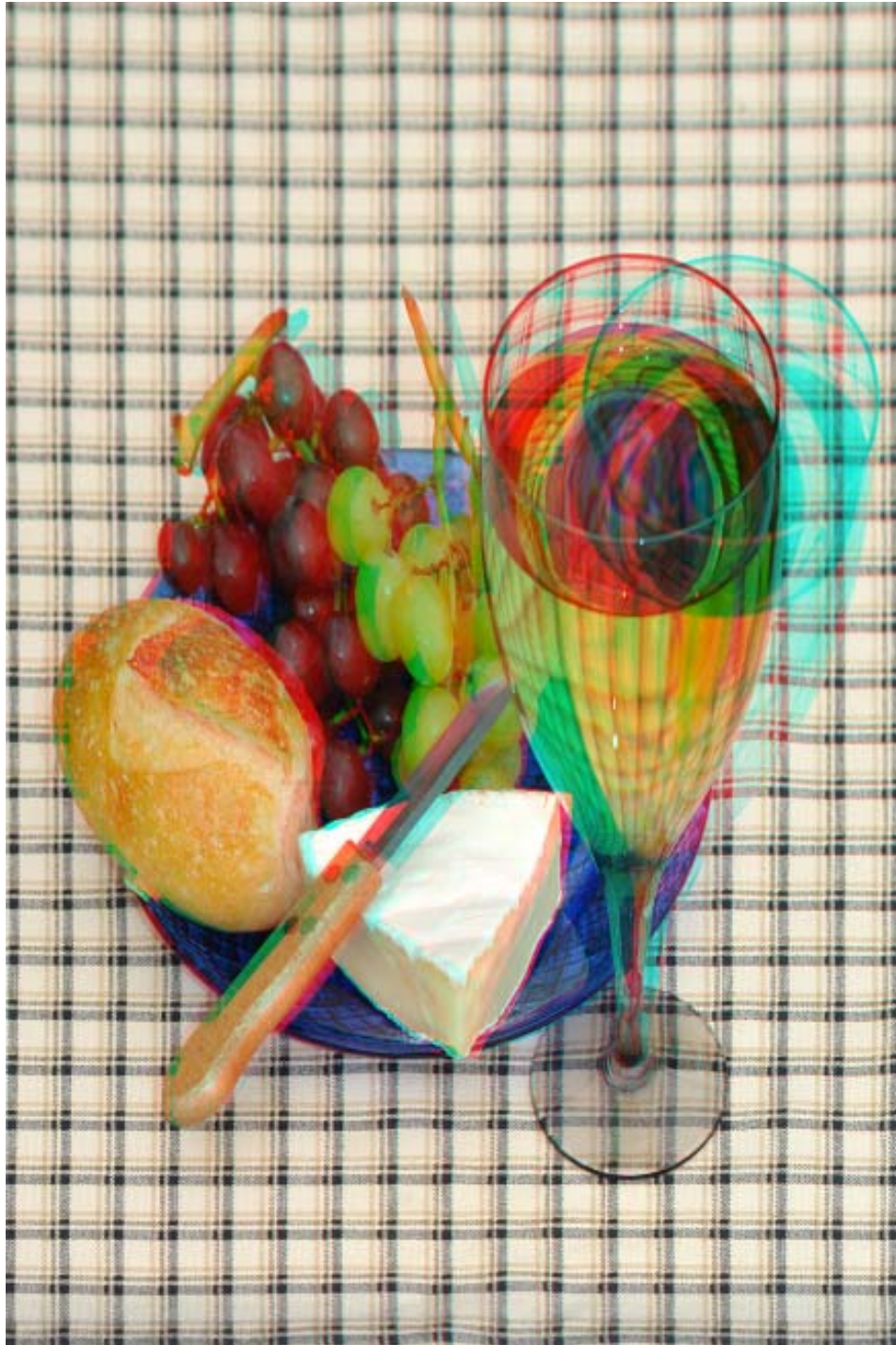# Shooting and Processing Photographic Phantograms

by Barry Rothstein

Introduction

Please don't take this tutorial as the last word on phantograms. It is merely a primer from the perspective of one phantogram artist. Use this article to get started, but more importantly, experiment to create and develop your own techniques.

