

# Grayscale



|                          |                              |                              |                            |                               |                                |
|--------------------------|------------------------------|------------------------------|----------------------------|-------------------------------|--------------------------------|
| R94 G28 B13<br>Dark Skin | R241 G148 B108<br>Light Skin | R97 G119 B171<br>Blue Sky    | R 90 G103 B39<br>Foliage   | R164 G131 B196<br>Blue Flower | R140 G253 B153<br>Bluish Green |
| R255 G116 B21<br>Orange  | R7 G47 B122<br>Purplish Blue | R222 G29 B42<br>Moderate Red | R 69 G0 B68<br>Purple      | R187 G255 B19<br>Yellow Green | R255 G142 B0<br>Orange Yellow  |
| R0 G0 B142<br>Blue       | R64 G173 B38<br>Green        | R203 G0 B0<br>Red            | R255 G217 B0<br>Yellow     | R207 G3 B124<br>Magenta       | R0 G148 B189<br>Cyan           |
| R255 G255 B255<br>White  | R249 G249 B249<br>5% Gray    | R180 G180 B180<br>35% Gray   | R117 G117 B117<br>65% Gray | R53 G53 B53<br>85% Gray       | R0 G0 B0<br>Black              |

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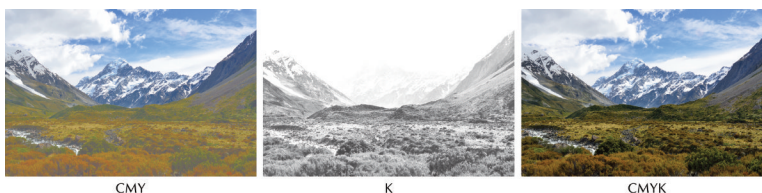
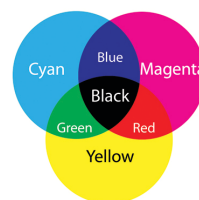
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# It's All Black & White

First white. It is surprising how often the forums get questions about white. Simply put, white is the paper color. In CMYK printing, also known as 4-color printing, white in non-printing. This is why KDP et al. print color only on various grades of white paper, and not cream; however, grayscale images can be printed on both cream and white stock.

As for black . . .

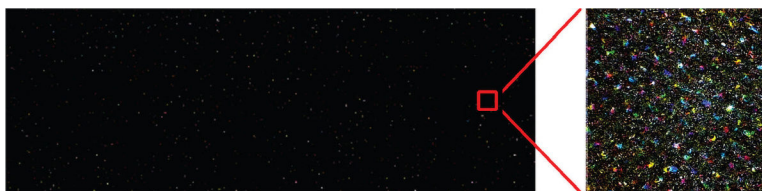
**Black**, as in 100% black ink, is one of the four process colors. In the CMYK color space model, being subtractive, CMY produces black. Color film, for example, is CMY. In practice, color printing requires a black for several reasons: The inks are not quite pure enough to produce a true black, and by using black, shadow detail is enhanced.



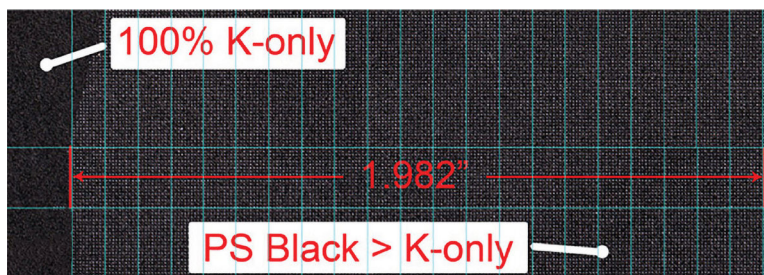
In graphics programs, the standard 100% black only (C00 M00 Y00 K100) is insufficiently black. Blacks with additional color produce a much darker black, called **rich black**.



Most graphics programs use either Photoshop black or something close to it for color images. When it is printed in color it looks like this:



But when it is converted to grayscale it is screened:



This screening may or may not be a problem, but you should be aware of it. In tests I ran last year with KDP, black in B&W books was printed with an **FM screen**, which was not as obvious (see the next page).

