TUTORIAL

PROBLEM SOLVING IN BLENDER

Design and implement practical solutions to practical 3D problems in Blender 2.28c
### BY LANDIS FIELDS

Why Blender?

Ultimately, 3D is all about problem solving. If there is a specific effect that you are trying to achieve, the odds are that there are a hundred different ways to get it out of any piece of software. And if your favourite application doesn't have a pre-packaged, all-in-one, click-of-the-button answer, then you might have to actually use your imagination and pull it off in another manner. In the end, no one cares how you achieve your effects, only what effects you can achieve. What the viewer wants in your work is quality, not to know whether you've used raytracing, or which animation package you prefer.

In this tutorial, we'll be demonstrating this problem-solving process in Blender 2.28c. As many of you may know, Blender is now open-source. This is a very exciting time for the user community, since anyone with a good idea can contribute it. If someone wants a particular click-of-the-button solution added to the software, all they have to do is submit the idea for approval and their voice will be heard. There is a team of volunteer programmers out there working around the clock, purely because of their love of what they do, and of the tools they use. It is the hard work of these people that provides budding artists with a competitive, legal alternative to commercial 3D software packages. The program offers digital sculptors of the 21st century (no matter what their age, operating system, or income may be) with freedom of choice, and the tools they need to create. That, to me, is something powerful… and that is why I choose Blender.

In this tutorial, we'll be looking at some of the challenges that arise in modeling the vase on the left of this page. Download Blender 2.28c from www.blender3d.org (it's only 2.2MB), grab your favourite form of caffeine, and let's go solve some problems!
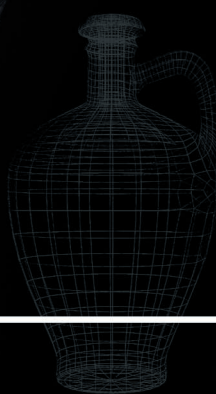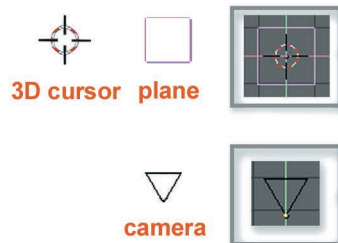
>> PROBLEM ONE →

We need to model a Turkish vase

POSSIBLE SOLUTIONS
- Spin (Blender's lathe function)
- NURBS
- Polygon Extrusion

MY CHOICE
I chose **Polygon Extrusion**. The **Spin** function can be tricky when it comes to seams, and though the object is smooth, SubSurfs should serve in place of **NURBS.**

3D cursor **plane**

camera

Go ahead and start by opening Blender. By default, the program gives you a bird's eye view of a **plane**, a **camera**, and the **3D cursor**. For now, all you need to know is that the 3D cursor allows you to tell Blender where to place new objects.

1
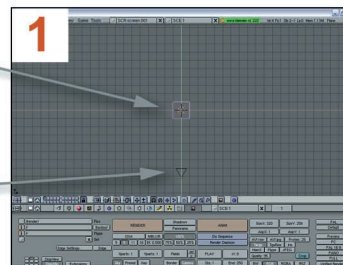
The plane is pink because it is currently selected. (Later, remember that selected vertices are yellow.) Delete the plane ([**Delete**] or [**X**]). Open your toolbox [**Space**]. **ADD > Mesh > Circle**. 12 vertices is good since we will be using SubSurf later.

2
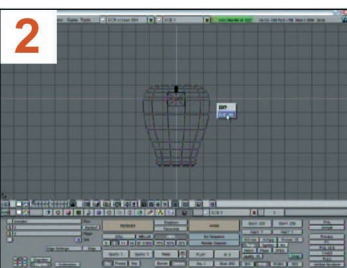
Switch to front view and **Zoom In** (see right of page). Enter **Border Select Mode** [**B**] and drag a box around all of the vertices. **Extrude** [**E**] the vertices upward and hit **Enter**. Unselect all vertices [**A**], **Border Select** the ones you just made, and extrude again. Use this process alongside the **Scale** [**S**] function to form the main body of the vase.

