

Preparing Graphs From Photographs Using Adobe Photoshop

by David Xenakis, for the members of KnitU
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Through my years of studying Photoshop, I've had the opportunity to use it many times as a way of reducing photographic material to charts. The program has all the tools you are likely to need, and even relatively inexperienced users can have good results. As you work through this tutorial, I think you will find that, though there are many steps, no one step is difficult, nor is it hard to understand.

Pick your photo

Your choice of photo is the most important decision you will make in this process. Good choices are images with strong contrast. The image should include shapes that are easily identified even if the you look at them with your eyes slightly out of focus. The process of converting to a chart will destroy most of the photo's detail, and you will want there to be no doubt about what the chart depicts. For that reason, you will want to avoid photographs that depend on detail.

For this study, I've chosen the hibiscus flower in Figure 00. This photo exhibits most of what I've described as desirable qualities for conversion to a chart. It has excellent contrast, detail that is relatively unimportant, a limited range of colors, and robust shapes.



Figure 00 Original photograph to be converted to chart.

Before you begin the conversion, it will be a good idea to enhance your image as much as possible. You will want to adjust it's color and to make sure that the color ranges available have a range that is as wide as possible. You can, if you wish, force the colors into ranges that would be unacceptable in any other circumstance. The conversion will tame those colors.

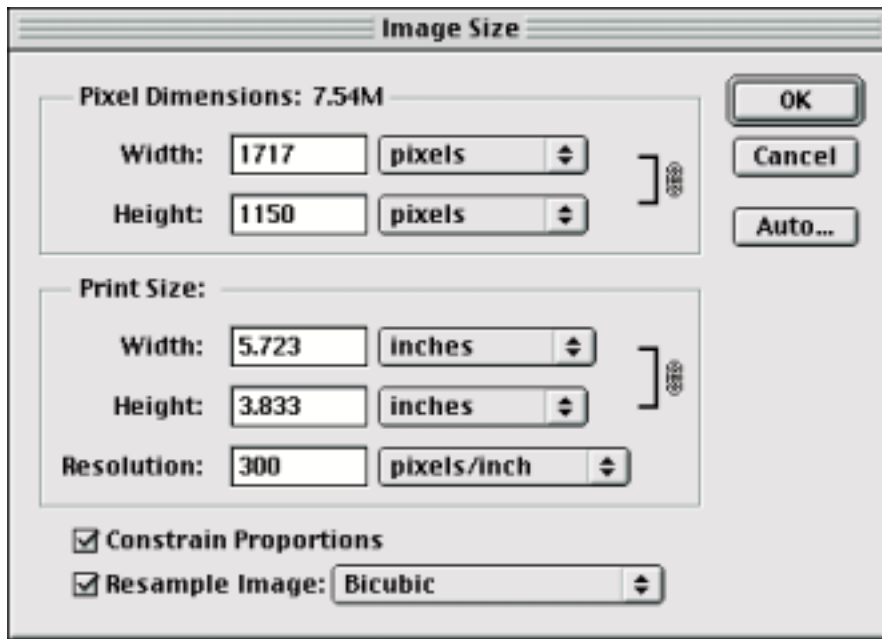


Figure 01 *Image Size* dialog box with default settings

The dialog box contains all of the information that relates to this file's current dimensions and resolution. It is here that we must change the file's dimensions so that the pixel numbers in either direction are some multiple that will be easy to remember. Let's say that when we work on this chart, we would like to have the squares 25 pixels wide and tall. As you can see, the width in pixels would not divide by 25 without a remainder. However, that's an easy matter to fix.

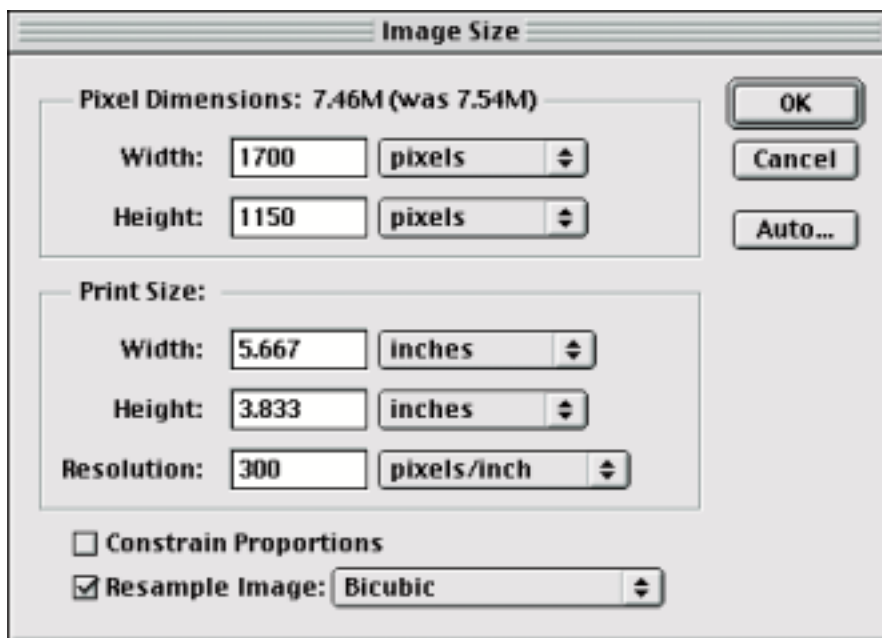


Figure 02 By turning off--unchecking--*Constrain Proportions*, Photoshop will allow you to resize the image asymmetrically.

Uncheck the *Constrain Proportions* checkbox and then enter a new dimension in the width data-entry field. In this case, I eliminated the extra 17 pixels. I could as easily have added 8 more pixels to bring the number up to 1725. This is one of the few cases in

Photoshop where not resizing proportionally is not especially harmful to the image. If you'll compare Figure 03 with Figure 00, you'll see that there are few visible differences.



Figure 03 The image has been asymmetrically resized and does not appear very different.

All of the fussy work is now out of the way. From now on you'll be able to concentrate on creating your graph.

Changing the photo image into squares is accomplished by applying the Mosaic filter. The Mosaic dialog box is seen below in Figure 04.

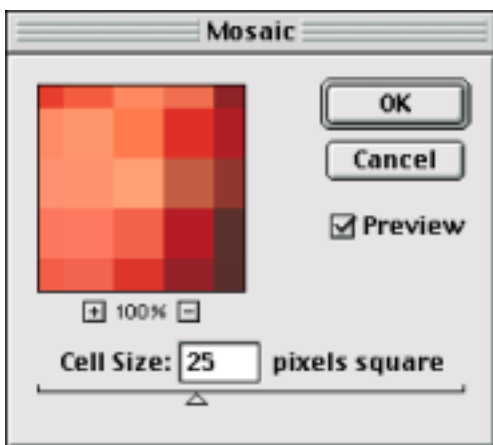


Figure 04 The squares of the chart are created by using the Mosaic filter.

You'll recall that the *Image Size* command was used to make sure the pixel dimensions of the photo were multiples of 25. 25 is now the cell size to request of the filter. When the filter has executed, you will see that your image has substantially changed. Notice that even at this stage, the flower and the leaves are still easily recognizable. Using this filter is a very good way to decide if an image is suitable. If the shapes are not recognizable, it isn't worth your while to proceed.



