

THE JOURNAL FOR LIGHTWAVE 3D<sup>®</sup> ANIMATORS

# LIGHTWAVE<sup>TM</sup> PRO

a Miller Freeman, Inc. journal

Volume 4 Issue Number 5 • \$8.00

## SEAMLESS INTEGRATION

Compositing 3D Animation  
Into Live Footage



**NEW! TURBS is a Bear**

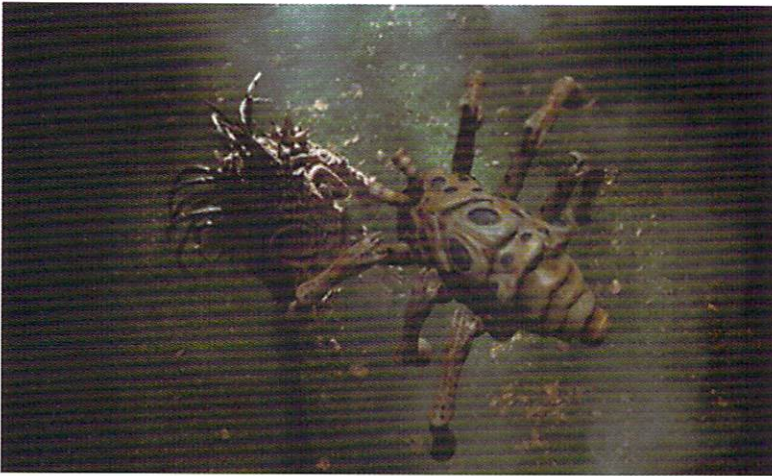
LightWave 5.0's New Feature

Soft Bump Maps with **Photoshop**

## Bump-O-Rama

A Photoshop tutorial in *LIGHTWAVEPRO*. See page six for the lowdown.

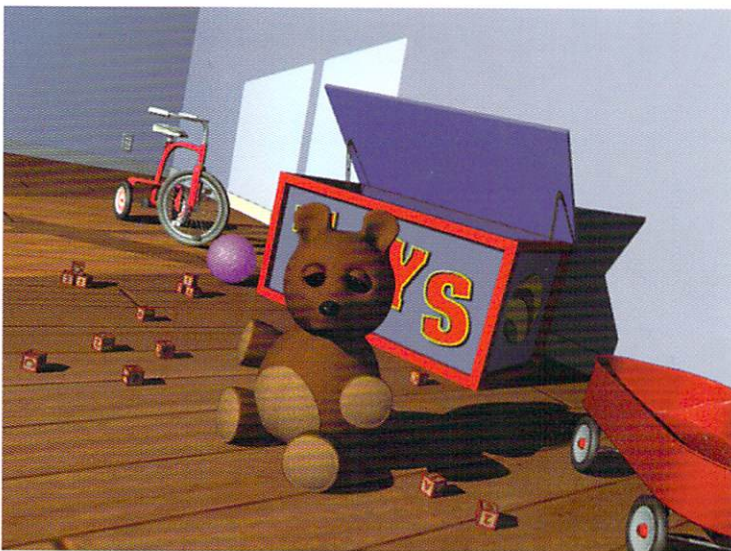
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## Meet The Tracker

This object was built using MacroForm for the Amiga.

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## TeddyBear

You can MetaNurb your way into Character Animation. Tell your own Toy Story.

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## Really for the Birds

This is how my completed bird looks rendered. Morphing of the wings provides a very effective animated simulation of flying

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## EDITOR'S MESSAGE

by John Gross

Last month we told you about LightWave 5.0. Well, there's already a new version of LightWave available right now. It is revision C and it's available on-line on America Online, CompuServe and NewTek's ftp site (ftp.newtek.com). There may be a bit of confusion as to revisions, so let me clear it up. There were about 100 CD's printed up with revision A for NAB. Very few of them actually shipped because of a problem with the CD, so next they printed a revision B. This is the version that was shipped out to those buying or upgrading. (The revision letter is printed by the CD hole).

To confuse matters even more, there is the *shipping* version, like A, B or C plus the internal *programmer* version. The upgrade from B to C actually updates LightWave to internal version *k* and Modeler to internal version *d*. (Check the About LightWave pop-up button to see the internal version. In Modeler, hold Ctrl-Shift and click About).

Now that you understand about the revisions, you can figure out if you need the upgrade or not by checking to see which version you have (just check your LightWave CD to see if it is B or C). If you have revision B, you can upgrade for free by downloading the upgrade patch from America Online, CompuServe, NewTek's ftp site (ftp.newtek.com), NewTek's web site (www.newtek.com) or NewTek's BBS (913-271-9299).

So, what's included in the upgrade? Bug fixes and improved plug-ins for one, but also a few new features. For instance, in Layout, you now have the option of using Enhanced Antialiasing, an improved antialiasing feature that Allen came up with while reading about another package's rendering methods. Also, Layout's motion graphs are now scaleable vertically and show related motion channels in different colors. For instance, while editing the X channel, which will appear in bright red, the Y and Z channels will also show up on the same graph in subdued green and blue colors. New bone strength falloff options are now available for object skeletons. These include inverse distance

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# LIGHTWAVEPRO

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About this month's cover:  
*The Trekin mothership* from Trimark Picture's "The Warrior of Waverly Street." Modeled and rendered in LightWave by Computer Cafe. (<http://www.computercafe.com>).

# Seamless Integration

## Compositing 3D into Live-Action Footage

by Tom Williamson

I love special effects. Ever since that Star Destroyer from *Star Wars* zoomed over my head when I was nine, I've had an never-ending passion for movie magic. I'm also pretty crazy about LightWave 3D. It's become my "ILM in a box." With a few tricks and a lot of ingenuity, you can accomplish just about anything. What once took 20 people three months to do 10 years ago, one guy and a reasonably powered computer can accomplish in a couple of weeks. It's just amazing, and I'm very excited to be taking part in it. One effect that's becoming more common is computer animation composited into live action footage. Everything from three-headed dragons to really irate rhinos can become seamlessly integrated. Here's a few tricks and tips to accomplishing this effect yourself.

### Meet the Tracker

For this article I'm going to use examples from the latest feature to consume the drives of Computer Café, *The Warrior of Waverly Street*. The script called for a rather tenacious alien to release a "Tracker," a small crab-like creature with six legs, 20 or so eyes, and quite agile flying capabilities (Figure 1). For most of the film, the Tracker consists of a practical creature puppet created by Interactive Lifeforms of Thousand Oaks, Calif. But for scenes where the Tracker needed to do something beyond the capabilities of the puppets—like flying—we were called in. I'll use a couple scenes in particular: scene 132, "Brood Warrior launches Tracker," and scene 182, "Tracker flies toward Janet's house." The first priority was meeting with Manny Coto, the film's director, and Tom Rainone, the film's FX supervisor to go over the storyboards. It was decided that for scene 132 we should shoot a background "plate" of the Brood Warrior and put the Tracker in later. A similar approach would be taken with all the flying scenes.

### Shooting the Plates

You can never be too prepared. When it's time to shoot footage that you intend on using for a background later, it's time for notes—lots of them. Start by writing all the camera information down,

because you may need to use similar settings on LightWave's camera. I include the following camera information:

1. Camera type (i.e. Arri BL-III 35mm)
2. Lens
3. Filters
4. F-Stop
5. Focal length(s)
6. Frames-per-second (FPS)
7. Lens height (the distance between the lens to the ground)
8. Camera tilt angle (its "pitch")
9. Camera dutch angle (its "bank")
10. Film stock

You're also going to need a lot of information about what you're shooting. A full list could be endless so I'll just name a few things. For the most part, simple common sense and the effect you're trying to achieve will dictate what notes are necessary. Here's a short list:

1. Scene number
2. Shot number
3. Shot description
4. Measurements of the set (bring a long measuring tape)
5. Measurements of the set (not a mistake, I'm making a point)
6. Measurements of the set (get the point?)
7. Distance to reference objects (I'll get to those)
8. A quad-view sketch of the layout
9. Light positions
10. Light intensity (measured in foot-candles)
11. Light gels (color)
12. Light types
13. Timing of shot (bring a stopwatch)
14. Polaroids
15. The cute PA's phone number (just kidding)
16. Weather conditions

17. Anything the director said that might be relevant
18. And everything else you can think of

After you take your notes, put them in a safe place. This may seem like a silly point to make but a film set is not a safe place for a pile of papers (I'm speaking from experience, my notes ended up 70 feet in the air dangling from a Condor crane once). I would also recommend rewriting your notes at the end of the day. Not only will they be neater, but you may remember something you left out.

The last thing I'd like to point out is when you are shooting the plates, stick up for yourself. If you see something that is going to make your life a living hell in the near future, point it out. More than likely whatever the problem is will be taken care of. If the problem can't be taken care of, point out that it will result in either more time or more money, then it will probably be taken care of. If you let them walk all over you, you're going to regret it later. If the camera moves during the shot, and you do not have the luxury of field motion control equipment, try and get the stats on the camera at all positions of its movement. Even guesstimates will come in handy later. Trying to do a "match move" with no information is tedious to say the least. A reference object placed in the scene may help in the match later.

A reference object can be anything that you know the dimensions of and has a shape that makes it easy to determine its orientation. For example, if you were shooting a shot of a room and had to put a purple platypus monster in, it might benefit you to get really accurate measurements of a chair that's in the shot. Then go into Modeler and build an accurate model of the chair (with a low polygon count, of course). When it comes time to do your match move, set up everything as accurately as possible and load your chair in and line it up with the one in the shot. To achieve the match move, just advance a few frames and reset the camera (not the chair) so that the chair lines up again, and repeat the process. When you get to the last frame, go back and fine tune your keyframes and hopefully you'll have a perfect match move.



Figure 1

### Scan-O-Rama

The next step is to get the footage scanned. We use Digital Film Works in Hollywood for all our scanning and record-out needs (contact Paul Bolger at (213) 874-9981 for details). We have almost all of our scanning done at 2K (2048 x 1556



Figure 2

at full aperture). For the most part this is more than adequate resolution. The data is delivered to us on Exabyte tape. Exabyte is a tape backup medium that uses 8 mm video tape (actually it's a higher grade than video, but the cases look the same). The data is backed up (and subsequently restored) using the TAR tape archive format. After popping the tape into an Exabyte drive, we use our SGI Indigo2 to restore the frames to our hard drives.

If you're going to do film effects you had better make an investment in storage, at 2048 x 1556 the file size is approximately 9.5 MB or a single frame! For the film we're using SGI format frames (.rgb). In LightWave, HIIP handles the .rgb frames with no problems (In fact, with our new Alphas, we can load, render, post-process and save faster than we could even load an .sgi frame on our old Amigas. We like our Alphas). After completing the effect (whatever it may be) we back-up the frames on Exabyte and send the tape back to DFW for record-

out. In a couple of days we have a strip of 35mm film with our effect on it (cool, eh?).

### Scene 132: Brood Warrior Launches Tracker

Brood what? That nasty looking alien you see in the back-

ground plate for scene 132 (Figure 2) is a Brood Warrior Usurper Drone. They're not very nice—big, ugly and mean, but quite resourceful. For example, to find his prey, the Brood needs only to remove a disgusting little pod from his chest and throw it into the air. It then morphs into a Tracker, which zips off to seek his next victim. A cool concept and an equally cool effect (one of my favorites in the movie). The plate for this scene was actually shot on stage, making things easier to control.