My own introduction into creating phantograms came from Steve Hughes at the 2004 NSA Convention in Portland, Oregon. You can find this tutorial online at:
        http://shughes.org/phantograms/nsa_2004_phantogram_workshop.htm

Shab Levy is also well know for teaching phantogram techniques. You can find him at:
        http://www.gravitram.com/stereoscopic_photography.htm

The goal of a phantogram is to provide each eye independently with the same information it would get in ordinary viewing of an object or scene. In this way it is approached primarily from an information science point of view, in an attempt to mimic normal vision.

The differences between a phantogram and traditional stereogram are:
1) While the subject of a traditional stereo image can be shop from any vantage point relative to its backdrop, a phantogram's subject is always shot from an angle relative to its backdrop.
2) In a phantogram the effects of perspective (things closer appear larger and things farther away appear smaller) are adjusted to normalize the image into its true proportions.
3) In a phantogram the stereo windows for both the left eye and right eye images are identical.

A photographic phantogram can be shot either with film or digital cameras, but no doubt you'll find it much more efficient with digital cameras, as you'll need digital files of your images to manipulate in Photoshop.

A still life phantogram can be shot with a single camera. A live-subject or in-motion image will require a stereo film camera or a pair of synchronized film or digital cameras.

Phantograms are most typically viewed in anaglyph form (red/cyan 3D glasses), but are certainly not restricted to that viewing technique. They can be viewed as a stereo pair either by freeview or with a viewer, or crossviewed.

They are, of course, best viewed from the same angle as the original placement of the camera, and as such viewing them straight on may provide a cool 3D image, but they won't pop as they should when viewed properly from an angle.

There are a couple of active patents involving the commercial use of phantograms. This tutorial will not delve into their merit, but rather will just show them. If you're producing phantograms for your fun or your own purposes they won't apply to you. If you're doing them for commercial purposes, they're something to think about. The following appears on all my commercial projects:

Chapter 1
Shooting Tabletop Phantograms

For this exercise I'll assume you have a regular digital camera mounted onto a slide bar that is mounted onto a tripod. If you're using a film mono or stereo camera or digital stereo camera soultion, the same directions apply, but you'll use one of your camera's viewers to determine center position, and then slide the camera(s) over to obtain the shot described below.

A good slide bar is an an essential tool for phantograms, allowing you to position your camera into three essential positions: center, left, and right. You can purchase an excellent slide bar for under $100, or else make one for very little. My first book was shot entirely with a home-made slide bar constructed for under $10 from aluminum sliding door track driled with holes and secured with a simple nail. It's also helpful to have a lefel on your slide bar. If your slide bar doesn't have one, buy the cheapest level you can find (usually under $2) and break it out of its outer support casing to use on your slide bar.

The interocular distance (IOD) between the left and right marks you'll be using should be normal eye interocular (approximately 2.5 inches) if you plan to print the images at true life size. A simple formula for proper IOD for phantograms (supplied to me by Boris Starosa) is:
IOD=Real Size divided by Print Size times 2.5
For example, if your stereo window is 16" wide and you plan to print the image 8" wide, IOD should be 16 / 8 x 2.5 = 5". If you're shooting something that's small and plan to print it much larger, you'll want to decrease you IOD proportionally.

That said, I've shot a grat number of phantograms at the normal eyewidth of 2.5", blown them up larger, or reduced them down to the size of thumbnail shots, and even while not presented at proper proportions, they still pop and are great fun to look at.

Assuming you may want to produce anaglyphs of your final images, consider the subject and backdrop of your image you're shooting. You'll want to avoid most reds (orange, pink) and the specific cyan you see in modern anaglyph glasses. Darker reds and blues are highly acceptable. Greens and purples work well, as do organic browns, grays, tans, etc. Metalic colors often make for very dramatic and beautiful anaglyphs.

Another issue to consider is ghosting. In all anaglyph imagery, the greater the contrast in your subject (i.e. a zebra), or the greater the contrast between subject and backdrop, the greater the ghosting. As such it's good to avoid high contrast images. Depth of field is another important consideration when making adjustments on your camera's exposure time and aparature settings.

Your backdrop for a tabletop phantogram will be a horizontal surface. You could use a blank sheet of white or colored paper, a tablecloth, placemat, etc. Textured backdrops are often interesting. If your backdrop is not already rectangular, such as a sheet of paper, onto the surface you'll need to impose some order in the form of a rectangle of known size. This cam be accomplished

by laying a book or other rectangular object onto your backdrop and tracing around it with a marker, or by laying down masking tape at the corners. The size of the rectangular "grid" you use depends on the size of your phantogram. This rectangular grid is your stereo window.

