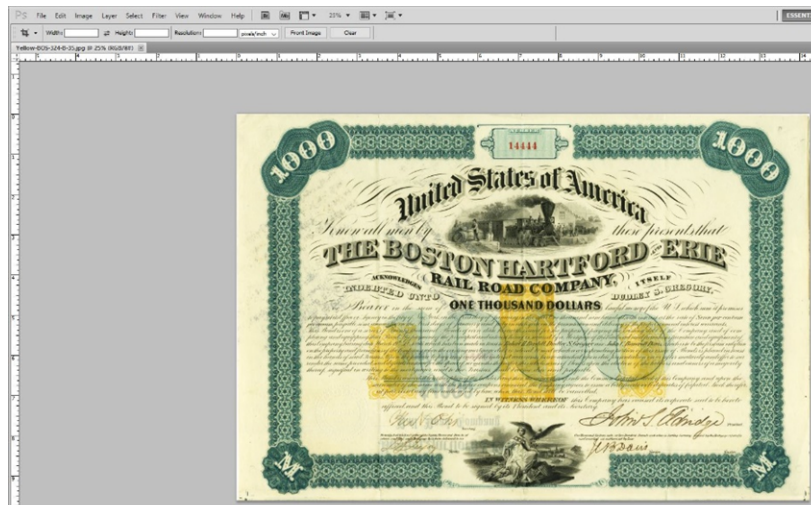


# → IMAGE MANIPULATION ←

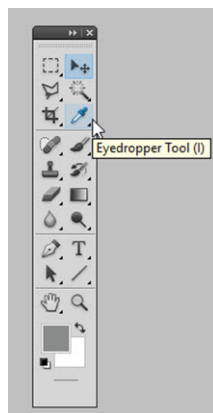
## Remove yellow from certificates using Photoshop© - Technical Approach

I'm going to show one of several ways to remove yellow from certificates using Photoshop, the most popular image editing software. I am going to assume you are scanning certificates, but the following technique works equally well with camera images.

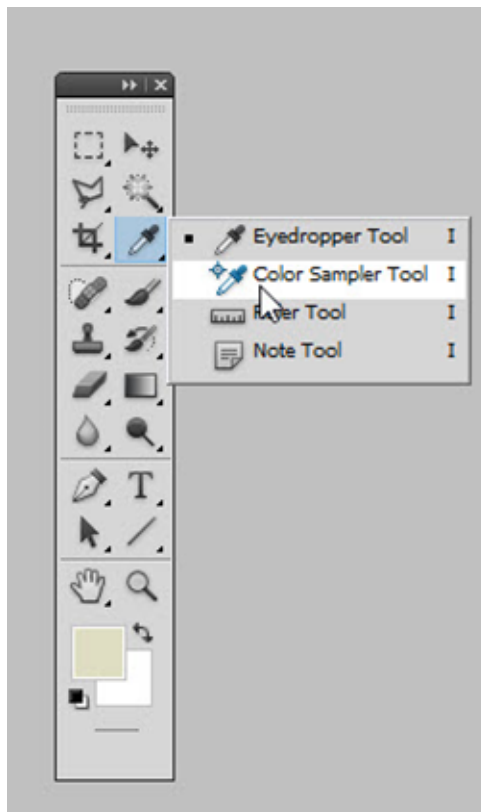
Open an image with a lot of yellow now.



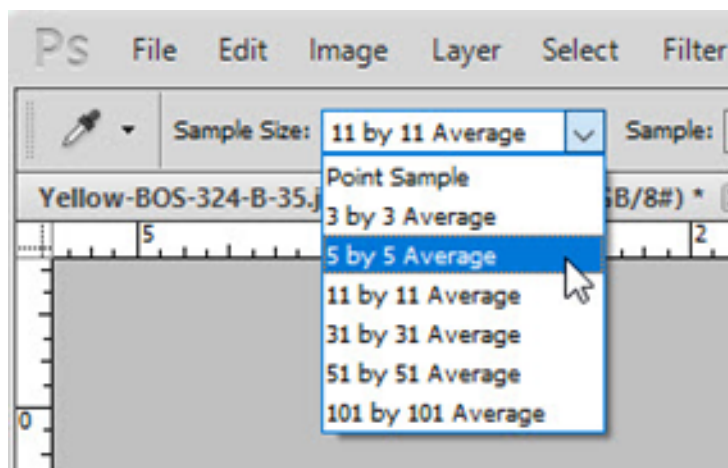
Find the Eyedropper tool in your Toolbox.



