Varis PhotoMedia Tutorials

Welcome

This tutorial has been prepared for the photographer who is striving to learn digital imaging. I make an effort to supply current information about digital imaging techniques and general information about computer technology that is pertinent for today's professional photographer. This information is based on my personal experience down in the trenches at the front lines of the digital revolution that is sweeping the photographic industry.

One thing is certain: all of the information contained herein will be obsolete in a fairly short time - how short, I can't say. Be forewarned that things are changing very rapidly and the only way to stay competitive is to keep learning. I devote a good percentage of my time learning new things and I am attempting to share what I learn with you but this information will go out of date so you should be flexible and not take this tutorial to be the ultimate statement on the subject.

I maintain a web site where I post additional information, examples and tutorials. You are invited to browse various portfolios as well as download free material and purchase additional tutorials at:

http://www.varis.com

I hope you find the information contained in this tutorial helpful. Please let me know if you find any errors or ommissions - I'm always trying to improve these materials! You may contatct me via email at:

varis@varis.com

best regards, Lee Varis 2003

Image Distortions
using displacement maps

We see the world around us as a 3-dimensional collection of forms, shapes and colors arranged in space. We most often represent this vision in two dimensions of value and color but somehow this 2-D photo record conjures up the full three dimensions of our real vision. Our visual system is very good at deciphering visual clues to reconstruct reality. By manipulating these visual clues, Photoshop allows us to push and pull our images in new ways to reconstruct realities that never existed.

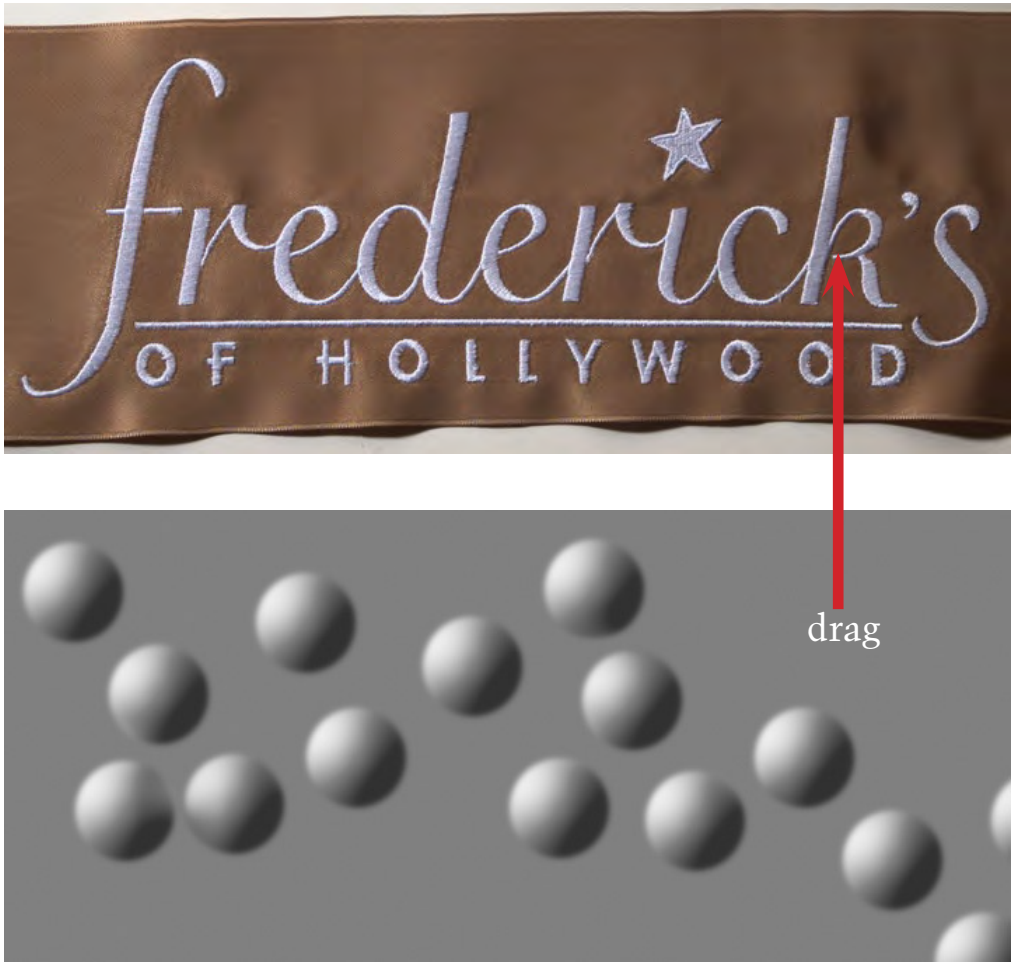
One of the most powerful methods of manipulation we have involves the use of one image to distort another. Photoshop accesses this under the Filter menu: Filter-> Distort-> Displace. Displacement maps can bend an image to fit the contours of another image and this comes in very handy for creating certain effects. Many of these effects have applications in commercial work though the way Photoshop presents the Displace filter it is not obvious how to achieve some of the easiest ones.

The follows pages will walk you through the use of the displace filter and provide some ideas for creating displacement maps. Like all good things in Photoshop, the best effects involve multiple steps and a collection of techniques applied in concert. I will outline the basic concepts and progress to more complex applications so we can fully exploit the power of displacement maps in your own work!

Turn off your phone, roll up your sleeves and lets begin...

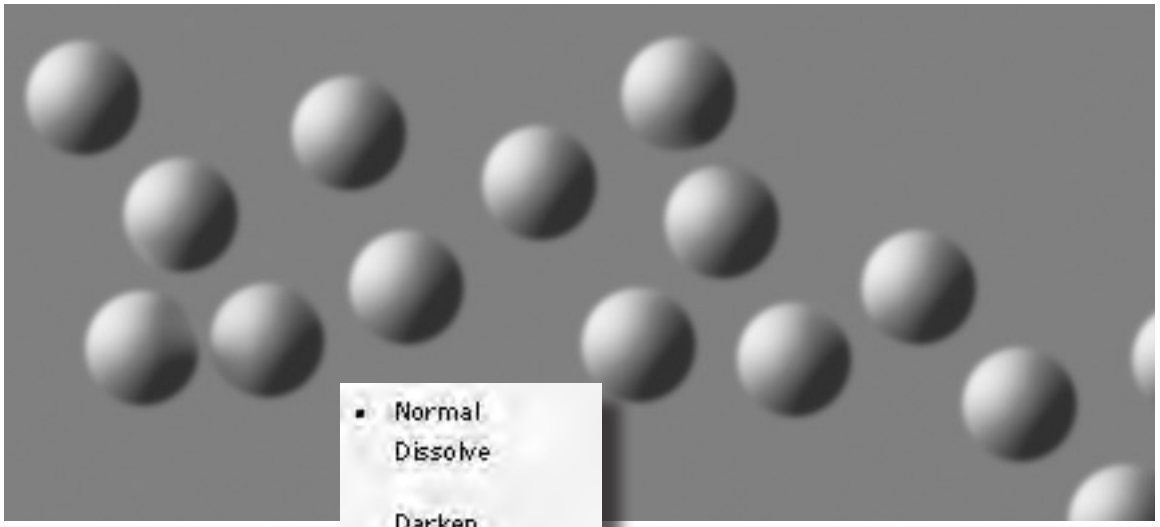
Image Distortions
conforming to a surface