The Brood enters the frame and mimes pulling the pod off and throwing it into the air. Then all we had to do is match-move the pod, which flies toward the camera and morphs into the Tracker, which rockets away. To accomplish this effect we had to use several steps. First, the pod was match-moved and animated to fly at the camera. Loading the footage of the background plate as the background image, a preview of the shot was created. The preview was then used as the layout background, allowing for speedy shuttling. The motion file of the pod

was saved so the Tracker would have an overlapping motion for the morph. The Tracker was then loaded from its "master scene" (see "10 Tips for Cleaner Objects" in Sept. 1995 *LIGHTWAVEPRO*). After loading the motion file from the pod, the animation was extended with leg movement and the flight off screen.

With notes in hand, the next task was lighting. To match the scene we used a "cookie cutter" in front of both lights in the scene. A "cookie" is used in film making to break up light. For ours we painted up a

mapped it on a plane. It should be noted that accomplishing this effect in LightWave is even easier in 5.0, with its ability to project images through spotlights (if we only had it a couple of months earlier, damn). Lighting is probably the most critical element of integration, take your time here and use your notes. Only two lights were in the scene, one to match the light angle that was on the Brood, and another to feature the tracker more esthetically. The film grain was matched with a custom grain plug-in developed for us by Steven Worley (thanks Steve). Output was again at 2048 x 1556, .rgb format. Both the pod and the tracker were rendered with an alpha channel saved off at the same time.

Once the two image sequences were rendered, it was mighty morphin' time (sorry, bad pun). We use Elastic Reality for our morphs. The alpha channels were loaded into the A and B rolls (I used the alphas because it was easier to see the edges) and a morph project was set up and saved. The alpha sequences were then swapped out for the rendered sequences, and final touches were made to the splines. After rendering the morph, the alphas were swapped back and the project was rendered a second time. The final result is a morph with a pixel accurate alpha for compositing. The final step was to composite all the pieces using LightWave and save off the .rgb sequence. Then it was off to DFW for record out.

### Scene 182: Tracker Flies Towards Janet's House

With the plate shot of the house completed (Figure 1), we're ready to get to work. The first thing we did was roughly recreate the layout that existed on set. With the lens height about the same, the same lens on the camera and the same pitch and dutch angles, the ground grid was just about perfect. Two key frames were necessary for the camera's dutch angle, with a little adjustment to the



Figure 3

see *Seamless*, page 22

# Soft Bump Maps

## A Photoshop Tutorial

by Bruce Branit

The journal for LightWave 3D professionals might seem like an odd place to feature a tutorial on Adobe Photoshop. This particular application, however, seems to be the secret weapon of great animators everywhere. It most defines the good ones. If you don't yet own Photoshop and feel you have a future in animation or the digital arts, get it. If you are considering purchasing a scanner, look around. Odds are you can pick up one with Photoshop bundled in. Photoshop is widely referred to as an image editing program. But it is oh so much more than that. You may have seen some of the features of Photoshop in some

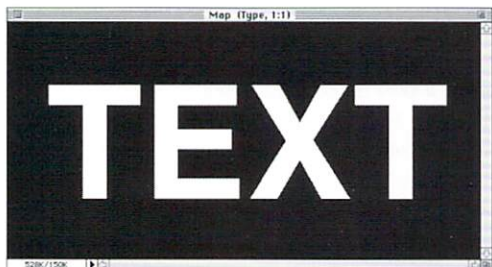


Figure 1

LightWave tutorial videos including the great series by Ron Thornton on space vehicles.

Photoshop (available on Macintosh, Windows and SGI) was released in 1991 and has always been the standard bearer for image editing software. Adobe has continually added features and beefed up Photoshop's capabilities to match the growth of processor power. The most recent release adds Layers, Color Range selection, and a 17-inch monitor full of new plug-ins. I use Photoshop hand in hand with LightWave. Whether I'm scanning in background plates or creating surface map textures, Photoshop is always running.

### Soft Bump Maps

One of the image maps you can create in Photoshop is a bump map, and a well thought out bump map can be every bit as important as modeling itself. In general, a bump map image is an image whose data is used in LightWave to define height values. These height values are derived from the

brightness of the image; light areas being raised while dark areas appear low. Bump maps don't actually affect the geometry of an object. A map affects the way light shines on a surface, casts shadows, and picks up specular highlights. (A highly detailed bump map can actually be used to change the geometry of an object if it were applied as a displacement map.) For memory's sake, the type of image we want to work with is a greyscale image. A type of bump map that I have used in the past is one that produces smooth curves that emulate a fully modeled surface with soft surface undulations. To do this, we need to create a greyscale image with subtle changes from black to white. Let's make a soft bump map and use it to create a dimensional logo using only images and one polygon. I'll cover some other Photoshop basics along the way.

This tutorial is specific to Photoshop 3.0 but the concepts here-in can be easily translated into such programs as ToasterPaint or AdPro. Open Photoshop and select New under the File menu. Create a new RGB document roughly 600 pixels wide by 300 pixels tall. In this file you will create a bump map and a color map. We will use a simple typed word for this example, but you could easily use a postscript logo or scanned line art from the newspaper.

Open the Channels pallet under the Windows-Palettes menu. This pallet will show alpha channels added to the existing RGB channels of the image. Create a new Channel using the pulldown menu (black triangle) in the channels pallet. Give this channel the name Type. Choose the type tool and type a word (your name, favorite delivery pizza, whatever) you will use this as the logo to dimensionalize. Choose a font you like. Size your type large, so that it fits nicely in the center of the file, but not too close to the edges. If your word is a long one you may want to resize your image before you see the type. You should end up with

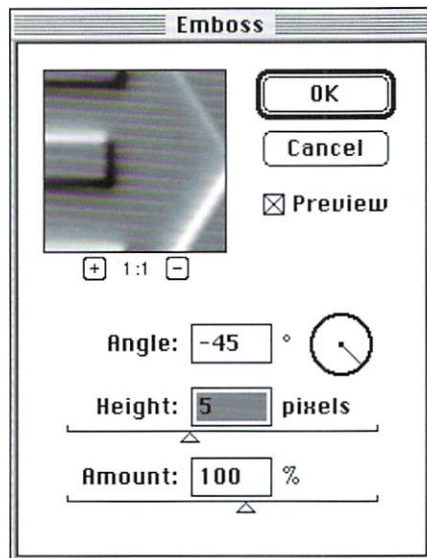


Figure 2

something like Figure 1 with white type on black. If your type is black on white, deselect the type and choose Invert under the Select menu. If we were to save this channel as an IFF or Targa file and use it as a bump map in LightWave right now we would see a sharply elevated area inside the text, so let's soften it up a bit.

Duplicate the channel with the text in it using the submenu in the Channels Palette. Use the Gaussian Blur filter in the Filter-Blur menu.

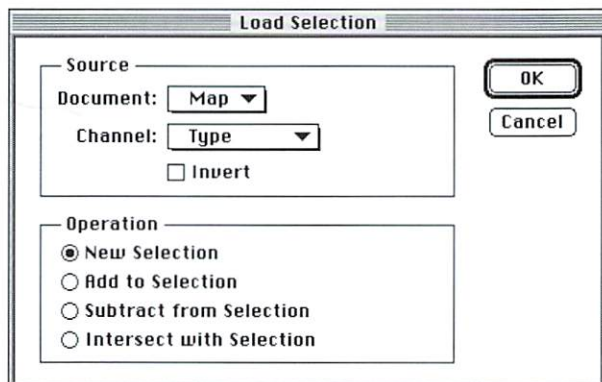


Figure 3

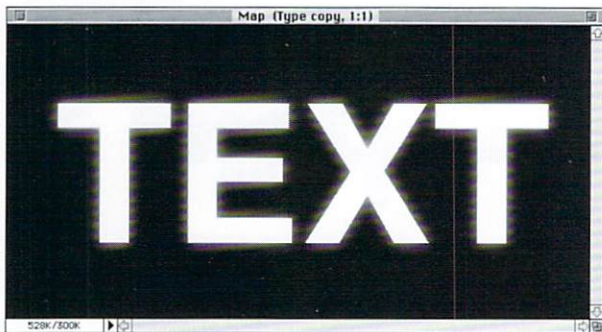


Figure 4

Depending on the scale of your text choose a value from 5 to 15 pixels in radius. This is the simplest form of softening a bump map. At any time you may see a rough estimate of what your bump map would look like by applying the Emboss filter (Filter-Styleze

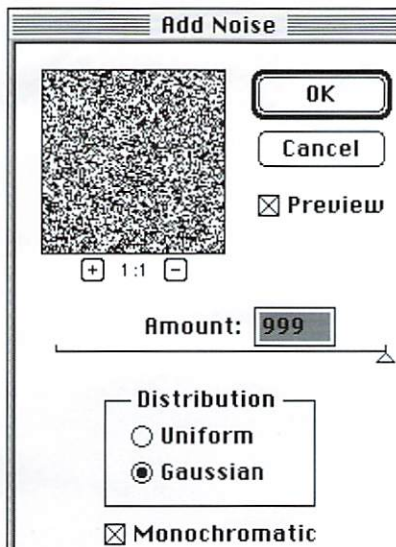


Figure 5

menu) (Figure 2).

The original channel where you typed the text is still unaffected. That's good because now we can use the original channel to further sculpt our bump map. Remaining on the blurred "Type copy" channel, load the original alpha channel as a selection by choosing Load Selection under the Select menu. (Figure 3) Take a good look at the dialog box for Load Selection. What this function does is create a selection out of a greyscale image where white is fully selected and black is unselected. (Sound familiar?) In addition to that, look at the bottom of the dialog box and you'll note that you can load any selection as a Boolean operation! With the text selected, switch your background color to white and press delete (Figure 4).

From this point you can Gaussian Blur the image again with a smaller pixel radius value, reload the original

text, refill it with white and blur it again. But why do all this? The Gaussian Blur and most procedural blurs in image editing applications blur images quite evenly. In essence the edge that they blur is in eased-in and eased-out. This means that you get gradual ramp up and ramp down. If your bump map was a single vertical line and you Gaussian blurred it, the result would be a bell curve. By understanding how this works, you can force the greyscale image to behave the way you want it to.

Try loading the selection after you have blurred the entire image, Invert your selection and use the Curves function (Image-Adjust menu). This graph will show a cross section of the grey values in the image and allow you to adjust it accordingly. (Be sure the Preview check box is active so you can see changes as you make them to the graph.)

### Color Maps

While you're in Photoshop, let's create a quick color map to go with your bump map. In the Channels Palette, choose the RGB channel by clicking on the RGB bar. A brushed metal texture is an easy texture to make in most programs. Make sure everything is deselected (like modeler, this means everything is selected), and choose the Add Noise filter in the Filter-Noise menu. Enter 999 for total noise and select Monochromatic to make our metal grey (Figure 5). Now apply the Motion Blur filter (Filter-Blur menu) (Figure 6). Motion blur applies a blur to an image in just one direction and can also be handy in creating bump maps that are soft or gradual in just one direction. Select a new foreground color by clicking the color swatch, and load the original text as a selection while remaining on the RGB channel. Select Fill under the Edit menu, fill the text area with the new foreground color (Figure 7) and you have a simple color map.

