

FRINGE EFFECTS

By Tom Coates ☰☱☲

**Oh, what a tangled web we weave
When first we practice to deceive!**

--Walter Scott, 1808

This column's topic is weaving. I'm using the term to refer to any technique where layered objects are intertwined in regular fashions to produce unusual textures and designs. There are a host of interesting woven effects that are producible within Canvas. Playing with these effects leads to a better understanding of the tools available to you.

If you look closely at a piece of cloth, you realize that its seemingly two-dimensional surface is actually a complex three dimensional surface that results from a regular inter-

change of two (or more) materials. There is a continuous swapping of foreground and background. This is an "Escherian" process that you can use to create images that have visual interest and aesthetic appeal. Such techniques are also useful if you are trying to draw realistic three dimensional images.

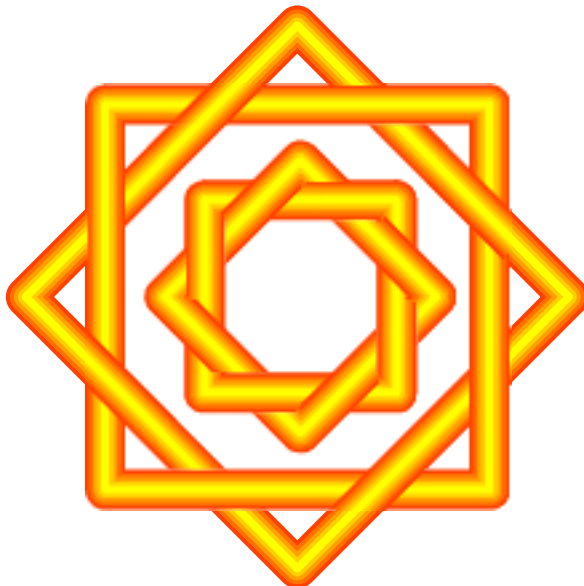
Some warnings... The techniques I'm going to use here are heavily Sprite-Transparency dependent. That means you'll need at least Canvas 6 to try them. The techniques are what I'd call intermediate to advanced level. I'm not going to spend a lot of time explaining "how to" on every step. But I hope a beginner can learn a bit too.

Now on with the show...



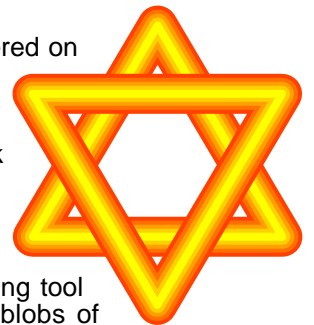
Over and Under

Below is an example of a seemingly simple geometric image, which is actually quite complex. Clearly there are four squares, which have Neon strokes for their edges, and no fill ink. The interest comes from the fact that the normal canvas layering order seems to be a bit confused. You'd be hard pressed to describe what's on top of what. One square will dive under its mate at one crossing, and



then pass over it at the next. Surprisingly this is a relatively easy effect to achieve. For variety's sake I'll demonstrate this with equilateral triangles, but the technique is exactly the same.

Start with two triangles, one centered on top of the other. Use the transparency palette to give a channel transparency mask to the top object. The default 72dpi mask resolution is okay. When you add the mask, you are immediately put into painting mode, where you can paint transparency onto the object. Use the Marker painting tool with a wide brush to drop three blobs of transparency onto the intersections where you want the top triangle to dive below the bottom one.