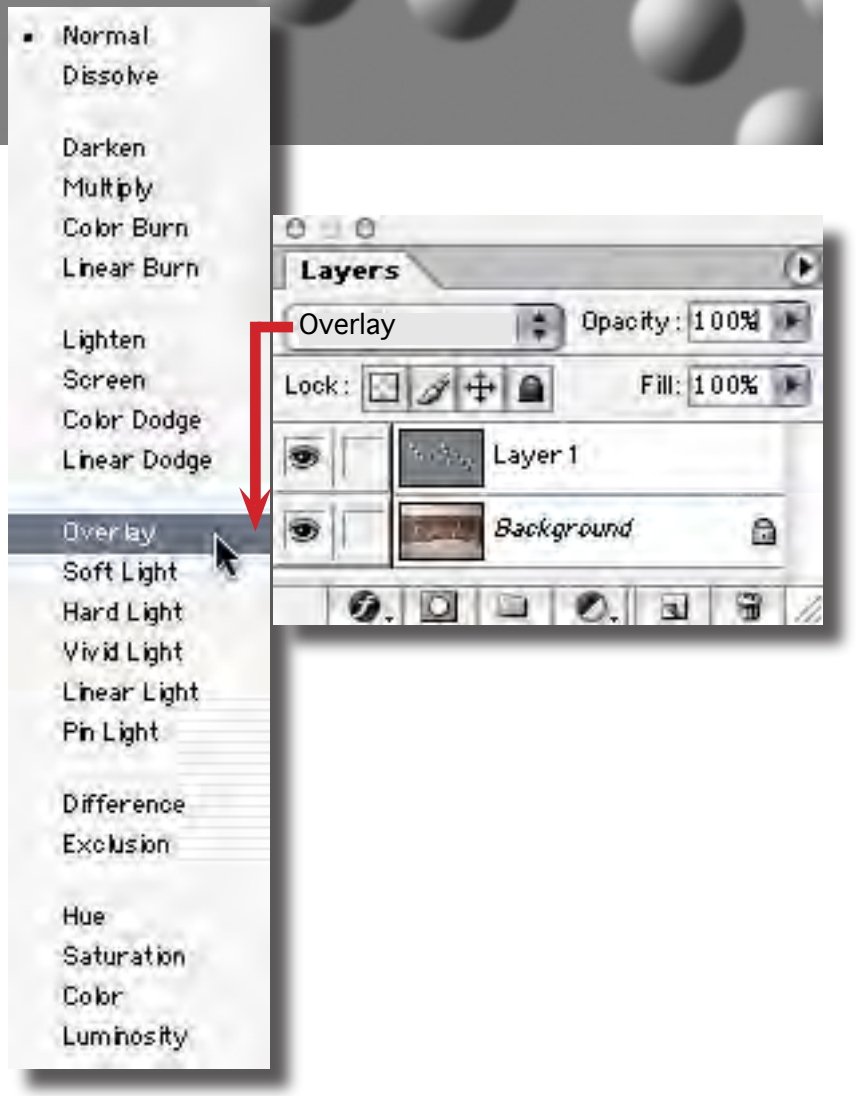
Here we have an image of an embroidered banner. We will be using this image a little later on for something a little more complicated - right now I want to place this bumped surface under the banner and I want the lettering to conform to the bumps. The gray *bump* image has a middle gray background with what appear to be circular *domes* protruding from the surface. This illusion is created by the dark-to-light transitions of tone that define each circular *bump*. We can use this to shift the position of the pixels in our embroidered banner. The bump image will become our displacement map for the banner image!



First, however, we need to get the shadows and light of the *bumps* into the banner image. To do that we can simply use the gray bump image as an overlay layer. With both images open, use the move tool to drag the gray bumps onto the banner image. In this, carefully prepared, example the files are the same size so, hold down the "shift" key before you drag and the image will be registered together. Now all you have to do is change the layer apply mode to "Overlay"...

Overlay
for light and shadow





An Overlay layer will lighten underlying layers where it is lighter than medium gray and darken underlying layers where it is darker than medium gray. Used in this fashion our bumps image acts as a lighting map...

Here is the banner with the bumps Overlayed at 100%

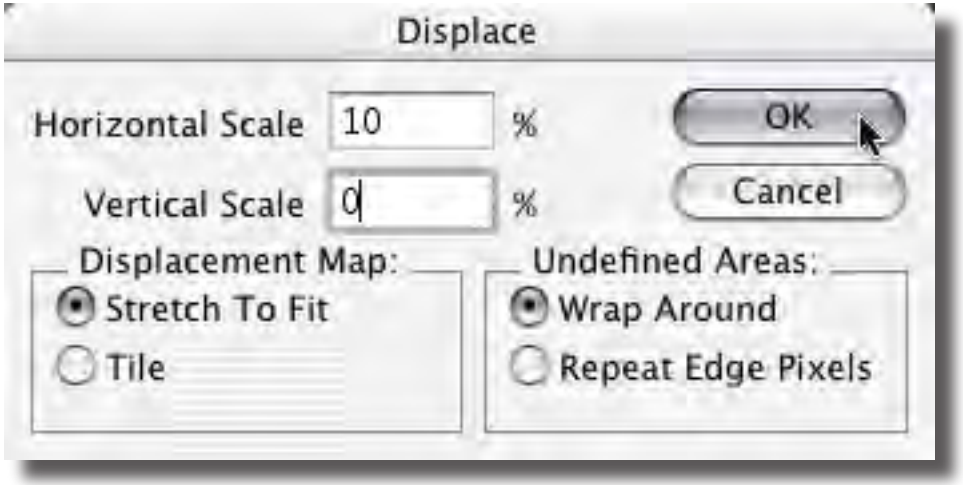
click for displace

Here we have changed the layer opacity to 60% for a less pronounced look. You'll notice that the bumps show up nicely but the embroidered lettering doesn't follow the contours of the bumps suggested by the lighting. This is where the Displace filter comes in...

