

Downloadable assignment, Winter 2004

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Constructing Color: Using Color Separations and Photoshop Layers

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Techniques to Explore

Can recording the various colors in a scene on different pieces of film be used to create a unique, full-color image?

This assignment uses traditional black-and-white film and digital technology to investigate the basic principles behind color photography and imaging. While working on this assignment, you will explore: how black and white film sees color; how filters work; how color film works; the beginnings of color theory; using Photoshop Layers to create a full-color image.

Overview of Assignment

1. Find a scene in daylight and expose each one with the filter set.
2. Make careful notes of which filter was used for each exposure.
3. Process the film.
4. Make a contact sheet and identify the filter used for each frame.
5. Scan a set of three negatives at the same size and resolution.
6. Manipulate and combine the files using Photoshop to create a full-color image.

Part 1: Making the Exposures and Processing the Film

Equipment needed: 35mm camera and 1 roll of Kodak Tri-X black-and-white film. Tripod. Three filters: red, green and blue. Cable release. Light meter or gray card, if necessary.

Find and expose several scenes using the Tri-X film rated at ISO 200. Shoot in daylight only; do not shoot under artificial light. Use the tripod and cable release to ensure that your composition does not change from shot to shot. When you are sure of your composition, expose the scene through each of the filters separately. Make two sets of exposures for each scene, for a total of six shots. Leave a blank frame between each set of negatives.

Each shot of a scene should be exactly the same composition since you will superimpose the negatives later. Take care not to move the tripod at all between exposures, especially when changing the filter. Make complete and careful notes as you make the exposure. Your notes will help you identify which frame was shot through which filter.

Process the film and make a contact sheet. Using the notes you made while shooting, identify the filter each negative was shot through. Mark this information directly on the contact sheet or on a separate reference sheet.

A Note on Exposure Compensation

The exposure must be adjusted to compensate for light blocked by the density of the filter. If you are using a through-the-lens meter (like on most 35mm cameras), the meter will automatically calculate the necessary compensation. If you are using a handheld meter, increase the indicated exposure by the amount shown below:

Filter Color	Filter Number	Filter Factor	Stops	Alternate Filters
BLUE (prints yellow)	47B	6	2 2/3	n/a
GREEN (prints magenta)	58	8	3	61 – 8 – 3
RED (prints cyan)	25	8	3	29 – 8 – 3

Part 2: Reassembling the Color Separations Using Photoshop

Scanning the negatives

Scan each color separation negative exactly the same way.

1. Adjust the scanner settings to make a grayscale file that will be 6 x 9 inches and 300 pixels per inch, assuming you are using a 35mm negative. If you have scanned correctly, the file size will be very close to 4.64 MB. If it is not, check your settings and do it over.
2. Include the color of the filter used to make the negative (red, green, blue; or R, G, B) in the name of the corresponding file. Save each scan twice in Photoshop (PSD) format, once as a working file and once as a backup.

Converting the Red scan to the Cyan layer

Each layer is converted to the color of the filter's complement. That is, the Red scan becomes the Cyan layer, the Blue scan becomes the Yellow layer, and the Green scan becomes the Magenta layer.

1. To prepare the Red scan to show the Cyan information, open the file shot with the Red filter. If it is still a negative, select the Image > Adjust > Invert menu option to make it a positive.
2. Convert the grayscale file to RGB color by selecting the Image > Mode > RGB menu option.
3. Create a new layer by choosing the Layer > New > Layer menu option. Name this layer CYAN in the dialog box.
4. Select the color for this layer. Open the Color Swatches Palette by selecting the Windows > Show Swatches menu option. If you let the cursor rest over a color square for a moment, a pop-up label will appear to identify the color's name. Find and click on "CMYK Cyan" (located in the upper left area). The foreground color in the Color Picker will change to this color.
5. Make sure that the new layer "CYAN" is active. Select the Paint Bucket tool and fill the layer with Cyan. The entire image area will be obscured with color.
6. Open Layers Palette by selecting the Windows > Show Layers menu option, if it is not already open. Change the Blending Mode from Normal to Screen (using the pop-up menu at the palette's upper left). This option blends all tones in the original layer with a proportional amount of cyan, leaving white areas white. (To see a different effect, try setting the the Blending Mode to Multiply, then change it back.)
7. You have now produced the equivalent of the cyan dye layer in a conventional color photo print or the cyan ink image on a printing press. Save the file and leave it open.

Converting the other scans to their respective colors

Covert the other scans to their respective color layers. Repeat the steps as above, but with the following modifications:

9. For the Green scan, choose "CMYK Magenta" from the Color Swatches Palette. Name the new layer MAGENTA and fill with magenta. Save the file and leave open.
10. For the Blue scan, choose "CMYK Yellow" from the Color Swatches Palette. Name the new layer YELLOW and fill with yellow. Save the file and leave open.

Combining the three separate images to form a full-color scene

Once you have prepared each layer, combine them in a new file to create a full-color image. Follow these steps:

11. Create a new file by selecting the File > New menu option. The New File dialog box will open. Give the file a name and set the width to 10 inches and the height to 7 inches. (Reverse these dimensions if your image is vertical.)
12. Set the resolution to 300 ppi to match the working files, set the Mode to "RGB Color," and set the Background to "White."
13. Copy the first layer. To do so, make the Red/Cyan image file the active window. Choose the Select > All menu option, then choose the Edit > Copy Merged menu option. (This single command produces the same result as flattening the layers and copying the flattened image.)
14. Go to the new, empty window. Click on the canvass and insert the new layer by choosing the Edit > Paste menu option.
15. Repeat the copy and paste steps for the Green/Magenta and Blue/Yellow files.
16. When you are finished, the Blue/Yellow layer should be on top. In the Layers Palette, make this layer active and change the blending mode to multiply.
17. Repeat this step for the Green/Magenta layer. (You do not need to change the Blending Mode for the Red/Cyan layer at the bottom.)
18. Your image should now be in color! In the Layers Palette, turn the individual layers on and off (by clicking on the "eyes") to see the combinations of two colors.
19. Save the file.

Improving Registration

20. It's likely that the three layers will not be in registration (that is, match up exactly). Turn of the top layer and select the Move tool. Select the middle layer and align it as well as possible with the bottom layer. It might help to zoom in or magnify to 100 percent. Repeat this process for the top layer.
21. It may also help to rotate a layer to achieve better registration. To do so, select the layer you wish to rotate and choose the Edit > Free Transform menu option. A bounding box appears around the image; you can rotate the layer around its center by positioning the cursor near one of the corner of the bounding box until the cursor changes to a curved double arrow, then clicking and holding the mouse to rotate the image. You can also use the Edit > Transform > Rotate menu option in the same fashion.
22. Select the File > Save menu option to save one version of the file keeping the layers to preserve each individual color and in case you need to make adjustments. To prepare to print the image, choose the File > Save As, and do not select the Save Layers checkbox, to save the file as a flattened image.