Figure 05 After the Mosaic filter is applied, the image is still recognizable.

Having destroyed nearly all of the image's detail, the next task is to severely reduce the number of colors. Assuming that this is an RGB file, it has the potential of having up to nearly 17,000,000 colors. You must decide what number of colors with which you wish to work. For knitting--possibly intarsia--you might wish to retain quite a few colors. If you are developing these charts for cross stitch or needlepoint, you could retain as many as you wish provided you can find yarns to match them. There are a few other things to consider. This image contains colors that are mainly red and green. However many colors you choose to retain, half will belong to the green group and half to the red. If we were to isolate the flower so that the image contained only the blossom, then all of the values could be in the red range. With more values, there is more color differentiation and the chart will be more *real*.

From the Image menu, choose Mode|Indexed color.

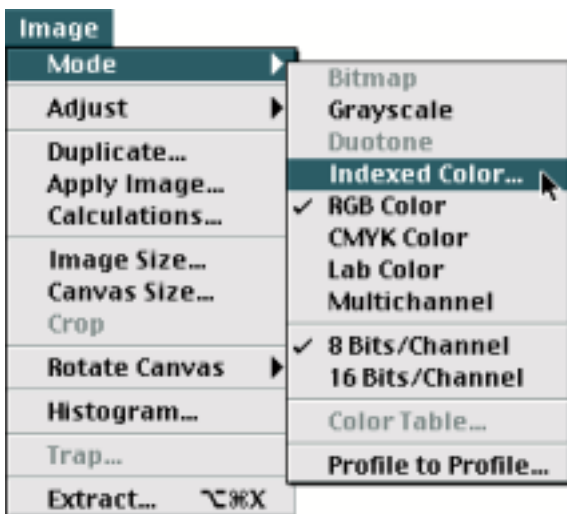


Figure 05 To limit the number of colors, the image is converted to Indexed Color.

Page 5 The Indexed Color dialog box, shown in Figure 07, has a bewildering number of choices. When you convert your image, make your dialog box look like this one. The one variable is how many colors you wish to retain. If the number is more or less than the number shown, go ahead and make the change. Immediately change the file back to RGB mode.

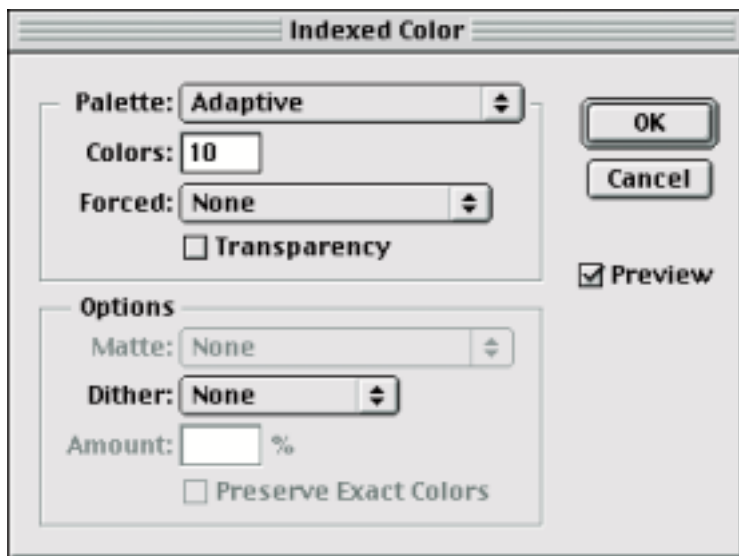


Figure 07 The Indexed Color dialog box lets you enter exactly the number of colors to retain.

Figure 08, below, has now been reduced to 10 colors. I used that number because it doesn't seem so far out of reach for intarsia knitters, especially when duplicate stitch can be used for isolated stitches.

As you can see from the figure, this image is still recognizable. Loosing color certainly does destroy detail, but there is no doubt that this is a flower of some kind, and that it is surrounded by leaves and leafy shadows.

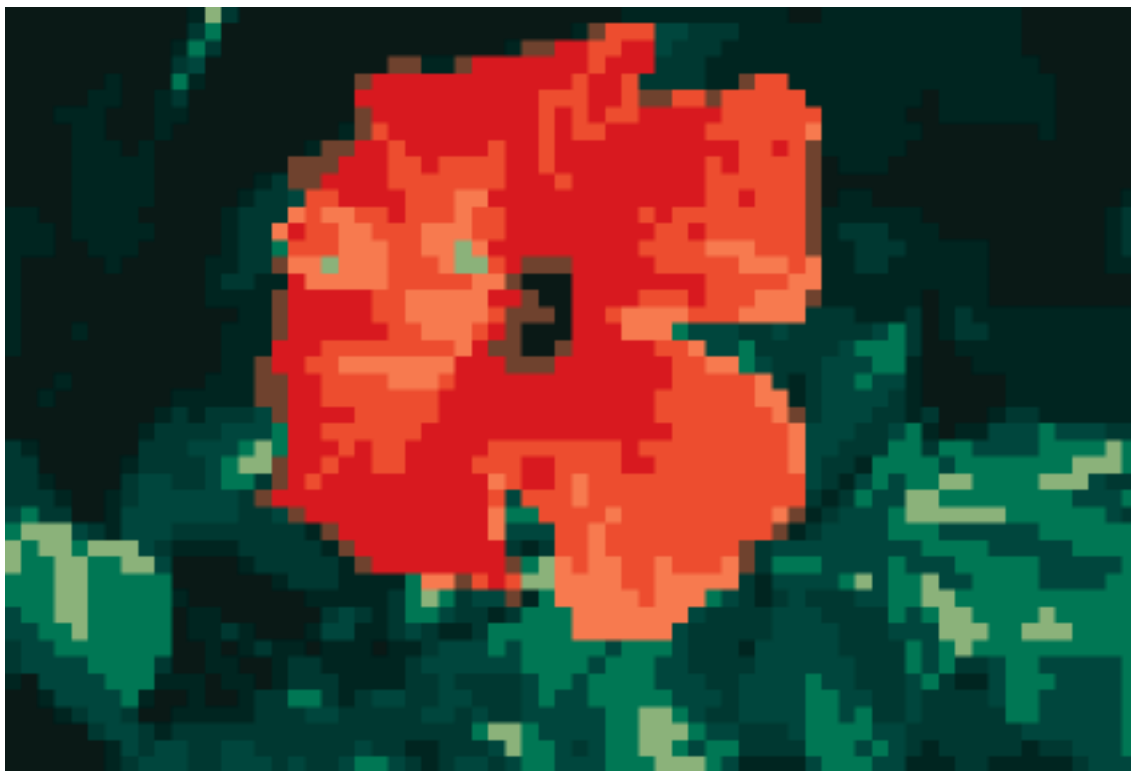


Figure 08 With Index Color, this image has been reduced to 10 colors.

The flower chart looks pretty good at this stage and could probably be used with no further modification. However, there are some fairly simple things that you can do to make it more usable. One possibility is to delineate the squares with a grid. We can make the grid white where it outlines very dark squares, and black everywhere else.

From the **File** menu, select **New**.