Click and hold down on the Eyedropper Tool icon and a flyout will appear. Select the Color Sampler Tool



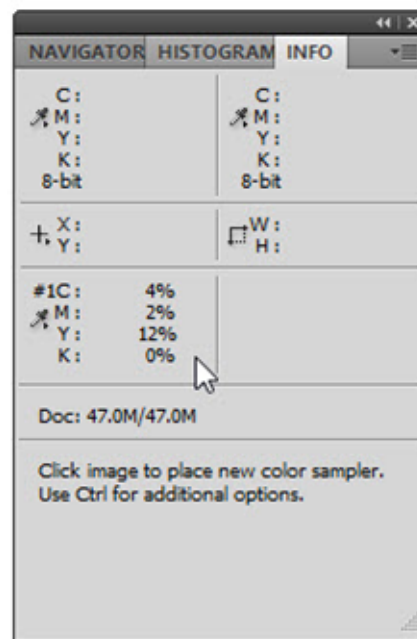
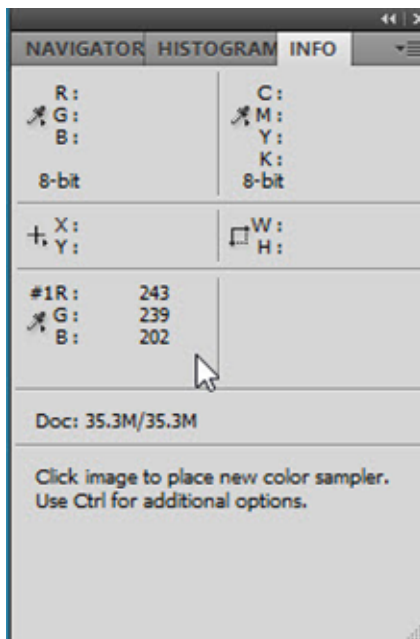
Look for "Sample Size" at the top left, under the Menubar. Adjust the Sample Size. A setting of "5 by 5 Average" or "11 by 11 Average" is usually good.



Click in a blank area of your certificate that displays a large patch of yellow paper.

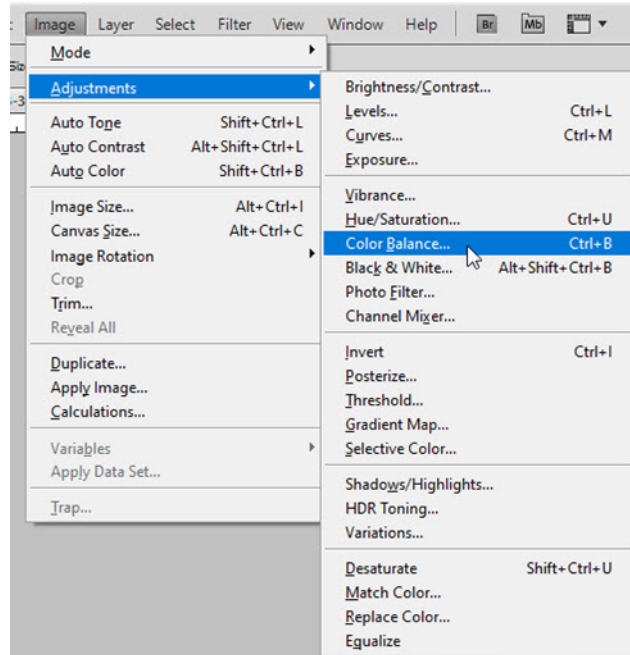


Click the left mouse button to sample. An **Info** dialog box will open somewhere on your screen. Look for the numbers just below the middle on the left side.

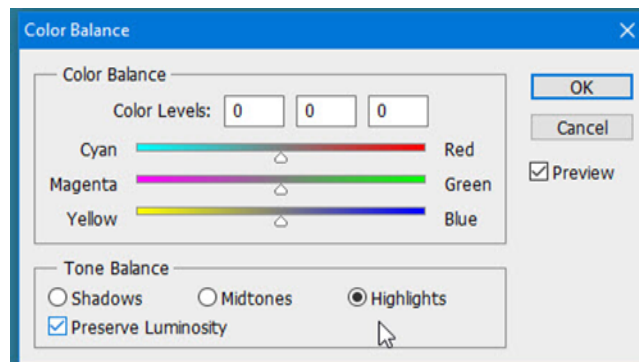


Your Info dialog box will display either "RGB" values (Red-Green-Blue) or "CMYK" values (Cyan-Magenta-Yellow-Black) depending on which **Color Space** you are using. If desired, you can convert from one Color Space to the other by selecting **Image > Mode** in the top menubar. I will show you how to make adjustments using both color spaces. **Keep the Info dialog box open.**

Select **Image > Adjustments > Color Balance...** from the top menubar.