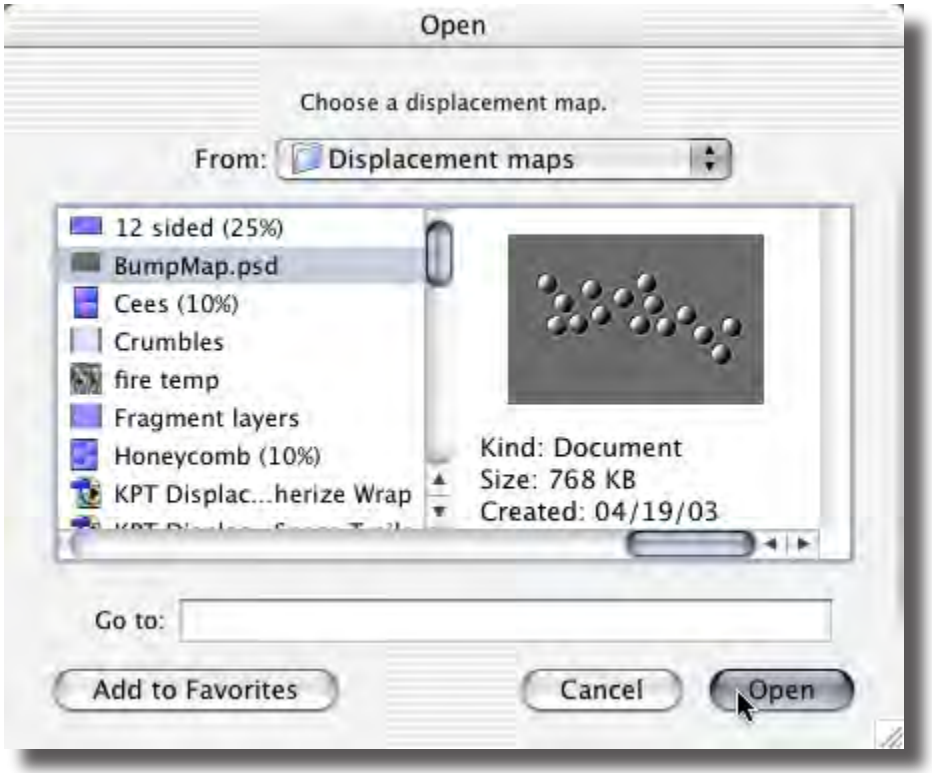
The general procedure for distorting our image so that it follows the bumps is to select: Filter-> Distort-> Displace... set the degree of distortion in the resulting dialog and then open the file that you want to use as a displacement map...

Displace Dialog

In this example we want to shift the lettering side to side to conform to the bumps so we will enter a value in the "Horizontal Scale" only. The radio buttons for the "Displacement Map" and "Undefined Areas" are unimportant in this image because the file we're using for the displacement is exactly the same size as the file we're distorting.



Once you click on "OK" you'll be presented with an open dialog - this is where you select the file you'll use as a displacement map. Photoshop defaults to the "Displacement maps" folder, inside the Plug-ins folder to locate the file. You can navigate anywhere to where you've saved the file but if you get in the habit of saving your displacement map files here you'll save yourself a few steps.



We will open the same file that we used for the overlay layer and this becomes the displacement map...

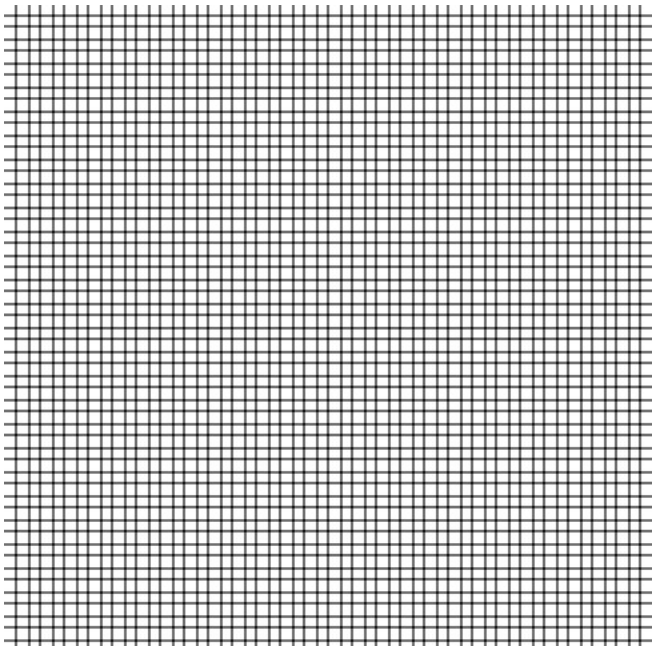
Here is the result of our 10% Horizontal displacement...

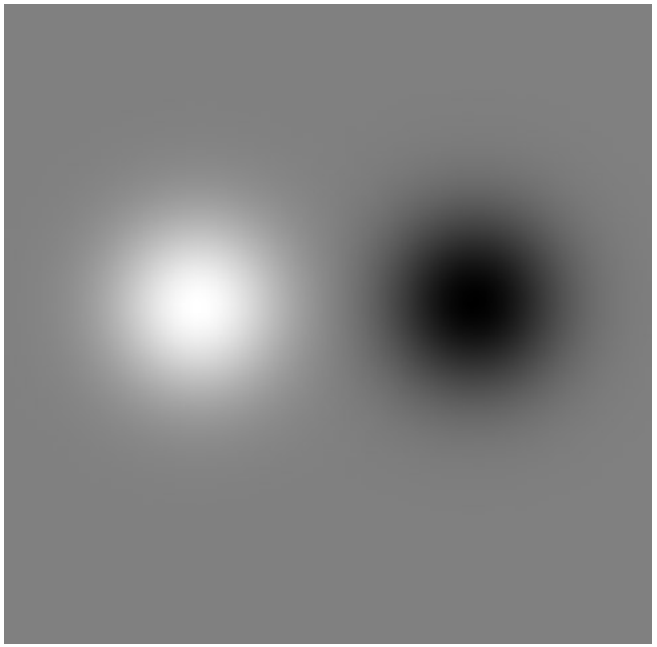
click to return

Here is a 5% Horizontal displacement that is perhaps a little more appropriate for the intensity of the bumps we've chosen for the effect.