To save these maps you will have to copy them into new documents. Select All of the RGB channel in the Select menu, Copy and create a new docu-

ment. The New document default values will match the size and type (RGB/Greyscale) of whatever is currently on the clipboard, so these values will be correct. Paste into the new document and save the file as an IFF file. Select all of the blurred channel "Type copy," copy and paste it into its own new document, and save it as an IFF as well. Whether you have changed the size of the document or not, it is a good idea to make note of the pixel size of the images at this point (in our case 600 x 300).

Now we need to create a polygon to map these images onto. Open Modeler and choose the Box tool in the Objects button set. Create a Box Numerically 6 meters by 3 meters, or any other scale as long as it corresponds to the dimensions of the maps. Give the polygon a surface name, center it if you need to and save it. Now load the object and

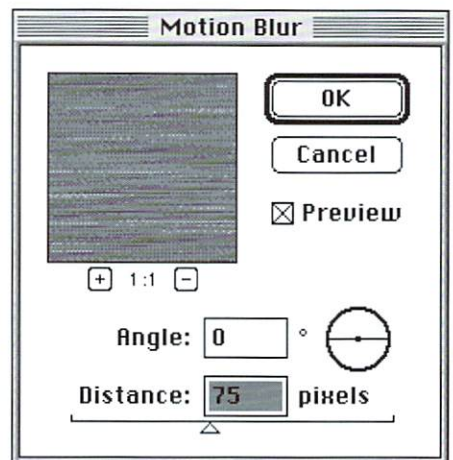


Figure 6

both image maps into an empty LightWave scene. Open the Surfaces panel and click the "T" or Texture button next to Surface Color. Select your color image as a planar map on the Z-axis, and choose Automatic Sizing. Click Use Texture and do the same with your bump map image in the Bump Map Texture panel. You may wish to use much larger Texture Amplitude values like 400 percent or so to give your bump map more contour.

With the ability to modify greyscale images based on an original piece of artwork, you can create all sorts of subtle maps, transparency maps, clip maps or whatever you want. Although this example may have seemed rather simple, the concepts will save you a lot of modeling work in the right circumstances. I've used Photoshop to create one polygon objects for several projects. Take a look at the color plates to see what can be done with the above process.

LWP

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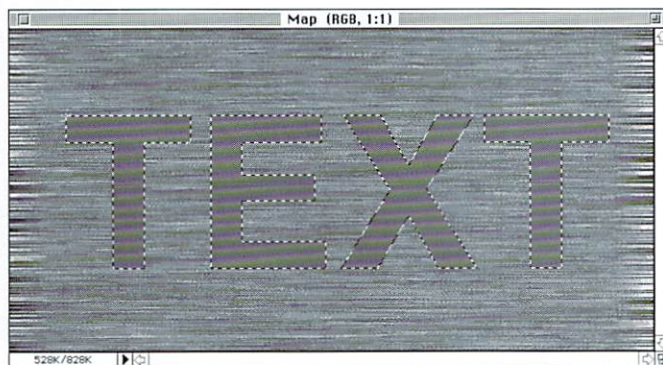


Figure 7

# Flight School — Part 1

## Create a 3D Bird for Flight Simulation

by James M. Curtis

**R**ecently, I needed a bird character to fly through a number of scenes in my 3D fantasy short subject entitled *Vengeance Quest*. Because of the realistic look of the other characters in the story, the bird couldn't be humorous in style, so I began to check for an existing object to use. Except for the high priced objects offered by professional modeling companies, I wasn't able to find anything suitable. I decided to challenge my modeling ability and create my own. What follows below is a tutorial that will also allow you to create a realistic bird character that can be animated easily to simulate flight.

Please note: this is an advanced tutorial meant for the more experienced modeler. It is assumed that the reader has a thorough knowledge of Modeler Version 3.5's functions and keyboard equivalents. In many cases, I will refer you to screenshots for detailed visual guidance during construction of the character. Your results may vary somewhat from my character depicted here. For those who subscribe to the *LIGHTWAVEPRO* Disk Series, all of the objects, screenshots and scenes will be on the next issue. But the first order of business is a little healthy research.

### Flight Class

To design the character, I made several quick sketches on paper. For my intended purposes, it had to look believable. It didn't have to be exact because it would never be seen in an extreme close-up. The bird did need to appear to fly properly, though.

In my library of references are Eadward Muybridge's two books, *The Human Figure in Motion* and *Animals in Motion*, which contain in-depth photographic motion studies. The latter book has an entire section on birds in flight. These sequences really are quite helpful, even though the images are a bit fuzzy due to their age. I highly recommend these books for figuring out a walking, running, or flying character's motion.

### The Phases of Flight

After doing some careful examination of the book's images, it's evident that some very subtle things happen as a bird flaps its wings. See Figure 1 for a diagram illustrating these phases.

When a bird prepares to take off and fly, it first unfolds its wings and uses its legs to propel itself off its perch. It spreads apart its wings to catch the air and begins a flight cycle. This can be broken down into four basic phases.

- Phase 1. The wings start the upward stroke. They are bent slightly downward in an arc from wind resistance.

- Phase 2. The wings approach the high point of the stroke. The wind resistance is reduced and the wings straighten out.

- Phase 3. The wings start the downward stroke. Once again they are bent slightly in an arc, but this time bent upward from wind resistance.

- Phase 4. The wings reach the low point of the stroke and straighten out once again.

- Phase 1 through 4 are repeated in cycle, lifting the bird higher and higher into the air.

- Once obtaining sufficient altitude, the bird stops flapping its wings, and by keeping them stretched outward, glides through the air currents.

Maneuvering left, right, up and down is accomplished by stretching out or retracting its wings and spreading or raising its tail feathers during flight.

### Beginning Construction

To make creation and animation of the bird as easy as possible, the character will consist of the following separate objects:

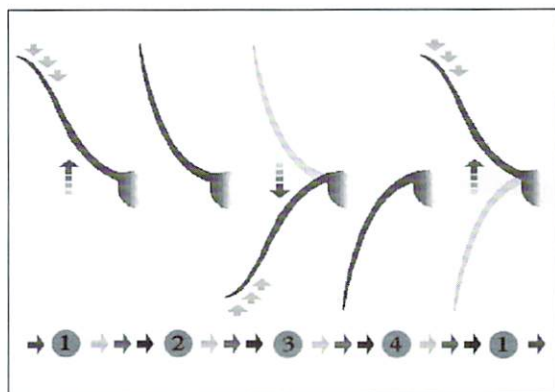


Figure 1: The four phases of flight diagram.

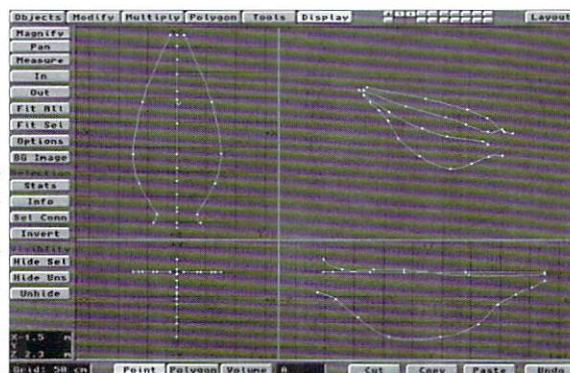


Figure 2: The body splines.

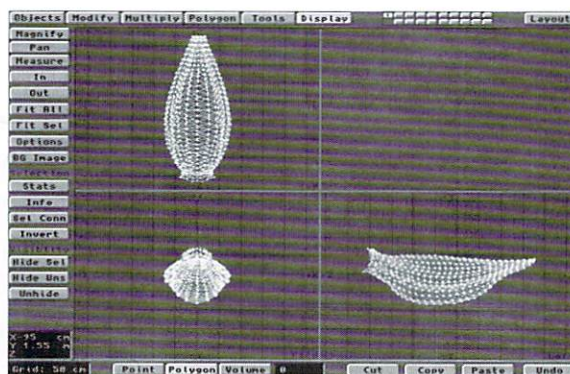


Figure 3: The finished body.



- 1 for the body.
- 1 for the head, beak, eyes and nostrils.
- 1 for the tail feathers.
- 1 for the left upper and lower leg.
- 1 for the right upper and lower leg.
- 1 for the left foot and toes.
- 1 for the right foot and toes.
- 4 for the left wing (4 Morph Targets).
- 4 for the right wing (4 Morph Targets).

Now let's get started.

## The Body

•To make the bird body, start by drawing out a simple slightly oval-shaped polygon (wider in the X) using the Disc (Objects panel) tool from the Face View. Use the Numeric option and give the disc 32 sides and 1 segment. Select the bottom half of the points and use the Stretch (Modify panel) tool to shrink the width by .85 on the X.

•On another layer, working from the Top View, draw two spline curves using the Sketch (Objects panel) tool that resemble those shown in Figure 2. Copy them to another layer. Use the Rotate (Modify panel) tool from coordinates 0, 0, 0, and rotate the splines 90 degrees. Now, use the Stretch (Modify panel) tool to scale the height to .75 of the Y value. Copy them back to the layer occupied by the other splines. Put this into a background layer and select the Rail Extrude (Multiply panel) tool. Now, set the Segments option to Lengths and Uniform and change the Segments value to 30. Turn on Oriented and Scaling and hit OK.

•You should now have something similar to the bird body shown in Figure 3. If the back end polygon ends up distorted by the extrusion process (as it did in mine), you can fix it by using Set Value (Tools panel). Simply find the Z value of one of the points and type this into the Set Value (Tools panel) requester and select the Z plane, and hit OK. Then use the Rotate (Modify panel) tool in the left view to angle them to 45 degrees. Triple (Polygon panel) all of the polygons except for the original disc at the front of the body.

•Now two surfaces need to be applied to the body. First, select the lower half of the polygons starting from the fifth or sixth row, select Surface (Polygon panel), and give them the name "Bird\_Belly". Use the Invert (Display panel) button to select the other polygons and name these as the surface "Bird\_MainBody". Save the completed section as "Bird\_Body.lwo".

## The Head Assembly

•To make the bird head, (from the Face View) select the Ball (Objects panel) tool and

drag it's bounding box out into a slightly oval shape that's wider at the sides and proportionate to about 65 percent of the width of the body object. Now from the Top View, drag the bounding box out to about 20 percent of the length. Go into the Numeric requester and type in 24 Sides and 12 Segments. Hit OK, and then use the Triple (Polygon panel) tool on the object.

•To make a beak, select six rows of three points at the front end of the ball. Now, select the Magnet (Modify panel) tool and place it's bounding box around the selected points in the Left View. Use the mouse to pull the points forward until the points have been stretched about half of the head's length. Next, from the Top View, select the four points at the edge of the beak (two on each side), and use the Stretch (Modify panel) tool to slim down the width.