Eventually you will lay the subject onto the backdrop, and start to position the camera and backdrop. Generally I make the camera stationery and adjust the backdrop, but it could be done the other way.

Put your camera into the center position of your slide bar. Angle your camera downward toward your subject and stereo window, perhaps at a 45 degree angle, more or less. There is no restriction as to precise angle for a phantogram, but generally I work somewhere between 30 to 60 degrees. If you're inclinded to be scientific about it, you could measure and record the angle, and the distance from your camera to your stereo window.

The subject of the shot should be placed toward the from of the stereo window (closest to the camera) From the "eye view" of the camera, the subject must fit entirely within the stereo window, preferably with a little room to spare. If it doesn't fit, you'll need to shoot from higher up at a greater angle, or create a larger grit/stereo window, or use a shorter subject.

Assuming your tabletop is level, make sure your slide bar (while angled toward the subject) is horizontally level. Next I'd recommend that you

Basic camera setup for a tabletop phantogram. The tripod is atop table, but it could be on the floor.

regular trapezoid

Left-eye shot of the subject   *Centered view of the subject*   *Right-eye view of the subject*

lock down the position of your camera on the tripod and tape your tripod firmly to the floor to prevent it from being bumped and moved. A camera with a big viewer is a huge plus. With the camera in the center position on the slidebar, move your backdrop until the stereo window appears as a "regular trapezoid" on your camera's viewer, as perfectly centered as possible, with both the bottom ant top horizontal elements perfectly horizontal. Zoom in and out to check for this. For greatest accuracy you could take test shots, viewing and verifying its "centeredness" in Photoshop and making minor adjustments, reshooting ests until it's as close as possible to perfect. At that point tape down or in some way secure your backdrop to it won't be bumped or moved.

You're almost ready to shoot. Move your camera to the right and left positions on your slide bar. From each position make sure your rectangular grid/stereo window is entirely within your camera's viewer and that your subject falls entirely within the stereo window from both angles. Take the two shots. Be consistent in always taking the right shot first and then the left (or vice versa to your preference). As you're already set up with your camera and stereo window, move your subject to get other views, and/or bring in other subject pieces.

Keep shooting and experimenting with different subjects, exposure and aperature settings and lighting elements. The most interesting composed phantograms generally have a range of vertical disparities, high spots, low spots, and in between.

Chapter 2
Shooting Outdoors or in Other Surroundings, and Verticle (Wallmount) Phantograms

Chapter 1 dealt with shooting objects on a tabletop, and this chapter will take up shooting outdoors or in other surroundings, and verticle (wallmount) phantograms.

In all cases the same basic rules apply. You must define a rectangular plane to contain your stereo window, center your camera/s on it, and take the shots from an angle.

Let's begin with outdoor shots on the ground. As a phantogram madman I own a great number of metal picture sides. These are fairly light weight, screw together at the corners, and set up quickly, providing me a rectangle in a couple of minutes. I purchased them at Aaron Brothers frame shop (also available at Michael's crafts stores, and other places). My collection of these contains sides includes 8", 12", 16", 18", 20", 24", 30", 32", 36", 48" and 60". I'd not recommend running out to buy all of these but I just want to show you the potential your mania may reach.

Another important tool is a level, or better yet, several tiny levels. Buy the cheapest levels you can find (usually under $2.00) and break the working parts out of their outer supporting casings. It's always good to carry a few of these with you.

Natural rectangles exist all around us, including segments of the sidewalk, indoor and outdoor tiles, and many others. Once I lay down a patio table top down onto the ground, and marked the corners with golf tees, and I've done similar setups laying down a cardboard box and marking corners with twigs.

The size of your rectangle should depend primarily on the size of your primary subject and whether it's stationary (i.e. a piece of sculpture or a potted plant) or likely moving (i.e. a child or animal).

If your subject is anchored to the ground (i.e. a flower or shrub) you'll need to build the rectangle around it. Otherwise try to lay your rectangle on fairly flat level ground. You'll want the top of the rectangle and bottom of the rectangle to be level (the sides of the rectangle need not be level). To accomplish this you may need in some way (i.e., rocks, sticks) to prop up its corners if using frame sides as I do. Most of my frame sides have "legs", wooden molding pieces held on with screws and wing nuts to allow me to adjust the height of corners of the frame when on uneven terrain.