The Mechanics of Displacement

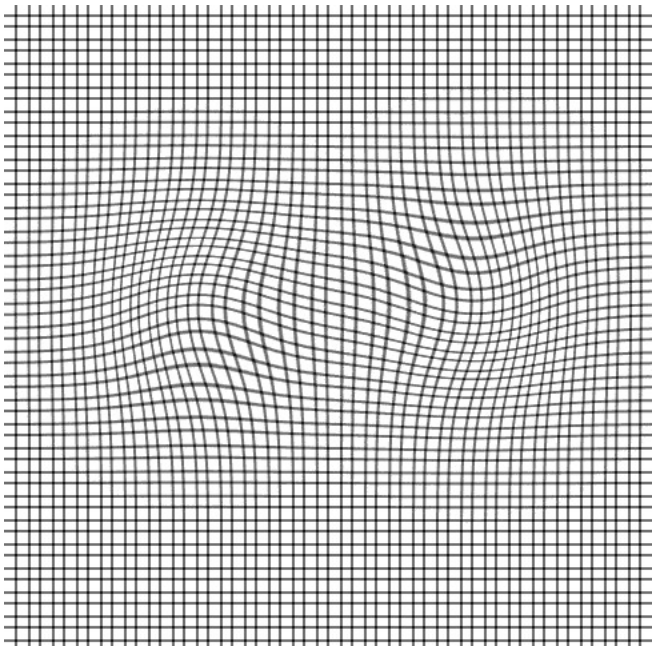
Let's examine how all this works. At the right we have a simple grid. Below it we have an image of soft white and black spots that we will use to distort the grid...

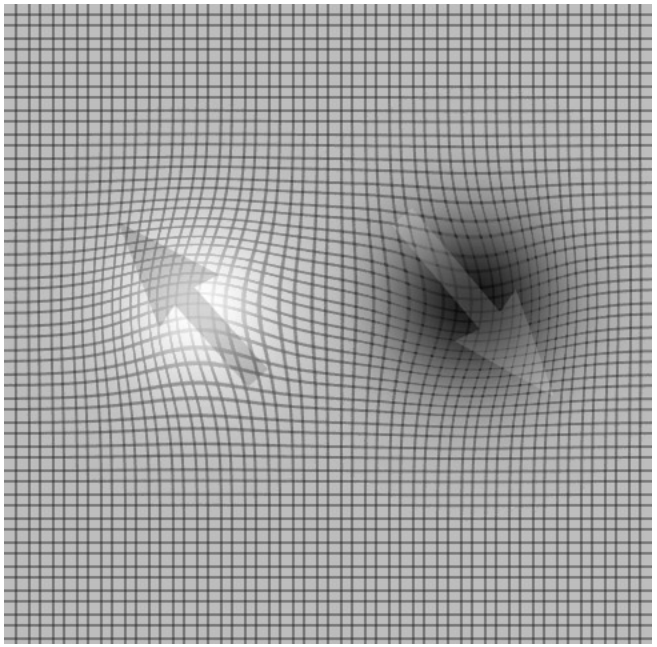




Single Channel Displacement

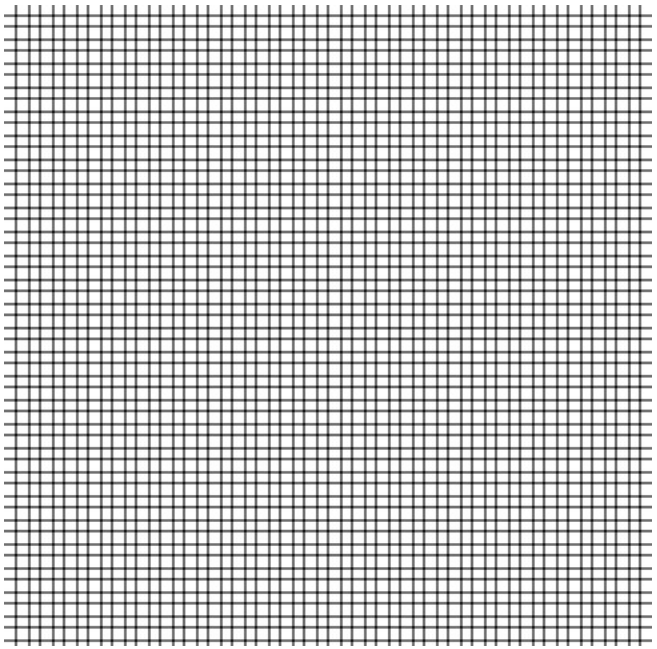
Here is the result of our displacement. This is a simple single channel displacement because the file that we used was a grayscale image that only contained light and dark information. We can see that light areas shift pixels up and to the left and dark areas shift pixels down and to the right - assuming that we enter percentage values for both Horizontal and Vertical Scale in the Displace dialog. We can imagine how a surface might have protruding areas that are light and receding areas that are dark because that follows normal lighting logic. This is why the bump image worked as both a lighting map and a displacement map.