•Now to make the nostrils, select the polygons just above the point where the beak joins the head, and Merge (Polygon panel) the selected polygons into one shape. Next, select the Bevel (Multiply panel) tool and experiment with the Inset and Shift numeric values (mine was 2 and 5 cm) to find one that raises the polygon enough to give it a good rounded edge. Triple (Polygon panel) the top polygon to eliminate any non-planar faces, then use Subdivide (Polygon panel) one time on the beak polygons. Select the new points created at the center of the beak and pull them up slightly using the Move (Modify panel) tool. Finally, once again Triple all of the polygons.

•At this time, select the polygons relating to each corresponding surface, hit (q) and name them "Bird\_Head", "Bird\_Beak", and "Bird\_Nostrils".

•To easily make a pair of eyes, create a Ball (Objects panel) with 16 Sides and 12 Segments about 20 percent of the size of the head. Rotate (Modify panel) it 90 degrees on the Z axis from the Front View. Use the Stretch (Modify panel) tool and squash it on the X axis. Position the eye using the Move (Modify panel) tool on the left side of the head so that it lays against and into the head halfway. Its Z position should be just behind and slightly above the beak. You may need to rotate the eye slightly to get a good fit.

•Select the center ring of polygons at the outer side of the eye, bring up the Surface (q) requester and name this "Bird\_EyePupil". Now select the next outer ring and name it "Bird\_EyeWhites". Finally, use the Mirror (Multiply panel) tool from the Face View to make the right eye. Save out the complete group of objects as "Bird\_Head.lwo". Refer to Figure 4 for a look at my completed Bird Head object.

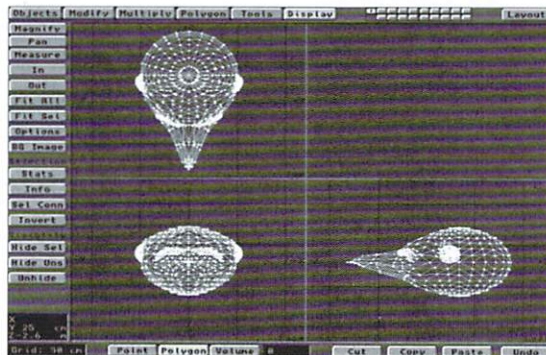


Figure 4: The final Bird Head.

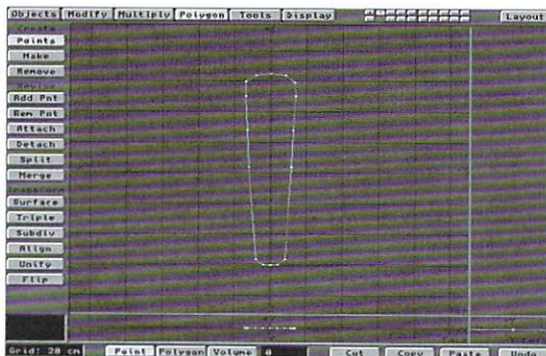


Figure 5: The Tail Feather shape.



Figure 6: One Tail Feather.

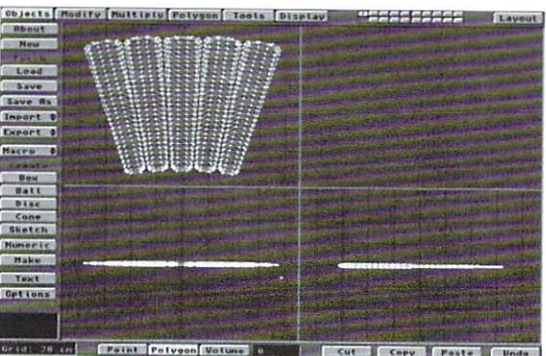


Figure 7: The final Tail Feather object.

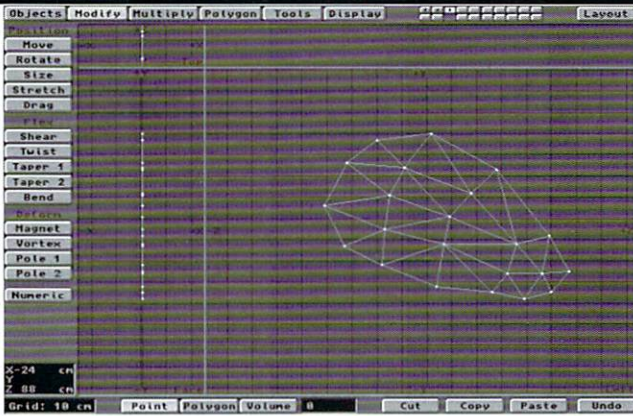


Figure 8: The Upper Leg basic shape.

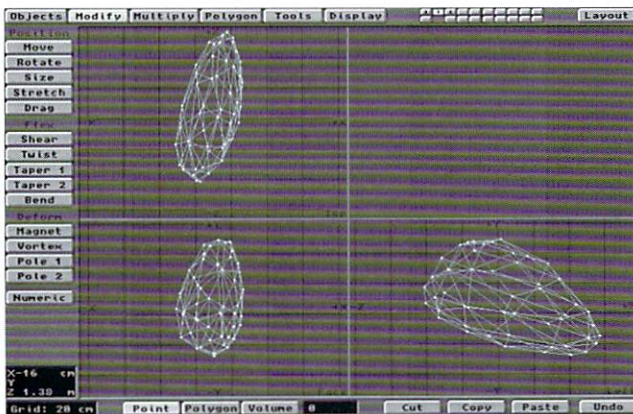


Figure 9: The finished Upper Leg.



Figure 10: The Lower Leg spline.

## The Tail Feathers

•To make the Tail Feather object, manually place points (from the Top View) in the shape of one tail feather as shown in Figure 5. Make the length about 50 percent that of the body. Turn this into a polygon (p) and then put it in a background layer. Next, in a new layer (also working from the Top View), select the Box (Objects panel) tool and draw out a rectangular shape to a size a little bit larger than the tail feather polygon. Using the Numeric option, specify 5 segments in the X, 1 segment in the Y, and 24 segments in the Z. Click OK. This creates a segmented flat plane.

•Now, make sure that the feather shape is in a background layer and that the segmented plane is in the current layer. Choose the Boolean (Tools panel) Template Drill option. Set the Core option to the Y axis and select OK. Once the operation is completed, the feather shape will be filled with the segments from the segmented flat plane.

•Next, use the Extrude (Multiply panel) tool, give it a Numeric value of 2 segments and hit OK. Select the middle points of the extrusion and pull them apart slightly using the Stretch (Modify panel) tool. This will produce one tail feather similar to the one in Figure 6.

•Because five of them are needed to make the complete object, click Copy at the bottom of the Modeler interface. Now use the mouse and move over the feather object. Select Paste. Continue to do this until you have created a total of five copies. Take each tail feather and arrange them into a fan-like shape. Do not, overlap them, but keep them as close to each other as possible. Once you are satisfied with the placement, give the object a Surface (q) of "Bird\_Tail-Feathers" and save it as "Bird\_Tail.lwo". Figure 7 shows the final tail feather group.

## The Upper and Lower Legs

•To make the right side upper leg, select the Points (Polygon panel) tool, and from the Left View, manually place points in a shape similar to that shown in Figure 8. Hit (p) to create the polygon. Be sure to make this shape in proportion to the body (about 1/3 it's size). Use the Extrude (Multiply panel) tool and set the Numeric option to 2 Segments on the X axis. Hit OK to create the extrusion and then Triple (T) all of the polygons.

•Now, from the Face or Top View, select the middle set of points. Use the Stretch (Modify panel) tool, and pull these points outward a little to round off the edges. Next, select groups of points and slightly rotate them to give the leg some musculature. See Figure 9 for a reference on how mine looks. Once you have done this to your satisfaction, give it a Surface (q) name of "Bird\_Feathers".

Finally, use the Move (Objects panel) tool to position the object and line it up with the outer edge of the body's right side.

•To make the right side lower leg, drag out and Make (Return or Enter) a simple oval disc on a new layer. Be sure it is centered behind the upper leg object you just created.

•On another layer, from just behind the position of the disc, create an inverted L-shaped curve that looks similar to the ones shown in Figure 10 with the Sketch (Objects panel) tool. Use the Mirror (Multiply panel) tool. Place it's axis alongside the curve on the X axis. Hit Return or Enter to create the mirrored spline curve. Now select the points on the lower end and pull them inward slightly with the Stretch (Modify panel) tool.

•Make the splines a background layer and the disc the foreground layer. Use the Multiple Rail Extrude (Multiply panel) tool set to it's defaults. Hit OK to create the part and give it a Surface (q) name of "Bird\_LowerLeg". Select both object layers and save them to disk as "Bird\_UpLowLeg\_R.lwo".

•To create the left side leg, simply use the Mirror tool (from the Face View) on the object. Clear the original object, then save it as "Bird\_UpLowLeg\_L.lwo". Take a look at Figure 11 to see my completed object group.

## The Foot and Toes

•The foot and toes are made in a similar way to that of the Lower Leg, but with a couple of additional steps. Once again, make a small eight sided Disc (Objects panel) in the Face View. On another layer, manually place four points in the Side View to make a curve (Ctrl + p) similar to that shown in Figure 12. Put the curve into the background and select the disc as the foreground. Select the Rail Extrude (Multiply panel) tool and give it a Numeric value of 16 segments. Hit OK. This will give you the basic shape of one toe.

•To make the sharp "toenail," select the points on the front most ring of points. Click the Points Weld (Polygon panel) tool. Now, take the remaining point and using the Move (Modify panel) tool, center it just in front of end of the toe.

•To create the joint "knuckles," select a ring of points at a joint bend. Now, using the Stretch (Objects panel) tool, drag the mouse to the right and upward to enlarge the ring. Repeat this for the other joint bends.

•Since the bird we are constructing has three front toes and one in the back, we need duplicates to work with. The easiest way to do this is to use the Mirror tool. Place the Mirror (Multiply panel) tool Axis just outside the edge of the toe and hit Return. You now will have two toes. Do this again, and you will have four.

•Now select each individual toe object, and by using the Move and Rotate tools in the Modify panel, position them as shown in Figure 13. Once this is done, the top and bottom of the foot needs to be created. This will also connect all the toes together.

•Select all of the points at the start points for the

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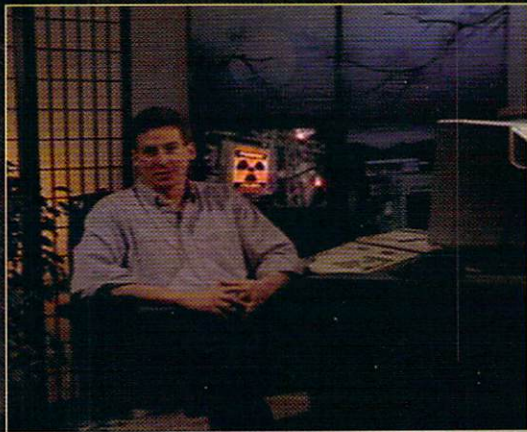


Dan Ablan is president of AGA Digital Studios in Chicago, IL. He has lectured for LightWavePro training seminars at Siggraph and VTU Expo. He is a columnist for VTU (Dr. Toaster) and LightWave Pro.