The rectangle becomes your shooting zone, your stereo window. Now it's time to set up your camera. The angle of the camera relative to the plane of your shooting zone could be 45 degrees, but precision in this is only as important as you want it to be. Experimant at first somewhere between 30 to 60 degrees. As you progress try shallower or steeper angles. If your tripod has a level on it, be sure that it is level. If not improvise one. If the front of your rectangle is level, the back of your rectangle is level, and your camera is level, you're chances will improve vastly.

Next, the following must be true:
1) Visually your subject/s must fit entirely within the rectangle.
2) The rectangle must fit entirely within the viewer of your camera/s.
3) Both statements 1 and 2 must be true for both the left and right shots.

As described in section 1 (tabletop phantograms) you'll want to position your camera so that your rectangle is as perfectly as possible centered within your camera's viewing window. You can best do this by zooming in out, attempting to see both the top and bottom of the rectangle are centered.

As a reminder from segment 1, the interocular distance (IOD) is best if based on the size of your shot compared to the size you'll be printing (IOD = Real Size / Print Size x 2.5"). That said it's no tragedy to make your best guess with IUD, the shot will still pop. Having established a good center point, your actual right eye and left eye shots should be equally off center from the center of the rectangle. You're ready to shoot.

Vertical Setup
Left-eye image

Vertical Setup
Right-eye image

Outdoor Horizontal Setup
Left-eye image

Outdoor Horizontal Setup
Right-eye image

Next let's consider a wall mount verticle phantogram. Conceptually it's very simple. Again I use my picture frame sides, in this case suspended from above or perhaps between two trees or posts. Another approach is a piece of paper mounted on that wall acting as your rectangle, and the subject mounted on the wall in the middle of the paper. Again, all the same rules apply. You'll position your camera/s down low so they're angled up (alternately there could be a shot angled down, i.e. a drinking fountain shot).

In a portrait shot with suspended frame sides, the person will most likely (although not necessarily) be positioned behind the frames sides in some way reaching through. In your image the frames sides will be flush with the wall, with that behind it seeming in the wall and that reaching through projected out of the wall. Try it, these are fun.

Chapter 3
Processing Phantograms

Chapter 1 dealt with shooting objects on a tabletop, chapter 2 with shooting outdoors or in other surroundings, and also included verticle (wallmount) phantograms. This chapter will deal with processing them in Photoshop CS. From what I understand any version from Photoshop 7 up has the needed perspective crop tool.

If you've been careful in the setup and execution of your shots, this is by far the easiest part, simple and formulaic. I'll go through the steps with a recent nature shot, using picture frame sides for reference, so adjust the words in this tutorial to suit whatever you used as a rectangular reference.

Start by loading the original left and right images. You will work each of these independently, correcting for perspective and size, doing exactly the same thing to each image. There are two steps in this process. Let's suppose we start with the left image.

Step 1: Crop out everything except your reference frame

Make the image larger to fit in the screen (Ctrl 0). To widen the working space for the image, grab and drag one or both edge of the image. Using the Crop tool (third one down on the left) at first click on the bottom left corner of the reference frame, drag to the top right corner and let go (which corner you start with and end with doesn't matter so long as they're diagonal opposites). In doing so you've selected what for now is a rectantular area of the image. The bottom of the rectangle should be fairly close to the corners of the bottom of the reference frame, and the top of the rect-angle will be considerably outside the corners of the reference frame. The selected rectangle should have a square node in each corner and you'll also see center nodes. The portion of the image not included within the selected area will darken. (Illustration 1)

Near the top of the screen a properties bar for the Crop tool will appear, including a checkbox for Perspective. It is essential that you check the Perspective checkbox. You only need to do this
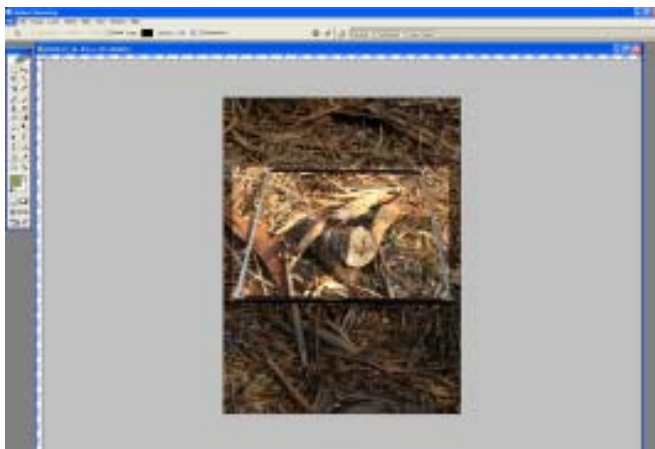