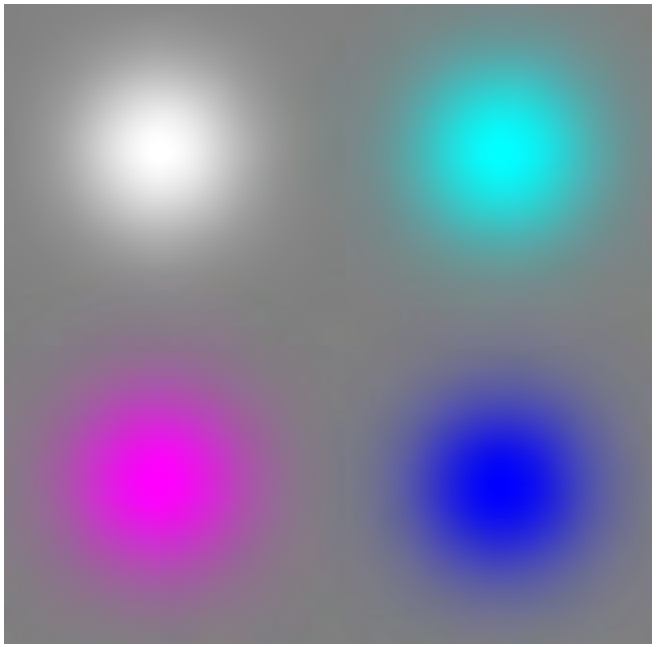




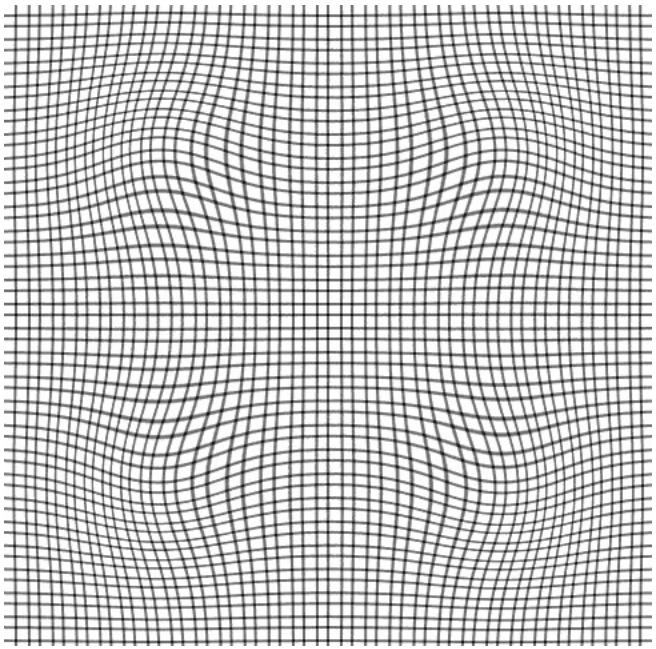
Multi-Channel Displacement

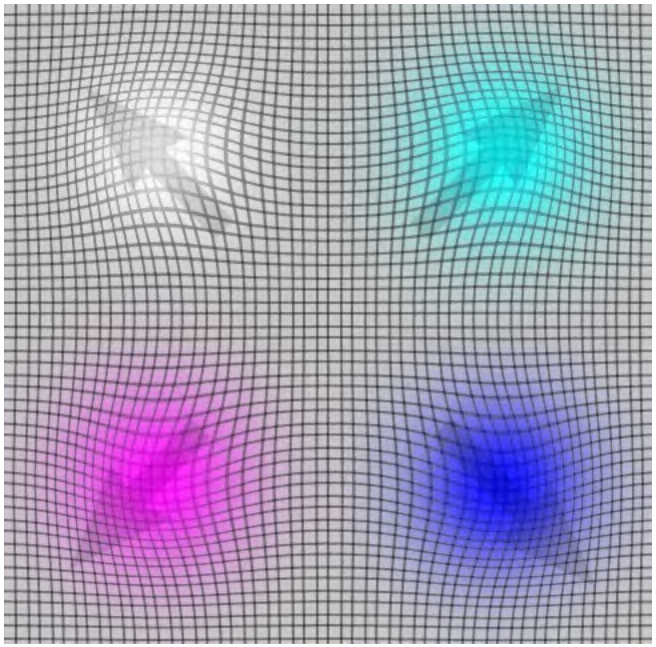
We can also use color information to distort the grid. Using the different values in additional channels allows us to shift pixels in more than 2 directions at once. Using the image below we will distort the grid in 4 directions...



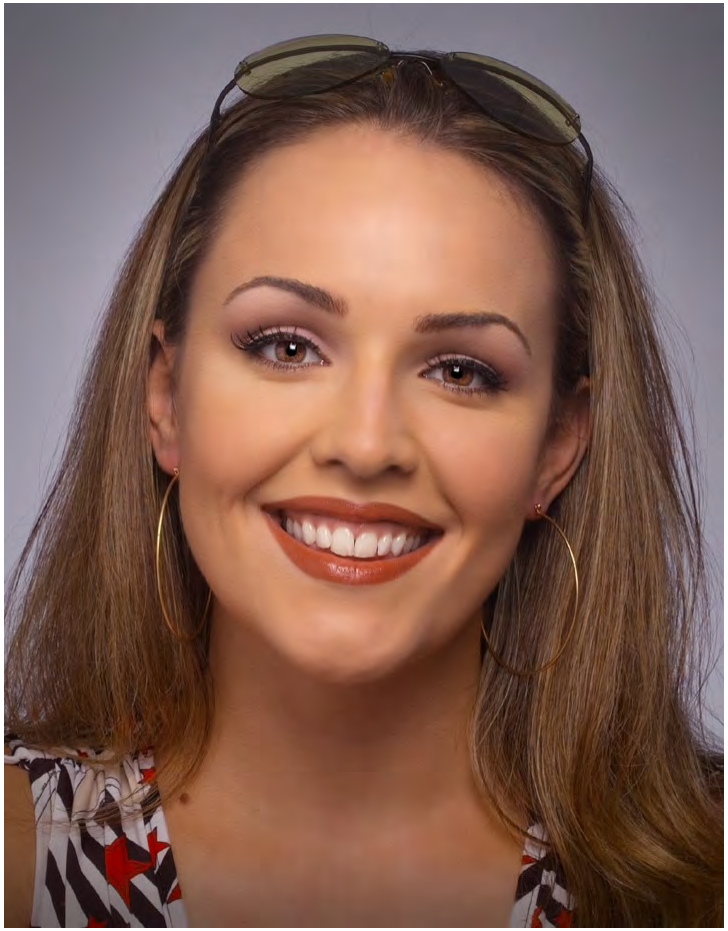


Here we can see that white shifts pixels up and to the left, cyan shifts pixels up and to the right, magenta shifts down and to the left and blue shifts pixels down and to the right. This is a bit more complicated and its also not clear how this kind of displacement relates to lighting direction. It seems, though, that Adobe intended the displace filter to be used for complex surface distortions that achieve a sort of shower door effect because all of the default displacement maps installed with Photoshop are of the multi-channel type...





Shower Door Displacements



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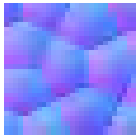