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# Bird

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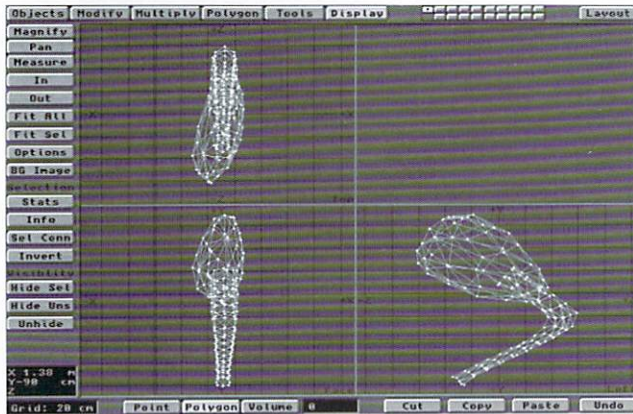


Figure 11: The final upper and Lower Legs.

toes. Copy and Paste them to another layer. Now, manually select the points and create polygons (p) between the toes. Do the same to the side, top and bottom as well. Triple the polygons. Copy and Paste this into the layer with the toes. Now, do a Merge Point (Polygon panel) operation to eliminate any duplicated points.

- To surface the object, select the polygons at the end of each toe, hit (q) and name them "Bird\_ToeNails". Invert the polygon selection and name these "Bird\_Feet".

- Next, position the foot object directly below the bottom edge of the "Bird\_UpLowLeg-R.lwo" object, then save it out as "Bird\_Foot-R.lwo". Finally, use the Mirror (Multiply panel) tool from the Face View (X=0) to create the left foot object. Select all of the polygons of the original object and Cut it (x). Now save the remaining object as "Bird\_Foot-L.lwo". Figure 14 shows the completed foot object.

That's all we have room for this time. Next time we'll start modeling the wings and body to complete the bird in Part 3.



Look for part two of this tutorial in the next issue of **LIGHTWAVEPRO**.

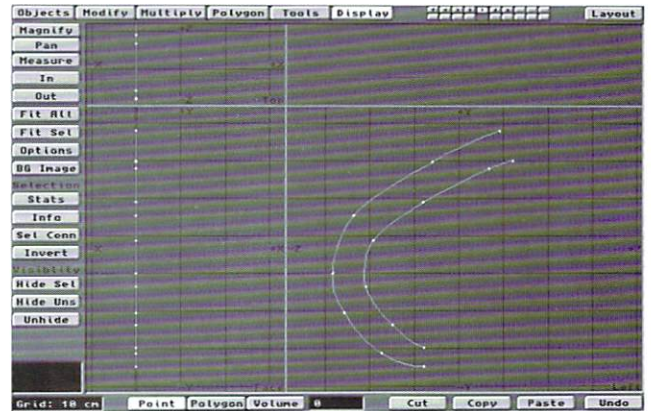


Figure 12: The Toe spline.



Figure 13: The Toes in position.

*Jim Curtis of JMC Graphics, specializes in 2D/3D Character and Logo design. He has worked with LightWave 3D since the first days of the Video Toaster and has produced animations for various companies in the Cleveland, Ohio area for corporate, industrial, and local broadcast use. He also holds a monthly LightWave 3D SIG for the local area user's group, the NCAUG. He can be reached by voice at (216) 354-6239.*

# Coming Up in LIGHTWAVEPRO

Look for the second parts of Arnie Boedecker's "MetaNURBS" and James Curtis' "Flight School" tutorials.

# MetaNURBs Is A Bear

## Part 1 Of a Cuddly 2—Part Tutorial

by Arnie Boedecker

**H**urrah! LightWave 5.0 is here! And with it come a bunch of new features. One of the most talked-about is the addition of the MetaNURBS Tool to LightWave's Modeler. Details of MetaNURBS and what it can do have already hit the LightWave arena, so I won't rehash them. Instead, let's start with a simple tutorial on using MetaNURBS to actually create something.

As the months pass, the talk of the town is increasingly becoming character animation. It seems that if you have a segment or two of character animation on your demo reel, you're considered a cut above the rest. That being the case, this seemed like a good opportunity to combine both worlds. Using MetaNURBS, let's create a simple character that will lend itself to animation. Let's get started.

### The Bear

As the title implies, our character will be a Teddy Bear. To start out, I built the bear's head. It's always a good idea to build things to scale. Teddy Bears come in all sizes and shapes, but I figured a bear with about a six inch head would be a good size. I'm personally more comfortable using the default measurement scale (using mm's) in Modeler.

•So to start, create a box with the following information:

Axis	Low	High	Segments
X	-75mm	75mm	1
Y	-75mm	75mm	1
Z	-75mm	75mm	1

•Next, use the Metaform Tool (Polygon/Subdivide/Metaform or Shift-D) to give you some more points to work with. Metaform the box a total of three times.

You may be wondering why we chose to Metaform a box into a sphere-like shape, rather than just using the Ball Tool to start with. The reason for this is because MetaNURBS only likes polygons with four points. So by Metaforming a box, we end up with a sphere shape consisting of all four-point polygons, whereas, with the Ball Tool, we can-

not avoid having at least some three-point polygons.

Back to the bear. Time to use the MetaNURBS Tool:

- Hit the TAB key to activate MetaNURBS. Then hit the key to fit your object in all three views. If RAM allows, it might also be a good idea to turn on Smooth Shaded Preview in the Display/Options Menu.

Our Bear Head will be basically symmetrical, so the first thing to do to make things easier is to delete half of the ball:

- Choose Polygon as your selection type, and lasso around the left half of the ball in the Face View. Once you have the entire left half of the ball selected, hit the (z) key to delete those polygons.

### Let's start 'Nurbing

- From the Top View, our entire object should be to the right of the Z-axis. Still in the Top View, select the 3rd and 4th polygon to the right of the Z-axis, that are just above the X-axis. The number of polygons selected should read 4. Now in the Face View, deselect the polygons that were selected on the bottom of our halfball. The two polygons that are left selected are going to help make our bear an ear.

- Using the Move Tool (Modify Menu) in the Face View, move the polygons up and to the right (Figure 1), or press the (n) key to use the numeric requester (8 mm, 40 mm, 0 mm). To make the ear a bit wider at the top, use the Stretch Tool (Modify Menu). Placing the cursor right in between the two selected polygons in the Top View, press the left mouse button, and move the cursor slightly to the right. Or numerically, stretch on the X axis with a factor of 1.55, and a center of (46 mm, 0 mm, 6 mm). Then deselect the polygons.

- Next, we need to make the base of the ear smaller. This is done by moving the points at the base of the ear inward. First, grab the points on the outside base of the ear. You should only have three points selected. It's easiest to grab these points from the Face View. If you grab the points

from the Top View, be sure to deselect any extra points you pick up from the bottom of the ball. Once you have the three points selected, use the Move Tool in the Face View to move them up and to the left (-8 mm, 12 mm, 0 mm). Then, we'll do the same to the points at the inner base of the ear. Make sure you grab the points a row in from the center axis, and not the points resting on the center axis. Again, you'll grab three points, this time moving them to the right and down (10 mm, -2 mm, 0 mm).

- Finally, let's make the top of the ear a bit more rounded. Grab the two points at the top of the ear that separate the two polygons that you moved earlier, and in the Face View, move them up and to the right (2 mm, 4 mm, 0 mm). Then deselect those points, and select the two points just to the left, on the top inner ear. Move those points, again in the

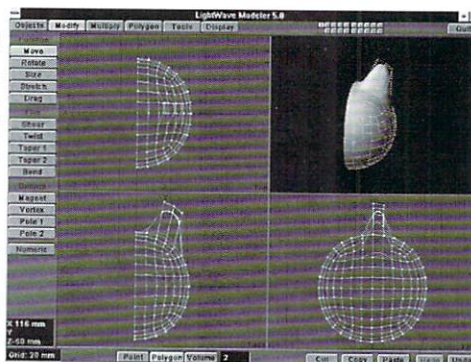


Figure 1

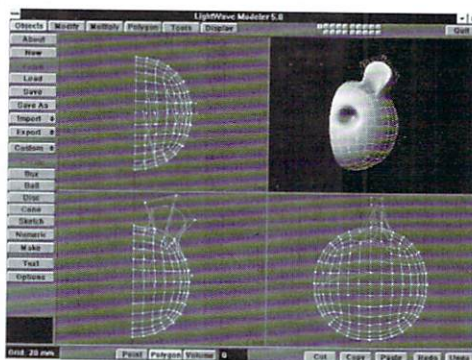


Figure 2



Face View, down and to the left (-16 mm, -10 mm, 0 mm). Finally, grab the two remaining points on the top, on the outside of the ear, and move those points to the right and down (8 mm, -16 mm, 0 mm).

- We'll also want the front face of the ear to cup in slightly, to look like a bear ear. To do this, grab the single point at center of the base of the ear, located around (36 mm, 53 mm, -11.8 mm). Once selected, in the Left view, move the point down and to the right (0 mm, -12 mm, 38 mm). That should finish the look of the ear.

- Next, we'll need to give the bear head a basic eye-socket. This can be done very easily. Choose a point where you want the center of the eye to be. I chose the point located at approximately (25 mm, 12 mm, -58 mm). Select this point, being sure to deselect any others you pick up on the back of the head. In the Top View, move this point back into the head (-16 mm, 0 mm, 60 mm). Finally, deselect all points and polygons (Figure 2).

- Time to make this half-head a whole! Use the Mirror Tool (Modify Menu) along the X-axis, to mirror the entire object. Then use the Merge Points Tool (Tools Menu) to get rid of duplicate points.

- Next, we'll want to pull out some polygons to form the bear's "muzzle." Grab the four polygons that would form the front face of the muzzle (Figure 3).

In the Left View, move the selected polygons down and to the left (0 mm, -6 mm, -32 mm). Again, certain points need to be adjusted to improve the overall shape of the muzzle. Grab the point at the front top center of the muzzle, where the nose would go, and in the Left View, move it up and to the left (0 mm, 8 mm, -12 mm). Next, select the two points at the bottom corners of the front muzzle polygons. Use the Stretch Tool in the Face View, placing the cursor between the two points on the Y-axis, and while pressing the left mouse button, dragging the cursor to the right. Numerically, you can enter these values:

Axis	Factor	Center
X	1.82	0 mm
Y	0.95	-42 mm
Z	1.0	0 mm

- To round out the bottom of the

muzzle, select the bottom center point where the muzzle meets the rest of the head, located at approximately (0 mm, -46 mm, -46 mm). In the Left View, move the point down and to the left (0 mm, -10 mm, 2 mm). This should finish the muzzle (Figure 4).

- At this point, if you're basically happy with the shape of the head, you're ready to convert the MetaNURB shape into polygons. You can change the density of polygons, and therefore the amount of smooth detail your MetaNURB retains, by changing the value of the Patch Division in the Objects/Options Panel. For a low density object, a value of 2 or 3 might do, but I would suggest a patch division of 4 or 5 if you plan to animate the bear. I used a patch division of 5. To convert the MetaNURB to polygons, use the Freeze Tool (Tools Menu). It's always a good idea to check for non-planar polygons after using tools like Metaform and MetaNURBS. You'll usually find a number of them. To avoid non-planars altogether, I just use the Triple Tool (Polygon Menu) to triple all polygons.