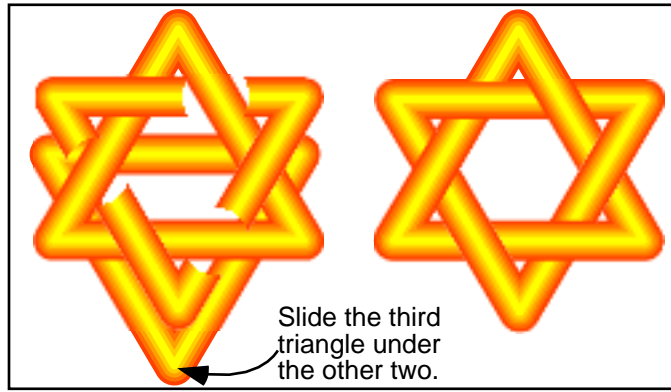
You can start to see the weaving effect at this point. You can also notice a problem. The erased areas leave some conspicuous gaps that aren't very pretty. The initial temptation is to start over and use a much finer brush when applying the transparency. That



would be tedious, even on this small an image. Fortunately, there's an easier way to clean things up.

Make a third triangle that matches the top triangle. Remove its channel mask and move it below the first two objects in the stacking order. Make sure it is below both of them! Slide it around until it lines up with the original "top" object. If this is done correctly, you end up with the bottom triangle precisely filling in the gaps, exactly where needed.

Understanding how this works takes a bit of thinking, and is a bit difficult to put into words. We now have three triangles, top, middle and bottom. But the top and bottom ones represent the same



"physical" object. Sometimes we want it to appear above the middle triangle, and sometimes below it. Using transparency on the upper one makes the lower one visible in the desired locations, so it can dive under the middle object. Now that was clear! Wasn't it?

Fortunately, the effect is a lot easier to implement than to explain. In practice, I create the three stacked objects before I start applying the transparency effects to the top one. It's pretty amazing when you start painting, as one section after another smoothly changes from *over* to *under*. If you accidentally overdo it, you can restore the original layering with undo, or by painting white onto the mask.



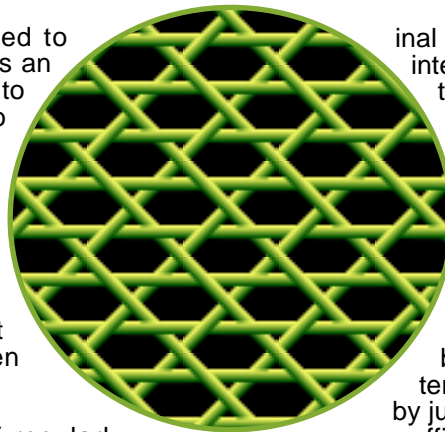
Weaving Textures

The same basic technique can be used to make more complicated patterns. Here's an example where I used a woven image to create a texture ink. The idea was to create an image with vector objects and then render it into a "tile" for use in the texture palette.

When creating geometric textures I find it useful to start out big, with a good snap-to-grid setup. This lets you get things aligned easily. Precise alignment across a large image is essential when making textures.

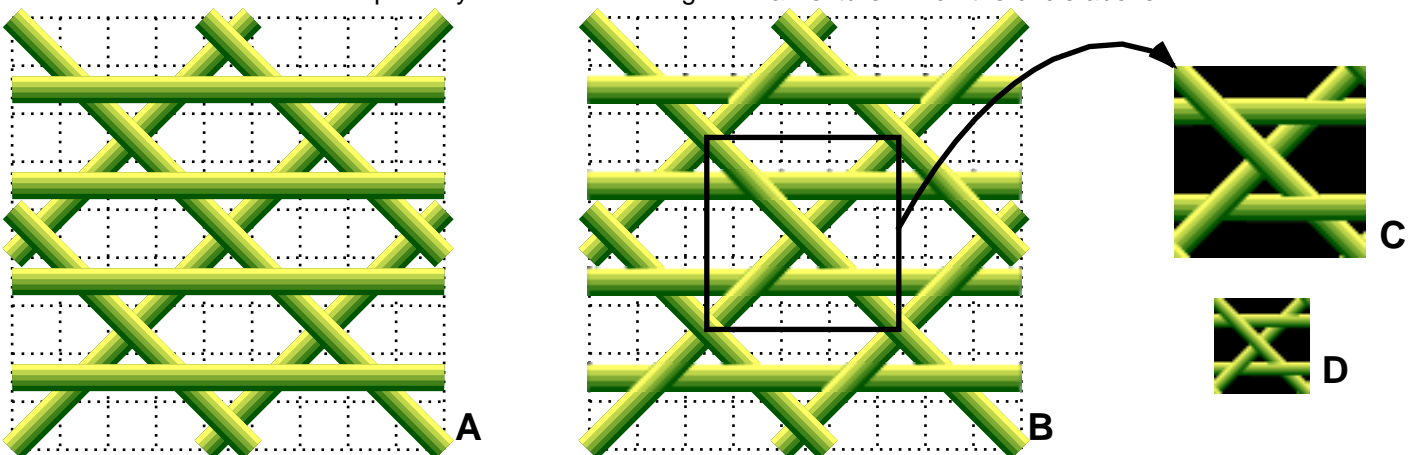
In this example, I started with sets of regularly spaced partial-neon lines (**A** below). I arranged the stacking order of the lines so that each direction seemed to be on a separate layer, but I did not use separate Canvas layers.