3
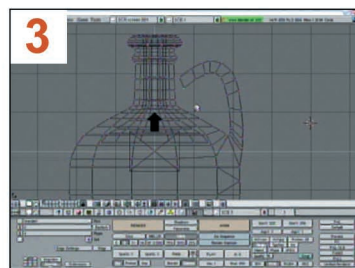
Next, **Free Look** (*see* Blender Quick Reference Card) and select four vertices where the handle will begin (it's best to start at the end closer to the bottom of the vase). Extrude the handle up and over the top by selecting each set of newly extruded vertices and **Rotating** [**R**] each set periodically just as you did for the body.

4
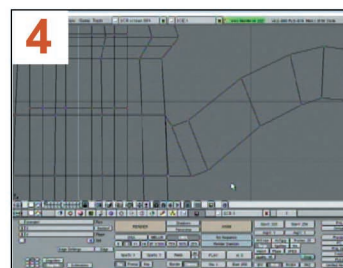
Now **Rotate** [**R**] the vertices to allow for the handle to curve upside down, and extrude it back to meet the pot. What we are going to try and do is match each one of these four points from the handle to a corresponding vertex of the main body. Basically, we are getting ready to weld the unconnected end of our new handle to the neck of the body.

5

Select   **Scale**

Before   **After**
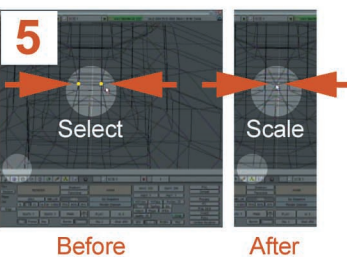
If you have followed each step, you will find that the center vertex of the handle does not meet up with that of the body. So select the two vertices of the body that are directly accross from the center vertex of the handle using **Free Look**, and **Scale** [**S**] them together while watching the lower left-hand corner of the window. When the numbers read zero, hit **Enter**.

6
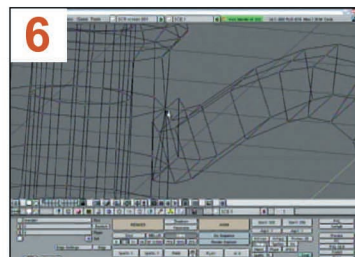
Next, pull up the **Specials** menu [**W**] and select **Remove Doubles**. If you have followed the tutorial correctly so far, you should now have a good setup for mating the vertices of the handle to those of the main body, using the methods discussed in the previous steps.

7
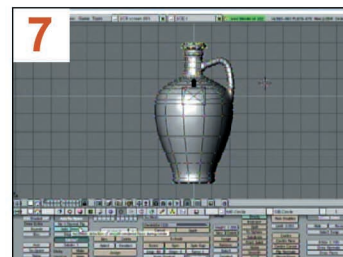
Finally, select all of the vertices [**A**]. Pull up the **Edit Buttons** [**F9**] and hit the button titled **Set Smooth**. At this point you may want to toggle **Solid View** [**Z**] to see the smoothing take place. Now, toggle **Auto-Smooth** located just to the left, and **SubSurf** with a 'Level of subdivision for rendering' of **1**.

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blender Quick Reference Card

Navigation

FREE LOOK ....

ZOOM IN .... + CTRL

PAN .... + SHIFT

Modeling

SELECT AN OBJECT.......

GRAB OBJECT.................... G

ROTATE OBJECT.............. R

SCALE OBJECT................ S

EXTRUDE POINTS........... E

TOGGLE "EDIT MODE"..... TAB

Render

F12

Point of View (P.O.V.)
How Blender uses the Number Pad on a standard keyboard.