- To see how we're doing, let's use another new Modeler Feature, and give our object a basic surface. Go to the Polygon Menu and select Surface (or just press the q key), and create a new surface, BearSkin. Give it a color of (100, 60, 10) and turn on smoothing.

While modeling smooth objects, I like to give them a little specularity, even if the finished object won't stay that way. Specularity brings out the highlights a bit better, and you can sometimes spot problems that would otherwise be overlooked. For now, I gave the BearSkin Surface a specularity of 30 percent.

### Eye for an Eye

- The bear's eyes are pretty simple. Using the Ball Tool, just create a 12 mm ball (16 segments, 8 sides). This ball is the eye...Easy, huh? Give the ball its own surface name, Beareye, and make the surface black with a specularity of 100%, maximum glossiness, and be sure to turn on smoothing.

- To make the eyelid, copy the eye object to a new layer, and using the Size Tool (Modify Menu), make the object slightly bigger (Factor of 1.10). Then, in another empty layer, with the

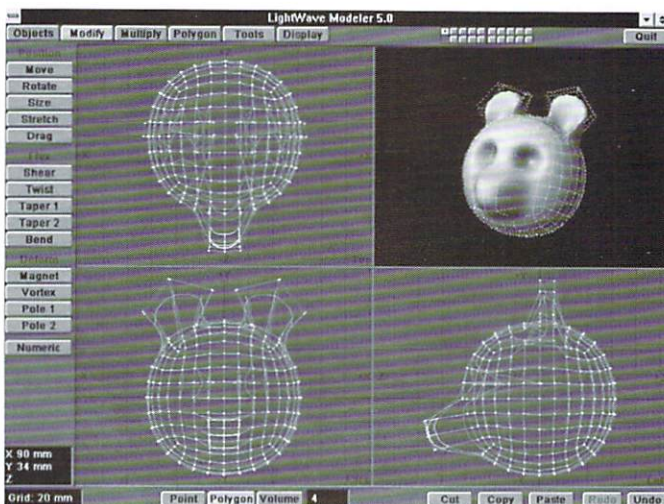


Figure 3

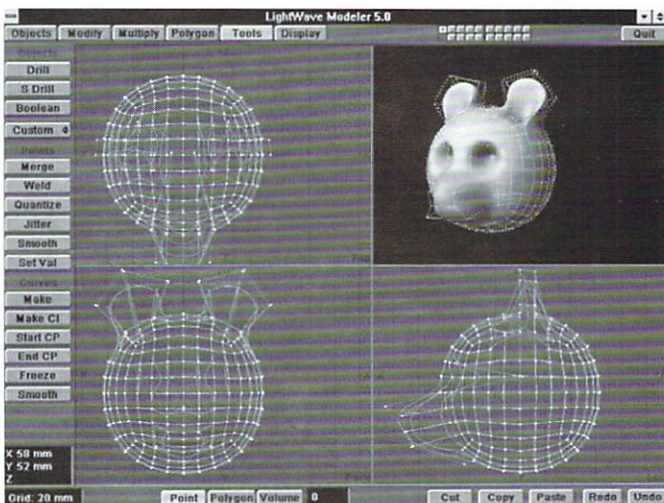


Figure 4

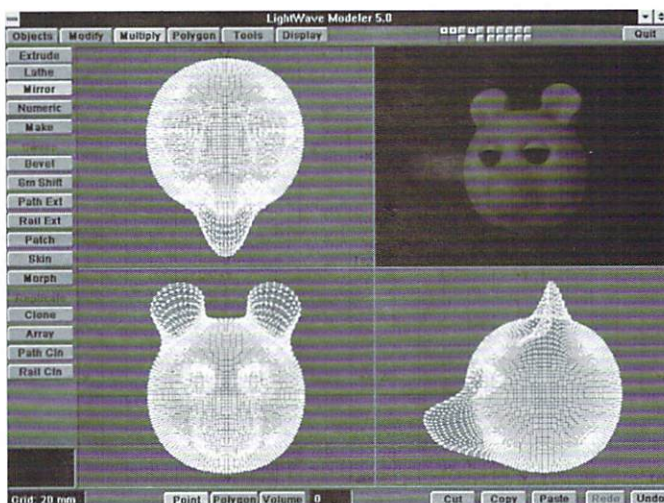


Figure 5

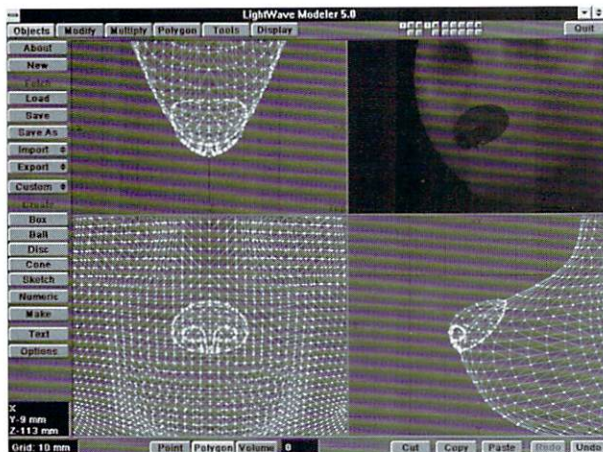


Figure 6

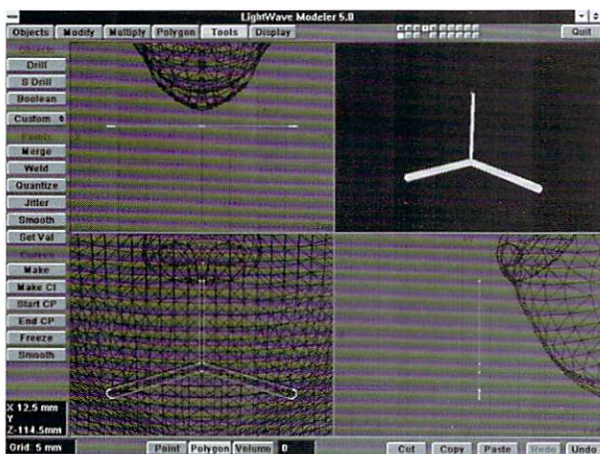


Figure 7

bigger ball in the background layer, draw out a box which intersects through the entire bottom half of the ball in all three views. Then with the eyelid ball in the foreground, and the box you just made in the background, use the Boolean Tool (Tools Menu) in Subtract Mode, to cut away the bottom of the ball.

•Next, keep the eyelid ball in the foreground, and put the eye object in the background, and do another Boolean/Subtract, which will hollow out the eyelid. Give the eyelid its own surface name, BearEyelid. For now, you can give the eyelid the same surface attributes as the BearSkin surface.

•Now we need to move the eye and eyelid into place. Put both the eye and the eyelid into the foreground layer, and put the BearHead in the background layer. Use the Move Tool to move the eye and eyelid into the left eyesocket, which should be approximately (-24 mm, 14 mm, -48 mm) if your eye is centered on the origin.

•You might want to rotate the eyelid forward or back, to open or close the eye to your taste. We'll be able to do this as part of an animation later on, but for now, use the Rotate Tool (Modify Menu) in the Left View, to rotate the eyelid to your satisfaction. Be sure to keep the lid centered on the eye. When you are satisfied with the position of the eye and eyelid,

mirror the two objects over the Z-axis (Figure 5).

•Being that we gave separate surface names to the BearHead, Eye, and Eyelid, we can safely cut and paste these objects together in one layer, and save them as one single object, if you're more comfortable with that. Later, if you decide that you'd like to animate the eyes and eyelids separately from the head, just select the polygons with the appropriate surface name, and again cut and paste them to a new layer to save them as a separate object. If you don't have a problem working with multiple objects in a hierarchy, save the objects separately.

## Sniff, Sniff

•It's time to build the nose. Using the Ball Tool, make a Level 2 tessellated sphere with the following dimensions (10.5 mm, 9 mm, 14 mm). In the Left View, with this new ball in the foreground and the bear head in the background, use the Move Tool to move the ball to the edge of the muzzle, so that the ball overlaps outside the bearhead just enough to give the impression of a nose.

•Once in place, use the Boolean/Subtract Tool again, to cut away the part of the ball inside of the bear head. Give the remaining polygons the surface name, BearNose, with a color of (20, 20, 20), specularity of 80 percent and turn on smoothing.

•If you'd like to give the nose nostrils, we can do that as well. Go to a new layer, and put the nose object in the background layer. Use the Points Tool (Polygon Menu) to create points in the basic shape of the nostril (see the color pages for shape ideas). Hit the (P) key to create your nostril polygon. When your happy with the nostril shape and position, use the Mirror Tool in the center of the nose, to duplicate the second nostril. Then, put the nose object in the foreground, and the nostril polygons in the background.

•In the Left View, select one of the outer nose polygons at the tip of the nose, and hit the (J) key. This should select all of the outer nose polygons. To add the nostrils, use the Drill Tool (Tools Menu), in Stencil Mode on the Z-axis, and create a new surface name, BearNostril. This will slice the nostril polygons into the existing nose geometry, with its own surface name. To indent the nostrils, select just the nostril polygons, and use the Smooth Shift Tool (Multiply Menu) with a value of -.5 mm.

•Give the BearNostril surface a color of (0, 0, 0)

and turn on smoothing (Figure 6). You may want adjust the smoothing angle to about 40 degrees if you have smoothing problems between the nose and nostrils (or you could just cut and paste the nostril polygons).

•Finally, copy the nose object and paste it onto the Bearhead object.

## Watch Your Mouth!

Finally, we need to give this Bear some kind of a mouth. If your modeling techniques are rather advanced, you may choose to cut in an open mouth and set up a variety of morph targets in order to make the Teddy Bear talk. To keep things simple, we will just "stitch in" a standard mouth for our stuffed bear. I used the basic "upside-down-Y" looking mouth for my bear. You can create a similar pattern for your bear mouth, or do something totally different.

•Just like the nostrils, you just need to plot points to create your mouth polygon. Then with the mouth polygon in the foreground, and the bear head in the background, align the polygon up in the Face View to where you'd like the mouth to appear on the bears face (Figure 7). Then, as with the nostrils, use the Drill/Stencil Tool on the Z-axis to slice in the mouth into the BearHead, giving it the surface name BearMouth. Make sure that before you stencil, the BearHead is in the foreground layer, and the mouth polygon is in the background layer.

•Select only the muzzle polygons you want stenciled. If you stencil the entire object, you'll have the mouth polygon sliced into the front as well as the back of the bearhead.

Once I stenciled in the mouth, I selected only the BearMouth polygons, and used the Smooth Shift Tool, with a value of -.5mm to shift the mouth slightly into the head.

•Color the BearMouth surface (30, 30, 30) and turn on smoothing. Again, you may have to adjust the smoothing angle to about 50 degrees, to avoid smoothing between the mouth and the muzzle.