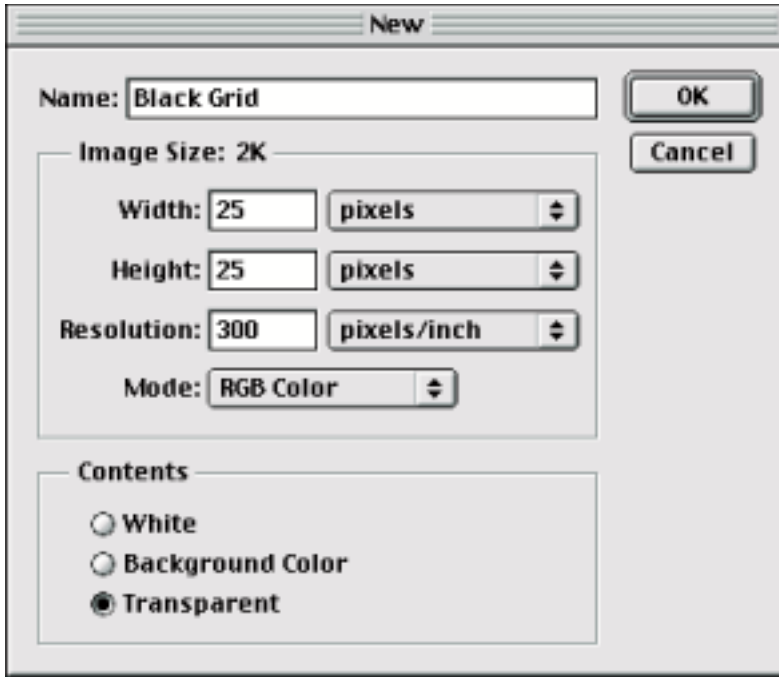


Figure 09 This 25x25 pixel file will allow us to outline the squares with a grid.

When the dialog box appears (Figure 09, above), name the new file something like the title shown in the figure. The dimensions are the same size as the squares in the flower image. You will also need to insure that the resolution and color mode of the new file are the same as for the photo chart.

The new window will appear. From the **Select** menu, choose **All**. From the **Edit** menu, select the **Stroke** command (Figure 10, below). Click OK.

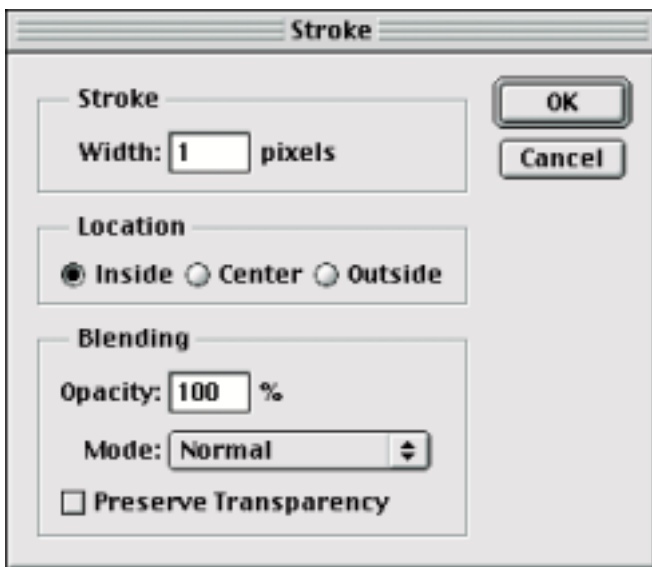


Figure 10 The Stroke command will place a line around the edges of the new file.

Page 7 It will probably be easier to understand why we are choosing a **Stroke** width of one pixel after you have applied it. I'll try to state the reasons and ask that you file the information and come back to it later when you have seen the grid constructed.

We need to use a line size for the grid that is not too wide or it will block too much of the color. a half-point line will be perfect. The file is at a resolution of 300 ppi. At that density, a one-half point line is almost exactly 2 pixels wide. You will be using many versions of this square stacked on top of each other and next to each other. As they fit together, each square will contribute half the width of the grid. The end result will be a line of the desired size.

From the **Image** menu, choose **Duplicate**. Another Dialog box will appear. Type in the name White Grid. When the new window appears, hold down the Command key (Mac) or the Control key (Windows) and type *i*. The line around the edge of the new window will change to white by using this **Invert** command, as shown in Figure 11.

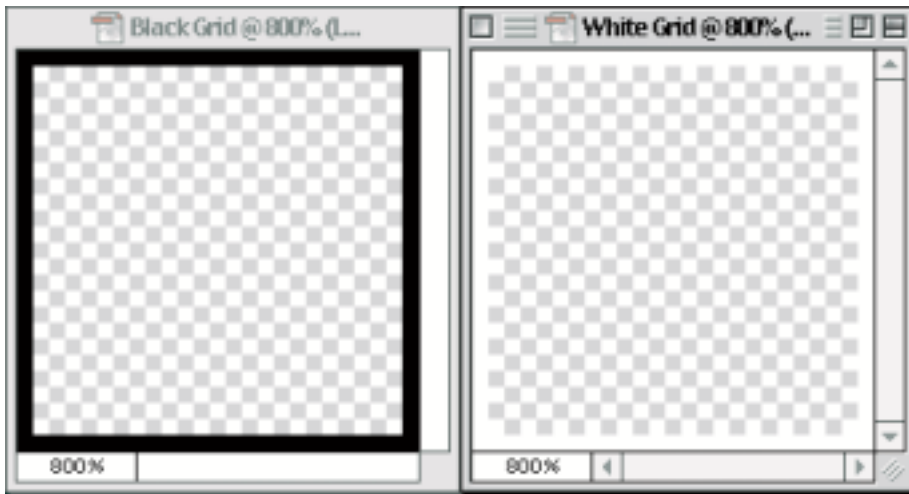


Figure 11 These two windows will provide both of the grids needed for the chart.

We'll work on the light grid first. Make the White Grid the active window. Choose **All** from the **Select** menu. From the **Edit** menu, choose **Define Pattern** (Figure 12). A pattern, in Photoshop terms, is any rectangular shape that has been designated. When patterns are used as fills, Photoshop tiles the patterns throughout the selection area. Patterns are very powerful and quite underused.



Figure 12 To make the White Grid file behave as a grid, you define it as a pattern.

Before you put your new pattern to use, you need to do a bit of preparation. First, if you cannot see it, look under the **Window** menu and choose **Show Layers**. Your image should show on the Layers palette as the **Background** layer. Just to the right of the small **Trash Can** icon at the bottom of the pallets is the **New Layer** icon. Click it to create a new layer above the original.

Type **W** to select the **Magic Wand** tool. If you do not have the **Options** palette open, use the **Show** command under the **Windows** menu. Make the settings on your palette agree with those in Figure 13.

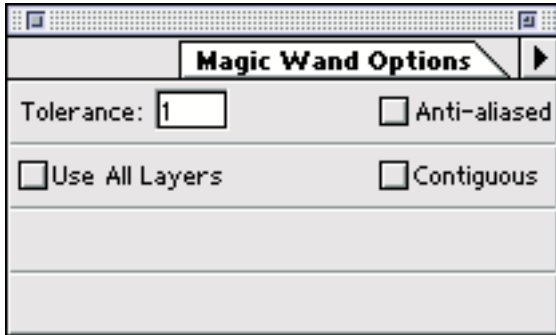


Figure 13 Your Magic Wand settings will be most useful if these settings are used.

