CHAPTER THIRTY-ONE

Displacement Maps

- *What is a Displacement Map?*
- *Making & Using Displacement Maps*
- *Example*

The question is: Does the Displacement Map fall under the heading of Filter or Transform? Like the *Liquify* Filter, it moves pixels around in a somewhat "transform-like" manner. But Adobe has the Displacement Map, like the Liquify tool, listed under the heading of filters and that's probably a better fit for what it does. The interesting thing about the Displacement Map is that, unlike any other filter, it uses the pixel values from one image to move (displace) the pixels in another.

For some reason, the Displacement Map isn't as well known as it deserves to be. You may have learned how you can make one Layer look more like a part of the image in a lower Layer by using Blend Modes (page 165). This is very helpful if you want to make, for example, grafitti look as if it's really painted on a wall, rather than added in Photoshop. A Displacement Map can make that kind of illusion even more convincing, especially when the background has large scale variations in texture.

Once you've learned how to make and use Displacement Maps you'll find more applications for them.

What is a Displacement Map?

A Displacement Map is an ancillary image used to distort the image you're working on. In other words, you use one image to distort another. This is accomplished by *moving* pixels in the working image based on lightness/darkness of pixels in the Displacement Map image. Where the Displacement Map image is dark, pixels in your working image will be moved one way; where the Displacement Map image is bright, pixels in your working image will be moved the other way.

Making & Using Displacement Maps

Here's a step-by-step guide to creating and using Displacement Maps. The process requires two images: one is the working image (the one you want to modify), the other is the Displacement Map image that's used to "displace" pixels in the working image. We'll start with the latter...

Save an Image to Use as a Displacement Map

- Open the image in Photoshop.
- Increase the contrast by any method(s) you prefer (levels, curves, unsharp mask, etc.)
- Convert the image to monochrome (black & white); this step isn't mandatory, but B&W is usually best.
- Save the image under a new name as a Photoshop .PSD file (JPEG and other file formats won't work).
- Close the image.

You can apply a Displacement Map image to any other image, but it's not uncommon to make a Displacement Map specifically for a single image. It's a good idea to set aside a specific location on your hard drive just for storing images you've made to be used as Displacement Maps.

How to Apply a Displacement Map

- Open your Working Image (the image you want to distort) in Photoshop.
- If the image has more than one Layer target the layer you want to distort. (You can only Displace one Layer at a time; if you need to Displace multiple Layers you should make a copy of each one and merge the copies into a single Layer.
- Decide before proceeding what image you want to use as a Displacement Map – there's no preview option for this filter.
- From the main menu pick *Filter > Distort > Displace...*

In the Displace dialog box *(full details on page 248)*:

- Choose the horizontal and vertical scaling you want to use – experience is your only guide.
- If the Displacement Map image is smaller (or larger) than the layer or selection you want to distort, choose either "Stretch To Fit" or "Tile".
- Choose either "Wrap Around" or "Repeat Edge Pixels" (this is often a guess and you may have to undo and try again to get the look you want.
- Navigate to the Displacement Map image you want to use.
- Click OK and you're done! Maybe...
- Click Undo and repeat with different settings if you didn't get the look you wanted on the first try...

Example

Download and Open the image at
www.robertstech.com/fotoshop/waves.php

Increase the contrast of the image any way you like; then convert it into black & white using ***Image Adjustments > Black & White…*** Save it under a new name as a Photoshop PSD image (not JPEG – images must be in PSD format to be used as Displacement Maps).

Close the B&W image and re-open the original (color) one.

Write the word "WAVES" at the top of the image in a bold, sans-serif font in black. I used the Impact font at 16opt size.

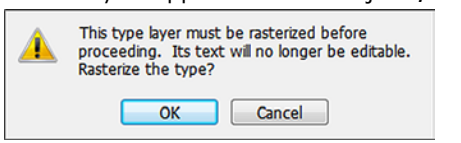
Copy the text layer (Cmd+J in Mac, Ctrl+J in Windows).

Now flip the new "WAVES" text over. There are a couple of ways to do this:
• Press Ctrl+T (Win) or Cmd+T (Mac), right-click the text and choose "Flip Vertical" from the pop-up menu, or…
• From the main menu pick ***Edit > Transform > Flip Vertical***;

Use the Move tool and move the flipped text down just below the original so that it looks like a reflection. The result should look something like the image here.

Be sure you have the *reflected* version of the word "WAVES" active in the Layers panel; from the main menu choose ***Filter > Distort > Displace…***

You'll get a dialog like the one shown here. It's telling you that the Displace effect can only be applied to raster objects, not vector shapes like text, so you have to rasterize this text to proceed. Click "OK" and Photoshop will rasterize the text for you.