## Just a Head?

Well, we will have to finish modeling the bear next time, as well as throw around a few animation ideas. Hopefully, after this quick tutorial, you have a little better idea of how to use MetaNURBS. Maybe you can get a head start on building the Teddy Bears body, but if not, don't worry—we'll cover it in detail next time. Remember, a tutorial like this is meant to just get you started...you're encouraged to take things a step further. Just do it

LWP

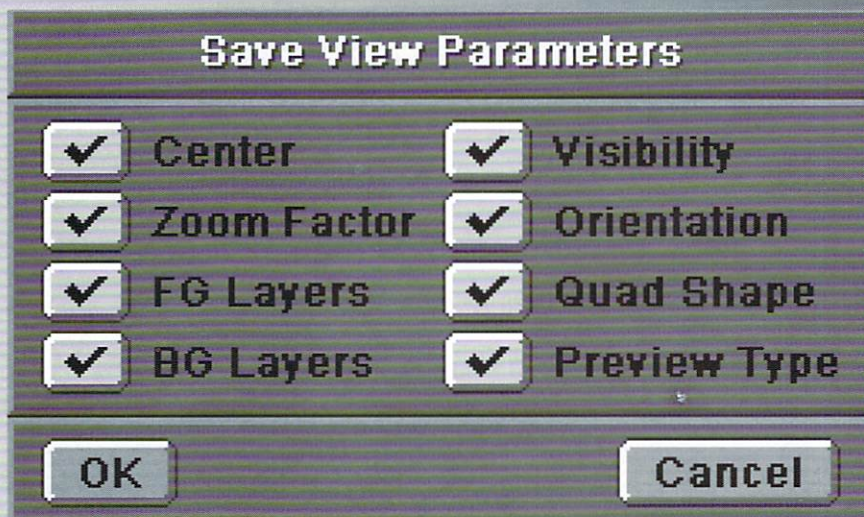
Arnie Boedecker has recently resurfaced after a move to the Chicago suburbs. He can be reached at (708) 213-6384, or via the Internet at awb@ais.net.

# Tip of the Month

## Modeler 5.0

by John Gross

Pressing the Control key in combination with one of the numeric keypad keys allows you to save any number of view parameters. By choosing the parameters you wish, you can assign different options to different numeric keys. Press a key to quickly turn on/off OpenGL shading or zoom into a specific level. Save active foreground or background layers and the shape of Modeler's quad view. Any combination of parameters is possible and all of these settings are saved in the config file when you exit for later recall.



### Editor's Message

*continued from page 3*

to the fourth power and inverse distance to the eighth power, both of which greatly weaken the influence of bones on distant points while retaining their power over nearby points. They have been found to cause deformations more like what users expect, making bone setup more intuitive. In particular, the Limited Range option should no longer be needed in most cases, resulting in smoother bends at joints. The old inverse square law is still used when old scenes are loaded (so they will still work the same), but for new skeletons, inverse fourth power is the default. In addition to the tighter con-

trol options, two looser control options are available but they are much less useful.

In general, if you haven't gotten the upgrade to revision C yet, you shouldn't delay. There are enough bug fixes and new features to make the download time worth every penny.

I recently attended what I hope will be a new trend in the entertainment industry. Quantel, the company behind the Harry, Henry and Domino products, sponsored a "wrap" party for the film *Independence Day*. It wasn't your typical wrap party. Instead of having a party when the actors are all done shooting the film (and when many say the "real" work begins), this party was to celebrate the

finishing of the post production work—the composing, editing, sound effects and everything else involved in "finishing" a film production.

The reason I hope this will be a trend is that it gives recognition to those that are behind the camera. Those people aren't necessarily in the limelight, but they do so much to make a film a success (or failure). People like us.

*John Gross*  
Editor

# LightWave 101

## Top 10 Compositing Tips

by Enrique Muñoz

**E**verybody under the sun wants to do it, but very few know how to do it effectively. Compositing—what is it anyway? Compositing is any task that involves combining several elements into one. Blue-screen shots are a good example. In any case, compositing is the seamless integration of special effects (3D elements, dynamic or otherwise) with live action footage. Hopefully, this article will explain some useful techniques on image compositing with LightWave 3D. Here are my top 10 tips.

### 1. Be There!

It's always a good idea to be present when the footage to be composited is being obtained. This way you can record all the information needed to use on your virtual CG camera and lights. Every measurement should be noted, such as the distance from the camera and lights to the object(s), the position and rotation of the camera and lights in relation to the ground, and the distances between objects in the shot. You should even note the type of camera and lenses used.

It is very important that you get these calculations and measurements correct. If you don't, you will get conflicting perspectives that will give everything away as a CG image composite. There are obvious mistakes, such as the background image being shot looking up, while back in the computer you point the CG Camera down. This is an extreme case, but a very good example of not paying attention to something so obvious—or not so obvious.

### 2. Obtaining The Footage

This is one of the most critical things you are going to have to decide. What type of medium are you going to use as an in-between from the live action to your computer. Film is the most ideal choice, but realistically, not everyone can afford that. If film is out of the question, try to use the highest video format you can get your hands on, not the lower end footage like VHS or 8 mm. Using low-end formats makes it hard to match your objects to the footage because the footage will be blurry while the objects are clean and sharp. Using something like Betacam SP is much easier to work with. If you

do have to use lower-end formats, use Low Resolution with High Antialiasing and Soft Filter turned on (Camera Panel). This way the objects will be a little blurred and will make compositing easier.

Take your computer on location with you if you can instead of recording your footage to tape (one generation), then going back to post and digitizing it to your computer (second generation). By eliminating the "middle-man," you will keep your images as clean as possible. Inputting directly into your computer is easily completed with peripherals like the Perception Video Recorder or a Personal Animation Recorder, both by DPS. To circumvent generation loss, I use a Three-Chip JVC video camera hooked up componently to my computer with a PAR card installed, and grab my image sequences this way.

If you want to use a still shot, you will get better results with a photographic camera and process the film on a Photo CD (or check the many CD ROM Photo collections out there to see if they have a shot of something that you can use). This way, you can take the shot into the computer, choose the resolution that you want by loading the image in an image processor and scale it down to the desired size. The cheaper but less effective way is to just have your film developed as a regular photograph, and then grab the shot with your video camera or a scanner.

### 3. Use The Real Thing

Whenever possible, use footage of real world objects. For instance, LightWave used to come with a highly detailed 3D tree object. Unfortunately, each copy of the object takes vast amounts of memory, and makes this object very limited in its uses. You wouldn't be able to use it for a forest unless you had a lot of money for all that RAM. Even if you did, your rendering would slow to a crawl because of all the polygons that would have to be drawn. So instead, use a one polygon plane with a color image map and a black and white silhouette of the same image used as a clip map. This will give the illusion of the real world object in your 3D scene. This option is more effective for two reasons. First, the only memory you use is for that one polygon, the image maps don't take nearly as much memory as a highly

detailed object. Second, you will get a faster response in screen redraws and in test renders, but there are drawbacks to this technique, such as, you must keep some distance away from the object(s). My tests have shown if you keep the object smaller than a quarter of the screen, you will be alright.

### 4. Colored Lights?

Never use plain white light. Real light never is just plain white. The basic rule is, outdoor lighting is more on the bluish side while indoor light is on the reddish-yellowish side. This may depend on the medium you obtain your footage from, the types of lenses you are using and the time of day. For now, let's just stick to the basics.

It's not enough to match the lighting of your 3D scene with your footage using basic color lighting. One trick to exactly match your virtual lights to the real world lights is to take a white card (it doesn't have to be too big, 8 1/2 x 11, will suffice) and face the card against the light. Take a shot of the white card (now colored differently because of the light). Do this for every light, then take these individual frames into a paint program such as Photoshop, and use the pick color function to get the exact numeric value of the color. Back in LightWave, plug these numbers into the Light Color palette (Lights Panel) for the individual lights.

### 5. Matching Blacks

This is the whole key to a great composite shot. What I mean by "matching blacks" is having seamless matching shadows in every characteristic way, such as shadow direction, shadow length, and tonal ranges of the shadows of the background plate and the CGI shadows to be added.

The first step is to set your Ambient Intensity (Lights Panel) to 0 percent. Ambient Intensity is always your worst enemy (the only reason it's there in the first place is to give beginners something to look at when they render, or else their images would be too dark if their lights aren't aimed correctly). This is what makes your 3D images look 2D. In essence, it flattens your image by not giving enough contrast between your different elements in the scene.

You may be thinking, but how about the shading for my objects and Front Projection-Mapped objects? First of all, FP-mapped objects shouldn't be shaded. Second, your other object's shading will be determined by how effectively you do your lighting. Follow this procedure when setting up your lighting for an outdoor scene:

- Make sure the lengths and the directions are the same. If they're not, then just rotate the light; there is no need to move it (assuming it's a distant light).

- Determine the tonal range (darkness) of the shading on your objects and see if they match the shading of the objects in your background plate.

- Most likely, they won't match, so this is where your fill lights are going to come into play. The easiest way to determine the position of the lights is to clone them from your original main light. Turn down the intensity (start with 50 percent of the original value) and turn off any shadow casting options.

- In layout, go to Lights as your Edit Item. Select your secondary light, then under Mouse Function select Rotation. Enter the numeric panel. In the Heading parameter, either add or subtract 180 degrees from its current value. In the Pitch parameter, change the value from a positive value to a negative or vice versa. For example, if your main light was at 60, 30, 0.0 you would change this for your Fill Light to 240, -30, 0, 0.

This effectively gives you the exact opposite direction of your main light, which is pretty much how Ambient Intensity works, except it fills it in a more global manner.

## 6. Surface Balancing

This is a term I like to refer to when I'm explaining the proper procedure to surface your Front Projection Mapped polygons. The problem arises when the FP-Mapped polygons need to have shadows cast on them. Shadows can only be cast on objects that have a Diffuse value on their surface. FP-Mapped polygons must be 100 percent Luminous to seamlessly match the background image footage. If the object is only using Luminosity, then no shadows will be cast on the object(s). The trick to matching shadows on your FP-Mapped polygons is to find a balance where your Diffuse and Luminosity settings will balance out to evenly light up the surface, but not so much as to not allow shadows to be cast. The general rule for this is to get a surface setting with a total value of  $Luminosity + Diffuse = 100$  percent. But remember—rules are meant to be broken, and this rule may vary if you have more than one main light facing the objects head-on. This will cause you to use lower values for both options. This applies differently to almost every case, depending on lighting conditions or on the shape of your objects (may they be spheres to flat 2D shapes). You will see why setting these values

correctly is so important. It will take a lot of test renders to get it right, but have patience. After each test render, change one thing at a time. For example, first change your Diffuse value, then render; change your Luminosity, then render; change the light intensity, then render, and so on. If you try to do many changes at once you won't know what exactly is causing the result you're getting, and you'll have to backtrack, wasting time in the process.

## 7. Reflections

We've talked about adding shadows to your Front-Projection mapped polygons. There is still one last obstacle that you may encounter when compositing—reflections. There are three variations you may encounter. The first is very easy to solve; it's the "perfect mirror reflection" you may get when your 3D objects (like 3D characters) are in front of objects such as a store window. The way around this is to use a one polygon plane. Use the show Background Image option in the Layout to match the perspective angles. Set your Luminosity value to 100 percent. The only other option you have to worry about is what Reflection value you want. There is no need to balance anything out.