On the Layers palette, click on the Background Layer to select it. Click with your Magic Wand anywhere on the image where you see an area of the darkest color present. Immediately, all of dark colored areas, everywhere in the image, are selected. Return to the Layers palette and click on Layer 1 to select it. Hold down the **Shift** key and type **Delete** or **Backspace**. This is the command used to summon the dialog box for filling selections (Figure 14).

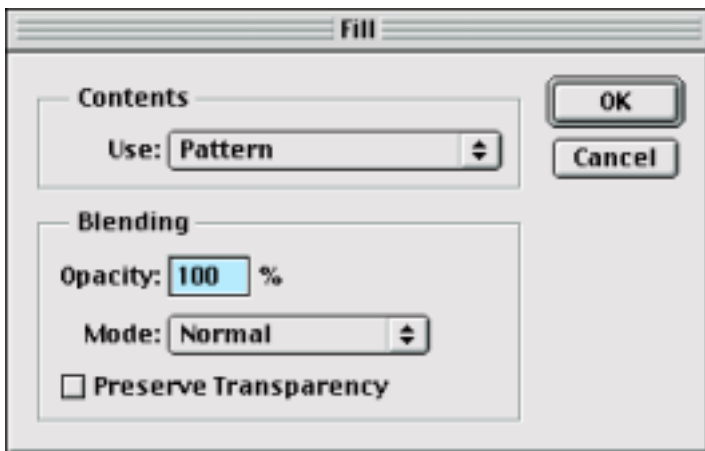


Figure 14 The Use option allows you to fill with a pattern if one has been defined.

The **Use** popup menu allows you to choose from a couple of colors for the fill. However, it also allows you to fill with a pattern if one has been defined. You have a pattern defined. Click OK and you'll see your white square magically spread out and fit itself to the area of the darkest squares (Figure 15, top of opposite page). Photoshop calculates the placement of patterns beginning in the upper left-hand corner of the window. Since your pattern tile is 25 x 25, and since the squares of the chart are the same size, your patterns will always fit this way.

Click again on the Background layer. With the Magic Wand, click on the image in a place occupied by the next lighter color--ie, the second darkest. Again select Layer 1. Type Shift+Delete or Shift+Backspace and Click OK. Again the pattern spreads itself into the selected area (Figure 17, opposite page). Do not deselect just yet.

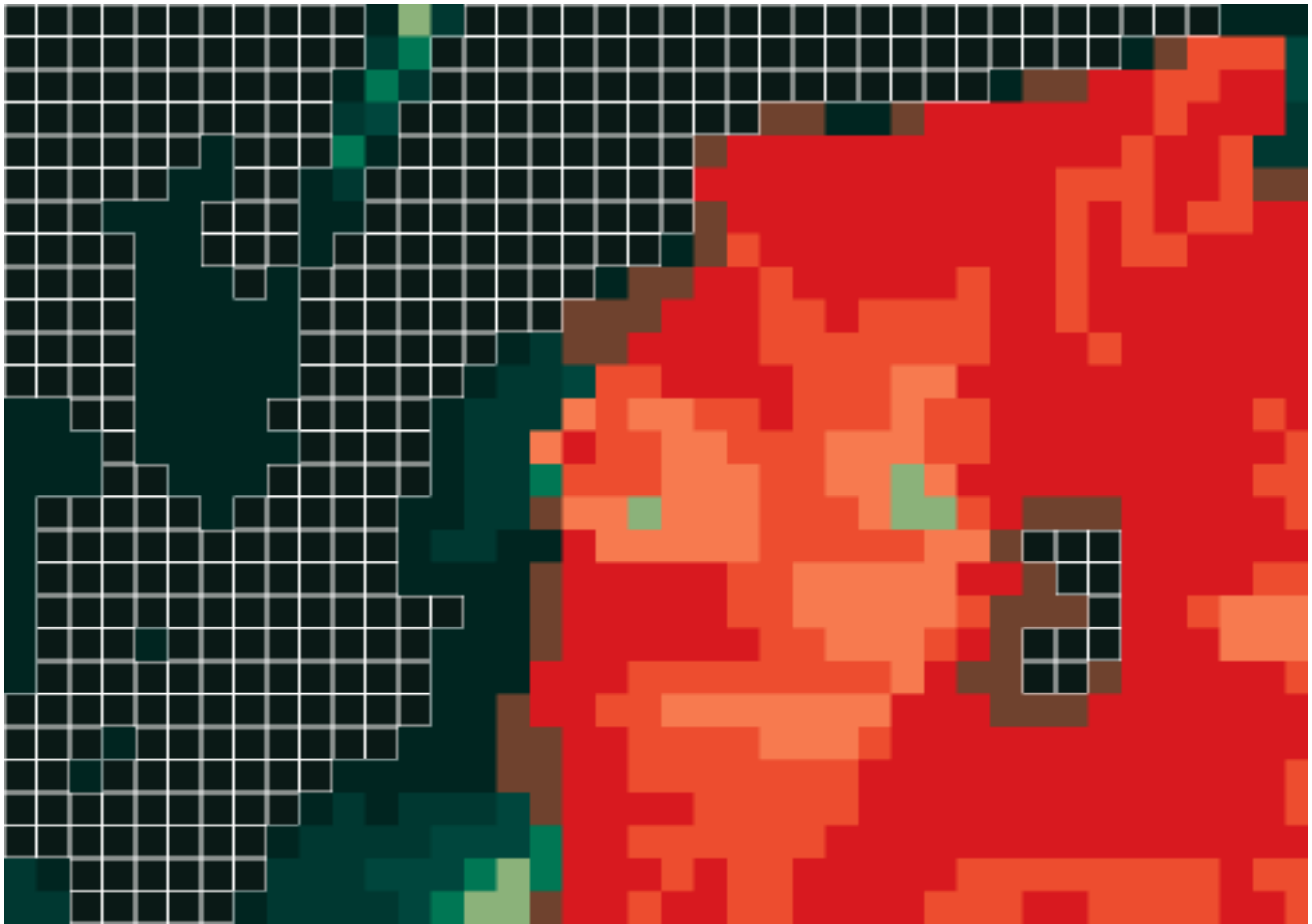


Figure 15 Your white pattern smoothly aligns itself to the darkest squares.