Once I had the starting materials, I began the weaving (**B**). I used the same technique I showed in the first example. This was a very organized process. I examined the image looking for places where an intersection needed to be flipped from *over* to *under*. When I found one, I duplicated that line, and moved the duplicate below the rest. I then added a transparency channel to the orig-



inal line, and erased around the appropriate intersections. Once you get used to this, it takes surprisingly little time. In this particular case, only the horizontal bars needed masks, and there were only two intersections on each one. After four easy operations, all the lines were tied together instead of being stacked like logs.

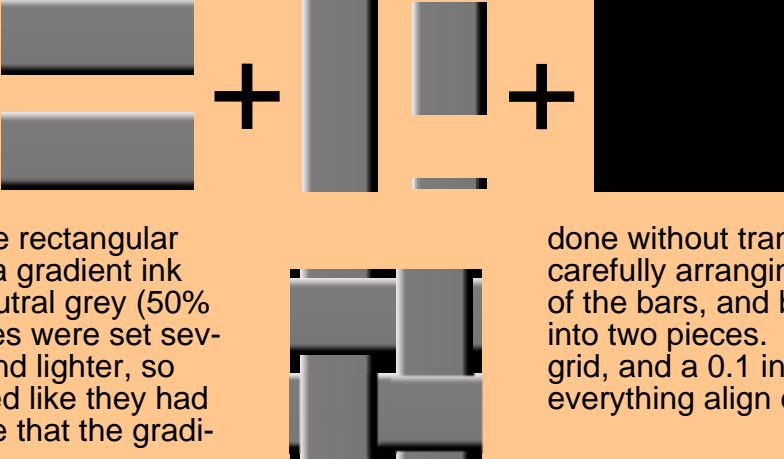
The only part left was to extract a paint object tile from this image which could be used as a texture ink. Clearly, the pattern could have been extended to any size by just increasing the number of lines. But it's more efficient to find a rectangular region that can be repeated over and over. Extracting a tile is just a matter of noticing what's called the "unit cell" and grabbing one. For this example, the cell is exactly one inch on a side. In image **B** I've outlined such a square but it could actually be positioned anywhere in the image. I rendered all the sticks (over a black background) into a single paint object at 72ppi. Then I used the Image>Crop command to extract exactly a 72p by 72p section, as in image **C**. Despite the jagged look of the cell edges, copies of it can be repeated in a grid and the edges line up perfectly. Image **D** shows a half size reduction which was used as a Texture Ink on the circle above.



Weaving Other Objects

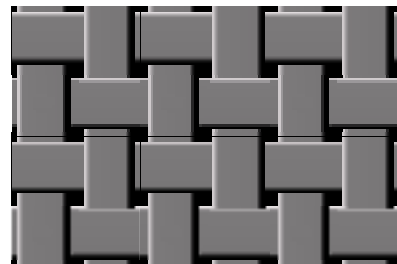
So far we've seen techniques for weaving objects, and creating woven textures. But it is also possible to use the same basic idea in combination with other Canvas tools to produce some striking visual effects. This example uses one of my favorite tools, the Hardlight Transfer Mode to apply a woven texture to a separate object.