Our monitors display black as the absence of light; having different blacks can sometimes be difficult to see. This is generally not an amateur problem, because most people simply accept

black as black. But professionals can run into problems. I check both my client's work *and* my own. Here is a panel of rich blacks. On the top row, I've applied a Levels Adjustment layer and pushed the gamma slider to check for different blacks—the various rich blacks *sometimes* print differently. You may or may not see differences between rich blacks; a lot depends on your monitor, but they are obvious when they are adjusted like this.



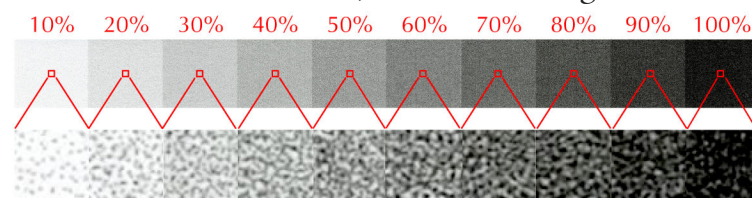
Rich Blacks with Levels/Gamma Adjusted



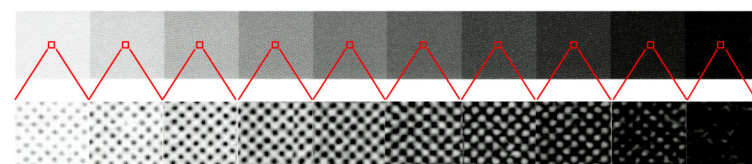
Rich Blacks

The following step wedge shows how black from 10% to 100% actually prints. Again, while these are steps, the use of halftone screens is to represent the gradients found in continuous tone art.

Sometimes we can unwittingly select a black for text that is less than 100%. In this case the text will be screened. Alas, sometimes text gets screened for no reason.



FM Screen



AM Screen

volutpat

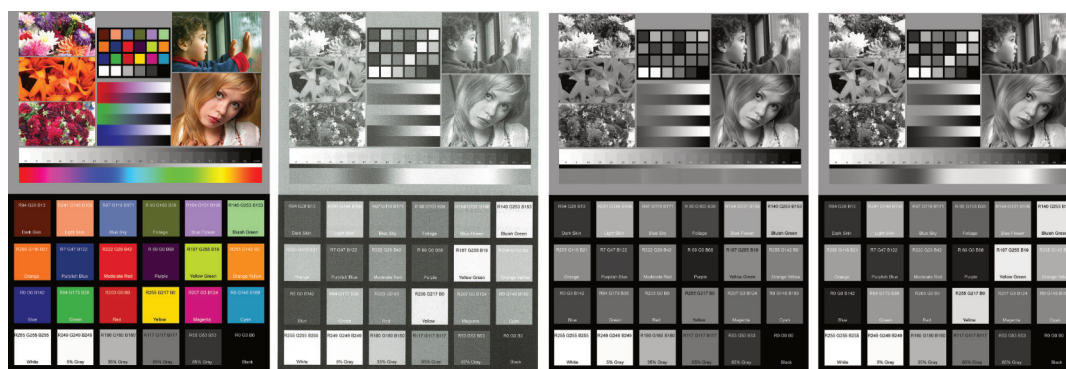
90% K-only FM Acreen

volutpat

90% K-only AM Acreen

Most people do one of two things to have images in B&W books (p-o-d): 1) they use a graphics program's convert-to-grayscale button; or 2) they let the printer convert on the fly. Most of the time, these work moderately well, but a lot depends on the original image.

These are all valid ways to convert color to grayscale, although not all are the best! However, depending on the image you might prefer one of them. In continuous tone images, this might manifest as something just not standing out as much as it should, or standing out too much.