Num Lk	/	*	-
Top View	8	9	+
4	5	6	
Front View	2	Side View	Enter
Camera View		.	
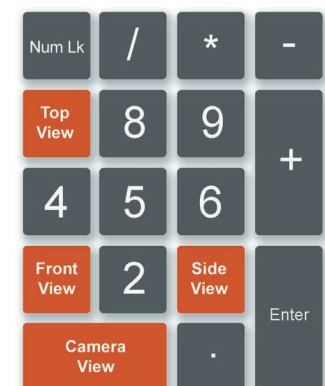
www.blender3d.org

Reference Card

Above is a **two sided** beginner's quick reference card that can be cut out and laminated.
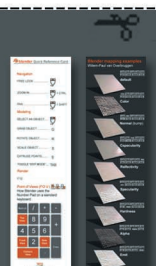
Front   **Back**

TUTORIAL

Blender mapping examples
Willem-Paul van Overbruggen

| Col | Nor | Csp | Cmir | Ref |
| pec | Hard | Alpha | Emit |

Default

| Col | Nor | Csp | Cmir | Ref |
| pec | Hard | Alpha | Emit |

Color

| Col | Nor | Csp | Cmir | Ref |
| pec | Hard | Alpha | Emit |

Normal (bump)

| Col | Nor | Csp | Cmir | Ref |
| pec | Hard | Alpha | Emit |

Cspecularity

| Col | Nor | Csp | Cmir | Ref |
| pec | Hard | Alpha | Emit |

Reflectivity

| Col | Nor | Csp | Cmir | Ref |
| pec | Hard | Alpha | Emit |

Specularity

| Col | Nor | Csp | Cmir | Ref |
| pec | Hard | Alpha | Emit |

Hardness