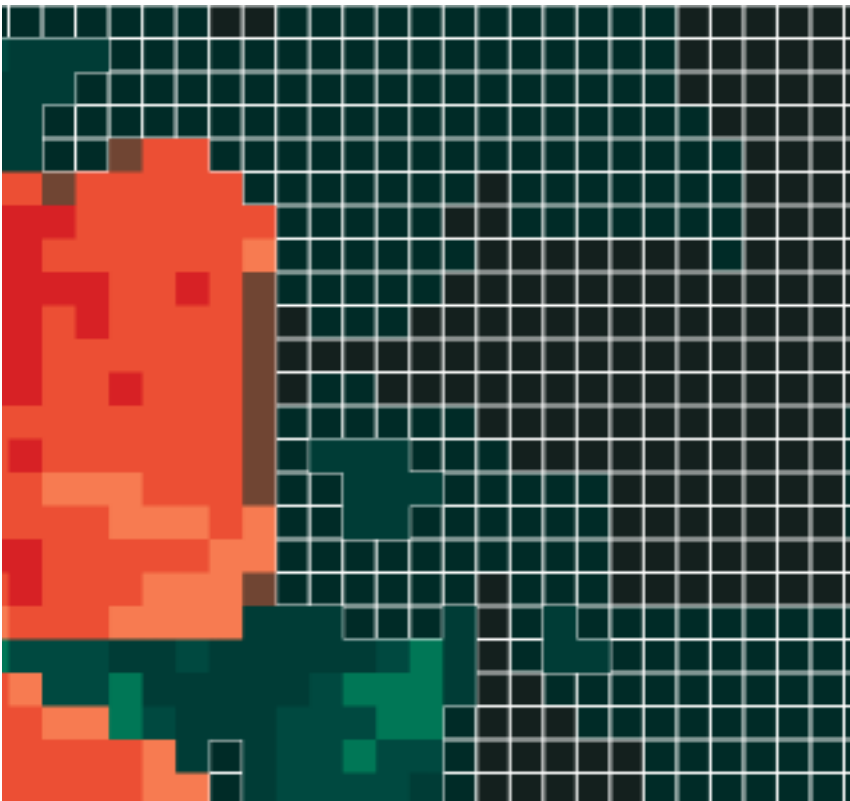


Figure 16 The white pattern now delineates the two darkest colors.

If you look closely at Figure 16, you'll see that there is some difficulty distinguishing between the two darkest colors once the pattern has been in place. We need a way to identify the two so that they are instantly recognized as different. Make your White Grid window active. Choose the *Marquee* selection tool (type m to select it) and make a small selection in the very center of the square as shown in Figure 17a.

Note: In this figure, white against a background of gray and white is very hard to see. I have shaded it blue for purposes of illustration. You will use white instead of blue.

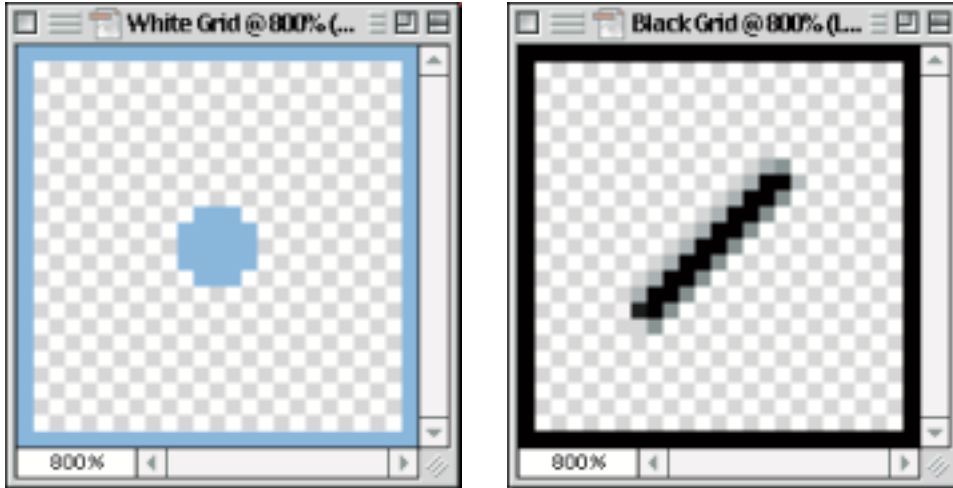


Figure 17a, left Put a small spot in the center of the White Grid file to make a new pattern tile.

Figure 17b, right Put a small line in the center of the Black Grid file to make a new pattern tile.

Select All, Define the Pattern, and return to the flower window. The selection defining the second darkest color is still selected. Type Shift+Delete or Shift+Backspace and click OK. The new pattern overwrites the original. The result is as shown in Figure 18.

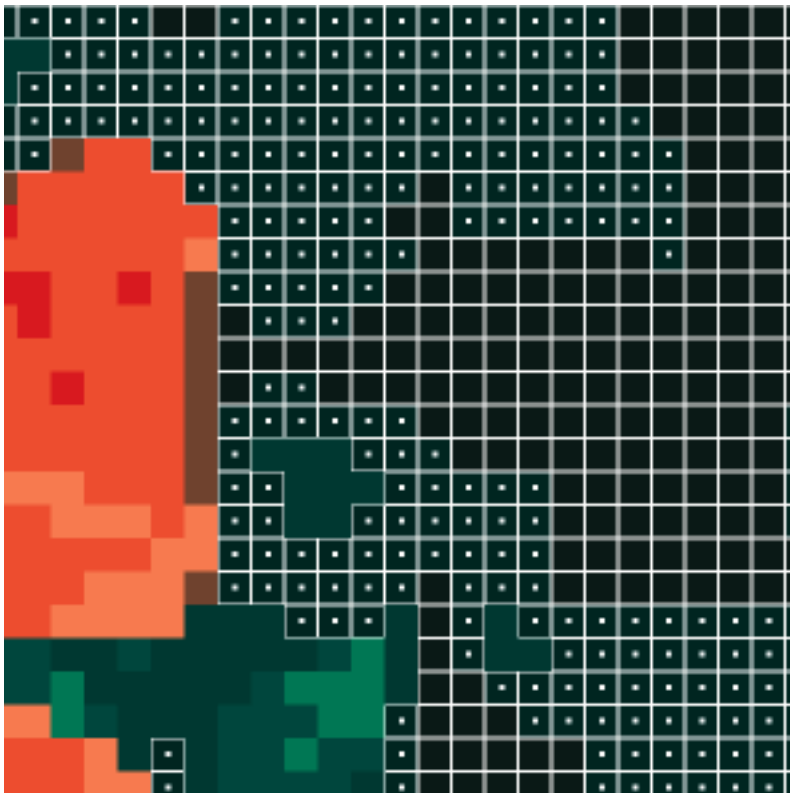


Figure 18 The modified white grid makes it easy to distinguish between the two darkest colors.

Page 11 Lets take a shortcut to completing the entire grid. All of the rest of the colors are light enough that they can support a grid of black. Click on the small Eye icon on the Layers palette to hide Layer 1. Click on the Background layer to select it. Hold down the Shift key and click in the image on an area of the darkest color. Now click on an area of the second darkest. You have now selected all of the dark-color area.

Return to the Layers palette. Make Layer 1 visible. Click on the Background layer, and then click on the New Layer icon at the bottom. The new layer will be automatically named layer 2. We are going to use Layer 2 as the layer to contain the black grid.

From the **Select** menu, choose **Inverse**. This deselects the dark colors and selects everything else. Bring the Black Grid window to the front. Select All, Define the Pattern, and return to the flower window. Summon the Fill dialog box, and click OK. You see the results in Figure 19.