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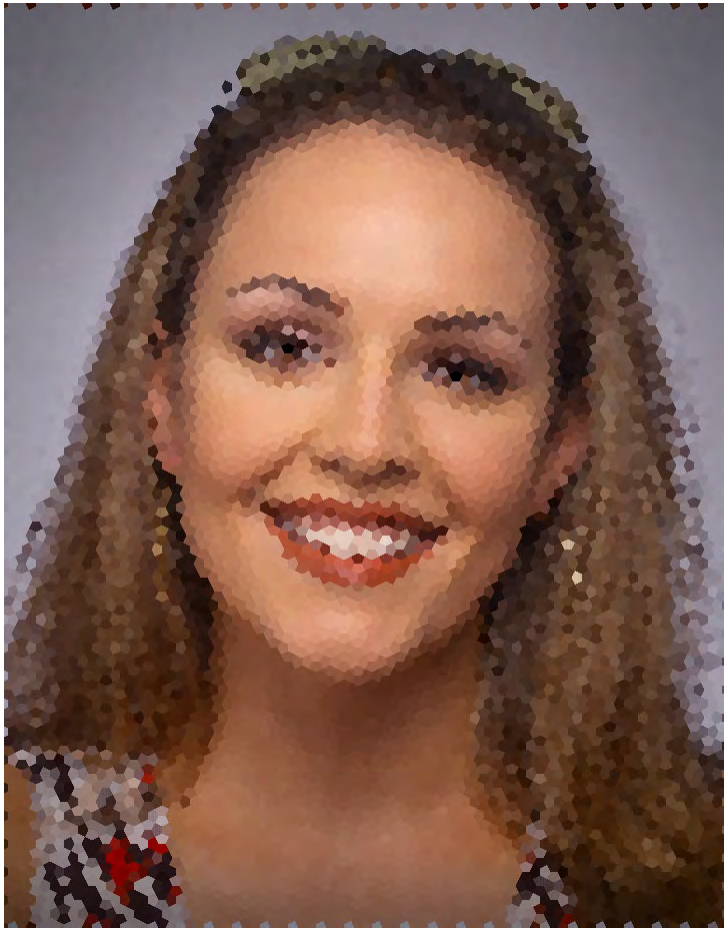


The set of default displacement maps are named with a suggested percentage value like the one shown here – Pentagons 10%. When you use these tiny files, set the "Displacement Map" to "Tile" instead of "Stretch to Fit" in the dialog. This results in a sort of impressionistic painting sort of distortion. Cute but ultimately not very useful. This is as far as most people get with displacement maps. We are after something entirely different however...

Practical Applications

I recently had an assignment to photograph a banner with a logo that was going to be used as a sort of "bug" (a graphic element, usually displayed in a corner of an ad and not part of the main composition) for some point of purchase ads for Fredericks's of Hollywood, a famous fashion store that specializes in sexy, exotic clothing.

The agency had a banner made up with embroidered lettering - we used this earlier for the bump image. The problem was that it ended up being the wrong color and the embroidering process left the banner wrinkled and unsuitable for use in the ad. They liked the lettering but asked me to shoot a different banner and composite the lettering over it.

I masked the original lettering, dropped it onto the new banner and used a grayscale version of the banner shot as a lighting map and displacement map to create the final composite. The following pages break down my actual steps...

Shoot & Retouch
original background

The first step was to take the photographs and retouch them.

A wide ribbon was used as the basis for a red banner. It was pinned/taped in place, shot digital with a Megavision S3 pro and a path created to knock out the background to white. Finally, the file was spotted, color corrected and a drop shadow was created in Photoshop.

Shoot & Retouch
original letters

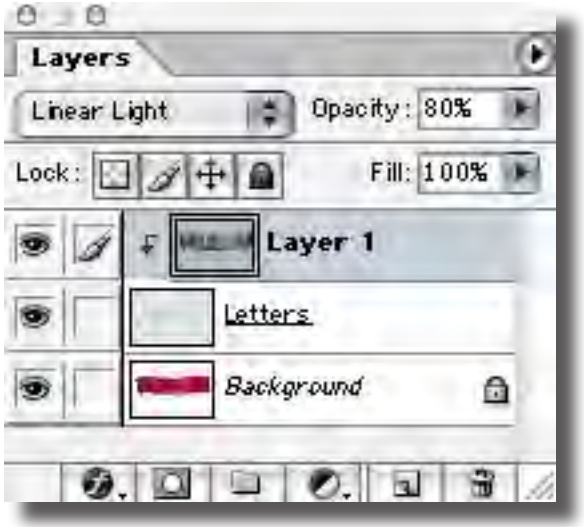
The embroidered lettering was photographed for maximum texture with a strong side light. This require that the exposure be equalized in Photoshop with a gradient mask side to side. The letters were then masked, isolated and placed in a separate layer against a red color similar to the ribbon photograph. That way the lettering could be evaluated better. Color and contrast was adjusted and minor spot knocking performed.

Drag Letters
onto new banner

The Lettering was then dragged onto the red ribbon image using the move tool.

Then the lettering was scaled and rotated with Free Transform (Edit-> Free Transform) to get it positioned properly over the ribbon.

Drag Gray Map
over new letters

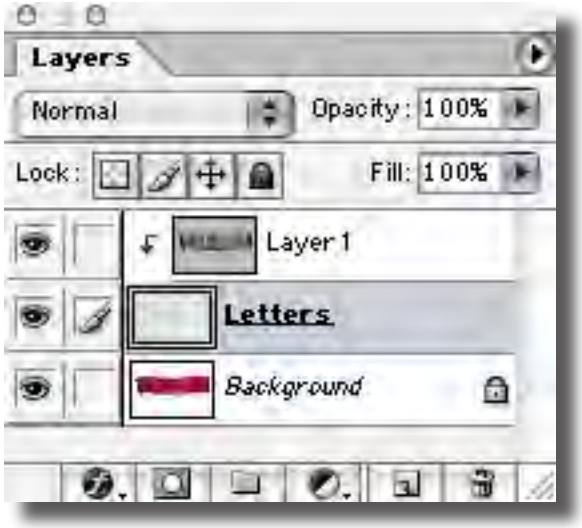


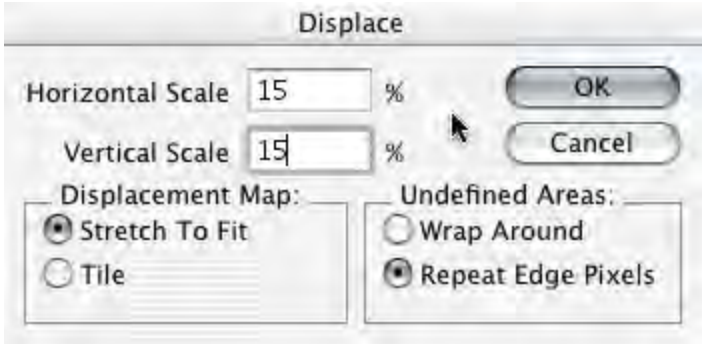
A grayscale version of the ribbon was created from the red channel of the image. This was contrast enhanced and darkened somewhat so that it could be used for the lighting map and the displacement map.

Special Note: any texture or grain in the displacement map can cause the displaced image to look ragged or jaggy. The image should be blurred with the Gaussian blur filter just enough to smooth out all texture.

This grayscale file was then dragged onto the composite image and grouped (Layer-> Group with Previous) with the lettering so it would not affect the ribbon. Finally the layer apply mode was changed to Linear Light.

