick choose Target. Activate the Top viewport again, then press Shift-Z to zoom out further in the viewport.

8. Now, place your cursor in the Top viewport at approximate XYZ coordinates X 0, Y -400, and Z 0. Then, click-hold to place Camera01, and drag vertically upwards along the Y axis to place the Camera01 target in the center of the Forcefield sphere.

9. When you're finished, right-click in the Perspective viewport to activate it and then press the C key on your keyboard to change this viewport to Camera01. At this point, your 3D Studio MAX Desktop should look like Figure 16:1.

Figure 16:1. The basic setup for the Forcefield test renderings.

10. Now, to make it easier to see the effects of the Forcefield material, load the standard STARS640.TGA bitmap into your scene as a Screen background. (By this point, you should be able to do this in your sleep.) Place it in Material Editor Slot #2.

11. Now, make sure the Forcefield object is selected, and return to the Material Editor. If necessary, click on the Go to Parent button, then activate Slot #1. We want to alter Material #1's attributes to create our Forcefield texture. This will look something like a soap bubble, with multicolored swirls of energy crawling over the Forcefield surface.

Click on the Assign Material to Selection button to assign Material #1 to the selected forcefield object.

12. Under Basic Parameters, click on 2-Sided, then change the Ambient color to solid black, or RGB values 0, 0, 0. Now, change Diffuse and Specular to pure white, or RGB 255, 255, 255.

13. Change Shininess to 50, Shininess Strength to 75, and change Opacity from 100 to 7. This will create an almost entirely transparent object, looking somewhat like a piece of tinted glass.

14. Open the Extended Parameters rollout. Under Opacity, keep Falloff set to In. Change the Amount from 0 to 100, and then change Opacity Type to Additive. This will give the illusion of a "halo" around the edges of the Forcefield. When you're finished, close the Extended Parameters rollout and open the Maps rollout.

15. Under Maps, click on Reflection to activate it, and change the amount from 100 to 20. Then, click on the Maps name field next to Reflection. When the Material/Map Browser appears, make sure New is selected, then click on Bitmap. When the Reflection rollout appears, change the coordinates from Environmental Mapping: Spherical Environment to Texture.

16. Now, click in the Bitmap name field to bring up the Select Bitmap Image File browser. From the \CHAP_16 directory of your 3D Studio MAX f/x CD-ROM, click once on the file FORCEFLD.FLC file to highlight it, then click on View. When the Media Player appears, click the Play button.

This is a 320 x 200, 8-bit flic created in Jame's Gleick's Chaos program, originally from Autodesk. Developed by chaos theory specialist James Gleick, this MS-DOS-based program lets you create fractal landscapes as 3D .DXF files, as well as low-resolution animations of various fractal phenomenon, such as landscapes, clouds, and 256-color contour patterns. A still frame from the animation is shown in Figure 16:2.

Figure 16:2. A still image from the FORCEFLD.FLC animation.

I created the FORCEFLD.FLC file you're viewing by animating various parameters of the Chaos Contour function across 120 frames. I then loaded this flic into Autodesk Animator Pro, and cross-faded the first 30 frames of the animation into the last 30 frames, resulting in an endlessly looping, 90-frame animation. I converted this animation to a 256-level grayscale palette, and then mapped a custom palette to it, without color fitting. The custom palette consisted of wildly ramped colors--from black to red, yellow, green, orange, blue, and then black again. Thus, the final result is this somewhat psychedelic, or solarized-appearing animated texture. For our purposes, it's perfect to convey the illusion of a "soap bubble" forcefield effect.

17. Click the Close button to dismiss the Media Player.

Although we could load up the FORCEFLD.FLC file as a reflection map, instead, let's load up a series of .GIF images created from this flic. This will speed up overall rendering time, 3D Studio MAX then does not have to load the entire FORCEFLD.FLC into memory. (Again, as stated in a previous chapter, it's much more memory-efficient to use a bitmap sequence, loaded via .IFLs, than use an entire flic or .AVI file as an animated texture or background.)

18. From the \CHAP_16 directory, load the file FORCE000.IFL. This will now load the 90 sequential .GIF frames of the

FORCEFLD.FLC animation; you see the first bitmap load on the sample sphere of Material Editor Slot #1.

19. In the Reflection rollout, go to the Coordinates section and change UV Tiling from 1.0 to 2.0 for both U and V. This quadruples the number of reflection image maps being applied across the surface of our Forcefield object.

20. When you're finished, click on the Go to Parent button to return to the main Material Editor Slot #1 rollout. Highlight the name field for Material #1 and change it to Forcefield 1.

Note that this material is included in the 3DSMAXFX.MAT Material Library on your 3D Studio MAX f/x CD-ROM.

21. Activate the Camera01 viewport, then press Alt-R and Enter to render a single frame of this object. After a moment the image appears; it should look something like Figure 16:3.

Figure 16:3. A test rendering of the Forcefield object.

Stopped here

If you take a look at Figure 16:3, you will see how using an almost completely transparent material with the reflection map has resulted in a glassy object that looks somewhat like a soap bubble. Note that for this demonstration, we have actually brought the reflection map percentage or amount, up to a higher level than it was actually applied to the battlecruiser forcefield object. This is so we can see the effects of the reflection map a little more easily.

Click the Close button to dismiss your Camera01 Virtual Frame Buffer Window or VFB. If you want, you could actually render a low resolution .AVI file to see the effect of the texture moving across this forcefield object surface. However, we've already rendered a test animation of this sequence, so let's take a look at it.

From the Menu bar select File/View and from the Images directory of your 3D Studio MAX F/X CD-ROM, find the file FORCEFLD.AVI. Double-click on it. Then, when the Media Player appears, click on the Play button to play through this demonstration AVI file. As you can see, the animated swirling colors of the chaos texture produces an ever-changing, solarized-looking spherical forcefield object.