A **Color Balance** dialog box will open.



The CMYK color space is merely the opposite of RGB. That is why the two color spaces are interchangeable. Select **Highlights** because we are going to adjust only the brightest parts of the image.

At this point, pay special attention the Yellow/Blue slider. Notice that blue is the opposite of yellow. To decrease yellow, you merely need to move the slider toward blue.

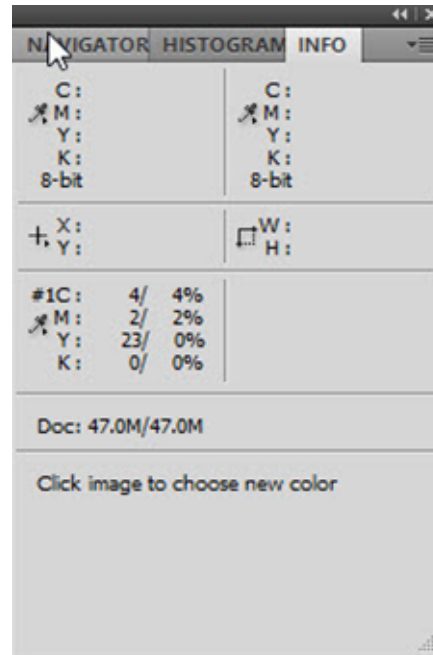
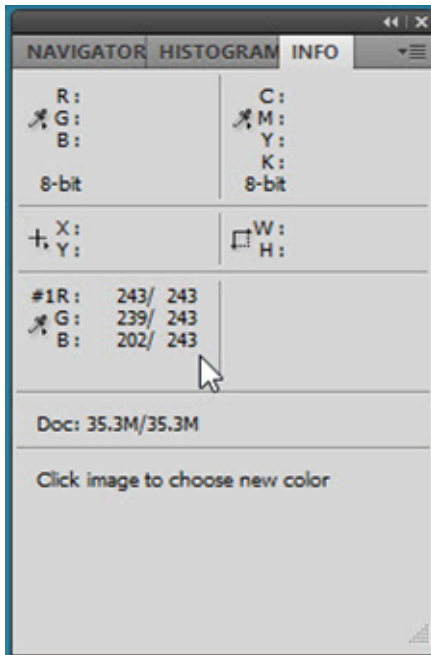
Some aged scanner bulbs can add a lot of yellow, but most additions are more subtle. We are more interested in removing the effects of a scanner, so we don't want the paper to appear purely white. We will first remove ALL yellow and then dial the settings back to a more realistic level.

If using the **RGB color space**, notice that Red is usually indicated by the largest number. To remove all yellow, **KEEP AN EYE ON THE INFO BOX** as you slide the Magenta/Green and Yellow/Blue sliders to the

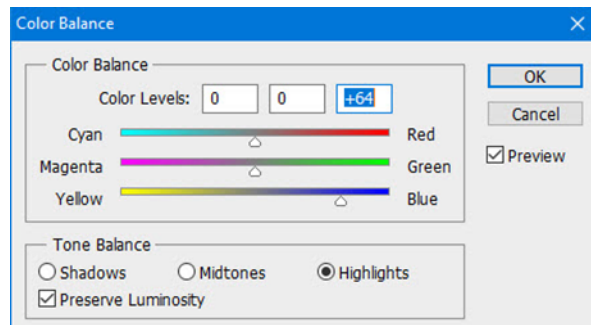
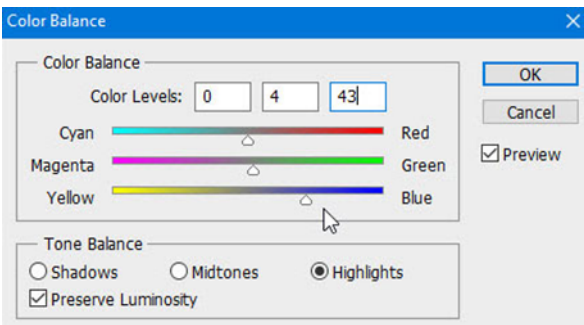
right until they equal the red value. At that point, the paper on your certificate should look white. (Or gray if your scan is abnormally dark.)