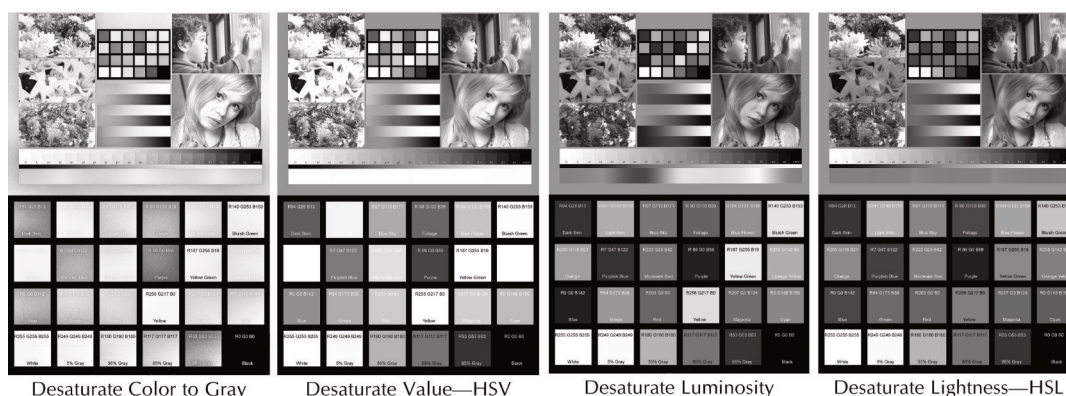


Original Art

Scan of KDP on the Fly  
Grayscale Conversion

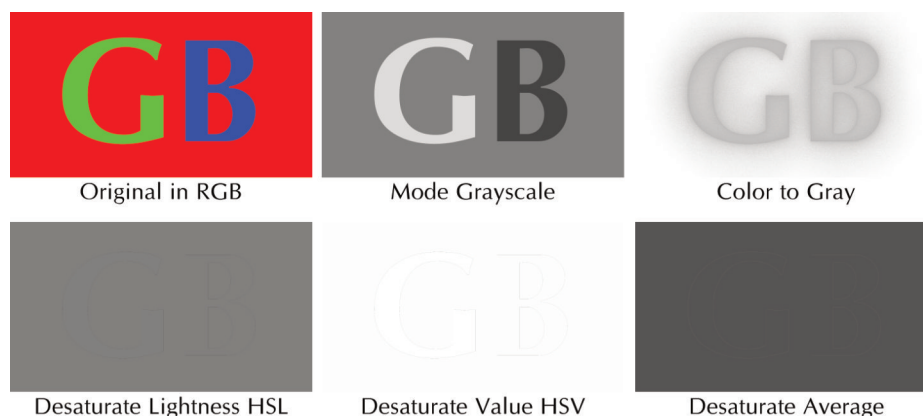
Desaturated HSL

Mode Grayscale



Working with adjustment layers makes converting to grayscale relatively easy. You certainly do not have to remember what method does what. Explaining all this is more complicated than simply playing with the controls available within some of the conversion panels.

But you need to be aware of the worst case conversions:



If your company's logo was a green and blue GB on a red field, the wrong choice would probably annoy your boss!

There is another reason for submitting grayscale images instead of having the color work converted on the fly. I have heard on the forums—although I cannot confirm it—if you upload a color PDF, but choose to have it converted on the fly, the Look Inside the Book feature on Amazon will show color images, not grayscale. This could create customer satisfaction issues.

The following two images were printed from the same art. I did nothing to enhance them. Most fiction is printed on cream paper; therefore, including images in most B&W books is likely to be on cream paper. While the image on the right has less contrast and appears softer—the print-ready art was identical—no one is going to be comparing an image on cream paper to the same image on white paper. The eye gets accustomed to images like this on cream; however, I wouldn't do a collection of B&W photos on cream unless that was the look I was going for.

What is limiting in printing grayscale in B&W books is that there is only one black being printed. Most books of B&W images—not p-o-d—use two blacks minimum, one for the shadow to midtone blacks, and one for the midtone to highlights; often printers will use three blacks, and I know of books of B&W photos printed with as many as ten different ink colors!

## Color to Grayscale

The goal is to find the grayscale conversion that comes the closest to capturing the overall feel of the color image or the feel that you imagine without losing anything important.

Despite the many options, the most common method is simply converting to your software's default Gray mode:

- *Photoshop*—Image > Mode > Grayscale
- *Affinity Photo*—Document > Convert Format > Gray/8
- *GIMP*—Image > Mode > Grayscale
- *xnView*—Image > Convert to gray > 256 Gray
- *IrfanView*—Image > Convert to grayscale

I cannot quantify this, but I would guess that 90% of Color to Grayscale mode changes are acceptable, certainly in the print-on-demand world. This takes half a minute, and I do it as a matter of routine. If this automatic conversion works perfectly, stop there. However, I also experiment with other conversion settings, or make enhancements to the original grayscale.