Displace Letters





The grayscale document was then saved to disk so it could be used as a displacement map. The lettering layer was selected then the displace filter was run: Filter-> Distort-> Displace...

A couple of different scale percentages were tried before finally settling on 15% in both Horizontal and Vertical Scale.

Its usually a good idea to try several variations, simply undo (Cmd/control-Z) the filter and redo it. Try using different values in Horizontal and Vertical to see if you can come up with a better look.

Click to Displace

Click to Return

With just a little attention to detail very impressive results can be had. You can avoid the expense of creating "hero" products by using clean digital graphics and wrapping logos and labels around plain products.

Logo on a T-shirt

Here is another example of a fairly common request. This assignment was done as a favor for a friend of mine.

John is an archery coach and he wanted to start a new archery club to recruit students. He had a logo designed and had plans to silk screen some T-shirts. However, he wanted to get some images up on a web site for his new club before he had the T-shirts printed.

I took some pictures of him with one of his students (that's John on the right!) All I had to do was change the girl's shirt from lavender to white, remove the logo from John's shirt and place the new logo on both shirts – easy!

Once you know how to use displacement maps impressing clients with this kind of thing becomes routine...

L.A.X–10
TARGET ARCHERY CLUB

Editing the Displace Map

The photo was retouched and corrected to get plain white shirts on both figures - fairly straightforward. The trick with this image is in how you edit the grayscale map. Here I did a very simple grayscale conversion and Gaussian blurred at about 8 pixels. The most important thing here was brushing in a little more shape for the girl's breasts. The cast shadow on her chest would distort the logo in the wrong way so I had to illustrate the shape I needed with a large soft brush. Remember to save the new grayscale document to disk!

Multiply & Displace

Next, I dragged the logo onto the image re-sized and duplicated it so I could position the logo over both shirts. I then changed the layer apply mode for both logo layers to Multiply. The logo is on a white field so multiplying it blends it seamlessly over the white T-shirts. Now all I needed to do was run the Displace filter over the logos using the grayscale file I created earlier.

Glass Effect

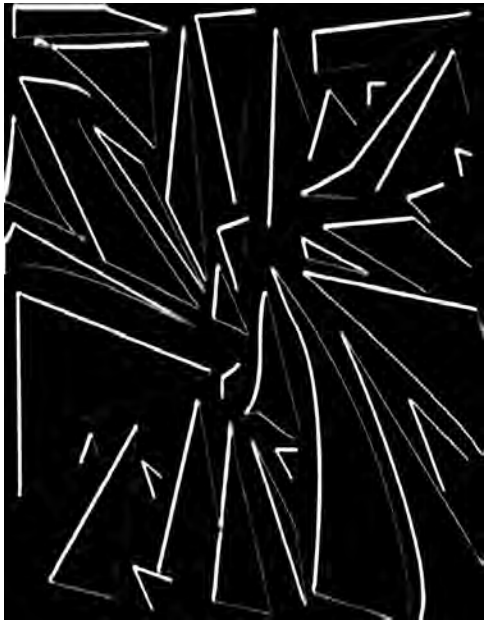
Our last example shows how displacement maps can be used for more complicated illustrative effects. In this case and illustrated "map" is used to create a shattered glass effect that displaces the image and creates the edges and drop shadows for the glass shards.

Shadows & Highlights

D-Map

Highlights

Shadows



Edges

The original Glass shatter image is the simple black and white illustration at the left. This was used as a starting point to generate the highlights, drop shadows and edges files. These variations were created by layering blurred/offset copies of the original and using different apply modes to generate the results. All of these files have been sized to match the CoverGirl image.

Original

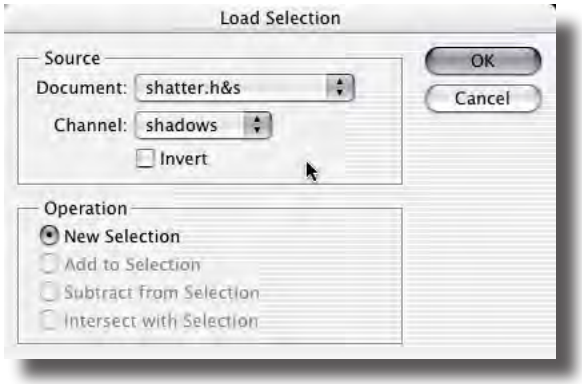
All of the operations used to create the final version can be done directly on the original document but its still a good idea to duplicate the original background into a new layer and do the work on this duplicate layer.

Open the various grayscale documents of the shattered glass so that you have all of them open at the same time. The first step is to perform the image distortion with the Displace Filter...