Displace Dialog Box Notes

Horizontal & Vertical Scale

These are the most important settings – they determine how much our image is distorted by the brightness/darkness of the Displacement Map image. Our image of water consists mostly of horizontal striations, so we'll apply more horizontal than vertical distortion. You'll have to use trial and error in most cases.

Displacement Map

Your Displacement Map image will often be much smaller than the image you're applying it to, so you have to decide if you want to *stretch* the Map to cover your entire image or keep it at its native size and *repeat* it across the area of your image (this is called tiling). In our our example is the working image and the Displacement Map are both 900 x 600, so this setting will have no effect.

Undefined Areas

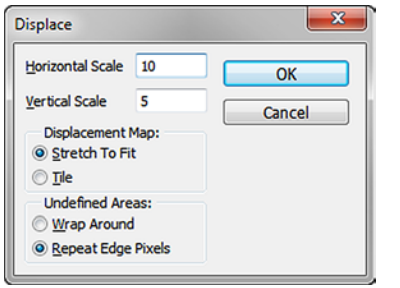
This controls how "undefined" areas (at the edges) of the image are treated. The issue arises because the Displace filter moves pixels around: Imagine shifting a lot of pixels to the left. At the left edge some pixels get shifted out of frame; at the right edge pixels that are moved left leave blank areas behind. The result can be weird effects in these "undefined" areas at the edges. (Even Adobe is a bit vague on this and I can't find any authoritative definitions of "undefined areas" on the web – it seems they really are undefined!)

Wrap Around fills undefined space with content from the *opposite edge* of the image.

Repeat Edge Pixels extends the colors of pixels along the image's edge in the direction of the distortion.

The only way to find out which works best is to try them both.

Now you'll see the Displace dialog shown below.



A detailed explanation of all the options in this dialog is shown in the sidebar at left. For now set the Horizontal Scale to "10" and the Vertical Scale to "5".

Because our Displacement Map image is exactly the same size as our Working Image, the *Stretch to Fit/Tile* option will make no difference, so either option will have the same effect. And because none of the pixels we're displacing are near the edge of the image (they're just in the word "WAVES") the *Wrap Around/Repeat Edge Pixels* choice won't make any difference either. In other situations these settings may make significant differences, but since this Filter has no preview your only way of addressing it is to guess and try... and undo and try again until you get what you want.

With the values set as shown in the illustration, click OK and the Displacement Map will be applied to your inverted "WAVES" text.

Change the Blend Mode of the displaced text to *Soft Light* and (if necessary) reposition it slightly under the original text (the distortion applied by the Displacement Map sometimes moves things around slightly).

That's it. Your image should look pretty much like the one shown on the facing page. If you feel like tweaking yours a little more try a slight *Perspective* Transform on the reflection and/or lower the opacity slightly to suite your taste.

Finished Image with Displacement Mapped Text

What if you need to change the word "WAVES" to something different? You'll have to delete it and perform the whole process over again. Unless... If you want to make and more easily edit an image like this, make the text into a Smart Object (page 193) immediately after you create it (*before* making a copy and inverting it). Then when you edit the text in the Smart Object the changes will immediately be reflected (pun intended) in the copy.

There are countless other ways to use a Displacement Map. The map we used in the preceeding exercise could be used for other purposes – giving a "spooky" appearance to something in a Halloween graphic, for example (you could achieve the same effect with the Liquify Tool, but it would take hours instead of seconds). Small images can by tiled (see the dialog box notes on page 248) to give an overall texture to an image or Layer.

Chapter 31 Synopsis

What is a Displacement Map

- A Displacement Map is an ancillary image used to distort the image you're working on.
- Pixels in your working image are moved (displaced) based on lightness/darkness of pixels in the Displacement Map image.

Save an Image to Use as a Displacement Map

- Open the image in Photoshop.
- Increase the contrast.
- Convert the image to black & white.
- Save the image as a Photoshop .PSD file (use a new filename and location).
- Close the image.

How to Apply a Displacement Map

- Open the image you want to distort.
- Target the layer you want to distort.
- Choose Filter > Distort > Displace…
- In the Displace dialog box set the horizontal and vertical scaling.
- Choose either "Wrap Around" or "Repeat Edge Pixels".
- If the Displacement Map image is smaller (or larger) than the layer or selection you want to distort, choose either "Stretch To Fit" or "Tile".
- Choose the Displacement Map image you want to use.
- Click OK.
- Undo and repeat with different settings if necessary.

Tips & Ideas

- Turn a Layer into a Smart Object before displacing it (to make future edits possible); this is particularly useful with text and other vector type Layers.
- Use small images (with tiling) as Displacement Maps to apply an overall texture.
- Experiment by applying custom Displacement Maps to new images they weren't intended for.

Keyboard Shortcuts from this Chapter:

(None)