The woven part was assembled from the vector objects shown here. The unit cell was made to be an exact one inch square. The rectangular bars were filled with a gradient ink which was mostly neutral grey (50% black). The two edges were set several shades darker and lighter, so that the objects looked like they had rounded edges. Note that the gradient was rotated 90 degrees for the second set of bars.

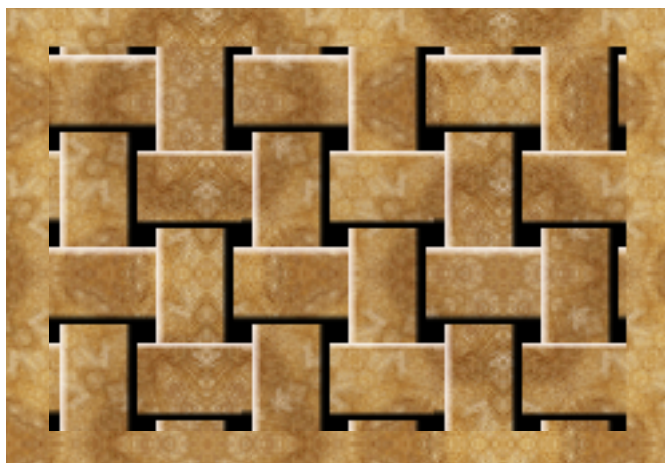


The weaving in this case was done without transparency effects, by carefully arranging the stacking order of the bars, and breaking the last bar into two pieces. Using the snap to grid, and a 0.1 inch grid setting let everything align easily.

Once the 6 pieces were arranged, they were grouped together into a single tile object. Six of these were duplicated into an array of tiles. The whole thing was grouped into a single object. A reduced size version looks like the image to the right. Notice how the edges all line up nicely. There are no gaps. This is a tribute to the precision layout techniques that Canvas provides. Using a grayscale color scheme makes this a pretty boring looking item, but fits perfectly with its intended use as a *texture map*.



A grayscale texture map, assembled from six individual woven tiles.



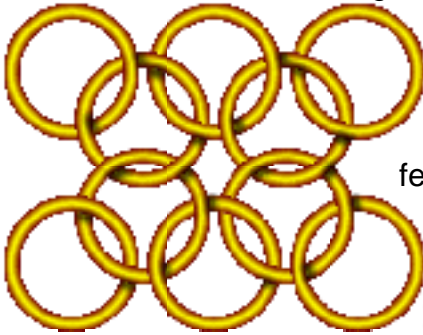
The grayscale texture map was Hardlight superimposed over the Texture Inked rectangle to combine the woven relief with the underlying object.

The woven texture object was then placed over another object. In this example, a simple rectangle with a texture fill was used. Then the woven group was selected and the Hardlight Transfer Mode invoked on the Transparency Palette. The grayscale object stopped being a normal visible item, and switched to being a modifier of the target object below it. Neutral grays in a texture map had no effect on what was below. Lighter grays lightened the target, while darker grays darkened it. Full black areas resulted in full black in the result. The final image is a very realistic simulation of a complicated physical object.

Once you have this sort of item in your toolbox, you can use it lots of different ways. Anything (photos, vector objects, text, etc.) can be woven just by putting it under the texture map. Creative possibilities abound.