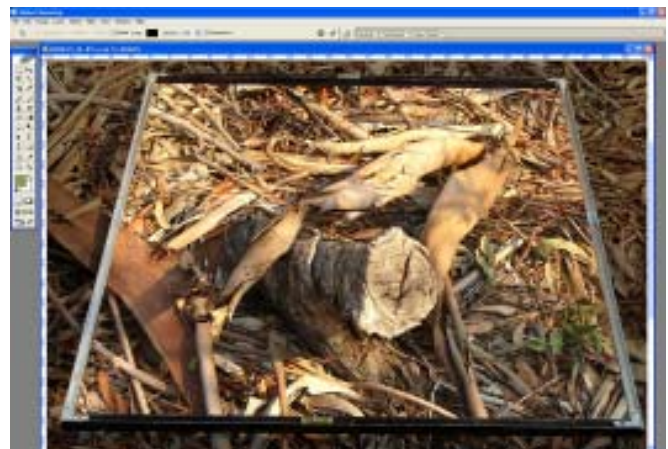*Illustration 1 -- Initially define the crop area*

Illustration 2 -- Refine the crop area to corners of the reference frame

once, as it will stay checked in all your workings unless you at some time uncheck it.

Place your cursor over each corner node, click and drag it to the corners of the reference frame. Then zoom in by hitting Ctrl + two or three times, so you can get a close view of each corner and refine your positioning of the node. Once you've got all four corner nodes placed perfectly into the corners (Illustration 2), hit the ENTER key. Everything outside of the selected area will disappear leaving you only the reference frame and what's inside it. The size and shape of the resulting image could be very odd, overly long or wide. Expect this, it's no problem.

Step 2: Resize the image to its actual proportions

From the selections at the top, choose Image and then Image Size (Illustration 3). At the bottom left is a checkbox for Constrain Proportions. Uncheck this (make it blank). Then in the Document Size area, enter the size of your actual reference frame. Below you can enter whatever resolution you want. If your reference frame sides were large, i.e. 48" x 60" and you choose 300 dpi, it will take a considerable time to render this and save it to a very large file size. Make the resolution adequate for good print quality at the size you expect to print.