If using the **CMYK color space**, the brightest part of the image will contain more yellow than cyan or magenta, so the largest number should be beside yellow. **KEEP AN EYE ON THE INFO BOX** as you slide the Yellow/Blue slider to the right until it just hits 0. Don't go any further.

At this point your Info box will resemble one of these (RGB left, CMYK right)...



... and your Color Balance box should resemble one of these.

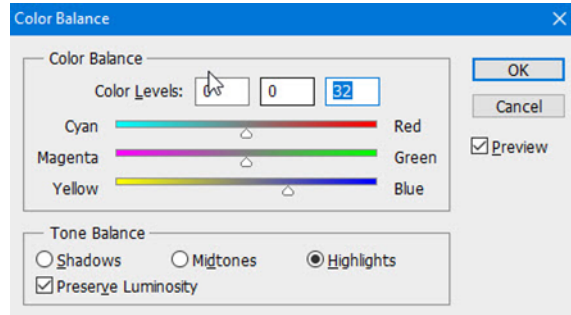
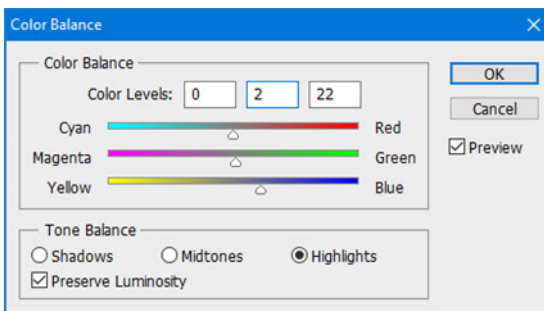


**DO NOT CLOSE YOUR COLOR BALANCE BOX YET.**

Black is built into colors in the RGB model, but is considered a separate "color" (or "channel") in the CMYK model. Therefore, the Color Balance dialog boxes will look similar but not identical. Regardless of the differences, the sample image at this point will look abnormally white.



To restore some of the certificate's natural appearance, move the sliders back about halfway. Keep an eye on your image. An adjustment of 40% to 50% less blue is often a good compromise, but it may be more or less. Use your judgment. In the RGB model, make sure you adjust the Magenta/Green slider by the same percentage. For example, an adjustment of blue from 43 to 24 is a 50% decrease. Therefore, decrease green by the same percentage: from 4 to 2. (RGB on the left, CMYK on the right.)



When finished, click "OK." The certificate color will now look more realistic.



**A few of you have asked what the numbers in the Color Balance dialog boxes mean.**

The short answer is that the numbers represent "bits."

It is easiest to think of a bit as a switch that has only two positions: on and off. You can also think of a bit as a specific spot on a disk that is either magnetized or not. For counting purposes, we could envision a bit as representing a value of 0 or 1.

If you have two bits, you can increase possibilities to four:

- 0-0
- 0-1
- 1-0
- 1-1

With a mere two bits, we can represent four possibilities. Those possibilities can be anything we want. They could be numbers such as 0, 1, 2, 3.

Since each bit can represent two possibilities, we can combine several bits and therefore multiply the number of possibilities we can represent. Thankfully, bits do not take up much space on hard drives or solid state drives and the space they consume is getting smaller and smaller and smaller. The goal is to decrease the space consumed by bits all the way down to the atomic level. Wow!

Getting back to colors, researchers have estimated that humans can detect about 30 shades of gray. Some people even fewer shades. Conversely, researchers have estimated (young) humans can detect differences between 10 million of more colors. How can we handle that spectrum of possibilities with bits?

If we put together eight bits, we end up with 256 possibilities. You may calculate that result by multiplying two possibilities eight times:

$$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 256$$

We could number those possibilities from 0 to 255. Then we could use those numbers to describe 256 shades of gray. That would certainly take care of human sensitivity to gray.

We could also use those numbers to describe 256 shades of red, or green or blue with each shade numbered from 0 to 255.

If we then combined variations in shades of those three colors, we could describe:

$$256 \times 256 \times 256 = 16,777,216 \text{ different colors.}$$

That number would certainly be more than adequate to cover human abilities to discriminate colors.

Note that we have just explained the functions and abilities of the three red, green and blue sliders displayed in the Color Balance dialog boxes.

Since each set of 256 possibilities is constructed from only 8 bits, we can construct 16,777,216 color combinations from 24 bits. Therefore, the RGB color spectrum is called "24-bit color." That is computer-speak jargon you will encounter when shopping for scanners.