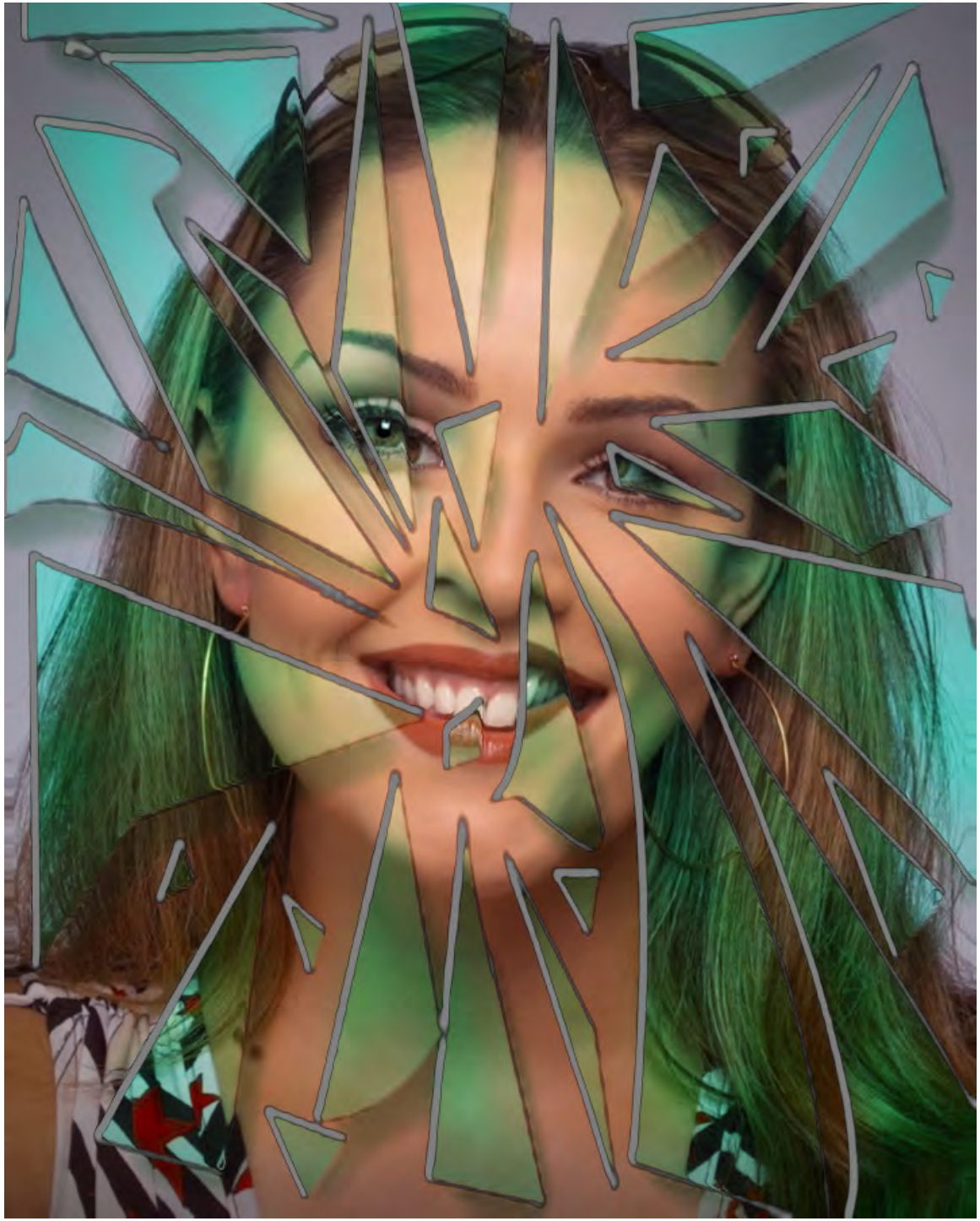
Displace

Filter-> Distort-> Displace... set Horizontal and Vertical Scale to 10% and open the "shatter.dmap" file. This produces the expected result at the right...

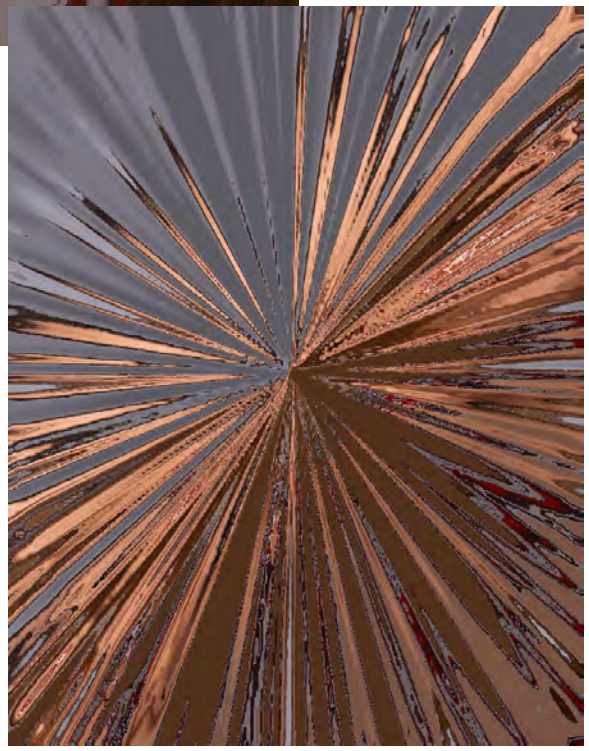
Highlights, Shadows & Edges



Now all you need to do is load selections from the open grayscale documents for highlights and shadows. Use the highlights selection to prepare a "curves" adjustment layer that shifts the color of the image. Next load the shadows selection and apply a "curves adjustment that creates the darker green shadow for the glass shards. Lastly, you can simply "shift-drag" the "Edges" document onto the image and change the apply mode to "Difference" – adjust the opacity to suit! The illusion of glass shards is complete.



Kai's Wacky Maps



As a final indication of the potential of displacement maps I've included some of Kai Kraus' original KPT tips "Displacement Maps" on the CD. These are a collection of small multi-channel "maps" that can be used to create some truly extreme distortions. Mostly these "maps" are intended for use at large scale percentages like 100-500%. Use the files as "tile" Displacements to create unique "shower door" style distortions or apply them with "Stretch to Fit" to create cool "fun house mirror" effects! I've used the "Star Explosion" map (seen at right) as the basis for numerous slit-scan style zoom explosions, star bursts and super novas. I've also included a couple of other odd little maps that I've collected over the years - have fun with these

Conclusion

Image distortions created with the Displace filter can have a wide range of applications. The examples given here really only scratch the surface of what's possible. The most obvious use in distorting an image to conform to a surface can be utilized a number of different ways.

Reflections in water can be simulated using a grayscale version of the water image to distort the image you want to reflect into the surface of the water. Displacement maps can also be used to create unusual textures by using very small "maps" in "tile" mode. The uses are only limited by your imagination so stretch a little and play... you never know what you may discover!

Varis PhotoMedia Tutorials

Thank you

I hope you enjoyed this tutorial. The techniques outlined here represent just the tip of the iceberg. Photoshop is a very deep application - a person could spend years studying it and there will always be more to learn. If all this seems a little overwhelming, take a break, do what you feel comfortable doing in Photoshop and return to this tutorial again later on. Often, it takes several weeks for a particular technique to sink in so give it time.

I have other tutorials available online (navigate to the methods section), some are free and some are available for a modest charge. See tutorials and some examples of my work at:

http://www.varis.com

There are many learning resourses available on the web - here are a few other sites with good information:

http://www.russellbrown.com

http://www.creativepro.com

http://luminous-landscape.com/

http://www.imaging-resource.com/HOWTO.HTM

http://www.photoworkshop.com/

http://www.adobe.com/misc/training.html

http://studio.adobe.com/expertcenter/photoshop/main.html

http://www.ledet.com/margulis/articles.html

http://www.steves-digicams.com/

http://www.photoshopuser.com/

http://www.handson.nu/

http://photoshopgurus.info/

Thes last two links are typical of the majority of Photoshop tutorial sites - they are focused on cool graphics effects not photography. You might want to look over this material anyway - sometimes you can learn alot about basic functions in Photoshop.

I'm always trying to improve these materials and I'm always open to your feedback. You may contatct me via email at:

varis@varis.com

best regards, Lee Varis 2003