Next, do exactly the same thing with the other image. After this you should probably Save As both the left and right altered image, careful to do so with a different file name. Always keep the original images intact. Congratulations. You now have a phantogram stereo pair.
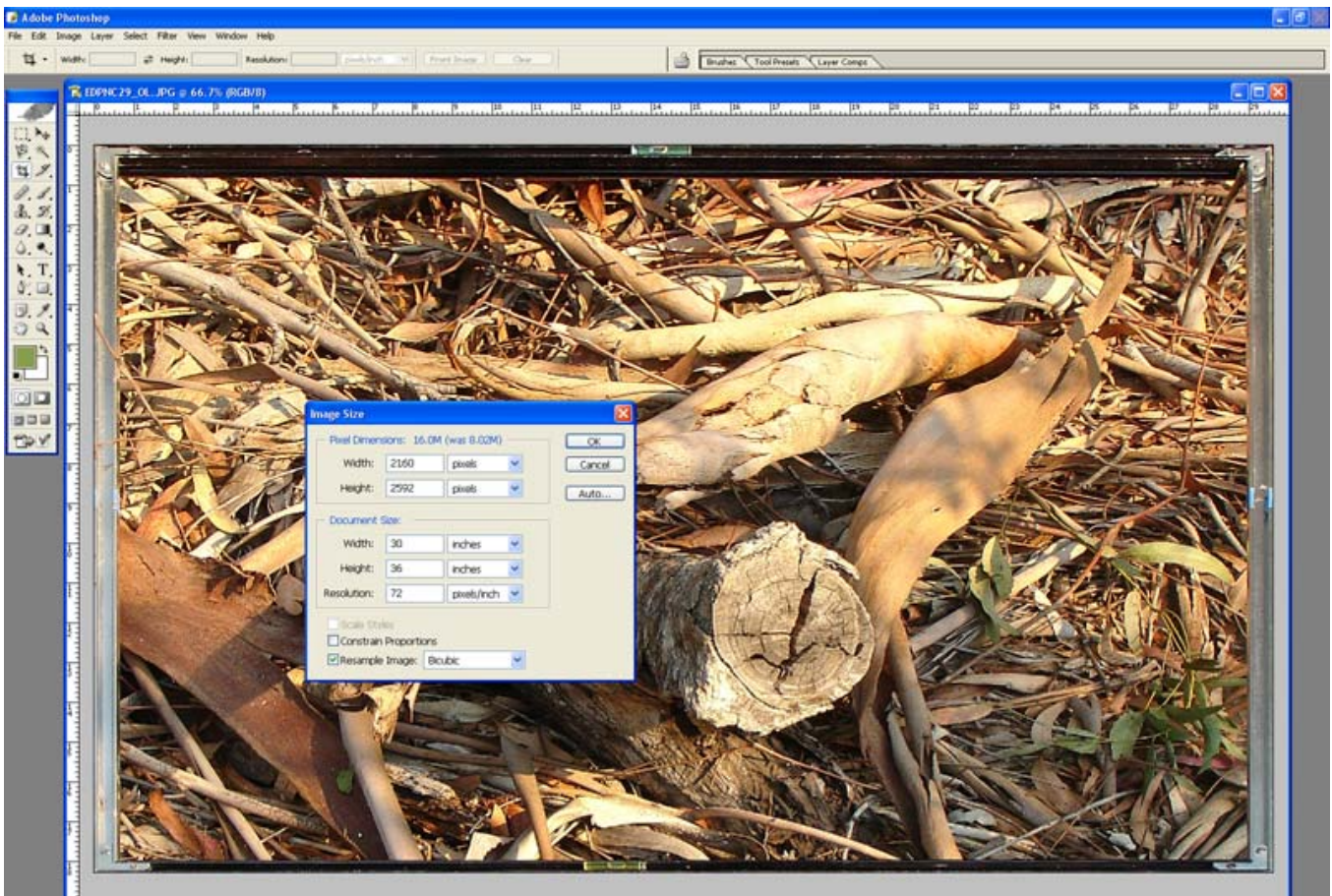

Illustration 3 -- Resize the image to original proportions

Chapter 4
Producing an Anaglyph from a Stereo Pair

If you want to make an anaglyph from them, here's a fairly quick approach. Thanks to Ray Zone for teaching me this.

Open the Channels window by selecting from above Window and Channels.

You'll see rows labeled RGB, Red, Green and Blue. You'll see columns with eyeballs (which channels you wish to see), pictures, color selections, and shortcuts.

One at at time select each of the left and right images by clicking anywhere on it. Click on the word Red in the Channels window. Then click on the eyeball box to the left of RGB. By doing so for each image you will have selected the Red Channel, but to see all channels (Illustration 4).

Having done so with both images, next click anywhere on the left image to select it. From the choices at the top, click on Select and then All (Ctrl A).

Using the Move tool (arrow icon, top right) click anywhere on the left image, hold down, and drag it onto the right image (Illustrations 5 and 6).
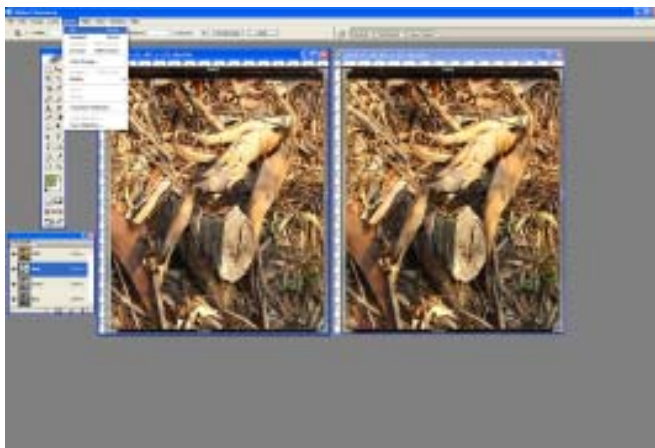