Linking Rings

For our final foray into weaving, I wanted to do something involving linked rings. I started out with something obvious, using neon stroked circles, and performing the same over-and-under tricks I showed in the early examples. The results were interesting, especially when I



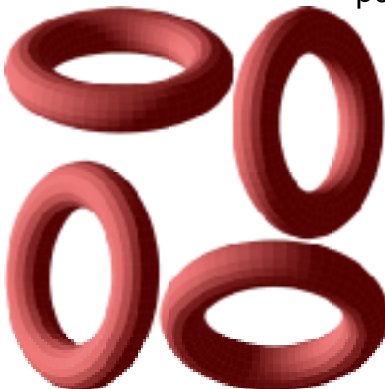
applied some shadows at the intersections. But this really wasn't all that different from what I've already shown and it just didn't grab me. I was disappointed that the rings

seemed too flat. The neon shading wasn't realistic. Real rings would be tilting back and forth, and, in fact, would have to be bent if this image represented real objects. I wanted something that was a bit more realistic.

So I turned to the Canvas Extrusion tool to make some more realistic links. If you've used the extrude tool, you know that it doesn't exactly make photo-realistic objects. But they were good enough for what I wanted since I was planning to reduce their size later. All of the smaller scale images shown here were first done at full size, rendered, and reduced by at least 50%. Scale reduction hides a multitude of sins.

I should say right now that what I'm about to show took lots of paper sketching to figure out what I wanted and several tries to get it right

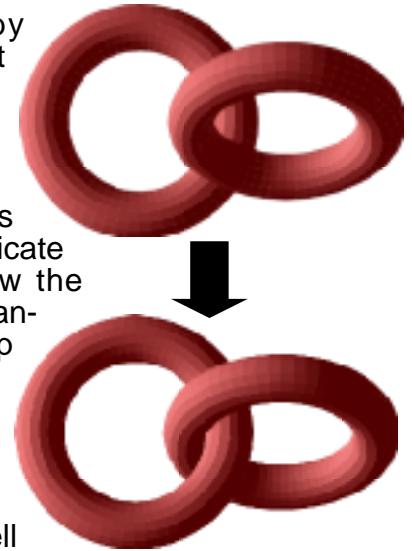
I started with a 0.5 inch diameter circle. This was circularly extruded to get a torus (donut shape) that was 2.5 inches across. From my sketches, I knew I wanted room for four other rings to fit through the middle and the pattern I had in mind required that the opening be three times the thickness of the ring.



Once I had a shape and color I liked, I duplicated it to produce four other rings and tilted them in different directions. The tilt-

ing was done with the same light source settings in the Extrude dialog box. This kept the apparent light source direction the same on each ring to enhance realism. These five rings became the raw materials to be duplicated and linked.

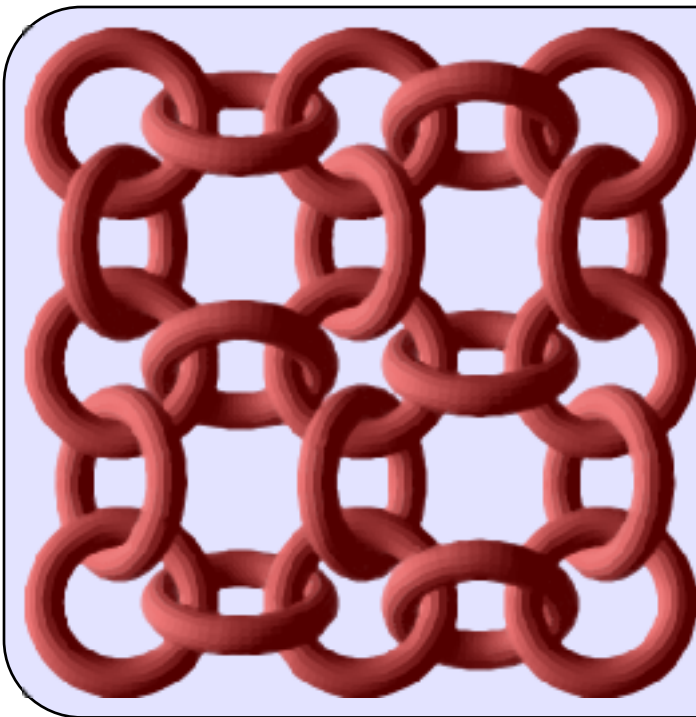
I initially started by linking in one ring at a time to get used to how this was going to work. I used the exact same technique as shown earlier. Duplicate the top object below the other two. Add a channel mask to the top object. Then erase the portions you want to dive under the other. As you can see, this works on extrusions as well as it does on regular objects.