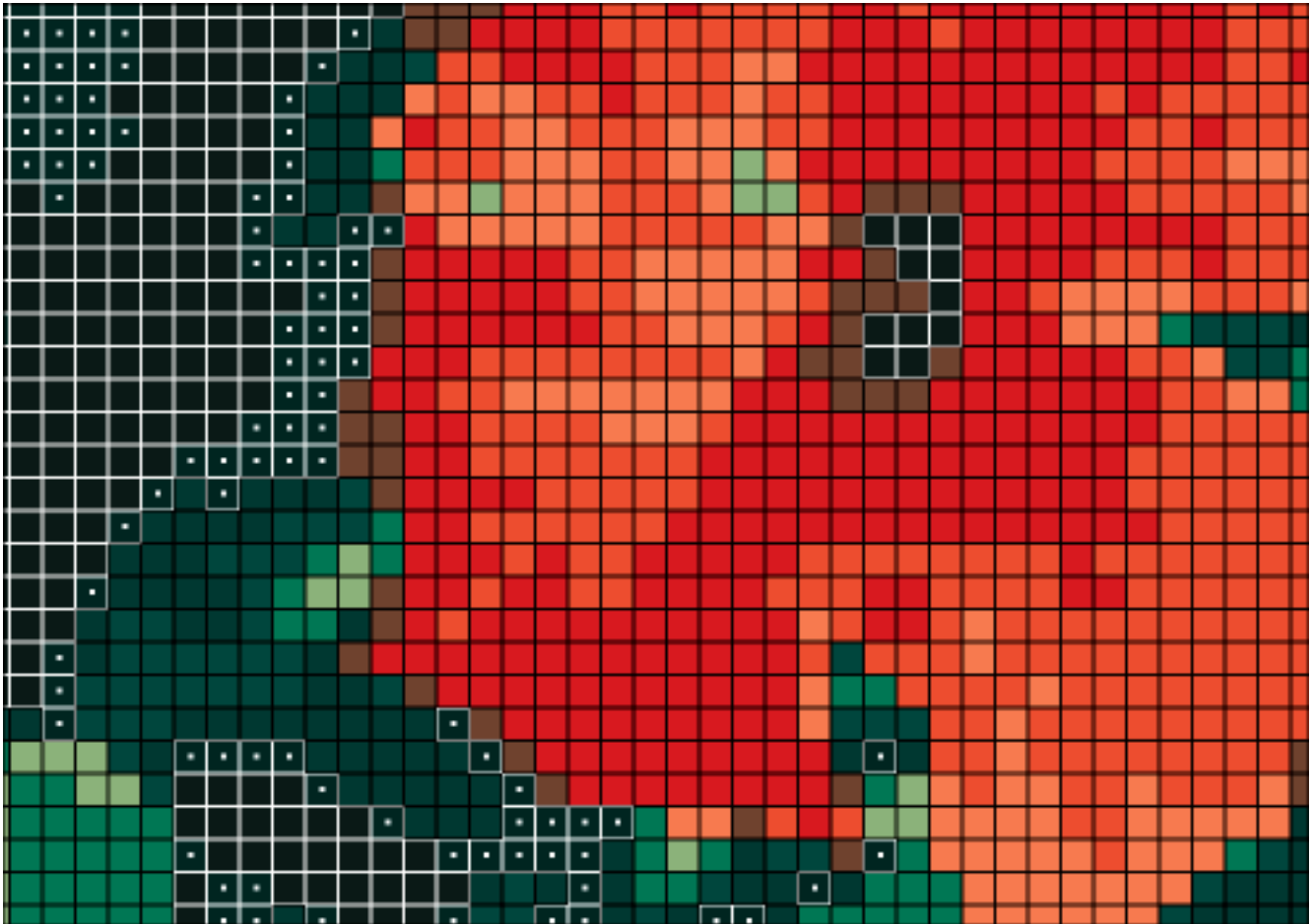


Figure 19 Both grid colors are now in place.

As you can see from this figure, the vivid red and the next lighter color are difficult to distinguish. It is a simple matter to bring the Black Grid window to the front and to use the line tool to make a small mark in the center (Figure 17b). This new iteration of the Black Grid pattern tile, when applied to the vivid red color, produces the effect shown in Figure 20 (top of the following page).

You can, if you wish, assign small symbols to every color. Coming up with symbols is simply a matter of imagination. For example, take the just-used mark and flip it along a vertical axis to make a slanted line in the other direction. Or take one line in each direction and combine them into an X. If you leave your file in layers, you can come back to it and modify it as often as you wish to do so.

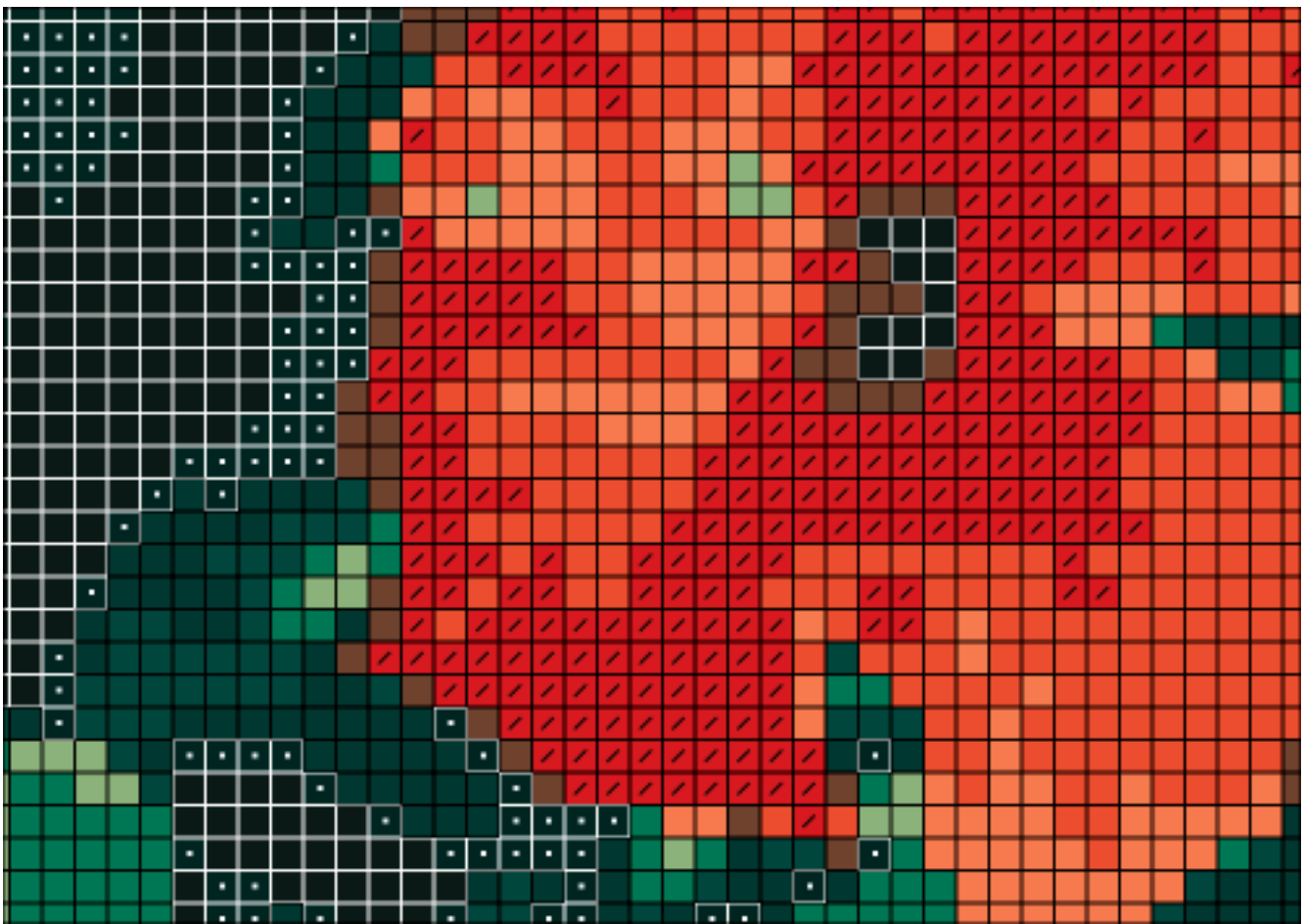


Figure 20 The marked variation of the black grid helps distinguish between two close reds.