Illustration 4 -- Select red channel & see all in both images
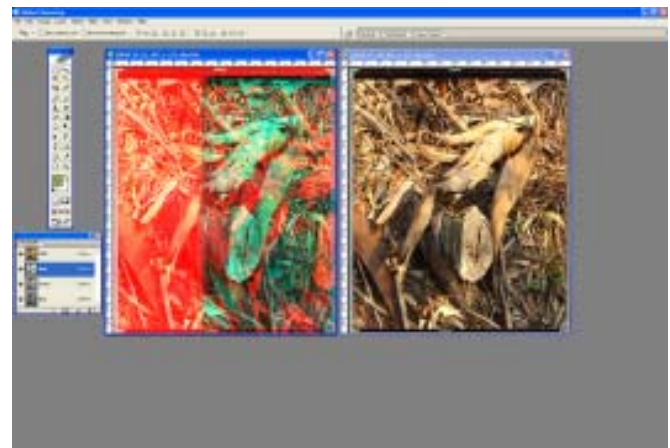

Illustration 5 -- Drag the red channel of the left image onto the right image

Now working on the right image, continue to drag it so that it covers the entire image. You should see a dotted line all the way around the image.

Effectively what you have done is to leave the blue and green channels in the right eye shot as they were, but replace the red channel of the