| Col | Nor | Csp | Cmir | Ref |
| pec | Hard | Alpha | Emit |

Alpha

| Col | Nor | Csp | Cmir | Ref |
| pec | Hard | Alpha | Emit |

Emit

GLAZING THE POTTERY Using the 'paint by number' method

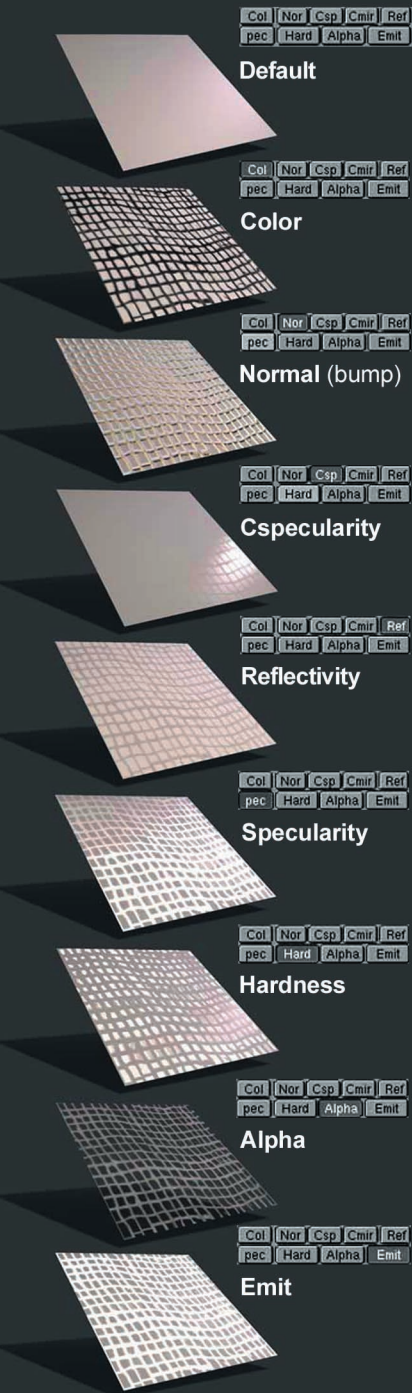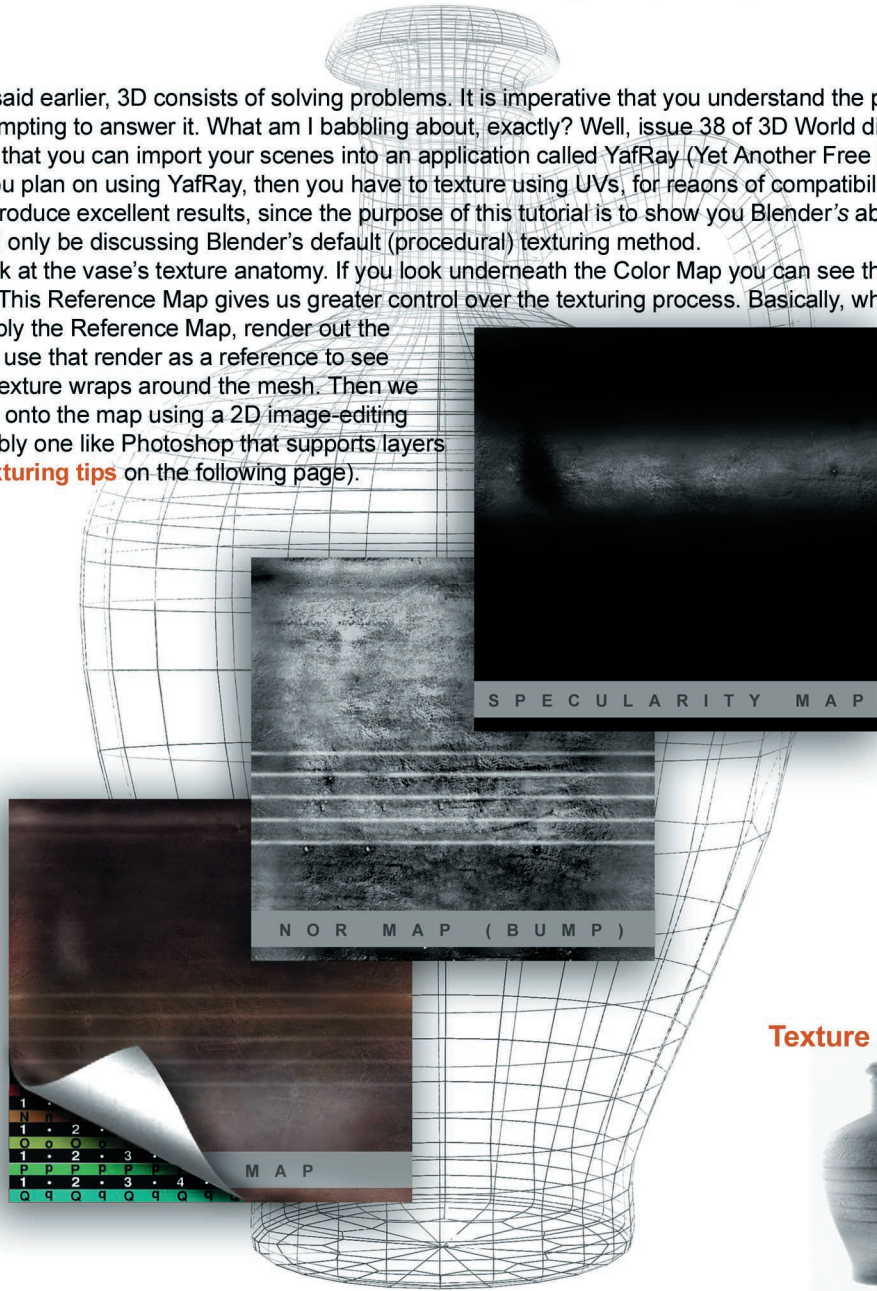A s I said earlier, 3D consists of solving problems. It is imperative that you understand the problem before attempting to answer it. What am I babbling about, exactly? Well, issue 38 of 3D World discussed the fact that you can import your scenes into an application called YafRay (Yet Another Free Raytracer). If you plan on using YafRay, then you have to texture using UVs, for reaons of compatibility. But while a raytracer can produce excellent results, since the purpose of this tutorial is to show you Blender's ability to solve problems, we will only be discussing Blender's default (procedural) texturing method.