Although I've shown some extreme examples of conversions that are problematic, here are Photoshop (PS), Affinity Photo (AP), and GIMP grayscales using their Black and White Adjustment Layers. These slider settings may be great places to start tweaking if a conversion needs more adjustments. GIMP does not have adjustment layers, however it has Color > Desaturate > Mono Mixer. There are only red, green, and blue adjustments. If you were going to use the GIMP setting in Affinity or Photoshop, you could set yellow, cyan, and magenta each to either 100% or 66%.

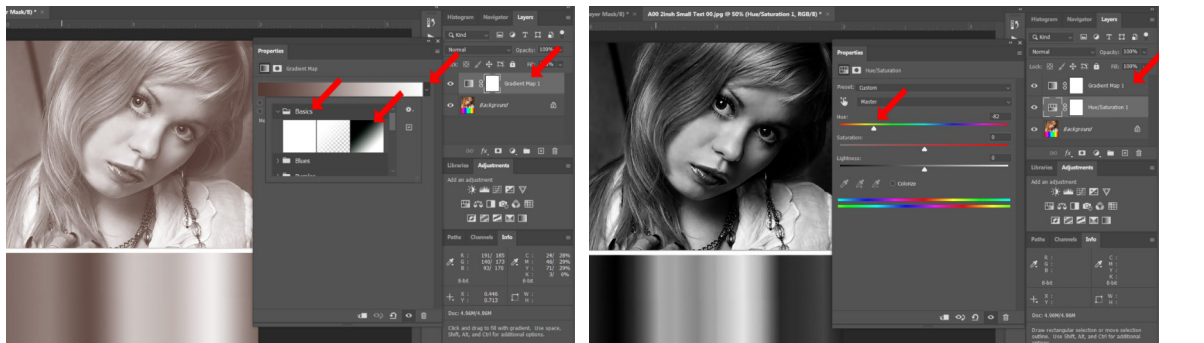
A standard workflow would be to set the sliders to produce the desired grayscale image then

|                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|   |   |   |   |   |   |   |   |   |
|                                                                                     | PS Default                                                                          | PS Lighter                                                                          | PS Darker                                                                           | TV Grayscale                                                                        | Grayscale Mode PS                                                                   | GIMP Default                                                                          | Neutral Density                                                                       | Max White/AF Default                                                                  |
| Red                                                                                 | 40                                                                                  | 50                                                                                  | 30                                                                                  | 30                                                                                  | 50                                                                                  | 33.3                                                                                  | 128                                                                                   | 100                                                                                   |
| Yellow                                                                              | 60                                                                                  | 70                                                                                  | 50                                                                                  | 89                                                                                  | 100                                                                                 | —                                                                                     | 128                                                                                   | 100                                                                                   |
| Green                                                                               | 40                                                                                  | 50                                                                                  | 30                                                                                  | 59                                                                                  | 100                                                                                 | 33.3                                                                                  | 100                                                                                   | 100                                                                                   |
| Cyan                                                                                | 60                                                                                  | 70                                                                                  | 50                                                                                  | 70                                                                                  | 60                                                                                  | —                                                                                     | 100                                                                                   | 100                                                                                   |
| Blue                                                                                | 20                                                                                  | 30                                                                                  | 10                                                                                  | 11                                                                                  | 22                                                                                  | 33.3                                                                                  | 128                                                                                   | 100                                                                                   |
| Magenta                                                                             | 80                                                                                  | 90                                                                                  | 70                                                                                  | 41                                                                                  | 55                                                                                  | —                                                                                     | 100                                                                                   | 100                                                                                   |
|  |  |  |  |  |  |  |  |  |
| AF Colder                                                                           | AF Warmer                                                                           | PS Max Black                                                                        | PS Blue Filter                                                                      | Infrared                                                                            | PS Red Filter                                                                       | PS Hi Cont. Red Filter                                                                | PS Green Filter                                                                       | PS Yellow Filter                                                                      |
| 100                                                                                 | 200                                                                                 | 0                                                                                   | 0                                                                                   | -40                                                                                 | 120                                                                                 | 120                                                                                   | 50                                                                                    | 100                                                                                   |
| 0                                                                                   | 300                                                                                 | 0                                                                                   | 0                                                                                   | 235                                                                                 | 110                                                                                 | 120                                                                                   | 120                                                                                   | 0                                                                                     |
| 200                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 144                                                                                 | -10                                                                                 | -10                                                                                   | 90                                                                                    | 200                                                                                   |
| 200                                                                                 | -100                                                                                | 0                                                                                   | 110                                                                                 | -68                                                                                 | -50                                                                                 | -50                                                                                   | 50                                                                                    | 200                                                                                   |
| 200                                                                                 | -200                                                                                | 0                                                                                   | 110                                                                                 | -3                                                                                  | 0                                                                                   | -50                                                                                   | 0                                                                                     | 200                                                                                   |
| 100                                                                                 | 10                                                                                  | 0                                                                                   | 110                                                                                 | -107                                                                                | 120                                                                                 | 120                                                                                   | 0                                                                                     | 100                                                                                   |