right shot with the red channel of the left shot. Voila, an anaglyph. The last step is to select RGB in the Channels window and then using the Rectangular Marquee tool, crop out the reference frame. Enjoy and share you phantogram. Say WOW!
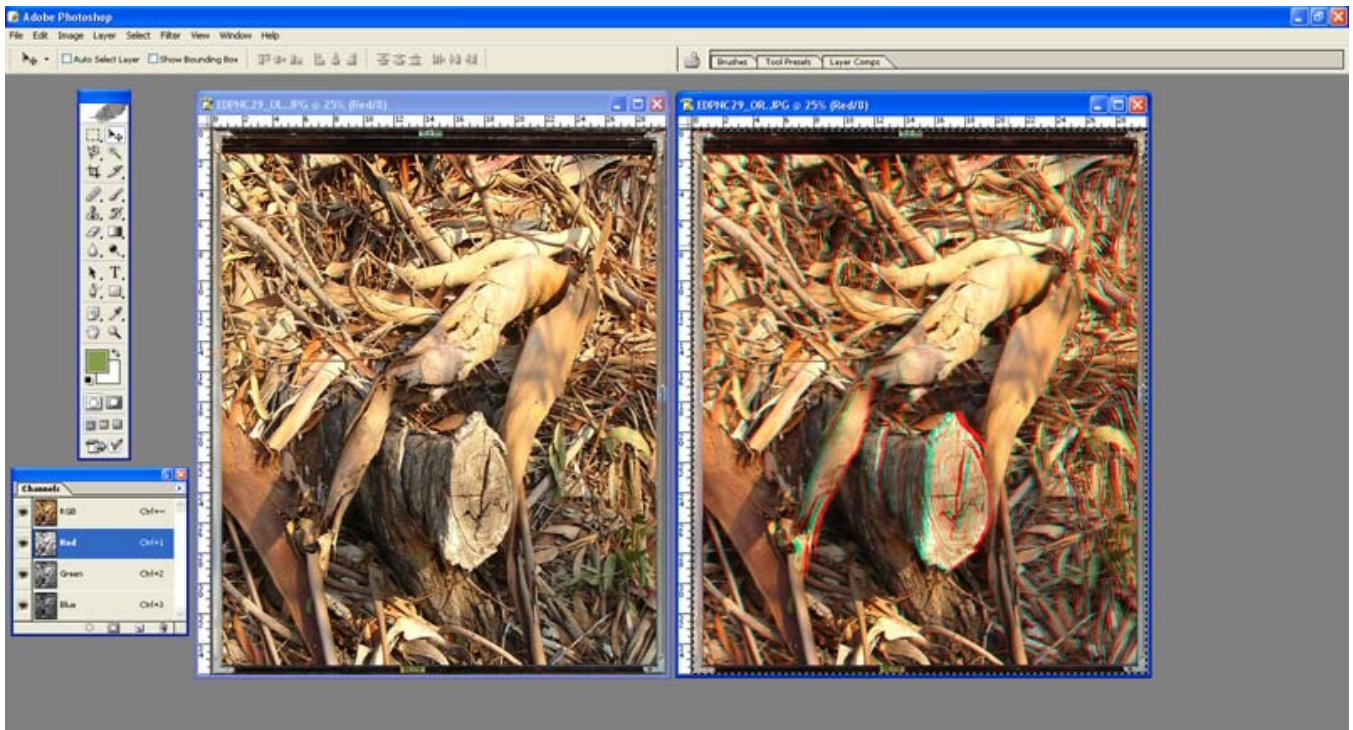
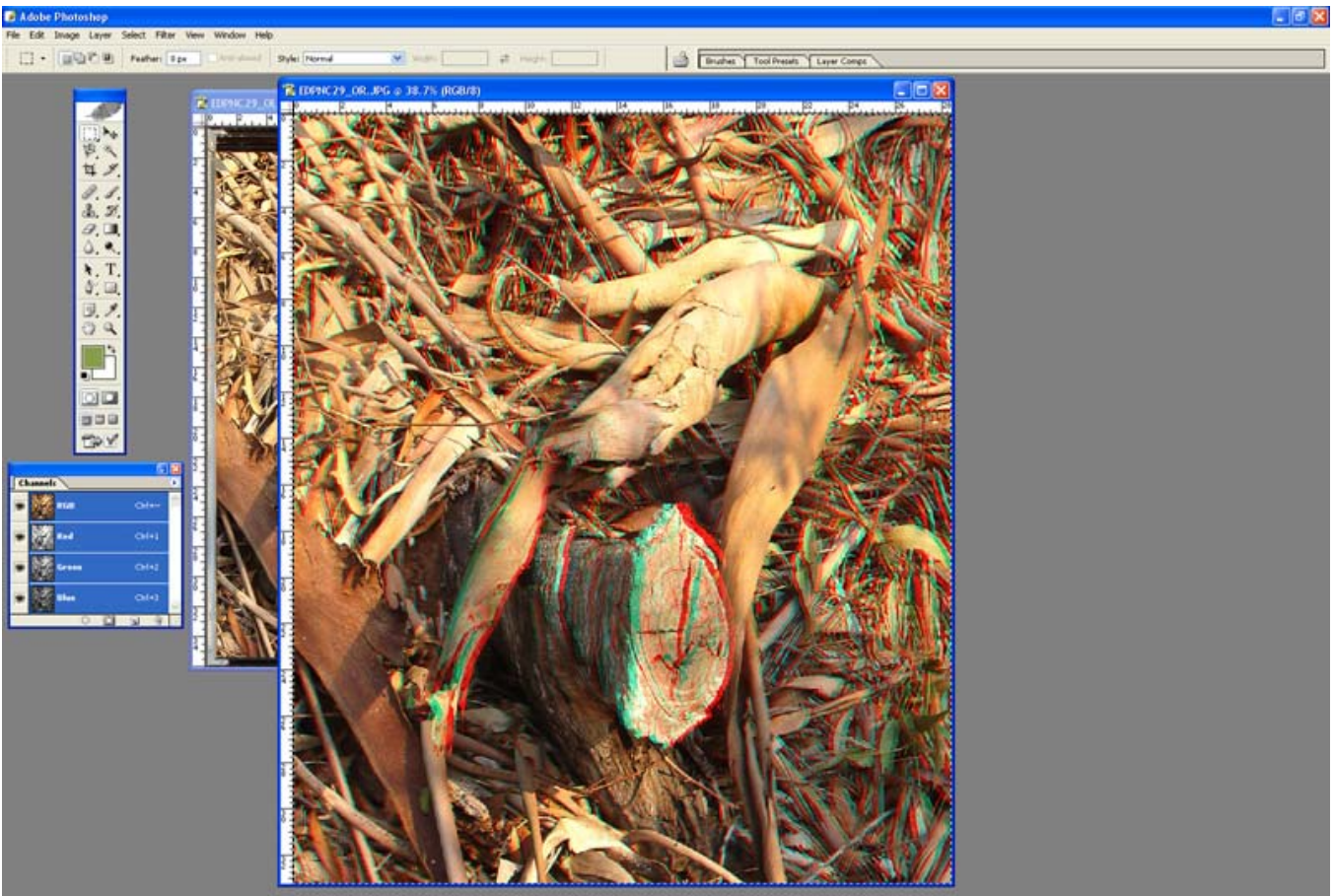*Illustration 6 -- Red channel of left images has replaced red channel of right image*

Illustration 7 -- Reference frames are cropped out. Final image.