The second and third kind of reflections relate to one another because they both need Fractal Bumps. The first is a soft reflection. What actually causes soft reflections and where do you see them? The most common places are on bumpy surfaces, like wood table tops and the bumps are what cause the softness. That is why a mirror's reflection is so sharp, because it is perfectly flat. To achieve the same in LightWave, all you have to do is follow the same procedure as above, the only exception being that you are going to add small bumps. To do this, go into the Bump Map texture and select Fractal Bumps under Texture Type. Make the Texture Size very small, like 0.01 or 0.001. Set your Texture Amplitude to a low value, like 10 percent. Doing this will cause your reflection to be broken up, and with the help of some antialiasing, it will blend and become smooth.

The third is the kind of reflection that you get when you try to match your objects to a watery surface, like a lake or an ocean surface. The best and basically only way to do this is to add some Fractal Bumps. Match the bumps of your background to your objects to get the sizing to around the same approximation.

## 8. Prepping up FP-Mapped Objects

The first thing that has to be done when constructing your FP-Mapped objects is to decide whether or not you are going to have the camera move or stay locked off. This will make you decide on how to construct your objects, 2D or 3D. If the camera needs to move, you should make a box that represents your object's depth, perspective and

scale so it is in proper placement. Most importantly, you need to have the outline of the object lined up with what you are tracing. To build your object in Modeler using your background image as a template, do the following:

- Go into Modeler and load the image that you will be compositing. (BG Image button in Display) Now set the correct aspect ratio by typing in size values for X, Y and Z. To do this, look into Layout's Camera Panel, then check the information window (where it tells you the resolution and segment memory, etc.). Under the Frame Aspect Ratio there is going to be a number. If, for example, you are using a D2 aspect ratio, then it should read 1.346.

- Back in Modeler, plug in the Frame Aspect Ratio value in the X Axis for size. Keep the Y and Z Axis at 1. Upon redrawing the image, you will see that the correct aspect ratio is being used. Zoom into the desired portion, and with the sketch tool, trace the area that you want. Save it and go back to the Layout. Make sure that your camera is located at 0,0,0 and all of its rotational values are reset to 0. Load in the cut out and move it back 1.6 meters in the positive Z direction. The cut out should match perfectly with the background. If it doesn't, check the camera's Zoom Factor. One half of the value of the zoom factor is the distance from the camera that your cut out object needs to be if you built it using the frame aspect as the x value. If you wish, you can double the frame aspect value when inputting the X size and use 2.0 for Y for the background image in Modeler. If you do this, you can use exact Zoom Factor value as the distance to place your object in order to line up with the background plate.

## 9. Alpha Compositing

Up to now, we've been talking about compositing with LightWave while using Front Projection Mapped polygons with other objects for your effects. Now we are going to add a little twist to the equation—Alpha Compositing. The only things you will be using are two or more images to create a new "composite" picture.

An alpha is nothing more than an 8-bit image (typically, you won't use 24-bit alpha images). The basic rule of alpha images is that LightWave just looks at the Lightness and Darkness values (the greyscale) of the image. A value of 255 is a fully rendered segment of the image (solid white in the alpha) while with a value of 0, no segment of that image is rendered (solid black in the alpha). Of course, a value of 127 will give you a result of about 50 percent.

How can you use this? One good example is getting around limitations, such as a scene that requires more objects, images, highly detailed objects with a lot of polygons—in other words, more memory than your computer system can handle. The solution is to break your work down into layers.

For example, let's say you have a scene where

you are going to have static elements and moving (dynamic) elements. Why not separate these two into their own separate layers where the static elements are only rendered once? You could even break down the dynamic elements into more layers if only some may require motion blur or extra antialiasing.

Manipulating these images together is not very hard in LightWave. All you do is go into the Image Compositing Panel (in the Effects Panel), and put the proper image in its corresponding spot. To get alpha images from LightWave, just select Save Alpha Images (from the Record Panel). When compositing, this saved alpha image would be loaded under FG Alpha Image. Of course you would have a matching image (or image sequence) to go along in the Foreground Image.

Whenever you are going to composite in LightWave you should always composite images rendered with a black background. The reason for this is that LightWave is an "additive" compositor, meaning that foreground and background image colors are added to each other. If you render your LightWave objects against a non-black background, you will receive colors of the background mixed into the antialiased edges of your objects.

You may have noticed a button labeled FG Fader Alpha under the Effects and Record Panel. This is where you can get around using non-black backgrounds. With Fader Alpha mode enabled, LightWave will ignore any areas of the Foreground Image corresponding to black areas in the FG Alpha Image. These same areas of the foreground will be taken out, which means you will be able to see the complete background instead. This method is not as accurate as normal compositing, but it can be use-

ful. (For a much more detailed look at alpha compositing, see "Understanding the Alpha Channel," by Mark Thompson in *LIGHTWAVEPRO*, June 1994.)

## 10. Shadow Alpha

This feature of LightWave is scary to many people mainly because they don't understand how to use it. Before I go into how to use Shadow Alpha, let me get into why you would want to use it when you already have Front-Projection Mapping. They are both similar in that you must first build primitive objects to represent complex objects in your background. But in Front-Projection Mapping, you get immediate feedback. Using Shadow Alpha is designed for casting shadows onto background images (without having to mess with playing with the Luminosity and Diffuse values of a Front Projection mapped polygon) With Shadow Alpha you must first build primitive objects to represent the portions of your background that you wish to cast shadows upon and save them out as black with some Diffuse value and Shadow Alpha selected. Set up your scene so objects will cast shadows onto these objects, then remove the background image and render and save your images (RGB image and Alpha Image). In the saved alpha images, you will notice that for those objects with Shadow Alpha selected, only the shadows that fall on these objects end up in the alpha channel. When finished rendering, clear the scene, load in all three images: foreground (saved RGB), background (Original background), and FG alpha (saved alpha) and put them into their corresponding spots in the Image Compositing Panel. Rendering out this sequence will now give you fully comped shadows on background "objects"

Using Shadow Alpha has many advantages. For example, you are able to add shadows with colored lights. If you were to do Front-Projection Mapping with colored lights, your images would never look right. Why? Because the colored light(s) would change the total color of your objects that you are trying to match with your background image. The background will never receive illumination from the colored lights. So this way, if you want to illuminate your objects with a colored light, but not the FP-Mapped objects, use Shadow Alpha. You will only see the shadows in the alpha image and the objects in the foreground image.

Another benefit is being able to do soft edge raytraced shadows. Saving the RGB image and the Alpha image (with Shadow Alpha) then take the alpha image into an image processor (like Photoshop) and slightly blur it. Recompile everything as you normally would, except with the altered image. You will have shadows with soft edges from the blurring. That's it!

This may seem like a lot of information, but this article covers some basic compositing with LightWave from all aspects. I doubt you will have to use all these techniques to accomplish a single special project, but you may need these techniques some time in the future. Now you're ready for almost anything.

LWP

*Enrique Muñoz is going to finish up high school this June and continue his education at Cogswell College where he will pursue a BFA in Computer Graphics and Video Imaging.*

## Seamless

*continued from page 5*

spline tension. After throwing in a few "proxy objects" (very crude objects meant to take the place of something that was on set) and setting the lights

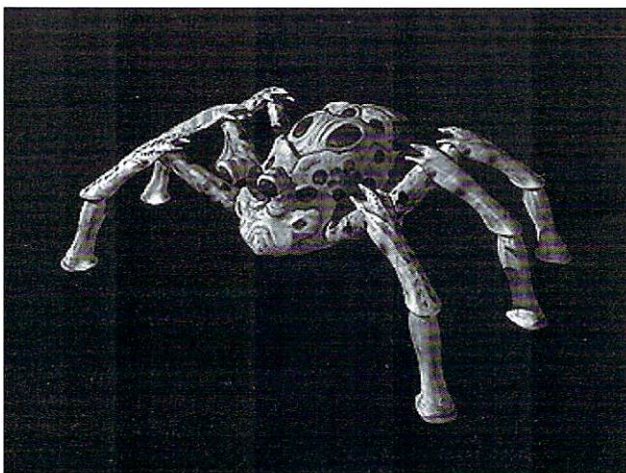


Figure 4

in position we were ready to do some animation. The Tracker was loaded from its master scene and positioned in front of the camera for lighting. For this scene the key light was on the left, a small fill was on the right and a backlight was at the rear-

right. There was also almost no ambient light. The key was a spot light at 65 percent intensity with a wide cone and no fall-off. The fill was a distant light at 40 percent and the backlight was a distant light set to 20 percent. All lights were white (200, 200, 200) with ray-trace shadows. If gels were used on set, colored lights would be used, and if diffusion was used on set, the lights would be set to shadow map shadows (for soft edges).

After lighting, The final step was to animate the Tracker, which was supposed to fly over

the camera, bank to the left and land on a post on the front of the house. After setting the camera options to high AA, dithered motion blur and ray trace shadows, the scene was rendered. Final output was at 2K, in the .rgb format.

The final FX count isn't in but this feature is certainly an *effects movie*. Our current figure is close to 205 shots. We are doing everything from wire-removal to digital characters. Almost all of the shots will be done at least in part with LightWave. I hope to do a few articles on our work for this picture, so please let me know if you enjoyed this one. Expect to see *The Warrior of Waverly Street* in theaters this winter.

LWP

*Tom Williamson is EX supervisor for Computer Caf  (http://www.computercafe.com). He's very proud to announce the recent arrival of who is sure to be the hottest young computer animator in the year 2019: Austin Tyler Williamson born 2/20/96, 7lbs 9oz. Tom can be reached at: tom-cat@terminus.com*

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BY BOB BARR, 3D ANIMATOR

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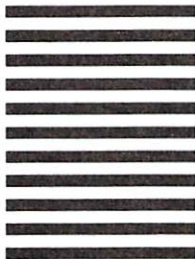
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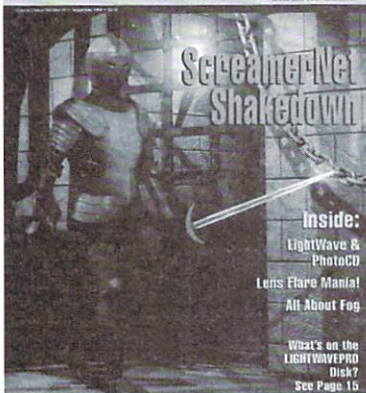
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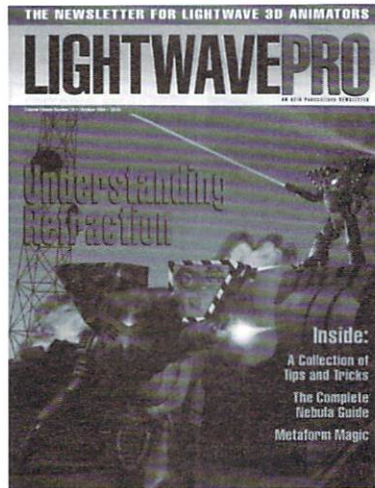
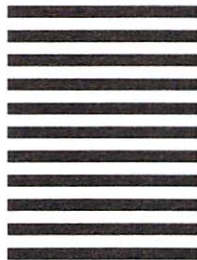
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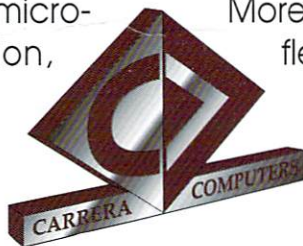


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