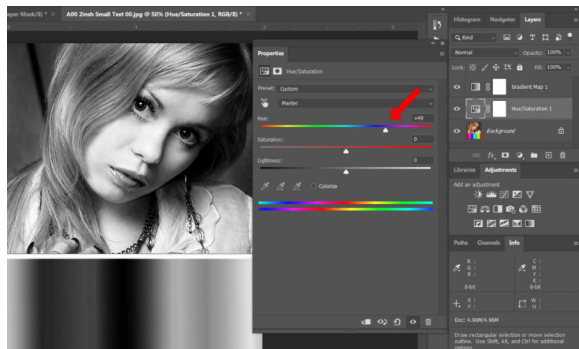
to convert to Grayscale, see bottom of previous page. Do not save to Grayscale at this point because it will convert to the Grayscale Mode, and the slider changes will be lost. I recommend saving the file, then make a copy. In the copy: in Photoshop, Flatten; in Affinity select all the layers, Merge Selected. Once you have a single layer, convert to Grayscale Mode. Although GIMP does not alter the adjusted Grayscale, I err on the safe side in GIMP, and I'll export the image to JPG, then open it and convert it to Grayscale mode.

Another—exciting—approach to converting to grayscale, is to create a Black to White Gradient Map Adjustment Layer. Then manipulate the color using additional adjustment layers—Curves, Levels, Color Balance, Selective Color, etc. The color will often become quite distorted, but idea is to adjust colors that, when remapped, produce effective grayscales. While GIMP does have gradient mapping, Color > Map > Gradient Map, because it is not an adjustment layer, this technique will not work: the Gradient Map needs to be interactive with the color layer.

In Photoshop, when I add a Gradient Map adjustment layer, my program opened to a sepia tone



gradient. Click on the Gradient drop down menu, and in the Basic folder, select the Black to White gradient. This may itself produce an acceptable grayscale conversion; however you can add additional adjustment layers—in the two B&W screen shots, I've added a Hue/Saturation and moved the Hue slider to the left then right—and adjust the color, all the while looking at the grayscale image!



The process is exactly the same for Affinity Photo, except: 1) access the Gradient Map through the Adjustments panel to see the presets; 2) after you create the Gradient Map Adjustment layer, when you add layers to adjust the underlying colors, you'll have to move those layers up or down: these

layers should be child layer(?) under the Gradient Map layers. For me, setting the layer order seems to be somewhat hit or miss: My solution, for example, if I'm adding a Curves layer, I will set the curve to an extreme position, then when I get it situated correctly, because it's effect is so obvious, I can quickly see that it is correctly positioned in the layer stack. Then, I can adjust it as I want. It's not as complicated as it sounds once you set it up.

In both Photoshop and Affinity, you'll want to merge visible, or export to JPG, etc. before converting to Grayscale mode, as I explained above.

The following examples show how different settings produce different results. In half of them, I've applied some adjustments using selections. These are not art-print quality adjustments, certainly not for thumbnails, but you should get an idea of the potentials.