Click the Close button to dismiss the Media Player. Of course, there are many ways of varying this effect. You could change the tiling of the Reflection Map. You could change the percentage of the reflection map used on the object, and of course, you could also change the Bitmaps used for the reflection map entirely.

Altering the Forcefield With Noise Shininess Maps

Now, let's alter this effect. Return to the Material Editor and use the hand cursor to scroll the rollout down until you see the Basic Parameter section. Let's change the shininess value from 50 to 35. Then, under highlight, put a checkmark next to Soften. This will soften the specular highlight of the forcefield object. Scroll back down to Maps. Click on Shininess to activate it and then double-click on the Name field under Maps. When the Material/Map browser appears, double-click on Noise.

By loading the Noise texture as a shininess map and then animating the settings, you can create another level of energetic movement on the surface of your forcefield object. As the noise texture evolves during the course of an animation, you will see the various patterns appear in the specular highlight, again, producing the illusion of another level of energy present in the forcefield.

Now, let's adjust the Noise parameters of our Shininess map. In the Noise rollout, go to Noise Parameters and change Noise Type from

Regular to Turbulence. Then, change Size from 25 to 10. When you are finished, right-click in the Camera01 viewport to activate it and press Alt-R, Enter and Enter again to render a test image. After a minute or so, the image will appear on your screen and it should resemble Figure 16:4.

Figure 16:4. The forcefield object with a turbulent noise texture loaded as a shininess map.

Note how the specular highlight on the forcefield object has been broken up into a complex pattern resembling something like a spider web. Of course, you can animate this specular highlight, simply by adjusting the parameters of the noise texture. By changing the XYZ offset, the tiling, the angle, and/or the levels and phase either singly or in combination during the course of an animation, you could produce quite striking results. If you want, you can take a look at a demonstration of this effect.

Click the close button to dismiss your Camera01 VFB, then select File/ViewFile and from the images directory of your 3D Studio MAX F/X CD-ROM, pick the file FORCEFL2.AVI and double-click on it to play it. When the Media Player appears, click on the Play button to play this 320 x 240 resolution AVI file. The animated specular highlight present in this AVI file was produced simply by animating the phase aspect or attribute of the noise parameters of the specular highlight. During the course of this 100-frame AVI file, phase was animated from 0.0 on Frame 0 to 10.0 on Frame 100. This produces the evolving or crawling specular highlight effect.

???Note to Jon. Make sure that you have rendered 100-frame .AVI demonstration files for all three of the examples that you will be discussing in Part 1 of Chapter 14.

Of course, during your own forcefield tests, you may want to alter, as stated before, different parameters of the Noise texture. When you're finished, click the Close button to dismiss the Media Player.

Using Animated Bump Maps

Now, let's alter the material on this forcefield object one more time. Return to the Material Editor and if you are still in the Noise Parameters rollout of Material #1 click on the Go to Parent button to return to the main material #1 rollout.

We have one more interesting effect to try for this simple forcefield object. Return to the Material Editor and if you are in the Noise parameters rollout of the Shininess Map click on the Go to Parent button to return to the main Material #1 rollout. Click-hold and drag the Noise Texture map from the Shininess slot down to Bump. For copy method, click on Copy and then click on OK. This will copy the Noise Material parameters from Shininess to Bump. Now, either click again in the checkbox next to Shininess to turn off the shininess parameters, or click-hold and drag one of the None name fields to the Shininess map. This will eliminate the noise texture from shininess.

Then, right-click in the Camera01 viewport to activate it. Press Alt-R, Enter and Enter again to render another test image of our forcefield effect. After a few minutes the image will appear and it should resemble Figure 14:4.

Figure 14:4. By using a noise texture as a bump map, you can subtly distort the surface of your objects and pick up unusual specular highlights.

If you take a look at the image on your screen or Figure 14:4, you will notice that by copying the Noise texture from Shininess down to the Bump map slot, we have distorted the surface of our forcefield object. The procedural noise texture produces an effect similar to a piece of old fashioned leaded glass. By distorting the apparent appearance of the face normals on the surface of the forcefield object, we have picked up an unusual pattern of specular highlights where the specular highlight created by the omni light, is scattered across the ridges and valleys produced by the Bump map. Of course,

if you were to animate these parameters, you would see the surface of this object undulating and waving as the specular highlights appear to crawl across the surface of the object.

Again, let's take a look at a demonstration AVI of this effect. Click the Close button to dismiss the Camera01 VFB, then select File/ViewFile and from the Images Directory of your 3D Studio MAX F/X CD-ROM pick the file FORCEFL3.AVI. When you play the animation, you'll see how the animated Bump map produces the illusion that the leaded glass texture is actually crawling across the surface of the object. Note that this effect could also be used for more conventional; that is more terrestrial applications. Instead of using a Noise map to distort the surface of this soap bubble-like forcefield object, you could perhaps use an extremely subtle bump map on a piece of window glass in an architectural rendering to suggest the illusion of old fashioned leaded glass in the windows.

When you're finished previewing this file, and again as with the previous file, the only aspect of the Noise map used in the Bump map slot that has been animated is the phase. An interesting side effect, of course, of having an animated bump map is that the bump map also distorts the ebb and flow of the reflection map moving across the surface of the forcefield object.

When you are finished viewing this file, click the Close button to dismiss the Media Player. Note that the file we have just created has been included in the Scenes directory of your 3D Studio MAX F/X CD-ROM as FORCEFIELD.MAX. In addition, the three forcefield textures we have created are also included in the 3DSMAXFX.MAT Material Library as FORCEFIELD, FORCEFIELD2 and FORCEFIELD3.

Moving On