Below is a look at the vase's texture anatomy. If you look underneath the Color Map you can see the Reference Map. This Reference Map gives us greater control over the texturing process. Basically, what we are going to do is apply the Reference Map, render out the scene [F12], and use that render as a reference to see exactly how the texture wraps around the mesh. Then we can paint directly onto the map using a 2D image-editing program, preferably one like Photoshop that supports layers (see **Blender texturing tips** on the following page).

S P E C U L A R I T Y   M A P

N O R   M A P   (B U M P)

M A P

Texture Anatomy

Blender material examples Blender V1.5 Manual

Plastic

RGB			R 0.921
HSV			G 0.260
DYN	Mir	pec	Color	B 0.285
Zoffset: 0.000		TexFace	No Mist
Spec 0.812	Ref 1.000
Hard 116	Alpha 1.000
SpTr 0.000	Emit 0.000
Add 1.000	Amb 1.000

ME:Default_name OB ME   1 Mat 1

Paper

RGB			R 0.921
HSV			G 0.881
DYN	Mir	pec	Color	B 0.830
Zoffset: 0.000		TexFace	No Mist
Spec 0.275	Ref 0.522
Hard 2	Alpha 1.000
SpTr 0.000	Emit 0.130
Add 1.000	Amb 1.000

ME:Default_name OB ME   1 Mat 1

Metal

RGB			R 0.739
HSV			G 0.674
DYN	Mir	pec	Color	B 0.330
Zoffset: 0.000		TexFace	No Mist
Spec 0.507	Ref 0.536
Hard 25	Alpha 1.000
SpTr 0.000	Emit 0.000
Add 1.000	Amb 1.000

ME:Default_name OB ME   1 Mat 1

>> PROBLEM TWO

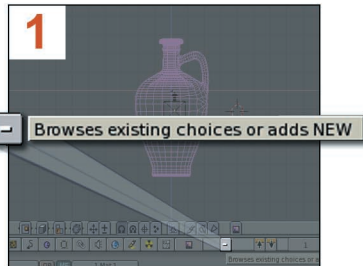We need to texture a Turkish vase

POSSIBLE SOLUTIONS
- UVs
- Plugins
- Procedurals + 'paint by number'

MY CHOICE
I chose **Procedurals**. This is a simple object so unless we were exporting to YafRay, **UVs** would be overkill. **Plugins** are nice but they are beyond the scope of this tutorial.

1

Browses existing choices or adds NEW

You cannot texture a mesh that does not yet have a material, so exit Edit Mode [**TAB**]. With the vase selected, pull up the **Material Buttons** [**F5**] and **ADD NEW**. Now, locate and activate (push in) the **Shadeless** and **Tube** buttons.

2
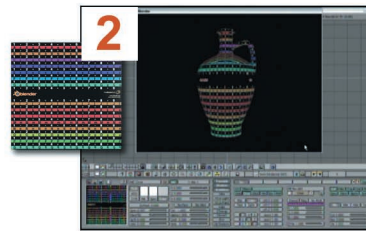
Pull up the **Texture Buttons** [**F6**] and **ADD NEW**. As you can see, the default is None, so change this to **Image**. Click the **Load Image** button. Locate the Reference Map on your 3D World cover CD. Once you find it, click **Load** and give it a render [**F12**].

3
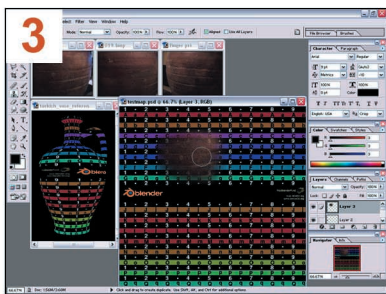
If the render is too small, pull up the **Display Buttons** [**F10**] and crank up the resolution. Now **Save** your render [**F3**]. Import it and the Reference Map into your 2D paint program. You can paint it as you like, or, as I did, open some digital images of the vase for copying and pasting.