There is a small house-cleaning task that needs attention. It is shown in figure 21. Where the white grid and the black grid meet, the effect is untidy looking—and easy to fix!



Figure 21 The boundary where white lines meet dark lines looks messy and needs to be fixed.

Page 13 Hide Layers 1 & 2. Use the Magic Wand to select both of the dark colors (hold down the Shift key and click on both). Select **Inverse** from the **Select** menu. Make both Layers visible. Click on Layer 1 to select it.

Type **D** and then **X.D** makes your Foreground/Background colors black and white. **X** reverses the arrangement. You need to have your Foreground color as white for the next operation. From the **Edit** menu, choose **Stroke**. When the dialog box appears, make your stroke one pixel and choose the **Outside** option. Click OK.. Photoshop will draw a one-pixel white stroke all around the outside of the white-grid area. The result is shown in Figure 22. Compare this to the previous figure to see how successful this clean-up maneuver is.



Figure 22 A white stroke around the entire white-grid area tidies the grid.

It is likely that the grid you have constructed will be too small for you to use easily. Please select **Image Size** from the **Image** menu. As you can see in Figure 23 (following page), the resolution is 300 ppi. Given that our squares are 25 pixels on a side, that makes each square $25/300$ or $1/12$ inches on a side. If you change this dialog box to the way it is shown in Figure 24, you can make the squares increase in size. You do that by taking away Photoshop's resampling capability. When you have done that, Photoshop is forbidden to manufacture new pixel values. All it can do, when you specify a smaller number for resolution, is to make the pixels larger. By changing to 200 ppi, you have changed the square size to $25/200$ or $1/8$ inches on a side. The final chart, shown on page 15, has been turned on its side so that you can see how clear the results can be.

I hope you have enjoyed this examination of using Photoshop to make charts from digital photographs. This file is offered as a gesture of thanks to the members of KnitU who have enriched my life beyond describing.

DAND

David Xenakis

May 2, 2000

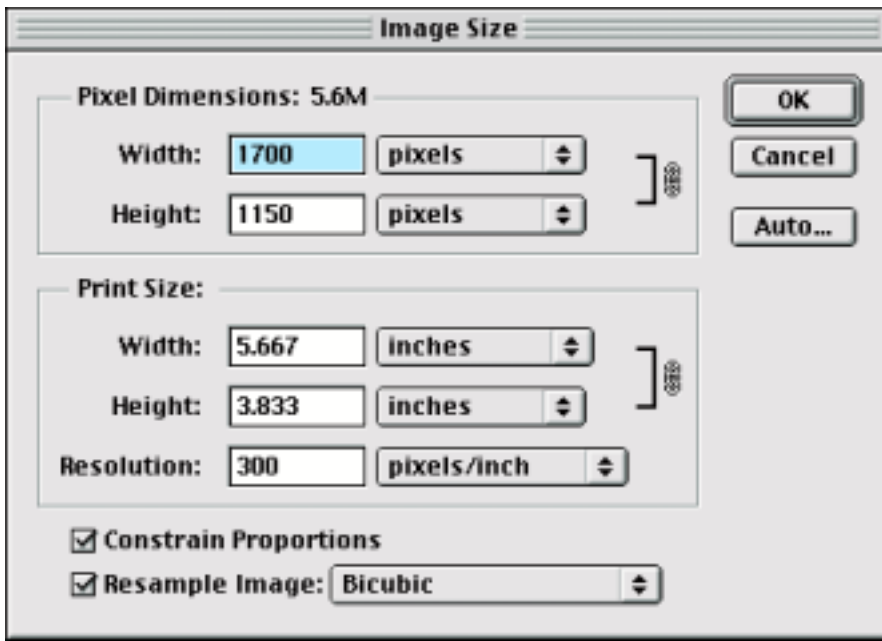


Figure 23 This resolution, with 25-pixel squares, makes each square 1/12" on a side.

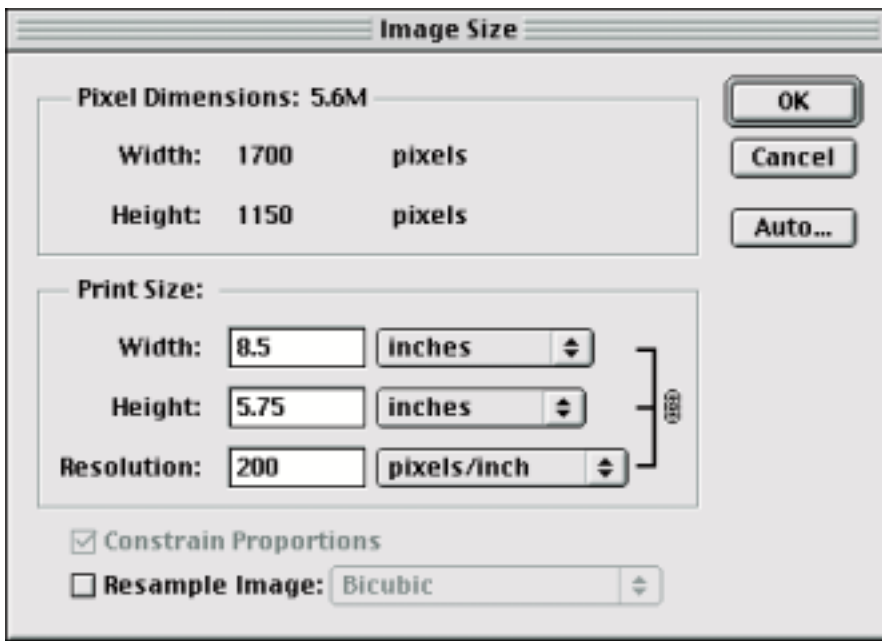


Figure 24 Using this setting changes the squares to 1/8" on a side.