Once I got the hang of this, it was just a *simple* matter of grabbing a link with the right orientation, and attaching it to the growing assemblage. Actually, it rapidly became quite confusing. I had duplicate extrusions and channel masks coming out of my ears. Canvas had no trouble keeping track of things, but I quickly lost control. I eventually had to start over with a more regular process.

I ended up putting down several grouped sets of rings. I started with an array of flat rings and grouped them together. Then I placed all of the tilted rings together in another group. It turned out that the effect I wanted could be achieved entirely by erasing portions of the flat rings, so a single transparency channel mask *on the group* was able to handle the entire job. Instead of 21 rings, plus duplicates, plus multiple channel masks, I ended up working with the tilted ring group, two copies of the flat ring group, and a single channel transparency mask. This made the problem a lot more manageable. In the end, it came to just erasing portions of the flat rings in a single paint operation.

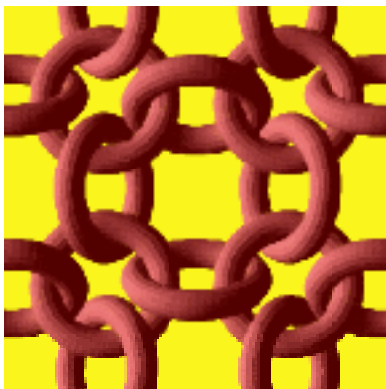
You can see the final result on the next page. It's significantly more realistic than the linked neon rings could ever hope to be.



Chain Mail Chew Toy

Here's the result of linking 21 extruded rings in various orientations. The flat rings formed the foundation. These were laid down first and grouped into a single object. The tilted rings were positioned over that. All of them were grouped and moved below the flat rings. A channel mask was applied to the flat ring group and various pieces were erased to link the two images. The 40% reduction shown here smooths out the roughness of the extrude tool.

Once I had the rings linked in the pattern, I was almost done. The image above was very nice, but I wanted a chainmail texture. What I had could obviously be extended as far as you had patience and Canvas RAM. But that's what Texture Inks are for. In order to use those, I needed a unit cell tile. Just visualizing this took some effort, and I ended up extending the pattern a bit to make a cell more obvious.



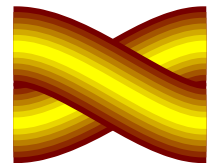
I then rendered the entire assembly, and cropped to get the tile I wanted. I also added a colored background prior to rendering. The final image was reduced and dropped in the Texture Ink palette.

You can see the result as part of the title image on the first page of this article.

Several items are worthy of note on a project like this. Start BIG. Reduce to final scale in a single operation when you are done. Use the Canvas alignment tools (grids, guides, align-objects palette) to get things precisely lined up. You can't make repeating tiles unless things are lined up carefully across the entire image. Do lots of sketches ahead of time. Plan on making a few false starts. Often it is necessary to experiment. Then throw away results that didn't work, while keeping the knowledge you gain.

Some Exercises for the Student.

I know that was supposed to be the final example, but I have to mention one more thing. While writing this column I needed some separating bars between sections. In keeping with the topic, I thought of some twisted ropes. Using the same weaving techniques, I was quickly able to generate some patterns that could be spliced end-to-end to get what I wanted. Transparency effects weren't needed in the end, though they helped to work out the process. A tile looks like the image shown here. If you want a project to test out these techniques, try figuring out how I got that.



And if you want to get fancy, you can try extending those techniques to make the ropes below.