4

I basically used the render as a reference while painting directly on top of the Reference Map using Photoshop's clone tool along with my digital images. By referring between the Reference Map and the render, you always know exactly what part of the model you are painting.

5

Since we applied our material using **Tube** mapping, in order for our image to seamlessly wrap, it needs to tile horizontally. To do this in Photoshop, use **Filter > Other > Offset**. Use the **Clone** tool to fix the hard edge of the new offset. For the finished Color Map, see **Texture Anatomy**.

6 Save your image as something other than Reference Map so that you can use it again in the future. Jump back to Blender and select **Load Image** again. Replace the Reference Map with your new Color Map. Once you find it, hit **Load**. Go to the **Display Buttons** [**F10**], press **OSA**, set it to **16**, and press **Shadows. Render** out [**F12**].

7 Now, pull up the **Material Buttons** [**F5**]. If you look just below the **ADD NEW** button you will see eight grey boxes, one of which is labeled **Tex**. These are **Texture Channels**. The one that says **Tex** was used by our Color Map. To add a Spec or a 'Nor' (Bump), select an empty channel. Below that, change **Col** to **Nor** and repeat steps 1 and 2.

8 And finally, lighting. An entire tutorial could be written on this alone. For the vase, I used a standard three-point light setup. Open the **Toolbox** [**Space**] and **ADD > LAMP**. Go to the **Lamp Buttons** [**F4**] and change **Lamp** to **Spot**. Use **Grab** and **Rotate** to position the lamps. Go to the **Material Buttons** [**F5**], turn off **Shadeless**, and give it a render [**F12**].

Blender texturing tips

LAYERS
If you are using a 2D paint program that supports layers, then use them! This not only helps when it comes to creating your 'Nor' (Bump), Spec, and other maps, but it is especially helpful when using the 'paint by number' method. When you begin to paint directly on top of the Reference Map, do so on a separate layer. This way, you can lower the layer's Opacity to allow you to see the Reference Map while you are working.

The Reference map
Something I found myself doing when first learning this 'paint by number' method was to forget to Reload the image in the Texture Buttons of the Material Settings. Hit that thing every time, or you will be painting and painting away in your graphics program trying to fix a problem that you already fixed over an hour ago, and which you are now just making worse!

Spec and Nor
The biggest mistake that I used to make was thinking that a Specularity map and a 'Nor' (Bump) map are nothing more than a black and white version of the Color (Col) map texture. This is not so! Sometimes, you will get away with this and achieve reasonable results, but if you do so regularly, you will be falling into bad habits. If you just get yourself away from the computer and concentrate on each texture's function, then you will be surprised at the mistakes you will catch yourself *almost* making.

Glass

ME:Default_name	OB	ME	1 Mat 1

RGB		R 0.739
HSV		G 0.909
DYN	Mir Spec Color	B 1.000
Zoffset: 0.000	TexFace	No Mist
Spec 1.000	Ref 1.000	
Hard 44	Alpha 0.261	
SpTr 0.812	Emit 0.000	
Add 1.000	Amb 0.304	

Halo

ME:Default_name	OB	ME	1 Mat 1

RGB		R 0.315
HSV		G 0.482
DYN	Ring Line Halo	B 0.800
	Rings: 3	Lines: 10
HaloSize: 0.50	Star: 4	Seed: 0
Alpha 1.000	reSize: 2.69	ub Size: 2.64
Hard 50	FlareBoost: 1.000	
Add 1.000	Fl.seed: 72	Flares: 9

Lens flare

ME:Default_name	OB	ME	1 Mat 1

RGB		R 0.315
HSV		G 0.482
DYN	Ring Line Halo	B 0.800
	Rings: 3	Lines: 10
HaloSize: 0.50	Star: 4	Seed: 0
Alpha 1.000	reSize: 2.69	ub Size: 2.64
Hard 50	FlareBoost: 1.000	
Add 1.000	Fl.seed: 72	Flares: 9