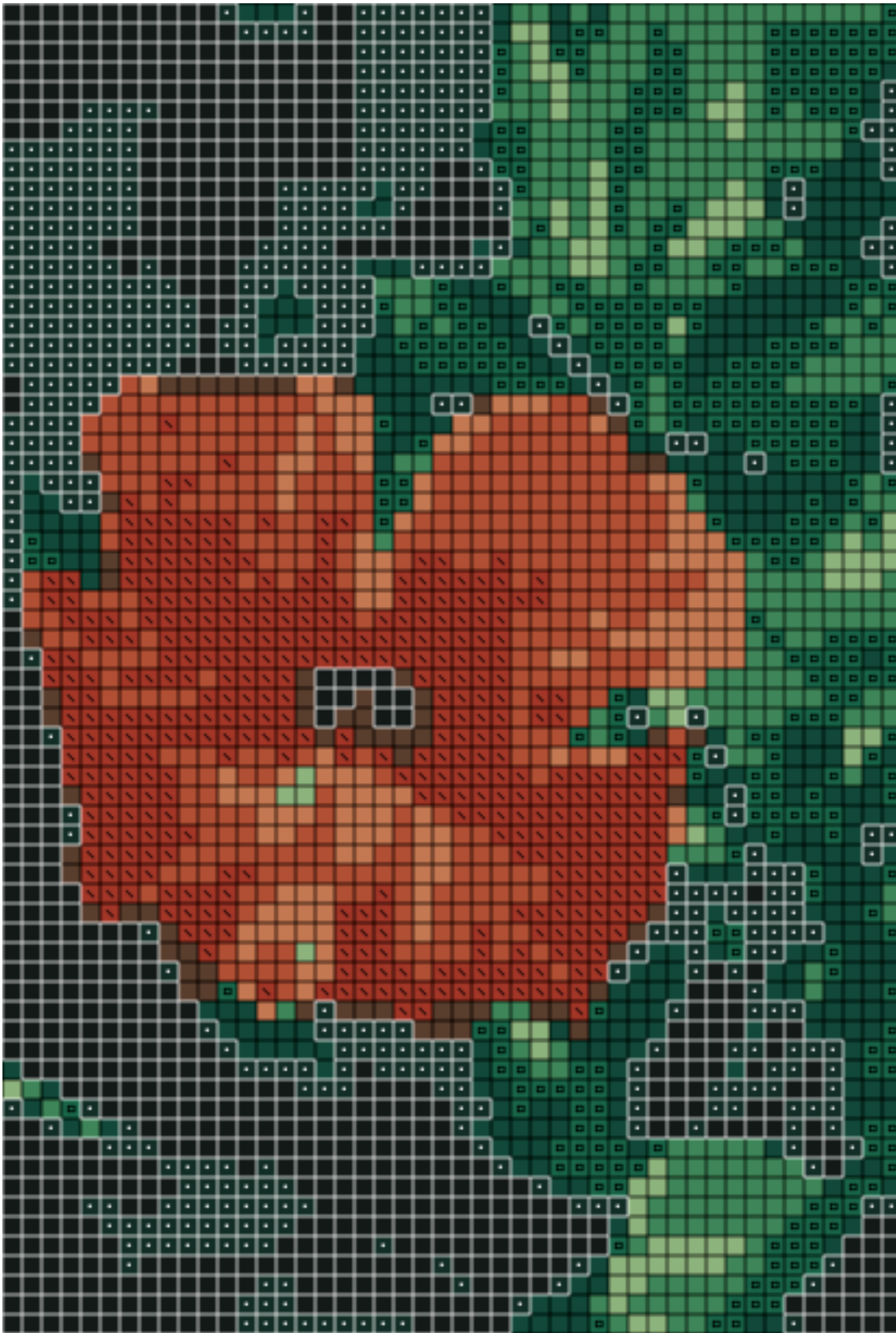


Figure 25 The final chart, turn on its side so that the entire image can be seen.

Although this set of instructions was written with Adobe Photoshop in mind, there are other software possibilities that you can consider. They are listed here:

Photoshop Elements from Adobe Systems, Inc. (Windows)

Photoshop Elements from Adobe Systems, Inc. (Mac)

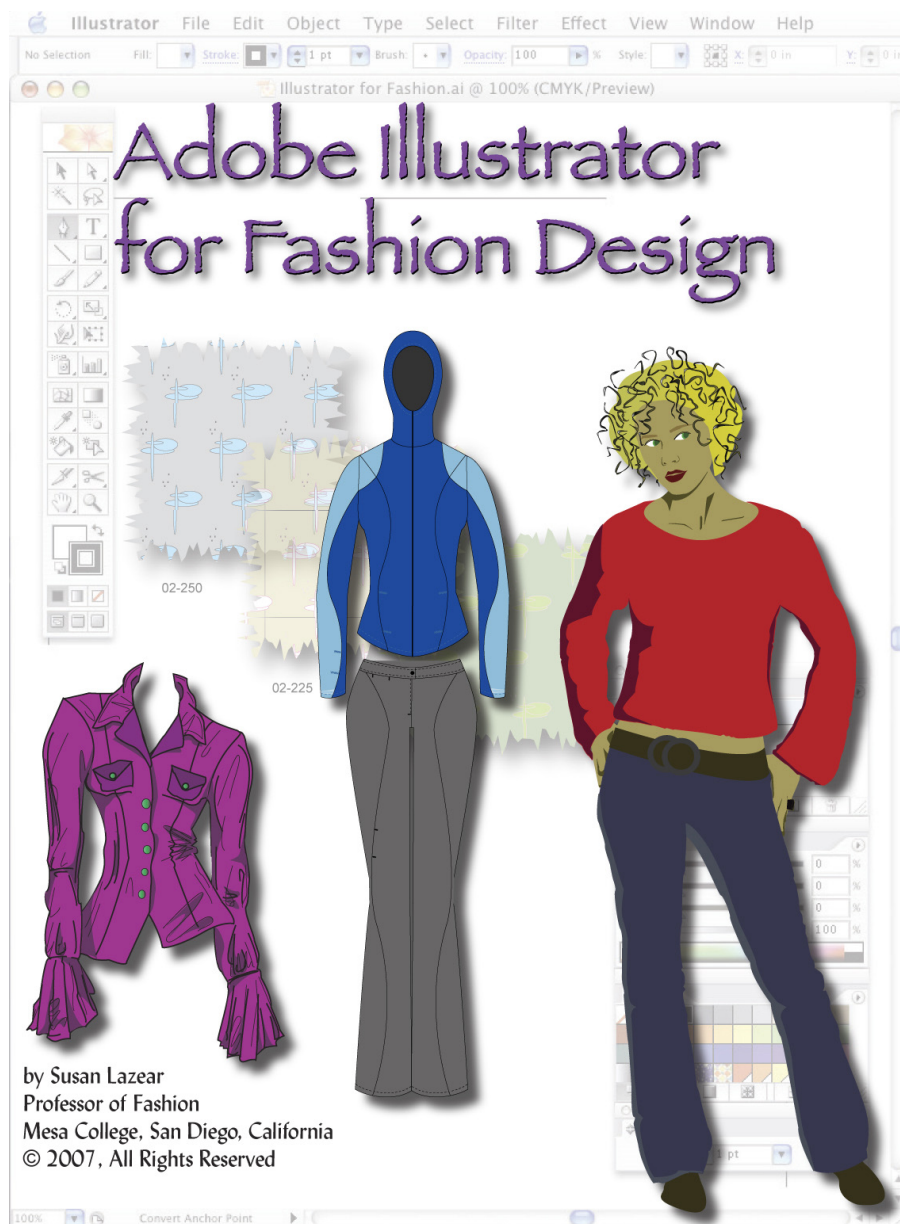
Photoshop CS from Adobe Systems, Inc. (Windows)

Photoshop CS from Adobe Systems, Inc. (Mac)

Adobe Illustrator from Adobe Systems, Inc. (Windows)

Adobe Illustrator from Adobe Systems, Inc. (Mac)

Stitch Painter from Cochenille Design Studio



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