Grayscale Mode



TV Grayscale



Photoshop Grayscale



Neutral Black



Cold Black



Grayscale Mode



TV Grayscale



Photoshop Grayscale



Neutral Black



Cold Black



Using a selection to adjust the t-shirt separately



Grayscale Mode



TV Grayscale



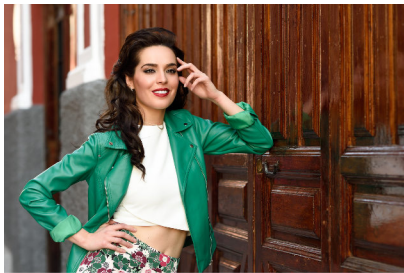
Photoshop Grayscale



Neutral Black



Cold Black



Grayscale Mode



TV Grayscale



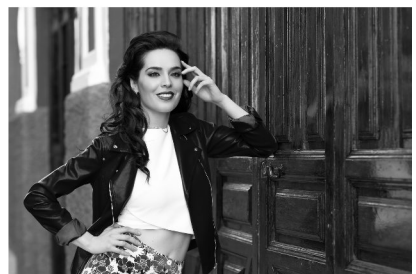
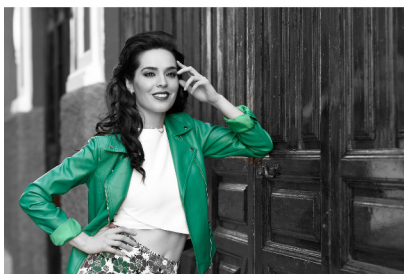
Photoshop Grayscale



Neutral Black



Cold Black



Using a selection to adjust the coat separately



Grayscale Mode



TV Grayscale



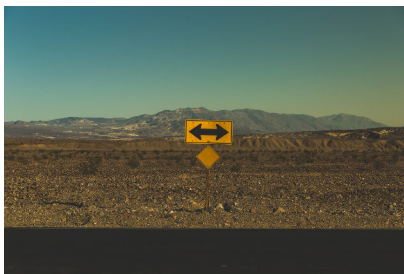
Photoshop Grayscale



Neutral Black



Cold Black



Grayscale Mode



TV Grayscale



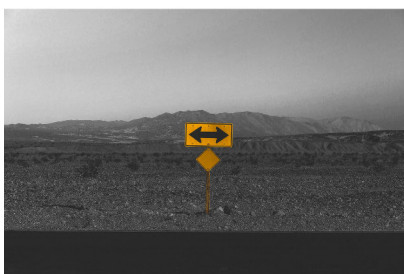
Photoshop Grayscale



Neutral Black



Cold Black



Using a selection to adjust the sign separately



Grayscale Mode

TV Grayscale



Photoshop Grayscale

Neutral Black

Cold Black



Grayscale Mode

TV Grayscale



Photoshop Grayscale

Neutral Black

Cold Black



Using selections to adjust the several buildings separately

If you convert to grayscale, you can still make adjustments: Levels, Curves, etc. I haven't mentioned Sharpening, but Sharpening can be a significant adjustment. These can be applied globally or with selections.

With programs like Photoshop and Affinity Photo, there are adjustment layers.

- Photoshop: Image > Adjustments > Black & White
- Affinity Photo: Adjustments > Black & White

These will give you access to both presets and color sliders.

Affinity Photos also has Adjustment Layers > Filters; Photoshop has Smart Filters. These are applied to a layer, then the layer can be adjusted and readjusted. The more you can do with adjustment layers the better: they are non-destructive and they can be changed a million times (time, patience, and family permitting). I recommend *not* flattening everything—always save and keep your multi-layered working file(s)—but exporting the final image to JPG.

You can save your favorite settings as presets, which is convenient.

*To summarize:* Most images can be converted to grayscale automatically, look good, and print well. In fact, KDP will convert color to grayscale on the fly. The results compare favorably with simply converting with the grayscale button in your graphics program. I do not know this for sure—while you can convert color to grayscale on the fly, the Look Inside the Book feature on Amazon's book pages will show color. Because this could be misleading, this alone is a big reason for doing the conversion yourself, presuming that is true.

As the examples show, there are differences between the various ways to convert to grayscale. Some are big, some are small. Conversions can also be done selectively. Using selections can make huge differences. The preceding eight examples probably took two hours, which included finding the pictures at Pixabay, planning the basic pattern, and working on each example. Making selections and adjusting them did not take a lot of time, probably no more than half an hour in total.

If you have lots of images in your book, you could also make your book with color art, and convert to PDF. Then convert the entire PDF to grayscale in Acrobat.

What you decide to do depends on your images, your goals, and your time. Obviously, experience counts, but converting to grayscale is not hugely technical. You also don't need Photoshop. Affinity Photo (currently \$70) does a great job, as does GIMP, which is free (although it doesn't permit working in CMYK).







